FLUXNET-CH4: A global, multi-ecosystem dataset and analysis of methane seasonality from freshwater wetlands

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Abstract. Methane (CH_4) emissions from natural landscapes constitute roughly half of global CH_4 contributions to the atmosphere, yet large uncertainties remain in the absolute magnitude and the seasonality of emission quantities and drivers. Eddy covariance (EC) measurements of CH_4 flux are ideal for constraining ecosystem-scale CH_4 emissions due to quasi-continuous and high temporal resolution of CH_4 flux measurements, coincident carbon dioxide, water, and energy flux measurements, lack of ecosystem disturbance, and increased availability of datasets over the last decade. Here, we 1) describe the newly published dataset, FLUXNET-CH4 Version 1.0, the first, open source global dataset of CH_4 EC measurements (available at https://fluxnet.org/data/fluxnet-ch4-community-product/). FLUXNET-CH4 includes half-hourly and daily gap-filled and non gap-filled aggregated CH_4 fluxes and meteorological data from 79 sites globally: 42 freshwater wetlands, 6 brackish and saline wetlands, 7 formerly drained ecosystems, 7 rice paddy sites, 2 lakes, and 15 uplands. Then, we 2) evaluate FLUXNET-CH4 representativeness for freshwater wetland coverage globally, because the majority of sites in FLUXNET-CH4 Version 1.0 are freshwater wetlands which are a substantial source of total atmospheric CH_4 emissions; and 3) provide the first global estimates of the seasonal variability and seasonality predictors of freshwater wetland CH_4 fluxes. Our representativeness analysis suggests that the freshwater wetland sites in the dataset cover global wetland bioclimatic attributes (encompassing energy, moisture, and vegetation-related parameters) in arctic, boreal, and temperate regions, but only sparsely cover humid tropical regions. Seasonality metrics of wetland CH_4 emissions vary considerably across latitudinal bands. In freshwater wetlands (except those between 20° S to 20° N) the spring onset of elevated CH_4 emissions starts three days earlier, and the CH_4 emission season lasts 4 days longer, for each degree C increase in mean annual air temperature. On average, the spring onset of increasing CH_4 emissions lags soil warming by one month, with very few sites experiencing increased CH_4 emissions prior to the onset of soil warming. In contrast, roughly half of these sites experience the spring onset of rising CH_4 emissions prior to the spring increase in gross primary productivity (GPP). The timing of peak summer CH_4 emissions does not correlate with the timing for either peak summer temperature or peak GPP. Our results provide seasonality parameters for CH_4 modeling, and highlight seasonality metrics that cannot be predicted by temperature or GPP (i.e., seasonality of CH_4 peak). FLUXNET-CH4 is a powerful new resource for diagnosing and understanding the role of terrestrial ecosystems and climate drivers in the global CH_4 cycle; and future additions of sites in tropical ecosystems and site-years of data collection will provide added value to this database. All seasonality parameters are available at https://doi.org/10.5281/zenodo.4672601. Additionally, raw FLUXNET-CH4 data used to extract seasonality parameters can be downloaded from https://fluxnet.org/data/fluxnet-ch4-community-product/, and a complete list of the 79 individual site data DOIs is provided in Table 2 in the Data Availability section of this document.

1 Introduction

Methane (CH_4) has a global warming potential that is 28 times larger than carbon dioxide (CO_2) on a 100-year time scale (Myhre et al., 2013), and its atmospheric concentration has increased by >1000 ppb since 1800 (Etheridge et al., 1998). While atmospheric CH_4 concentrations are substantially lower than those of CO_2, CH_4 has contributed 20-25% as much radiative forcing as CO_2 since 1750 (Etminan et al., 2016). Despite its importance to global climate change, natural CH_4 sources and sinks remain poorly constrained, and with uncertain attribution to the various biogenic and anthropogenic sources (Saunois et al., 2016, 2020). Bottom-up and top-down estimates differ by 154 Tg/yr (745 versus 591 Tg/yr, respectively); much of this difference arises from natural sources (Saunois et al., 2020). Vegetated wetlands and inland water bodies account for most natural CH_4 emissions, as well as the majority of uncertainty in bottom-up emissions estimates (Saunois et al., 2016). Better diagnosis and prediction of terrestrial CH_4 sources to the atmosphere requires high frequency and continuous measurements of CH_4 exchange across a continuum of time (hours to years) and space (meters to kilometers) scales.

Tower-based eddy covariance (EC) measurements provide ecosystem-scale CH_4 fluxes at high temporal resolution across years, are coupled with measurements of key CH_4 drivers such as temperature, water and recent substrate input (inferred from CO_2 flux), and thus help constrain bottom-up CH_4 budgets and improve CH_4 predictions. Although EC towers began measuring CO_2 fluxes in the late 1970s (Desjardins 1974; Anderson et al., 1984), and some towers began measuring CH_4 in the 1990s (Verma et al., 1992), most CH_4 flux EC measurements began within the last decade (2010s). Given that many EC CH_4 sites are relatively new, the flux community has only recently compiled them for global synthesis efforts (e.g., Chang et al., in press) and is still working to standardize CH_4 flux measurements and establish gap-filling protocols (Nemitz et al., 2018; Knox et al., 2019). Furthermore, the growth of EC networks for CH_4 fluxes has sometimes taken place in a relatively *ad hoc* fashion, often at sites that were already measuring CO_2 fluxes or where higher CH_4 fluxes were expected, potentially introducing bias. The representativeness and spatial distribution of CO_2 flux tower networks have been assessed to evaluate its ability to upscale fluxes regionally (Hargrove et al., 2003; Hoffman et al., 2013; Papale et al., 2015; Villarreal et al., 2018, 2019) and globally (Jung et al., 2009; 2020). However, a relatively sparse coverage of CH_4 flux towers prompts the question of how well the current observation network provides a sufficient sampling of global or ecosystem-specific bioclimatic conditions.

Broad-scale wetland CH_4 seasonality estimates, such as when fluxes increase, peak, and decrease and the predictors of seasonality, remain relatively unconstrained across wetlands globally. These key seasonality metrics vary considerably across high-emitting systems such as wetlands and other aquatic systems (Desjardins, 1974; Dise, 1992; Melloh and Crill 1996; Wik et al., 2013; Zona et al., 2016; Treat et al., 2018). Few continuous CH_4 flux datasets across representative site-years make it difficult to establish trends in seasonal dynamics, though monthly or annually aggregated estimates of CH_4 fluxes from different seasons do exist for high latitudes (Zona et al., 2016; Treat et al., 2018). Seasonal variability in freshwater wetland CH_4 fluxes is expected to be driven by changes in air and soil temperature, soil moisture (including water table dynamics), and recent carbon substrate availability, which influence the rates of CH_4 production and consumption (Lai, 2009; Bridgham et al., 2013; Dean et al., 2018). Temperature has widely been found to strongly affect CH_4 flux (Chu et al., 2014; Yvon-Durocher et al., 2014; Sturtevant et al., 2016), but the relationship is complex (Chang et al., 2020) and varies seasonally (Koebsch et al., 2015; Helbig et al., 2017). CH_4 flux is also driven by inundation depth since anoxic conditions are typically necessary for methanogenesis (Lai, 2009; Bridgham et al., 2013), though CH_4 production under bulk-oxic conditions has been observed (Angle et al., 2017). Substrate availability influences CH_4 production potential and is linked with gross primary productivity (GPP) because recent photosynthate fuels methanogenesis though this relationship can vary by ecosystem type, plant functional type and biome (Megonigal et al., 1999; Chanton et al., 2008; Hatala et al., 2012; Lai et al., 2014; Malhotra and Roulet, 2015; Sturtevant et al., 2016). In process models, the seasonality of CH_4 emissions from wetlands globally is primarily constrained by inundation (Poulter et al., 2017), with secondary within-wetland influences from temperature and availability of carbon (C) substrates (Melton et al., 2013; Castro-Morales et al., 2018). Bottom-up and top-down global CH_4 estimates continue to disagree on total CH_4 flux magnitudes and seasonality, including the timing of annual peak emissions (Spahni et al., 2011; Saunois et al., 2020). Thus, the variability and predictors of wetland CH_4 seasonality globally remain a knowledge gap that high-frequency and long-term EC data can help fill.

Here, we first describe Version 1.0 of the FLUXNET-CH4 dataset (available at https://fluxnet.org/data/fluxnet-ch4-community-product/). Version 1.0 of the dataset expands and formalizes the publication of data scattered among regional flux networks as described previously in Knox et al. (2019). FLUXNET-CH4 includes half-hourly and daily gap-filled and non gap-filled aggregated CH_4 fluxes and meteorological data from 79 sites globally: 42 freshwater wetlands, 6 brackish and saline wetlands, 7 formerly drained ecosystems, 7 rice paddy sites, 2 lakes, and 15 upland ecosystems. FLUXNET-CH4 includes an additional 2 wetland sites (RU-Vrk and SE-St1), but they are not available under the CC BY 4.0 data policy and thus are excluded from this analysis. Since the majority of sites in FLUXNET-CH4 Version 1.0 (hereafter referred to solely as "FLUXNET-CH4") are freshwater wetlands, which are a substantial source of total atmospheric CH_4 emissions, we use the subset of data from freshwater wetlands to evaluate the representativeness of freshwater wetland coverage in the FLUXNET-CH4 dataset relative to wetlands globally, and provide the first assessment of global variability and predictors of freshwater wetland CH_4 flux seasonality. We quantify a suite of CH_4 seasonality metrics and evaluate temperature and GPP (a proxy for recent substrate input) as predictors of seasonality across four latitudinal bands (northern, temperate, subtropical, and tropical). Due to a lack of high-temporal resolution water table data at all sites, our analyses are unable to evaluate the critical role of water table on CH_4 seasonality. Here we provide parameters for better understanding and modeling seasonal variability in freshwater wetland CH_4 fluxes and generate new hypotheses and data resources for future syntheses.

2. Methods

2.1 FLUXNET-CH4 dataset

2.1.1 History and data description

The FLUXNET-CH4 dataset was initiated by the Global Carbon Project (GCP) in 2017 to better constrain the global CH_4 budget (https://www.globalcarbonproject.org/methanebudget/index.htm). Beginning with a kick off meeting in May 2018 in Washington DC, hosted by Stanford University, we coordinated with the AmeriFlux Management Project, the European Ecosystem Fluxes Database, and the ICOS Ecosystem Thematic Centre (ICOS-ETC) to avoid duplication of efforts, as most sites are part of different regional networks (albeit with different data products). We collected and standardized data for FLUXNET-CH4 with assistance from the regional flux networks, AmeriFlux's "Year of Methane", FLUXNET, the EU's Readiness of ICOS for Necessities of Integrated Global Observations (RINGO) project, and a U.S. Geological Survey Powell Center working group. FLUXNET-CH4 is a community-led project, so while we developed it with assistance from FLUXNET, we do not necessarily use standard FLUXNET data variables, formats, or methods.

FLUXNET-CH4 includes gap-filled half-hourly CH_4 fluxes and meteorological variables. Gaps in meteorological variables (TA - air temperature, SW_IN - incoming shortwave radiation, LW_IN - incoming longwave radiation, VPD - vapor pressure deficient, PA - pressure, P - precipitation, WS - wind speed) were filled with the ERA-Interim (ERA-I) reanalysis product (Vuichard and Papale, 2015). We used the REddyProc package (Wutzler et al., 2018) to filter flux values with low friction velocity (u_*) based on relating nighttime u_*, to fill gaps in CO_2, latent heat, and sensible heat fluxes, and to partition net CO_2 fluxes into gross primary production (GPP) and ecosystem respiration (RECO) using both the daytime (Lasslop et al., 2010) and nighttime (Reichstein et al., 2005) approaches. Data gaps of CH_4 flux were filled using artificial neural network (ANN) methods first described in Knox et al. (2015) and in Knox et al. (2019), and summarized here in Sect. 2.1.2. Gap-filled data for gaps exceeding two months are provided and flagged for quality. Please see Table B1 for variable description and units, as well as quality flag information. For the seasonality analysis in this paper we excluded data from gaps exceeding two months, and we encourage future users of FLUXNET-CH4 to critically evaluate gap-filled values from long data gaps before including them in analyses (Dengel et al., 2013; Kim et al., 2020).

In addition to half-hourly data, the FLUXNET-CH4 Version 1.0 release also contains a full set of daily mean values for all parameters except wind direction and precipitation. Daily precipitation is included as the daily sum of the half-hourly data, and daily average wind direction is not included.

2.1.2 Gap-filling methods and uncertainty estimates

As described in Knox et al. (2015) and in Knox et al. (2019), the ANN routine used to gap-fill the CH_4 data was optimized for generalizability and representativeness. To avoid biasing the ANN toward environmental conditions with typically better data coverage (e.g., summer-time and daytime measurements), the explanatory data were divided into a maximum of 15 clusters using a k-means clustering algorithm. Data used to train, test, and validate the ANN were proportionally sampled from these clusters. For generalizability, the simplest ANN architecture with good performance (<5% gain in model accuracy for additional increases in architecture complexity) was selected for 20 extractions of the training, test, and validation data. Within each extraction, each tested ANN architecture was reinitialized 10 times, and the initialization with the lowest root-mean-square-error was selected to avoid local minima. The median of the 20 predictions was used to fill each gap. A standard set of variables available across all sites was used to gap-fill CH_4 fluxes (Dengel et al., 2013), which included the previously mentioned meteorological variables TA, SW_IN, WS, PA, and sine and cosine functions to represent seasonality. These meteorological variables were selected for their relevance to CH_4 exchange and were gap-filled using the ERA-I reanalysis data. Other variables related to CH_4 flux (e.g., water table depth [WTD] and soil temperature [TS]) were not included as explanatory variables as they were not available across all sites or had large gaps that could not be filled using the ERA-I reanalysis data (Knox et al., 2019). The ANN gap- filling was performed using MATLAB (MathWorks 2018, version 9.4.0).

While the median of the 20 predictions was used to fill each gap, the spread of the predictions was used to provide a measure of uncertainty resulting from the ANN gap-filling procedure. Specifically, the combined annual gap-filling and random uncertainty was calculated from the variance of the cumulative sums of the 20 ANN predictions (Knox et al., 2015; Anderson et al., 2016; Oikawa et al., 2017). The (non-cumulative) variance of the 20 ANN predictions was also used to provide gap-filling uncertainty for each half-hourly gap-filled value. While this output is useful for data-model comparisons, it cannot be used to estimate cumulative annual gap-filling error because gap-filling error is not random, which is why the cumulative sums of the 20 ANN predictions are used to estimate annual gap-filling error.

Random errors in EC fluxes follow a double exponential (Laplace) distribution with the standard deviation varying with flux magnitude (Richardson et al., 2006; Richardson et al., 2012). For half-hourly CH_4 flux measurements, random error was estimated using the residuals of the median ANN predictions, providing a conservative "upper limit" estimate of the random flux uncertainty (Moffat et al., 2007; Richardson et al., 2008). The annual cumulative uncertainty at 95% confidence was estimated by adding the cumulative gap-filling and random measurement uncertainties in quadrature (Richardson and Hollinger, 2007; Anderson et al., 2016). Annual uncertainties in CH_4 flux for individual site-years are provided in Table B2. Throughout this paper, we include uncertainties on individual site years when discussing single years of data. In sites with multiple years of data, we report the standard deviation of the multiple years.

2.1.3 Dataset structure and site metadata

FLUXNET-CH4 contains two comma-separated data files per site at half-hourly and daily resolutions which are available for download at https://fluxnet.org/data/fluxnet-ch4-community-product/, along with a file containing select site metadata. Each site has a unique FLUXNET-CH4 DOI. All data from the 79 sites used in this analysis are available under CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/) copyright license (FLUXNET-CH4 has an additional 2 sites available under the FLUXNET Tier 2 license (https://fluxnet.org/data/data-policy/), though these sites are not included in our analysis).

Metadata (Table B3) include site coordinates, ecosystem classification based on site literature, presence/absence and dominance for specific vegetation types, and DOI link, as well as calculated data such as annual and quarterly CH_4 flux values. FLUXNET-CH4 Version 1.0 sites were classified based on site-specific literature as fen, bog, swamp, marsh, salt marsh, lake, mangrove, rice paddy/field, wet tundra, upland, or drained ecosystems that previously could have been wetlands, seasonally flooded pastures, or agricultural areas. To the extent possible, we followed classification systems of previous wetland CH_4 syntheses (Olefeldt et al., 2013; Turetsky et al., 2014; Treat et al., 2018). Drained systems are former wetlands that have subsequently been drained but may maintain a relatively shallow water table, which can contribute to occasional methane emissions, although we do not have specific water table depth information at all drained sites. Upland ecosystems are further divided into alpine meadows, grasslands, needleleaf forests, mixed forest, crops, tundra, and urban. Freshwater wetland classifications follow hydrological definitions of bog (ombrotrophic), fen (minerotrophic), wet tundra, marshes and swamps, and were designated as per primary literature on the site. For all sites, vegetation was classified for presence or absence of brown mosses (all species from the division Bryophyta except those in the class Sphagnopsida), *Sphagnum* mosses (any species from class Sphagnopsida), ericaceous shrubs, trees (of any height) and aerenchymatous species (mostly Order Poales but includes exceptions). These categories closely follow Treat et al., (2018), except that aerenchymatous species had to be expanded beyond Cyperaceae to incorporate wetlands globally. Presence/absence of vegetation groups was designated based on species lists in primary literature from the site. Out of the vegetation groups present, the dominant (most abundant) group is also reported and is based on information provided by lead site investigators.

In addition to the variable description table (Table B1) and the site metadata (Table B3), we provide several more tables to complement our analysis. Table B4 includes the climatic data used in the representativeness analysis. Table 5 provides seasonality parameters for CH_4 flux, air temperature, soil temperature (from the probe closest to the ground surface), and GPP. For sites with multiple soil temperature probes, the full set of soil temperature parameters are in Table B6. Table B7 contains the soil temperature probe depths. Table B2 contains the annual CH_4 flux and uncertainty. All Appendix B tables are also available at https://doi.org/10.5281/zenodo.4672601.

2.1.4 Annual CH_4 fluxes

Annual CH_4 fluxes were calculated from gap-filled data for site-years with data gaps shorter than two consecutive months, or for sites above 20° N where >2 month data gaps occurred outside of the highest CH_4-emission months of May 1 through October 31. Since we did not sum gap-filled values for >2 month gaps during the winter, annual sums from these years will be an underestimate since winter fluxes can be important (Zona et al., 2016; Treat et al., 2018). Several sites had less than one year of data, and we report gap-filled CH_4 flux annual sums for sites with between six months and one year of data (BW-Gum = 228 days, CH-Oe2 = 200 days, JP-Swl = 210 days, US-EDN = 182 days). While these sums will be an underestimate of annual CH_4 flux since they do not span a full year (and we therefore do not use them in the seasonality analysis), their relative magnitude can still be informative. For example, site JP-SWL is a lake site, and even with less than a year of data the summed CH_4 flux of 66 g C m^{-2} is relatively high (Taoka et al., 2020). In addition to sites with short time series, the annual CH_4 sum for site ID-Pag represents 365 days spanning June 2016 to June 2017.

2.1.5 Subset analysis on freshwater wetland CH_4 flux

In addition to the FLUXNET-CH4-wide description of site class distributions and annual CH_4 fluxes, we also include a subset analysis on freshwater wetlands, given that it is the dominant ecosystem type in our dataset and an important global CH_4 source (Saunois et al., 2016). First, we analyze freshwater wetland representativeness, and subsequently the seasonality of their CH_4 emissions. Freshwater wetlands included in the seasonality and representativeness analysis are indicated in Table B3, column "IN_SEASONALITY_ANALYSIS".

2.2 Wetland representativeness

2.2.1 Principal Component Analysis

To compare the FLUXNET-CH4 site distribution to the global wetland distribution, we evaluated their representativeness in the entire global wetland cover along four bioclimatic gradients. Only freshwater wetland sites were included in this analysis. Coastal sites were excluded because salinity, an important control on CH_4 production, could not be evaluated across the tower network due to a lack of global gridded salinity data (Bartlett et al., 1987; Poffenbarger et al., 2011). The four bioclimatic variables used were: mean annual air temperature (MAT), latent heat flux (LE), enhanced vegetation index (EVI), and simple ratio water index (SRWI; data sources in Table B4). We use EVI because it is a more direct measurement than GPP from global gridded products and is considered a reasonable proxy for GPP (Sims et al., 2006). Together, these environmental variables account for, or are, proxies for key controls of CH_4 production, oxidation at the surface, and transport (Bridgham et al., 2013). We use a principal components analysis (PCA) to visualize the site distribution across the four environmental drivers at once. For this analysis, we consider the annual average bioclimatic conditions over 2003-2015. In the PCA output, we evaluate the coverage of the 42 freshwater sites over 0.25° grid cells containing >5% wetland mean cover in Wetland Area and Dynamics for Methane Modeling (WAD2M; Zhang et al., 2020; Zhang et al., 2021) for the same time period.

2.2.2 Global Dissimilarity and Constituency Analysis

To further identify geographical gaps in the coverage of the FLUXNET-CH4 Version 1.0 network, we quantified the dissimilarity of global wetlands from the tower network, using a similar approach to that taken for CO_2 flux towers (Meyer and Pebesma 2020). We calculated the 4-dimensional Euclidean distance from the four bioclimatic variables between every point at the land surface to every tower location at the FLUXNET-CH4 network. We then divided these distances by the average distance between towers to produce a dissimilarity index. Dissimilarity scores

<1 represent areas whose nearest tower is closer than the average distance among towers, while areas with scores >1 are more distant. Lastly, we identified the importance of an individual tower in the network by estimating the geographical area to which it is most analogous in bioclimate space. We divided the world's land surface according to closest towers in bioclimatic space. The area to which each tower is nearest is defined as the tower's constituency.

2.3 Wetland CH_4 seasonality

To examine freshwater wetland CH_4 seasonality across the global range of sites in FLUXNET-CH4, we extracted seasonality parameters for CH_4, temperature, and GPP using Timesat, a software package designed to analyze seasonality of environmental systems (Jönsson and Eklundh, 2002; Jönsson and Eklundh, 2004; Eklundh and Jönsson, 2015). Timesat calculates several seasonality parameters, including baseline flux, peak flux, and the slope of spring flux increase and fall decrease (Fig. 1). We also calculate parameters such as amplitude (peak flux - baseline, which is the average of spring and fall baselines; ("e" - (("a" + "b")/2) in Fig. 1), and relative peak timing (("g" - "f") / ("h" - "f") in Fig. 1). Timesat uses a double-logistic fitting function to create a series of localized fits centered on data minima and maxima. Localized fits are minimized using a merit function and the Levenberg-Marquardt method (Madsen et al., 2004; Nielsen, 1999). These localized fits are then merged using a global function to create a smooth fit over the full time interval. To fit CH_4 time-series in Timesat, we used gap-filled data after removing gaps exceeding two months. We do not report Timesat parameters when large gaps occur during CH_4 emissions spring increase, peak, or fall decrease.

We estimate 'start of elevated emissions season' when CH_4 emissions begin to increase in the spring ("f" in Fig. 1), and 'end of elevated emissions season' when the period of elevated CH_4 flux ends in the fall ("h" in Fig. 1), as the intercept between the Timesat fitted baseline parameter and shoulder-season slope (similar to Gu et al., 2009). To extract seasonality parameters with Timesat, sites need a sufficiently pronounced seasonality, a sufficiently long time period, and minimal data gaps (we note that while Timesat is capable of fitting two peaks per year, all the freshwater wetland sites have a single annual peak). We excluded site-years in restored wetlands when wetlands were still under construction. Of the 42 freshwater wetland sites in FLUXNET-CH4 Version 1.0, 36 had sufficient data series to extract seasonality parameters. These 36 wetlands had 141 site-years of data total, which we fit with the double-logistic fitting method which followed site data well (representative examples in Fig. 2). For extratropical sites in the Southern Hemisphere, we shifted all data by 182 days so that maximum solar insolation seasonality would be congruent across the globe.

We also used Timesat to extract seasonality metrics for GPP, partitioned using the daytime-based approach (Lasslop et al., 2010) (GPP_DT), air temperature (TA), and soil temperature (TS_1, TS_2, etc). For sites where winter soil temperatures fall significantly below 0 °C, Timesat fits a soil temperature "start of elevated season" date to periods when the soil is still frozen. In order for Timesat to define the soil temperature seasonality within the thawed season, we converted all negative soil temperatures to zero (simply removing these values results in too many missing values for Timesat to fit). Many sites have more than one soil temperature probe, so we extracted separate seasonality metrics from each individual probe (although we used the metrics from the shallowest temperature probe in our analysis). Tables B4 contain the Timesat seasonality parameters used in the seasonality analysis. We did not include water table depth in the seasonality analysis because many sites either lack water table depth measurements or have sparse data.

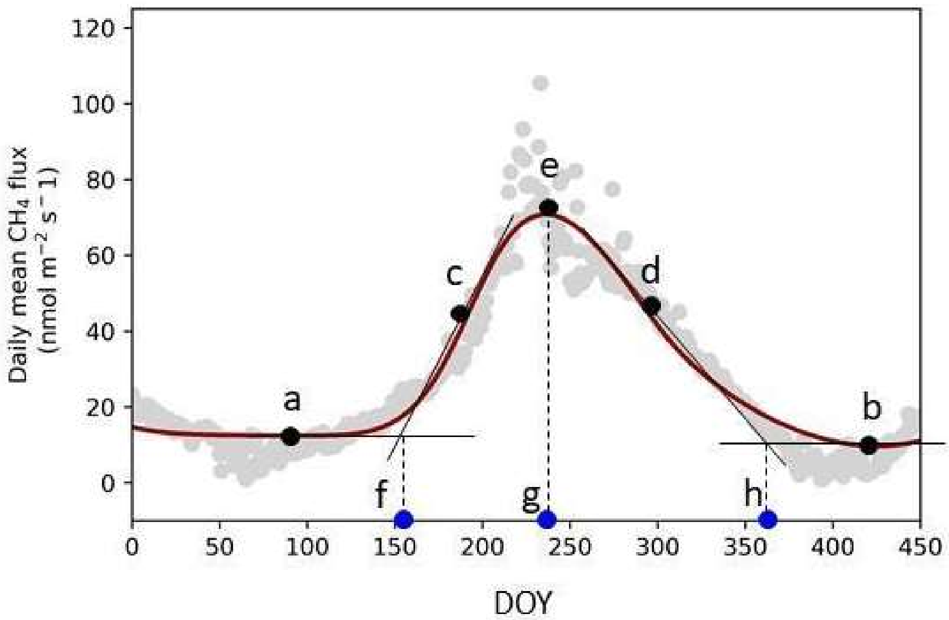

Figure 1: TIMESAT parameter description. (a) and (b) base values (Timesat reports the average of these two values), (c) and (d) slopes of seasonal curves (lines drawn between 20% and 80% of the amplitude), (e) peak value, and day of year (DOY) for the start (f), peak (g), and end (h) of the elevated methane (CH_4) emissions season. Data points are the mean daily gap-filled CH_4 fluxes from site JP-Bby in 2015.

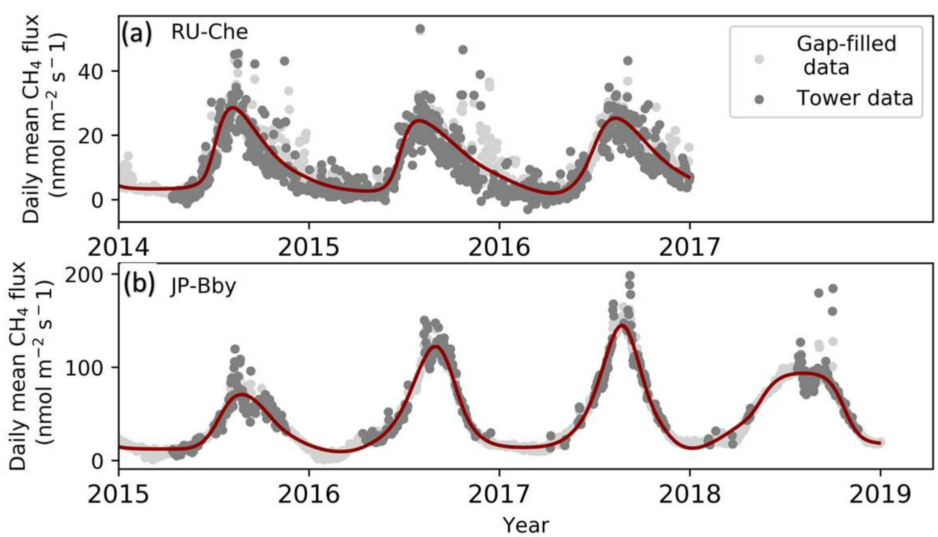

Figure 2: Examples of Timesat fits for two FLUXNET-CH4 sites, (a) RU-Che and (b) JP-Bby. Methane (CH_4) flux data showing daily average flux tower data, with several high outliers excluded to improve the plot (dark gray), gap-filled

values (light gray), and Timesat-fitted curve (dark red line) for sites JP-Bby and RU-Che. Timesat captures the size and shape of peaks (note different scale on y-axes). CH_4 = methane.

We regressed the CH_4 seasonality parameters from Timesat against annual temperature, annual water table depth, and Timesat seasonality parameters for air temperature, soil temperature, and GPP (proxy for recent carbon input available as substrate) using linear mixed-effect modeling with the *lmer* command (with site as a random effect) from the R (R Core Team 2018, version 3.6.2) package lmerTest (Kuznetsova et al., 2017). For these regressions we present the marginal R^2 outputs from *lmer*, which represent the variance explained only by the fixed effects. Mixed-effect modeling was necessary to account for the non-independence between measurements taken at the same site during different years (Zona et al., 2016; Treat et al., 2018). We also compared how seasonality metrics varied across latitudinal bands by dividing sites into northern (> 60° N), temperate (between 40° N and 60° N), subtropical (absolute value between 20° and 40° latitude, with site NZ-KOP being the only Southern hemisphere site), and tropical (absolute value below 20°). Site-year totals for the northern, temperate, subtropical, and tropical bands were n = 57, 36, 39, and 9, respectively. We used the Kruskal-Wallis test to establish whether groups (either across quarters or across latitudes) were from similar distributions, and the post hoc multiple comparison "Dwass, Steel, Critchlow, and Fligner" procedure for inter-group comparisons. Kruskal-Wallis and post-hoc tests were implemented in Python Version 3.7.4, using stats from scipy for Kruskal-Wallis and posthoc_dscf from scikit_posthocs.

We also compared quarterly CH_4 flux sums by dividing data into quarterly periods: January/February/March (JFM), April/May/June (AMJ), July/August/September (JAS), and October/November/December (OND). For the sake of simplicity, we chose to compare quarterly periods rather than site-specific growing/non-growing season periods so that all time periods would be the same length. Quarterly sums were computed from the gap-filled CH_4 fluxes when the longest continuous data gap within the quarter did not exceed 30 days, leading to site-year counts of 67, 92, 95, 72 for JFM, AMJ, JAS, and OND, respectively. We compared quarterly CH_4 fluxes across latitudinal bands both for the total CH_4 flux, and for the quarterly percentage of the annual CH_4 flux. Quarterly statistics were also conducted with the Kruskal-Wallis test and the post hoc multiple comparison "Dwass, Steel, Critchlow, and Fligner" procedure implemented in Python. Quarterly values are provided in Table B3, and the sum of mean quarterly CH_4 flux does not always equal mean annual CH_4 flux because some quarters either do not have data, or have data gaps that exceed 30 days.

3. Results and Discussion

3.1 FLUXNET-CH4 dataset

3.1.1 Dataset description

Version 1.0 of the FLUXNET-CH4 dataset contains 79 unique sites, 293 total site-years of data, and 201 site-years with sufficient data to estimate annual CH_4 emissions. A synthesis paper, published prior to the public data release of FLUXNET-CH4 Version 1.0, had 60 unique sites and 139 site-years with annual CH_4 emissions estimates (Knox et al., 2019). Freshwater wetlands make up the majority of sites (n = 42), and the dataset also includes five salt marshes and one mangrove wetland. Notable additions to FLUXNET-CH4 from the previous unpublished dataset used in Knox et al., (2019) include six tropical sites (between 20° S and 20° N), including one site in South America, two sites in southern Africa, and three sites in Southeast Asia. The 15 upland sites include six needleleaf forests, three crop sites (excluding rice), two alpine meadows, one grassland, one mixed forest, one tundra, and one urban site. The drained sites represent former wetlands that have been artificially drained for use as grasslands (n = 3) or croplands

(n = 3). FLUXNET-CH4 sites span the globe, though are concentrated in North America and Europe (Fig. 3). Table B3 includes characteristics of all sites in the dataset.

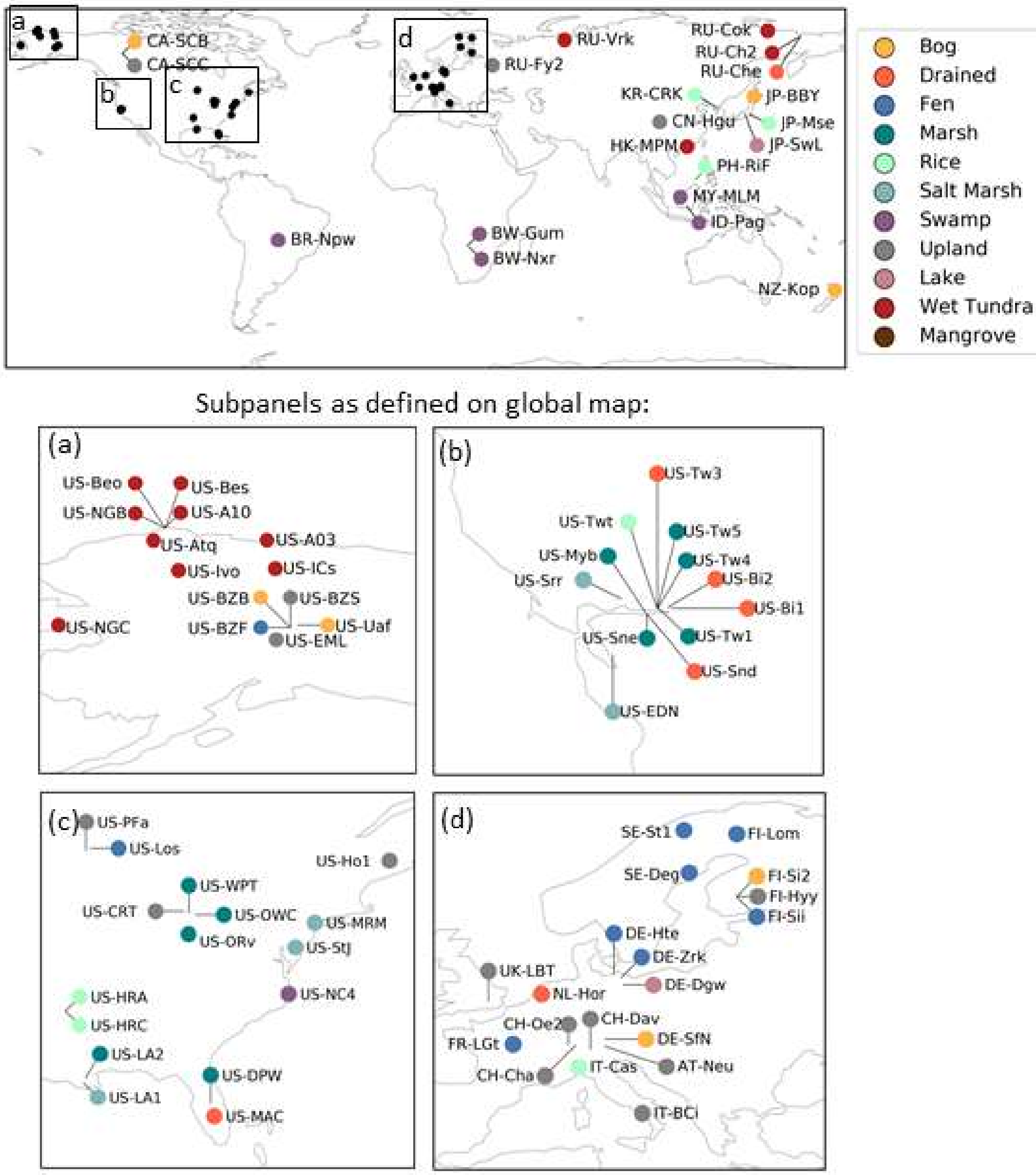

Figure 3. Global map of FLUXNET-CH4 Version 1.0 site locations colored by site type. Insets (a)-(d) show sites that were too closely located to distinguish in the global map.

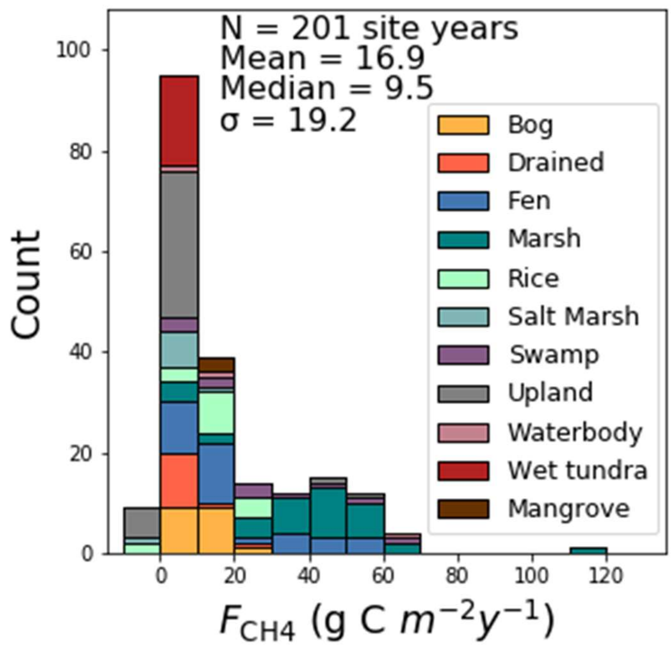

Figure 4. Histogram of annual methane fluxes (F_{CH4}, g C m^{-2} yr^{-1}) grouped by site type.

Sites represent a range of ecosystem types, latitudes, median fluxes, and seasonality patterns (Table 1). Across all FLUXNET-CH4 sites, mean average annual CH_4 flux is positively skewed with a median flux of 9.5 g C m^{-2} yr^{-1}, a mean flux of 16.9 g C m^{-2} yr^{-1}, and numerous annual CH_4 fluxes exceeding 60 g C m^{-2} yr^{-1}. Marshes and swamps have the highest median flux, and upland, salt marsh, and tundra sites have the lowest (Fig. 4). Lake emissions are highly variable due to one high-flux lake site (JP-SWL). Flux data at many sites show strong seasonality in CH_4 emissions, but data coverage is also lower outside the growing season (Table 1). Data coverage is lowest during the JFM quarter (on average 20% of half-hourly time periods contain flux data) reflecting the predominance of Northern hemisphere sites and the practical difficulties in maintaining EC tower sites during colder winter months (Table 1). Bogs, fens, and marshes have pronounced seasonality, with fluxes being highest in the AMJ and JAS quarters. In contrast, CH_4 fluxes from uplands, drained sites, and salt marshes are more uniform and low year-round.

Table 1: Summary table of sites grouped by ecosystem class reporting annual mean flux (Ann_Flux) and standard deviation from inter-annual variability (Ann_Flux_SD), site-years of data, % data cover per quarter, and median (med.) flux across site class. JFM= January, February, March; AMJ = April, May, June; JAS = July, August, September; OND = October, November, December.

	# of Sites	# of Site-Years	Ann_Flux g C m^{-2} $year^{-1}$	Ann_Flux_SD g C m^{-2} $year^{-1}$	JFM cover-age (%)	AMJ cover-age (%)	JAS cover-age (%)	OND cover-age (%)	JFM flux (med.)	AMJ flux (med.)	JAS flux (med.)	OND flux (med.)
Salt marsh	5	10	2.9	4.7	7	42	50	37	1.5	1.7	2.1	1.6
Wet tundra	11	39	3.8	1.8	8	28	40	18	0.4	2.6	8.1	3.2

Upland	15	47	4.0	10.5	23	35	39	28	1.2	0.5	1.4	0.8
Drained	7	20	6.3	7.1	22	39	39	29	4.6	3.6	5.1	3.6
Bog	7	32	10.5	6.4	8	27	37	18	7.2	11.0	24.8	9.5
Mangrove	1	3	11.1	0.5	46	28	30	41	3.2	7.2	22.5	14.1
Rice	7	20	14.4	8.8	16	37	45	27	3.2	11.9	43.1	4.2
Fen	8	40	20.5	16.0	29	43	40	30	2.8	14.2	26.0	6.4
Swamp	6	15	26.4	19.9	24	34	29	19	14.7	24.9	31.0	24.4
Lake	2	4	28.2	33.4	15	13	27	36	0.2	47.6	90.2	40.3
Marsh	10	42	40.8	20.7	22	43	53	30	13.5	55.0	85.8	36.1

3.1.2 Freshwater wetland CH_4 characteristics

The FLUXNET-CH4 Version 1.0 dataset contains 42 freshwater wetlands that span 37°S to 69°N, including bogs, fens, wet tundra, marshes, and swamps, and a range of annual CH_4 emission rates (Fig. 4). The majority of freshwater wetlands in our dataset emit 0-20 g C m^{-2} yr^{-1}, with 10 emitting 20-60 g C m^{-2} yr^{-1}, and one more than 60 g C m^{-2} yr^{-1}. Differences in annual CH_4 flux among wetland types is partially driven by temperature (which is often linked to site type), with mean annual air temperature explaining 51% of the variance between sites (Fig. 5, exponential relationship). The global relationship between annual methane emissions and temperature can be described using a Q_{10} relationship where $Q_{10} = R2/R1^{((T2-T1)/10)}$, with R2 and R1 being the CH_4 emission rates at temperatures T2 and T1, respectively (temperature in degrees C). The Q_{10} based on Fig. 5 data is 2.57. We also note that annual CH_4 flux from individual biomes may have different relationships with temperature, as previous work has shown biome-specific trends in CH_4 flux with environmental drivers (Abdalla et al., 2016). However, there currently are not enough data points in each biome category to compare relationships between mean annual CH_4 flux and temperature. Annual CH_4 flux is not correlated with mean annual water table depth in FLUXNET-CH4, unlike in Knox et al., (2019), which used a subset of the FLUXNET-CH4 sites where CH_4 flux was correlated with water table depth only for sites with water table below ground for 90% of measured days ($r^2 = 0.31$, $p<0.05$, $n = 27$ site years). Freshwater wetland seasonality is further described in Sect. 3.3.

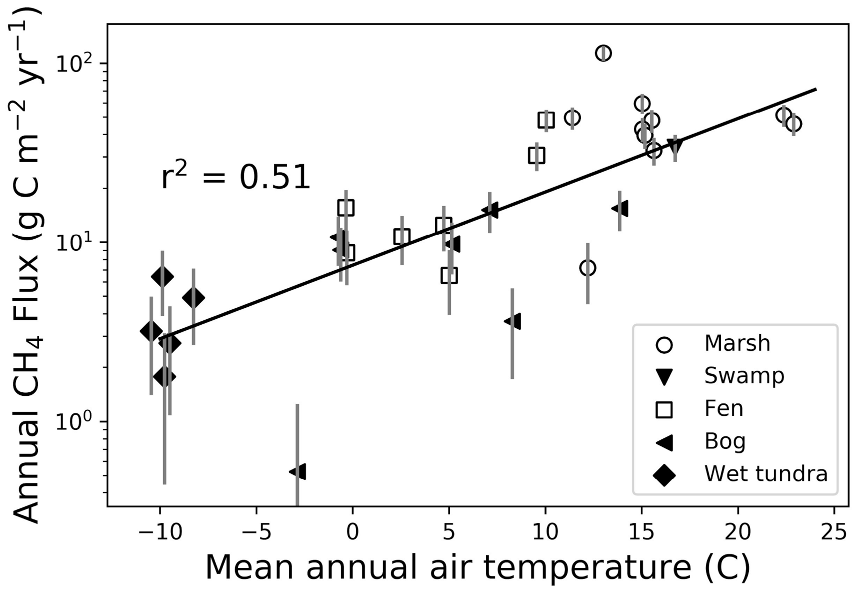

Figure 5: Relationship between mean annual wetland methane (CH_4) flux (g C m^{-2} yr^{-1}, logarithmic scale) and mean annual air temperature (°C) for each freshwater wetland site, with wetland type indicated by symbol. Markers represent individual site means, with vertical error bars representing the standard deviation of interannual variability.

3.1.3 Upland, rice and urban CH_4 characteristics

Upland agricultural sites are characterized by a lack of seasonal pattern in CH_4 emissions, relatively low flux, and sometimes negative daily flux (i.e., CH_4 uptake) averages. All of the upland non-agricultural sites in FLUXNET-CH4 Version 1.0 are net (albeit weak) CH_4 sources except for the needleleaf forest site US-Ho1, which has mean annual CH_4 flux of -0.1 ± 0.1 g C m^{-2} yr^{-1} (see Table B3 for site acronyms and metadata). The average agricultural site emissions are 1.3 ± 0.8 g C m^{-2} yr^{-1} and non-agricultural site emissions are 1.6 ± 1.2 g C m^{-2} yr^{-1} across sites.

Rice sites (n = 7) have average annual emissions across all sites of 16.7 ± 7.7 g C m^{-2} yr^{-1} and are characterized by strong seasonal patterns, with either one or more CH_4 emission peaks per year depending on the number of rice seasons and field water management. One peak is typically observed during the reproductive period for the continuously flooded sites with one rice season (i.e., US-HRC, JP-MSE) (Iwata et al., 2018; Runkle et al., 2019; Hwang et al., 2020). For sites with only one rice season but with single or multiple drainage and re-flooding periods, a secondary peak may appear before the reproductive peak (i.e., KR-CRK, IT-Cas, and US-HRA; Meijide et al., 2011; Runkle et al., 2019; Hwang et al., 2020). Two reproductive peaks appear for sites with two rice seasons (i.e., PH-RiF), and each reproductive peak may be accompanied by a secondary peak due to drainage events (Alberto et al., 2015). Even sites with one, continuously flooded rice season may experience a second peak if the field is flooded during the fallow season to provide habitat for migrating birds (e.g., US-Twt; Knox et al., 2016).

The dataset has one year of urban data from site UK-LBT in London, England. UK-LBT observes CH_4 fluxes from a 190 m tall communications tower in the center of London, and has a mean annual CH_4 flux of 46.5 ± 5.6 g C m^{-2} yr^{-1}. This flux is more than twice as high as the mean annual CH_4 flux across all FLUXNET-CH4 sites, 16.9 g C m^{-2} yr^{-1}. The London site has higher CH_4 emissions in the winter compared to summer, which is attributed to a seasonal increase in natural gas usage (Helfter et al., 2016.)

3.1.4 Saltwater and mangrove wetland CH_4 characteristics

Three of the five saltwater wetlands in FLUXNET-CH4 (US-Edn, US-MRM, and US-Srr) have a very low mean annual CH_4 flux (see Table B2 for individual site-year CH_4 flux sums and associated uncertainty) and minimal seasonality. Two other FLUXNET-CH4 saltwater sites (US-La1 and US-StJ) have significantly higher fluxes, with annual sums of 12.6 ± 0.6 and 9.6 ± 1.0 g C m^{-2} yr^{-1}, respectively, while the mangrove site HK-MPM has annual mean fluxes of 11.1 ± 0.5 g C m^{-2} yr^{-1}. This range of CH_4 fluxes across different saltwater ecosystems could be valuable for exploring the effect of salinity and different biogeochemical pathways of CH_4 production, oxidation, and transport of CH_4 (Bartlett et al., 1987; Poffenbarger et al., 2011). Saltwater wetlands along the coast have unique CH_4 dynamics attributable to the presence of abundant electron acceptors, most importantly sulphates, which inhibit methanogenesis (Pattnaik et al., 2000; Mishra et al., 2003; Weston et al., 2006), but at low concentrations can have no effect (Chambers et al., 2011) or even increase methanogenesis (Weston et al., 2011). In fact, estuarine wetlands with moderate salinity can still be significant sources of CH_4 (Liu et al., 2020). Even under sulfate-rich conditions, high CH_4 production can be found via methylotrophic methanogenesis (Dalcin Martins et al. 2017; Seyfferth et al., 2020,) or because the processes of sulfate reduction and methanogenesis are spatially separated (Koebsch et al., 2019). Consequently, representing the biophysical drivers of ecosystem-scale CH_4 fluxes in non-freshwater wetlands is challenging and may represent a combination of competing or confounding effects (Vazquez-Lule and Vargas 2021).

3.2 Wetland Representativeness

We evaluated the representativeness of freshwater wetland sites in the FLUXNET-CH4 Version 1.0 dataset against wetlands globally based on bioclimatic conditions of our sites. When evaluating bioclimatic variables individually, the distribution across the network was significantly different from the global distribution (alpha > 0.05; two-tailed Kolmogorov-Smirnov tests; see Table B4).

When considering the four bioclimatic variables, MAT, LE, EVI and SRWI in a PCA, we found that our tower network generally samples the bioclimatic conditions of global wetland cover, but some noticeable gaps remain (Fig. 6). Three clusters of the world's wetland-dense regions are identified, but are not equally sampled by the network. A cluster of low temperature wetlands is sampled by a large number of high-latitude sites. The other two wetland clusters are not as well sampled: a high temperature and LE cluster is represented only by two towers (ID-Pag and MY-MLM), while drier and temperate and subtropical wetlands including large swathes of the Sahel in Africa only have a site in Botswana (BW-Npw) as their closest-analog tower.

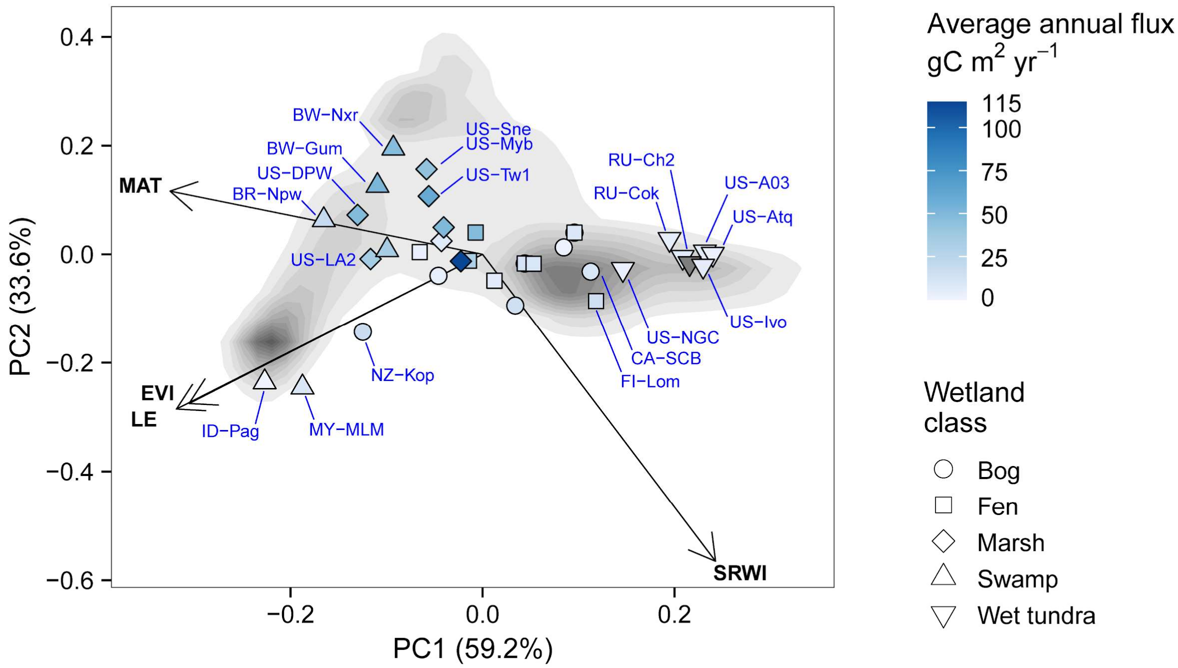

Figure 6: Principal Component Analysis displaying the distribution of freshwater wetland sites (points) along the two main principal components together accounting for 91.9% of variance. Tower sites are represented as points with shapes indicating their wetland type and color shade representing the annual methane (CH_4) flux (gray points represent sites for which <6 months of flux data was available to estimate annual budget). Sites codes are labeled in blue text for selected sites deviating from average conditions. Loading variables are represented by the arrows: mean annual temperature (MAT), simple ratio water index (SRWI), latent heat flux (LE) and enhanced vegetation index (EVI). The background shades of gray are a qualitative representation of the density of global wetland pixels and their distribution in the PCA climate-space, with darker color representing higher densities (excluding Greenland and Antarctica). Only grid cells with >5% average wetland fraction according to the WAD2M over 2000-2018 are included (Zhang et al., 2020). The loading variables are represented by the arrows: mean annual temperature (MAT), simple ratio water index (SRWI), latent heat flux (LE) and enhanced vegetation index (EVI).

Evaluating the bioclimatic dissimilarity of global wetlands to the FLUXNET-CH4 network shows the least captured regions are in the tropics (Fig. 7A). Sparse coverage in the tropics also means that the few existing towers occupy a critical place in the network, particularly as tropical wetlands are the largest CH_4 emitters (Bloom et al., 2017; Poulter et al., 2017). Highly dissimilar wetlands are limited in extent and distributed across all latitudes, but the average dissimilarity is higher in north temperate (55° to 65°) and tropical (-5° to 5°) latitudes (Fig. 7B). To evaluate the importance of individual towers in the network, we estimated the geographical area to which it is most analogous in bioclimate-space (Fig. 7C). We found that some towers have disproportionately large constituencies (i.e., wetland areas that share the same closest bioclimatic analog tower). Towers in Indonesia (ID-Pag), Brazilian Pantanal (BR-Npw), and Botswana floodplains (BW-Nxr) represent the closest climate analog for much of the tropics (678, 300 and 284 thousand km^2, respectively) while CA-SCB represents a vast swath (291 thousand km^2) of boreal/arctic regions (Fig. 7D).

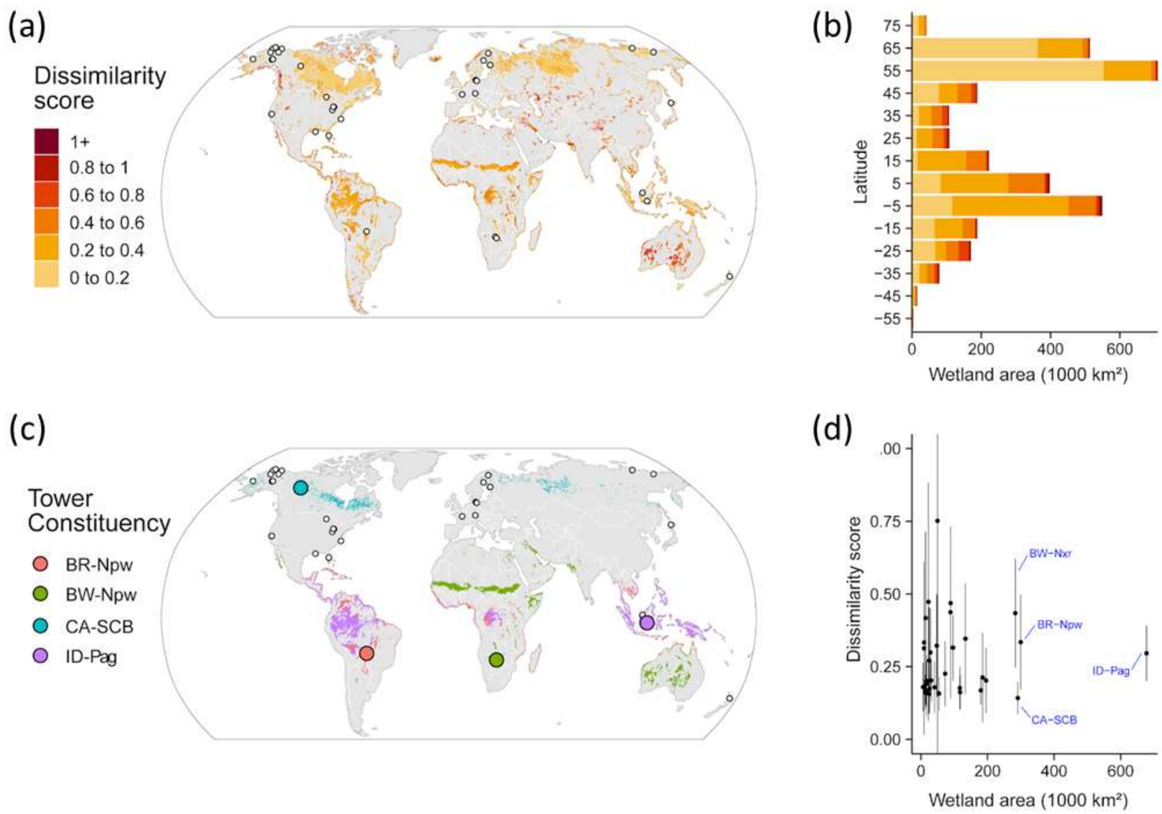

Figure 7: (a) Distance in bioclimatic space between global land surface and the FLUXNET-CH4 Version 1.0 tower network (gray areas indicate no mapped wetlands). The Euclidean distance was computed on the four bioclimatic variables and was then standardized by the average distance within-network. Most of the land surface has a dissimilarity score lower than 1, meaning these areas are closer than the average tower distance (lower dissimilarity score means a similar bioclimate to that represented by towers in the network). However, this pattern reflects more the sparsity of the tower network than a similarity of the land surface to the network. Areas with <5% coverage by wetlands were excluded to focus on wetland-dense regions. (b) Latitudinal distribution of dissimilarity score, (c) Map of the four largest tower constituencies, (d) Scatterplot of wetland area in each tower constituency plotted against the average dissimilarity score (point) and +/- standard deviation (error bar).

Our assessment of wetland CH_4 tower coverage determines the ability of our dataset to represent global wetland distributions and highlights some clear representation gaps in the network, particularly in tropical and humid regions. Other geographic regions such India, China and Australia, where towers exist but are not included in the current network should be prioritized when expanding the network, even though they are not among the most distant areas to the current network. Similar representativeness assessments have been developed for CO_2 tower networks to identify gaps and priorities for expansion (Jung et al., 2009). To improve the geographic coverage of the network for representing global-scale fluxes, locations for new tower sites can be targeted to cover bio-climatically distant areas from the current network (Villarreal et al., 2019). Candidate regions for expansion that are both high CH_4 emitting (Saunois et al., 2020) as well as located in under-sampled climates are: African Sahel, Amazon basin, Congo basin, South-East Asia. Climatic conditions over boreal and arctic biomes are generally better represented (primarily at lower elevations), but there is scope to expand the network in wetland-dense regions like the Hudson Bay Lowlands and Northern Siberian Lowlands. Moreover, establishing sites in other ecosystem types, especially lakes and reservoirs (see Deemer et al. 2016, Bastviken et al. 2011, Matthews et al. 2020) in most climatic zones would help capture CH_4 fluxes from these ecosystems.

Understanding the representativeness of the network is essential when inferring general patterns of flux magnitude, seasonality, and drivers from the tower data (Villarreal et al., 2018). We produced a first-order representativeness of average bioclimatic conditions, but temporal representativeness (across seasons, climate anomalies and extreme events) is particularly needed given the episodic nature of CH_4 fluxes (Chu et al., 2017; Mahecha et al., 2017; Göckede et al., 2019).

Assessing representation of wetland CH_4 sites is complicated by the fact that wetlands occupy only a fraction of most landscapes (except wetland dense regions such as Northern Siberian Lowlands, Hudson Bay Lowlands, Congo basin, etc.) and that not all relevant factors affecting CH_4 production and consumption could be considered in our analysis. For instance, our assessment of representation did not consider wetland types as such maps are limited by the inherent difficulties in remotely sensing wetland features (Gallant, 2015). The attribution of representativeness is further complicated by the fact that many EC tower locations are subject to small-scale variability within the field of view, or footprint, of the sensor. Consequently, the individual time steps within EC flux time series may represent a mixture of different wetland types, or different fractions of wetland contribution to the total CH_4 flux, varying with wind direction, atmospheric stability, or season (Chu et al 2021). This further complicates upscaling efforts. Additionally, this representativeness analysis did not apply weights to the drivers to reflect their varying influence on CH_4 flux. Such weights can be included in future versions as they are generated by a cross-validated machine learning approach (Jung et al., 2020). Future efforts could include the dissimilarity index from this analysis as a metric of extrapolation in a CH_4 flux upscaling effort.

3.3 Freshwater wetland flux seasonality

3.3.1 Seasonal flux comparisons by latitudinal bands

CH_4 flux and seasonality varied substantially across latitudinal bands (northern, temperate, subtropical, and tropical) (Fig. 8). Annual CH_4 fluxes for temperate, and subtropical sites were significantly higher than for northern sites (8.7 ± 5.0, 29.7 ± 25.2, 40.1 ± 14.6, and 24.5 ± 20.7 g C m^{-2} yr^{-1} for northern, temperate, subtropical, and tropical, respectively, $p<0.0001$ using Kruskal Wallis and post hoc comparisons; Fig. 8a), and tropical sites were similar to all other latitudinal bands likely because of their small sample size. The ratio of seasonal amplitude to peak flux provides a measure of the relative seasonal increase in emissions compared with baseline, where a ratio of zero indicates no seasonal change in amplitude, a ratio of one indicates the off-season flux is zero, and values over one means the off-season baseline CH_4 fluxes were negative (i.e., uptake). Average amplitude to peak flux ratios were similar across all latitudinal bands (0.9 ± 0.1, 0.9 ± 0.1, 0.9 ± 0.1, 1.0 ± 0.7, for northern, temperate, subtropical, and tropical, respectively; Fig. 8b). The spring increase in CH_4 emissions began later in northern sites compared with temperate and subtropical sites (end of May versus April, respectively, $p=0.001$; Fig. 8c), while tropical sites vary widely in elevated emission season start date. Northern sites also had shorter elevated CH_4 flux season lengths (138 ± 24 days) compared to temperate sites (162 ± 32 days), and both were shorter than subtropical sites (209 ± 43 days; $p<0.0001$; Fig. 8e). On average, CH_4 flux peaked earlier for temperate sites compared to northern ($p = 0.008$) and subtropical sites ($p = 0.02$; mid to late July compared with early August; Fig. 8f), while tropical sites again vary widely. Given their unique seasonality, and low number of site-years ($n = 9$), tropical systems are discussed separately in Sect. 3.3.3, and not included in the comparisons in the remainder of this section. While our results on CH_4 seasonality corroborate expected trends for these latitudinal bands, they provide some of the first estimates of CH_4 seasonality parameters and ranges across a global distribution of sites.

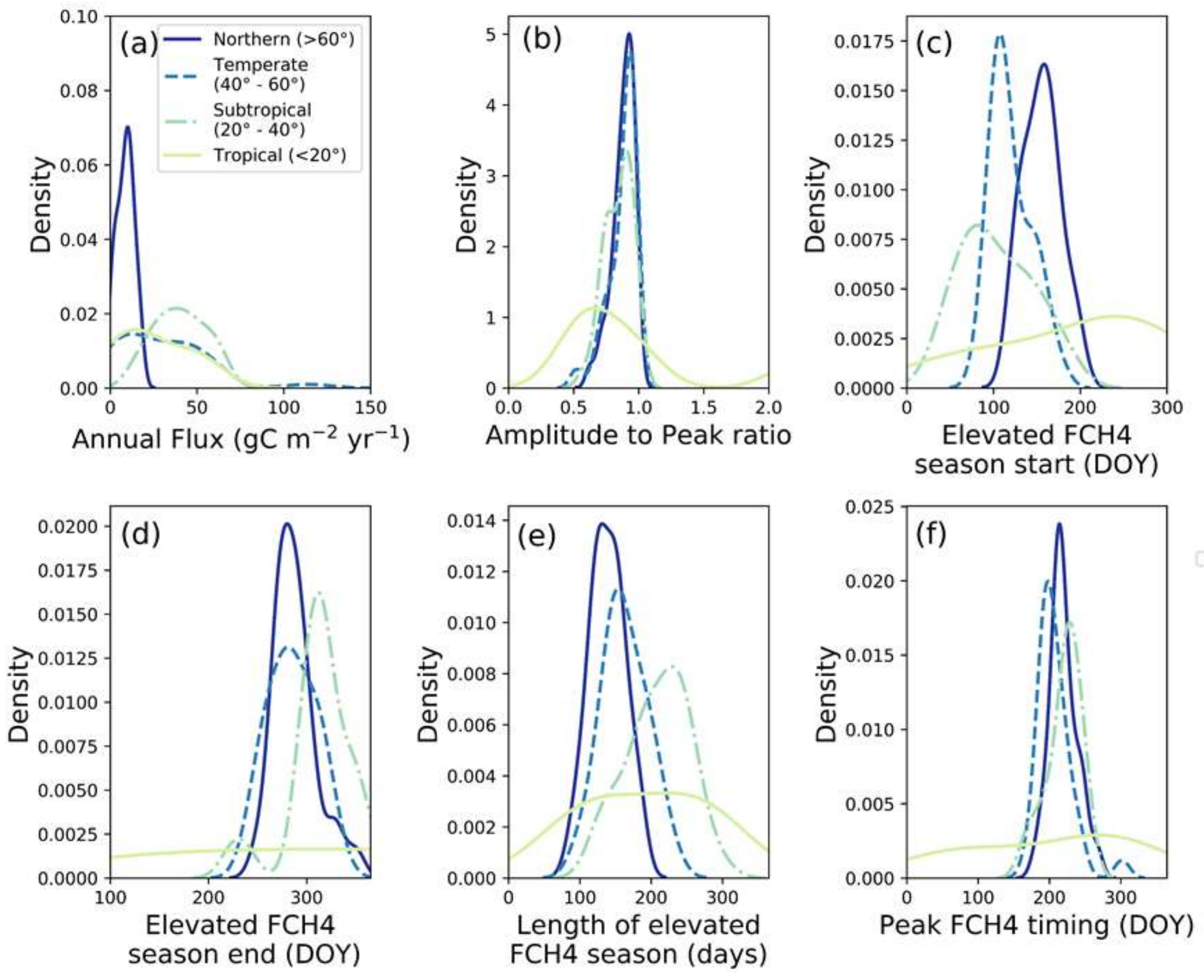

Figure 8: (a) Annual methane (CH_4) flux (g C m^{-2} yr^{-1}), (b) Ratio of seasonal amplitude to seasonal peak, where values of 0 indicate uniform annual CH_4 flux, values of one indicate zero off-season fluxes, and values exceeding one indicate negative off-season fluxes, (c) CH_4 flux (FCH4) elevated emissions season start by day of year (DOY), (d) FCH4 elevated emissions season end by DOY, (e) Length of elevated CH_4 flux season (days), and (f) DOY of peak FCH_4. Northern (dark blue, solid line), Temperate (blue, dashed line), Sub-tropical (green, dot-dash line) and Tropical (light green, solid line) wetlands plotted using the kernel density function. Each panel has lines that represent latitudinal bands as follows: northern (> 60°), temperate (between 40° and 60°), subtropical (between 20° and 40°), and tropical (< 20°), though the site-year totals vary between these groups (n = 57, n = 36, n = 39, and n = 9 respectively). All total CH_4 flux values and elevated season start values are positive, and the apparent continuation of the data distribution into negative values is an artifact of the kernel density function. Southern Hemisphere sites below 20° S were shifted by 182 days to make summer the middle of the year for comparability with Northern Hemisphere sites.

We found that latitudinal groups showed strong differences in absolute CH_4 flux across quarters, and narrower differences in percentage of annual CH_4 flux (Fig. 9a versus 9b). Thus, the AMJ quarter had a similar relative contribution to the annual CH_4 flux across latitudes, regardless of the absolute annual CH_4 flux. CH_4 fluxes (Fig. 9a) were highest during JAS for northern, temperate, and subtropical sites and highest in AMJ and JAS for temperate sites ($p<0.01$). Though CH_4 fluxes in northern sites are most commonly measured during warm summer months (Sachs et al., 2010; Parmentier et al., 2011), fluxes in JFM and OND (50% of the yearly duration) on average make up 18.1 ± 3.6%, 15.3 ± 0.1%, and 31.2 ± 0.1% (northern, temperate, subtropical, respectively) of annual emissions. This pattern indicates that a substantial fraction of annual CH_4 fluxes occurs during cooler months. The contribution of nongrowing season CH_4 emissions to annual CH_4 fluxes has previously been described for arctic and boreal regions (Zona et al., 2016; Treat et al., 2018) and our analysis suggests comparable contributions in temperate and subtropical systems for the same quarterly periods.

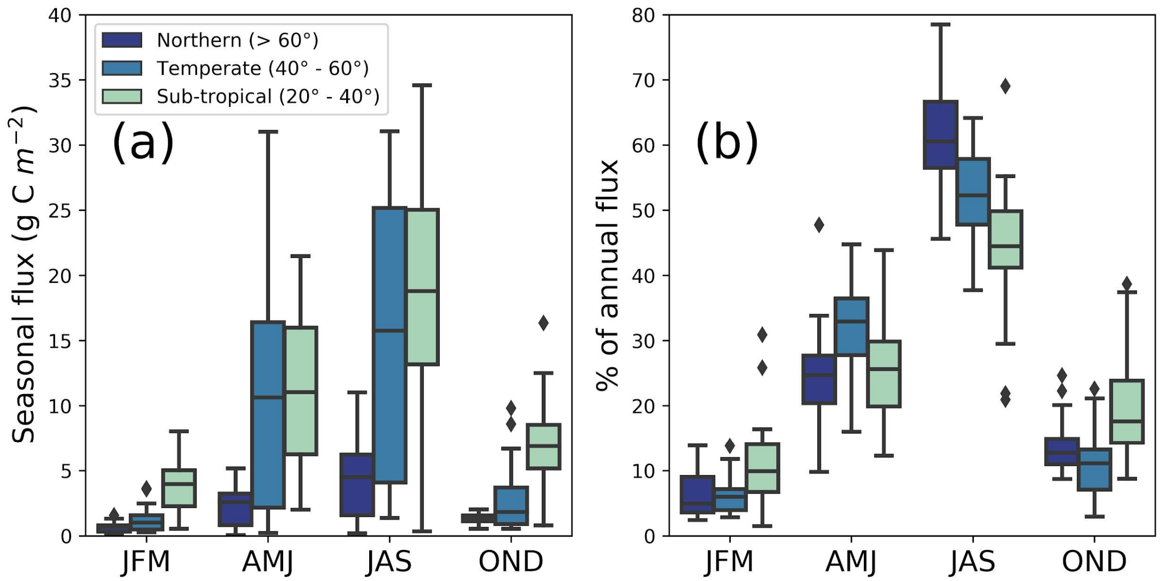

Figure 9: (a) Quarterly contribution to total annual CH_4 flux in g C m^{-2}, and (b) percentage of annual CH_4 flux. Sites were divided into northern (> 60° N), temperate (40° N - 60° N), and subtropical (20° N - 40° N). Quarters with continuous data gaps exceeding 30 days were excluded. We used the following quarterly periods: January/February/March (JFM), April/May/June (AMJ), July/August/September (JAS), and October/November/December (OND). Tropical sites are discussed separately in Sect. 3.3.3 because of their unique seasonality and low number of sites.

3.3.2 Predictors of CH_4 flux phenology

The start of the elevated CH_4 flux season, and how long the elevated flux season lasts, correlated strongly with mean annual air temperature (Fig. 10; $p<0.0001$ for each). Methane flux began to increase roughly two months earlier in the warmest systems (mean annual temperature > 20 °C) compared to the coldest (mean annual temperature near -10 °C), though several of the warmer sites had high variability. Our data suggest that the CH_4 season started 2.8 ± 0.5 days earlier for every degree Celsius increase in mean annual temperature (Fig. 10a). In contrast, the end of the CH_4 emission season was not correlated with mean annual temperature, but a positive trend existed despite high variability in warmest and coldest sites (Fig. 10b). The high variability seen in the end of CH_4 season at northern sites is important to note and would likely be better resolved by incorporating other seasonality or phenological characteristics, such as moisture, active layer depth, and plant community composition (e.g., Kittler et al., 2017). Plants with aerenchymatous tissue, for example, influence the timing of plant-mediated CH_4 flux and are a key source of uncertainty while predicting CH_4 seasonality for northern wetlands (Xu et al., 2016, Kwon et al., 2017). Despite the relative lack of trend with season end date, the season length was still positively correlated with mean annual temperature, with the warmest sites having roughly three more months of seasonally elevated CH_4 emissions than the coldest sites (Fig. 10c). CH_4 season length increased 3.6 ± 0.6 days for every degree Celsius increase in mean annual temperature (note that these relationships are correlations, and we cannot disentangle causality with this analysis). Temperature is highly correlated with other parameters (i.e., radiation, days of snow cover, etc.), so CH_4 flux is also likely to correlate with other environmental parameters.

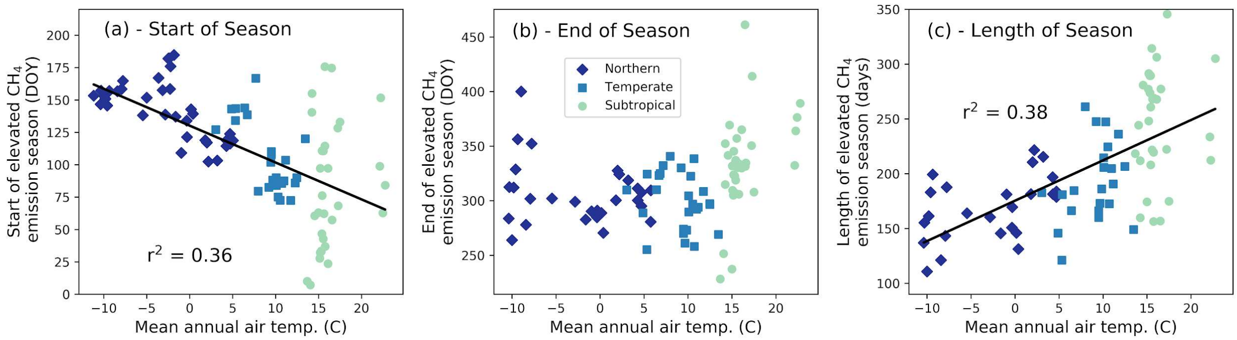

Figure 10. The (a) start of the elevated methane (CH_4) emission season (y = -2.8x + 130, with 'x' in °C and 'y' in day of year (DOY)), (b) the end of the elevated emission season in DOY, and (c) the length of the emission season with mean annual site air temperature (y = 3.6x + 176.6, with 'x' in °C and 'y' in days). Each point represents a site-year of data and all reported r^2 are significant to $p < 0.0001$. Tropical sites are discussed separately in Sect. 3.3.3.

Although the spring onset of increasing CH_4 emissions correlated with mean annual air temperature, on average it lagged the spring increase in the shallowest soil temperatures by 31 ± 40 days (Fig. 11, lag is significantly different than zero, $p < 0.001$), with very few instances of CH_4 emissions beginning before seasonal soil temperatures increase (and by 20 ± 50 days for the deepest temperature probes). In contrast, for roughly half of the sites, CH_4 emission increased prior to seasonal GPP (a proxy for fresh substrate availability) increases. This suggests that the initiation of increased CH_4 fluxes at the beginning of the season was not limited by availability of substrate derived from recent photosynthate. Additionally, the onset of CH_4 fluxes tended to occur closer to the onset of soil temperature increase for cooler temperature sites (sites with later start dates tend to be cooler; Fig. 11a). This result is likely attributable to the direct influence of increased temperature on microbial processes (Chadburn et al., 2020), as well as the indirect influences of snow melt, both via release of CH_4 from the snowpack as well as a higher water table leading to more CH_4 production (Hargreaves et al., 2001; Tagesson et al., 2012; Mastepanov et al., 2013; Helbig et al., 2017). These observed trends hold for the entire temperature or GPP range of freshwater wetland sites, but are not necessarily applicable within individual latitudinal bands.

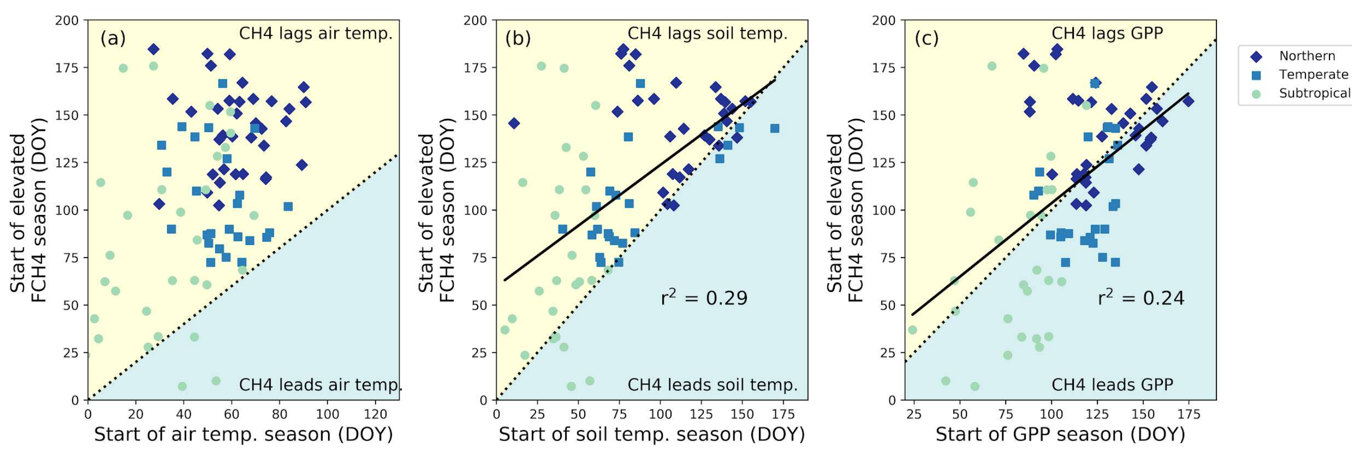

Figure 11. Relationship between the onset of the onset of the methane (CH_4) emission season to (a) the beginning of the air warming by day of year (DOY), (b) soil warming at the shallowest probe depth per site by DOY, and (c) gross primary productivity (GPP) increase for the subset of sites with soil temperature data by DOY. Each point represents a site-year of data. Dashed lines represent a 1:1 relationship, solid lines are significant ($p < 0.05$) regression fits. On average, the CH_4 emission season lags the soil temperature increase by 31 ± 40 days, and is more synchronous with GPP.

In contrast with the CH_4 season-start timing, the timing of the CH_4 peak did not correlate with either the timing of the soil temperature peak or the GPP peak (Fig. A1). For 63% of the sites, the average timing of peak CH_4 emissions lagged the soil temperature peak, and at 83% of the sites average peak CH_4 lagged peak GPP (Fig. A1). Although there was no simple relationship between absolute CH_4 peak timing and the environmental drivers we investigated, there was a correlation ($p = 0.0005$) between the relative timing of peak CH_4 compared to season onset (calculated as described in Section 2.3) and mean annual air temperature (Fig. 12a). For cooler sites, the peak of seasonal CH_4 emissions occurred closer to the onset of the CH_4 emission season than the end of the season, resulting in an asymmetrical seasonal CH_4 flux shape that is illustrated in Fig. 2a. Soil temperature also peaked earlier in the season for cooler wetlands, though the relationship is not as pronounced ($p = 0.009$, Fig. 12b). In contrast, GPP peaked later in the season for cooler wetlands ($p = 0.009$, Fig. 12c). Previous work on Arctic sites (sites US-Ivo, US-Beo, US-Atq, US-Bes, and RU-CH2) highlighted the asymmetrical annual CH_4 peak, with higher fall emissions being attributed to the "zero curtain" period when soil below the surface remains thawed for an extended period of time due to snow insulation (Zona et al., 2016; Kittler et al., 2017). Furthermore, soils can stay above the "zero curtain" range for an extended time into the fall and winter (Helbig et al., 2017), which may also be caused by snow insulation. The rapid onset of emissions in the spring following snowmelt could be attributed to the release of accumulated CH_4 (Friborg et al., 1997), and other high latitude sites have seen similarly sharp increases in CH_4 emissions at snowmelt (Dise, 1992, Windsor, 1992). However, not all studies in high latitudes have observed asymmetrical CH_4 emission peaks, pointing to the inherent complexity of these ecosystems (Rinne et al., 2007; Tagesson et al., 2012).

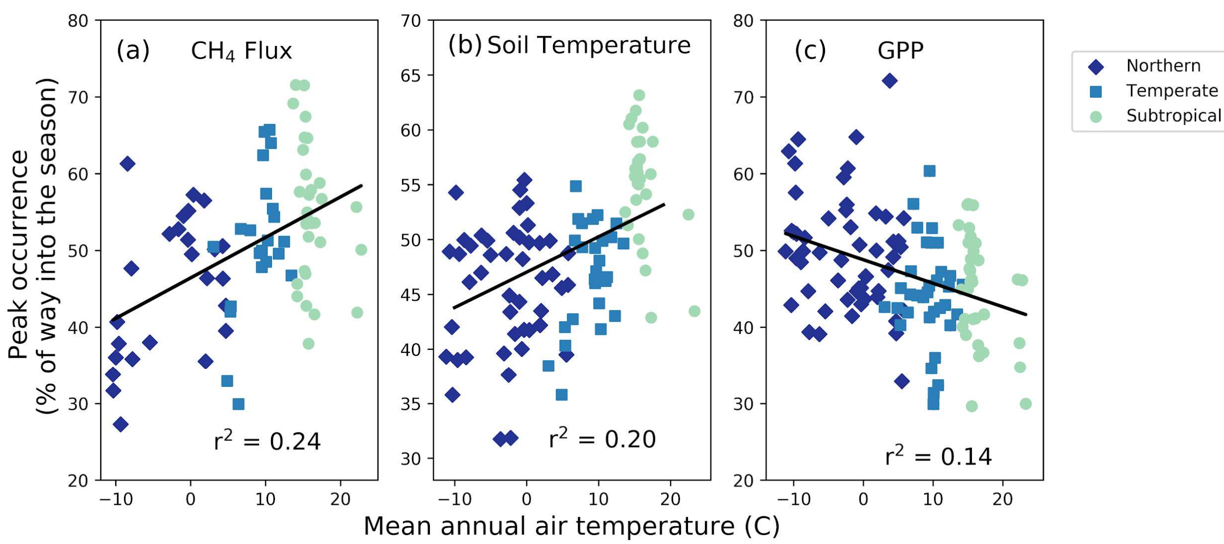

Figure 12. Site-year peak methane (CH_4) emission (a) and peak soil temperature (b) occur earlier in the season for sites with lower mean annual temperatures. (c) Gross primary productivity (GPP) tends to peak earlier in the season for warmer sites, though the trend is weak. All r^2 values are significant at $p < 0.001$. Each point represents a site-year of data.

3.3.3 Uniqueness of tropical wetlands

Tropical wetlands typically do not experience the large swings in temperature and GPP that contribute to CH_4 flux seasonality in temperate and northern sites. Indeed, the relatively constant high temperatures and high GPP in tropical ecosystems may lead to the lower ratio between seasonal amplitude and peak CH_4 flux compared with temperate and northern sites (Fig. 8b). Tropical flux sites have historically been under-studied, leading to a lack of synthesized information about these ecosystems. FLUXNET-CH4 has five tropical wetland sites (latitude between 20° S and 20° N), and one tropical rice site, representing 13 site-years of data. These sites are especially insightful as they provide the first estimates of CH_4 fluxes from tropical, large seasonal floodplain systems.

We found a broad range of annual CH_4 fluxes across tropical sites in FLUXNET-CH4 Version 1.0. Annual CH_4 flux emissions from two Southeast Asian flooded peat forests were relatively low, 0.01 ± 0.1 and 9.5 ± 0.6 g C m^{-2} yr^{-1} for ID-PAG and MY-MLM, respectively, which is consistent with annual CH_4 fluxes measured at another peat forest in Indonesia (Deshmukh et al., 2020). In contrast, mean annual CH_4 flux for a seasonally flooded swamp in the Brazilian Pantanal region (BR-NPW) was over twice as high as MY-MLM, at 19.2 ± 2.5 g C m^{-2} yr^{-1}. Similarly high annual CH_4 fluxes were observed at the two Botswana swamp sites in the Okavango Delta (51.7 ± 10.6 and 47.3 ± 3.7 g C m^{-2} yr^{-1} for BW-GUM and BW-NXR, respectively), one of which is seasonally inundated and surrounded by grassland (BW-NXR) and the other is a permanently flooded lagoon covered in a floating papyrus mat (BW-GUM). The relatively low fluxes found at the two Southeast Asian peat forest sites indicate that these ecosystems may be smaller CH_4 sources than expected, given their location in the humid tropics. Even the higher-emitting tropical sites in Brazil and Botswana are still well within the range of annual CH_4 flux typical in cooler latitudes (Fig. 1).

In addition to having highly variable CH_4 flux magnitudes, the tropical sites differ from each other in their seasonality. CH_4 flux hit a minimum around July for two sites (BW-GUM, latitude 18.965 °S and MY-MLM, latitude 1.46 °N), while CH_4 flux increased through July and the subsequent months for the other Botswana site, BW-NXR (latitude 19.548 °S). Site ID-Pag (latitude 2.32 °S) had minimal seasonality, whereas the flooded forest site in Brazil (BR-NPW, latitude 16.49 °S) had near-zero fluxes from approximately July to January, and consistently high fluxes for the remainder of the year. The rice site PH-RiF (latitude 14.14 °N) had two annual CH_4 flux peaks, which is consistent with some other rice sites and likely reflects management practices. Baseline CH_4 flux values also differed, with the two Botswana sites having the highest off-season fluxes (29 and 133 nmol m^{-2} s^{-1} for BW-NXR and BW-GUM, respectively, estimated by Timesat), MY-MLM having an intermediate baseline CH_4 flux (16 nmol m^{-2} s^{-1}, estimated by Timesat), and the remainder of the sites having essentially zero flux at baseline. While more tropical wetland data will be needed to extract broad scale conclusions about these ecosystems, the six tropical sites in FLUXNET-CH4 provide an important starting point for synthesis studies and highlight tropical wetland CH_4 variability.

4.0 Data Availability

Half-hourly and daily aggregations are available for download at https://fluxnet.org/data/fluxnet-ch4-community-product/, along with a table containing site metadata compiled from Table B3. Variable descriptions and units are provided in Table B1, and at https://fluxnet.org/data/fluxnet-ch4-community-product/. Each site has a unique FLUXNET-CH4 DOI as listed in Table B3. All site data used in this analysis are available under the CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/) copyright policy (2 additional sites in FLUXNET-CH4 are available under the more restrictive Tier 2 data policy, https://fluxnet.org/data/data-policy/; these sites are not used in our analysis). The individual site DOIs are provided below in Table 2. All seasonality parameters used in these analyses are available at https://doi.org/10.5281/zenodo.4672601.

Table 2: Site identification (SITE_ID), data DOI, and DOI reference for each FLUXNET-CH4 site.

SITE_ID	DOI	DOI_REFERENCE
AT-Neu	10.18140/FLX/1669365	Wohlfahrt et al., 2020.
BR-Npw	10.18140/FLX/1669368	Vourlitis et al., 2020.
BW-Gum	10.18140/FLX/1669370	Helfter, 2020a.
BW-Nxr	10.18140/FLX/1669518	Helfter, 2020b.
CA-SCB	10.18140/FLX/1669613	Sonnentag and Helbig, 2020a.
CA-SCC	10.18140/FLX/1669628	Sonnentag and Helbig, 2020b.
CH-Cha	10.18140/FLX/1669629	Hörtnagl et al., 2020a.
CH-Dav	10.18140/FLX/1669630	Hörtnagl et al., 2020b.
CH-Oe2	10.18140/FLX/1669631	Hörtnagl, et al., 2020c.
CN-Hgu	10.18140/FLX/1669632	Niu and Chen, 2020.
DE-Dgw	10.18140/FLX/1669633	Sachs et al, 2020a.
DE-Hte	10.18140/FLX/1669634	Koebsch and Jurasinski, 2020.
DE-SfN	10.18140/FLX/1669635	Klatt et al., 2020.
DE-Zrk	10.18140/FLX/1669636	Sachs et al., 2020b.
FI-Hyy	10.18140/FLX/1669637	Mammarella et al. 2020.
FI-Lom	10.18140/FLX/1669638	Aurela et al., 2020.
FI-Si2	10.18140/FLX/1669639	Vesala et al., 2020a.
FI-Sii	10.18140/FLX/1669640	Vesala et al., 2020b
FR-LGt	10.18140/FLX/1669641	Jacotot et al., 2020.
HK-MPM	10.18140/FLX/1669642	Lai and Liu, 2020.
ID-Pag	10.18140/FLX/1669643	Sakabe et al., 2020.
IT-BCi	10.18140/FLX/1669644	Magliulo et al., 2020.

IT-Cas	10.18140/FLX/1669645	Manca and Goded, 2020.
JP-BBY	10.18140/FLX/1669646	Ueyama et al., 2020.
JP-Mse	10.18140/FLX/1669647	Iwata, 2020a.
JP-SwL	10.18140/FLX/1669648	Iwata, 2020b.
KR-CRK	10.18140/FLX/1669649	Ryu et al., 2020.
MY-MLM	10.18140/FLX/1669650	Tang et al., 2020.
NL-Hor	10.18140/FLX/1669651	Dolman et al., 2020a.
NZ-Kop	10.18140/FLX/1669652	Campbell and Goodrich, 2020.
PH-RiF	10.18140/FLX/1669653	Alberto and Wassmann, 2020.
RU-Ch2	10.18140/FLX/1669654	Goeckede, 2020.
RU-Che	10.18140/FLX/1669655	Merbold et al., 2020.
RU-Cok	10.18140/FLX/1669656	Dolman et al., 2020b.
RU-Fy2	10.18140/FLX/1669657	Varlagin, 2020.
SE-Deg	10.18140/FLX/1669659	Nilsson and Peichl, 2020.
UK-LBT	10.18140/FLX/1670207	Helfter, 2020c.
US-A03	10.18140/FLX/1669661	Billesbach and Sullivan, 2020a.
US-A10	10.18140/FLX/1669662	Billesbach and Sullivan, 2020b.
US-Atq	10.18140/FLX/1669663	Zona and Oechel, 2020a.
US-Beo	10.18140/FLX/1669664	Zona and Oechel, 2020b.
US-Bes	10.18140/FLX/1669665	Zona and Oechel, 2020c.
US-Bi1	10.18140/FLX/1669666	Rey-Sanchez et al., 2020a.
US-Bi2	10.18140/FLX/1669667	Rey-Sanchez et al., 2020b.
US-BZB	10.18140/FLX/1669668	Euskirchen and Edgar, 2020a.
US-BZF	10.18140/FLX/1669669	Euskirchen and Edgar, 2020b.
US-BZS	10.18140/FLX/1669670	Euskirchen and Edgar, 2020c.

US-CRT	10.18140/FLX/1669671	Chen and Chu, 2020a.
US-DPW	10.18140/FLX/1669672	Hinkle and Bracho, 2020.
US-EDN	10.18140/FLX/1669673	Oikawa, 2020.
US-EML	10.18140/FLX/1669674	Schuur, 2020.
US-Ho1	10.18140/FLX/1669675	Richardson and Hollinger, 2020.
US-HRA	10.18140/FLX/1669676	Runkle et al., 2020.
US-HRC	10.18140/FLX/1669677	Reba et al., 2020.
US-ICs	10.18140/FLX/1669678	Euskirchen et al., 2020d.
US-Ivo	10.18140/FLX/1669679	Zona and Oechel, 2020d.
US-LA1	10.18140/FLX/1669680	Holm et al., 2020a.
US-LA2	10.18140/FLX/1669681	Holm et al., 2020b.
US-Los	10.18140/FLX/1669682	Desai and Thom, 2020a.
US-MAC	10.18140/FLX/1669683	Sparks, 2020.
US-MRM	10.18140/FLX/1669684	Schafer, 2020.
US-Myb	10.18140/FLX/1669685	Matthes et al., 2020.
US-NC4	10.18140/FLX/1669686	Noormets et al., 2020.
US-NGB	10.18140/FLX/1669687	Torn and Dengel, 2020a.
US-NGC	10.18140/FLX/1669688	Torn and Dengel, 2020b.
US-ORv	10.18140/FLX/1669689	Bohrer and Morin, 2020a.
US-OWC	10.18140/FLX/1669690	Bohrer et al., 2020b.
US-PFa	10.18140/FLX/1669691	Desai and Thom, 2020b.
US-Snd	10.18140/FLX/1669692	Detto et al., 2020.
US-Sne	10.18140/FLX/1669693	Short et al., 2020.
US-Srr	10.18140/FLX/1669694	Windham-Myers et al., 2020.
US-StJ	10.18140/FLX/1669695	Vazquez-Lule and Vargas, 2020.

US-Tw1	10.18140/FLX/1669696	Valach et al., 2020a.
US-Tw3	10.18140/FLX/1669697	Chamberlain et al., 2020.
US-Tw4	10.18140/FLX/1669698	Eichelmann et al., 2020.
US-Tw5	10.18140/FLX/1669699	Valach et al., 2020b.
US-Twt	10.18140/FLX/1669700	Knox et al., 2020.
US-Uaf	10.18140/FLX/1669701	Iwata et al., 2020c.
US-WPT	10.18140/FLX/1669702	Chen and Chu, 2020b.

5.0 Conclusions

The breadth and scope of CH_4 flux data in the FLUXNET-CH4 dataset make it possible to study the global patterns of CH_4 fluxes, particularly for global freshwater wetlands which release a substantial fraction of atmospheric CH_4. To help data users understand seasonal patterns within the dataset, we provide the first global estimates of CH_4 flux patterns and predictors in CH_4 seasonality using freshwater wetland data. In the seasonality analysis, we find that, on average, the seasonal increase in CH_4 emissions begins about three months earlier and lasts about four months longer at the warmest sites compared with the coolest sites. We also find that the beginning of the CH_4 emission season lags the beginning of seasonal soil warming by approximately one month, with almost no instances of CH_4 emissions increasing before temperature increases. Additionally, roughly half the sites have CH_4 emissions increasing prior to GPP increase; highlighting the importance of substrate versus temperature limitations on wetland CH_4 emissions. Furthermore, relative to warmer climates, wetland CH_4 emissions in cooler climates increase faster in the warming season and decrease slower in the cooling season. This phenomenon has previously been noted on a regional scale and we show that it persists at the global scale. Constraining the seasonality of CH_4 fluxes on a global scale can help improve the accuracy of global wetland models.

FLUXNET-CH4 is an important new resource for the research community, but critical data gaps and opportunities remain. The current FLUXNET-CH4 dataset is biased towards sites in boreal and temperate regions, which influence the relationships presented in our analyses. Tropical ecosystems are estimated to account for 64% of potential natural CH_4 emissions (<30° N, Saunois et al., 2020) but only account for 13% of the FLUXNET-CH4 sites in the dataset. Unsurprisingly, tropical sites in our network do not represent the range of bioclimatic wetland conditions present in the tropics. Therefore, while maintaining flux towers in tropical ecosystems is challenging, it is necessary to further constrain the global CH_4 cycle. Coastal wetlands are also poorly represented in FLUXNET-CH4 even though there is evidence of substantial CH_4 emissions from these ecosystems, so better representation across salinity gradients is warranted. Lastly, the average time series for FLUXNET-CH4 Version 1.0 is relatively short, only 3.7 site-years on average compared with 7.2 for CO_2 sites in FLUXNET (Pastorello et al., 2020). Adding additional site-years of data from existing sites, as a complement to adding new sites, will increase the community's ability to explain interannual variability in CH_4 emission and seasonality. Nevertheless, FLUXNET-CH4 is an important and unprecedented resource with which to diagnose and understand drivers of the global CH_4 cycle.

Author contribution

Kyle B. Delwiche oversaw the data release, performed the seasonality analysis, gathered metadata, and prepared the manuscript with contributions from all co-authors. Sara Helen Knox gathered and standardized the data, and gap-filled the CH_4 flux data. Avni Malhotra prepared the manuscript and gathered metadata. Etienne Fluet-Chouinard did the representativeness analysis and prepared the manuscript. Gavin McNicol gathered data and prepared the manuscript. Robert B. Jackson oversaw the data collection, processing, analysis, and release. Danielle Christianson and You-Wei Cheah oversaw the FLUXNET-CH4 dataset release on fluxnet.org. Dario Papale, Eleonora Canfora, and Carlo Trotta did the data collection, curation, and pre-processing for all of the sites outside North and South America. Remaining co-authors contributed eddy-covariance data to FLUXNET-CH4 dataset and/or participated in editing the manuscript.

Competing interests

The authors declare that they have no conflict of interest.

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APPENDIX A

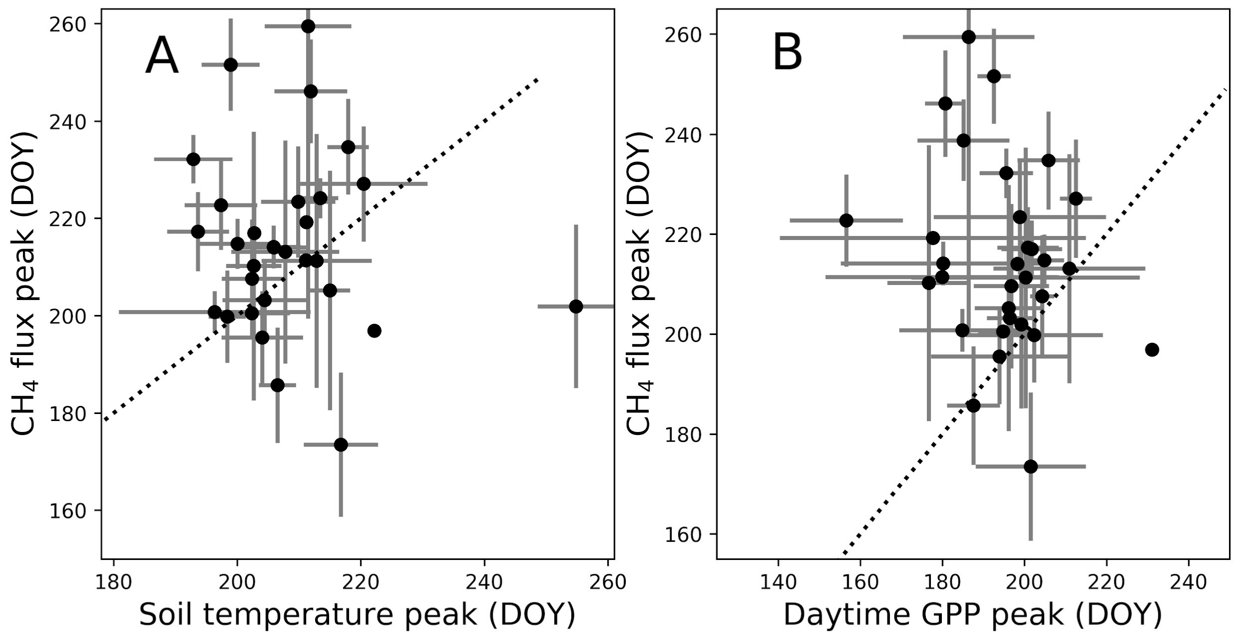

Figure A1: Peak methane (CH_4) flux timing versus peak gross primary productivity (GPP) timing (A) and peak soil temperature timing by day of year (B). Points represent site average and error bars represent standard deviations. Dotted line represents 1:1 relationship.

APPENDIX B

Table B1: Data variable names, descriptions, and units

FLUXNET-CH4 Data Variables

This webpage describes data variables and file formatting for the FLUXNET-CH4 Community Product.

1. Data Variable: Base names

Base names indicate fundamental quantities that are either measured or calculated/derived. They can also indicate quantified quality information.

Table 1. Base names for data variables

Variable	***Description***	***Units***
TIMEKEEPING		
TIMESTAMP_START	ISO timestamp start of averaging period, used in half-hourly data	YYYYMMDDHHMM
TIMESTAMP_END	ISO timestamp end of averaging period, used in half-hourly data	YYYYMMDDHHMM
TIMESTAMP	ISO timestamp used in daily aggregation files	YYYYMMDD
MET_RAD		
SW_IN	Shortwave radiation, incoming	W m-2
SW_OUT	Shortwave radiation, outgoing	W m-2
LW_IN	Longwave radiation, incoming	W m-2
LW_OUT	Longwave radiation, outgoing	W m-2

PPFD_IN	Photosynthetic photon flux density, incoming	µmolPhoton m-2 s-1
PPFD_OUT	Photosynthetic photon flux density, outgoing	µmolPhoton m-2 s-1
NETRAD	Net radiation	W m-2

MET_WIND

USTAR	Friction velocity	m s-1
WD	Wind direction	Decimal degrees
WS	Wind speed	m s-1

HEAT

H	Sensible heat turbulent flux (with storage term if provided by site PI)	W m-2
LE	Latent heat turbulent flux (with storage term if provided by site PI)	W m-2
G	Soil heat flux	W m-2

MET_ATM

PA	Atmospheric pressure	kPa
TA	Air temperature	deg C

VPD	Vapor Pressure Deficit	hPa
RH	Relative humidity, range 0-100	%
MET_PRECIP		
P	Precipitation	mm
PRODUCTS		
NEE	Net Ecosystem Exchange	µmolCO2 m-2 s-1
GPP	Gross primary productivity	µmolCO2 m-2 s-1
RECO	Ecosystem respiration	µmolCO2 m-2 s-1
GASES		
FCH4	Methane (CH4) turbulent flux (no storage correction)	nmolCH4 m-2 s-1
MET_SOIL		
TS	Soil temperature	deg C
WTD	Water table depth (negative values indicate below the surface)	m

2. Data Variable: Qualifiers

Qualifiers are suffixes appended to variable base names that provide additional information about the variable. For example, the _DT qualifier in the variable label GPP_DT indicates that gross primary production (GPP) has been partitioned using the flux partitioning method from Lasslop et al. 2010.

Multiple qualifiers can be added, and they must **follow the order in which they are presented here**.

2.1. Qualifiers: General

General qualifiers indicate additional information about a variable.

· **_F :** Variable has been gap-filled by the FLUXNET-CH4 team. Gaps in meteorological variables (including air temperature (TA), incoming shortwave (SW_IN) and longwave (LW_IN) radiation, vapor pressure deficit (VPD), pressure (PA), precipitation (P), and wind speed (WS)) were filled with ERA-Interim (ERA-I) reanalysis data ((Vuichard and Papale 2015)). Other variables were filled using the MDS approach in REddyProc (see Delwiche et al. 2020 for more details).

· **_DT :** Variable acquired using the flux partitioning method from (Lasslop et al. 2010), with values estimated by fitting the light-response curve.

· **_NT :** Variable acquired using the flux partitioning method from (Reichstein et al. 2005), with values estimated from night-time data and extrapolated to day time.

· **_RANDUNC:** Random uncertainty introduced from several different sources including errors associated with the flux measurement system (gas analyzer, sonic anemometer, data acquisition system, flux calculations), errors associated with turbulent transport, and statistical errors relating to the location and activity of the sites of flux exchange ("footprint heterogeneity") (Hollinger and Richardson 2005).

· **_ANNOPTLM :** Gap-filled variable using an artificial neural net routine from Matlab with the Levenberg-Marquardt algorithm as the training function, and parameters optimized across runs (more detail in (Sara Helen Knox et al. 2016; Sara H. Knox et al. 2019)).

· **_UNC :** Uncertainty introduced from ANNOPTLM gap-filling routine, as described in Knox et al. 2016 and Knox et al. 2019.

· **_QC :** Reports quality checks on FCH4 gap-filled data (_ANNOPTLM) based on length of data gap. 1 = data gap shorter than 2 months, 3 = data gap exceeds 2 months which could lead to poor quality gap-filled data. Nondimensional.

2.2. Qualifiers: Positional ***(_V)***

Positional qualifiers are used to indicate relative positions of observations at the site. For FLUXNET-CH4, positional qualifiers are used to distinguish soil temperature probes for sites with more than one probe. Probe depths for each positional qualifier per site are included in the metadata file included with data download and also in Table B7 of Delwiche et al. 2020. For sites where the original database file release in Ameriflux, AsiaFlux, or EuroFlux contains multiple probes at the same _V depth, we average values and report only the average for each _V position. The one exception to this is site US-UAF where the original positional qualifier from the data we downloaded from Ameriflux had different depths for the same qualifier. We still averaged the probe data, so _V qualifiers from US-UAF represent an average of more than one depth.

3.0 Missing data

Missing data are reported using -9999. Data for all days in a leap year are reported.

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Table B2 Site year annual sums and uncertainties

	SITE_ID	Year	Ann_Flux_g_C_m-2	Ann_Flux_Uncertainty_g_C_m-2	Mean_Soil_Temp_C	Mean_Water_Table_Depth_m
1	AT-Neu	2010	0.38	0.03	8.65	NaN
2	AT-Neu	2011	0.25	0.02	8.61	NaN
3	AT-Neu	2012	NaN	NaN	9.39	NaN
4	BR-Npw	2013	NaN	NaN	NaN	NaN
5	BR-Npw	2014	NaN	NaN	25.95	NaN
6	BR-Npw	2015	20.95	1.18	26.2	-0.47
7	BR-Npw	2016	17.48	1.14	25.31	-0.41
8	BW-Gum	2018	51.73	10.59	NaN	NaN
9	BW-Nxr	2018	47.32	3.70	NaN	NaN
10	CA-SCB	2014	10.42	0.66	9.6	-0.15
11	CA-SCB	2015	NaN	NaN	5.58	-0.1
12	CA-SCB	2016	12.12	0.31	5.38	-0.15
13	CA-SCB	2017	9.48	0.27	6.32	-0.21
14	CA-SCC	2013	NaN	NaN	7.2	NaN
15	CA-SCC	2014	4.94	0.12	4.38	NaN
16	CA-SCC	2015	6.76	0.15	3.15	NaN
17	CA-SCC	2016	6.76	0.12	NaN	NaN
18	CH-Cha	2012	2.13	0.38	11.88	NaN
19	CH-Cha	2013	2.30	0.36	10.89	NaN
20	CH-Cha	2014	3.46	0.40	12.2	NaN
21	CH-Cha	2015	3.93	0.68	11.93	NaN
22	CH-Cha	2016	NaN	NaN	12.28	NaN
23	CH-Dav	2016	1.21	0.40	4.33	NaN
24	CH-Dav	2017	NaN	NaN	4.41	NaN
25	CH-Oe2	2018	0.29	0.13	12.32	NaN
26	CN-Hgu	2015	NaN	NaN	NaN	NaN
27	CN-Hgu	2016	0.81	0.16	7.26	NaN
28	CN-Hgu	2017	0.82	0.45	7.66	NaN
29	DE-Dgw	2015	NaN	NaN	NaN	NaN
30	DE-Dgw	2016	7.51	0.22	NaN	NaN
31	DE-Dgw	2017	10.42	0.16	NaN	NaN
32	DE-Dgw	2018	NaN	NaN	NaN	NaN
33	DE-Hte	2011	59.85	6.39	NaN	-0.41
34	DE-Hte	2012	36.83	3.46	NaN	-0.21
35	DE-Hte	2013	49.72	2.34	NaN	-0.25
36	DE-Hte	2014	NaN	NaN	13.26	-0.19
37	DE-Hte	2015	51.37	1.75	10.78	-0.26
38	DE-Hte	2016	50.77	2.09	9.8	-0.25
39	DE-Hte	2017	46.61	1.40	10.39	-0.4
40	DE-Hte	2018	41.62	2.52	6.12	-0.22
41	DE-SfN	2012	NaN	NaN	NaN	-0.08

42	DE-SfN	2013	3.62	0.93	10.32	-0.05
43	DE-SfN	2014	NaN	NaN	8.16	NaN
44	DE-Zrk	2013	NaN	NaN	13.03	NaN
45	DE-Zrk	2014	NaN	NaN	11.67	NaN
46	DE-Zrk	2015	30.76	1.00	10.85	NaN
47	DE-Zrk	2016	31.14	1.23	11.28	0.12
48	DE-Zrk	2017	29.10	0.87	10.84	0.31
49	DE-Zrk	2018	31.10	1.20	10.54	0.25
50	FI-Hyy	2016	NaN	NaN	5.41	NaN
51	FI-Lom	2006	13.77	0.76	4.47	0
52	FI-Lom	2007	17.22	0.25	4.33	0.04
53	FI-Lom	2008	15.52	0.22	3.79	0.06
54	FI-Lom	2009	17.63	0.27	3.98	0.02
55	FI-Lom	2010	13.78	0.29	3.71	0.03
56	FI-Si2	2012	9.27	1.17	9.4	0.06
57	FI-Si2	2013	10.22	1.17	10.47	0.13
58	FI-Si2	2014	NaN	NaN	7.7	0.1
59	FI-Si2	2015	NaN	NaN	8.18	0.09
60	FI-Si2	2016	NaN	NaN	7.67	0.09
61	FI-Sii	2013	14.58	0.32	6.45	0.04
62	FI-Sii	2014	12.93	0.78	6.42	0.03
63	FI-Sii	2015	NaN	NaN	6.92	-0.02
64	FI-Sii	2016	16.56	0.68	5.87	-0.01
65	FI-Sii	2017	8.63	0.23	8.4	0.06
66	FI-Sii	2018	9.46	1.10	6.68	0.11
67	FR-LGt	2017	NaN	NaN	10.45	-0.24
68	FR-LGt	2018	2.45	0.60	10.87	-0.22
69	HK-MPM	2016	11.62	0.61	25.06	-0.61
70	HK-MPM	2017	10.60	0.30	23.14	-0.64
71	HK-MPM	2018	11.04	0.59	NaN	-0.8
72	ID-Pag*	2016	0.09	0.07	NaN	NaN
73	ID-Pag*	2017	0.09	0.09	NaN	NaN
74	IT-BCi	2017	NaN	NaN	17.16	NaN
75	IT-BCi	2018	NaN	NaN	17.36	NaN
76	IT-Cas	2009	25.44	1.46	9.62	NaN
77	IT-Cas	2010	17.80	1.26	12.37	NaN
78	JP-BBY	2015	9.53	0.29	10.12	0
79	JP-BBY	2016	16.42	0.45	10.02	0
80	JP-BBY	2017	19.61	0.65	9.33	-0.03
81	JP-BBY	2018	NaN	NaN	9.79	-0.04
82	JP-Mse	2012	9.50	1.97	14.52	0.03
83	JP-SwL	2016	66.68	4.29	NaN	1.91
84	KR-CRK	2015	NaN	NaN	14.41	0.02
85	KR-CRK	2016	29.12	0.91	12.48	0.03

86	KR-CRK	2017	25.84	0.86	13.94	0.02
87	KR-CRK	2018	28.82	1.15	11.32	0.02
88	MY-MLM	2014	9.55	0.59	26.8	-0.09
89	MY-MLM	2015	NaN	NaN	26.9	-0.01
90	NL-Hor	2007	NaN	NaN	12.4	NaN
91	NL-Hor	2008	NaN	NaN	10.37	NaN
92	NL-Hor	2009	NaN	NaN	11.61	NaN
93	NK-Kop	2012	23.98	1.38	12.17	-0.08
94	NK-Kop	2013	15.33	0.43	12.68	-0.13
95	NK-Kop	2014	15.67	0.39	12.38	-0.11
96	NK-Kop	2015	14.37	2.66	12.46	-0.1
97	PH-RiF	2012	NaN	NaN	27.78	NaN
98	PH-RiF	2013	12.41	0.99	28.17	NaN
99	PH-RiF	2014	NaN	NaN	27.47	NaN
100	RU-Ch2	2014	6.99	0.14	-4.21	NaN
101	RU-Ch2	2015	5.86	0.14	-4.87	NaN
102	RU-Ch2	2016	NaN	NaN	-2.88	NaN
103	RU-Che	2014	3.84	0.14	-3.31	NaN
104	RU-Che	2015	4.19	0.22	-3.28	NaN
105	RU-Che	2016	4.24	0.19	-1.65	NaN
106	RU-Cok	2008	NaN	NaN	NaN	NaN
107	RU-Cok	2009	NaN	NaN	NaN	NaN
108	RU-Cok	2010	NaN	NaN	NaN	NaN
109	RU-Cok	2011	NaN	NaN	NaN	NaN
110	RU-Cok	2012	NaN	NaN	-0.46	NaN
111	RU-Cok	2013	NaN	NaN	-5.73	NaN
112	RU-Cok	2014	NaN	NaN	-4.82	NaN
113	RU-Cok	2015	4.45	0.15	-4.4	NaN
114	RU-Cok	2016	NaN	NaN	-11.1	NaN
115	RU-Fy2	2015	NaN	NaN	9.83	NaN
116	RU-Fy2	2016	2.69	0.59	6.88	0.68
117	RU-Fy2	2017	2.17	0.52	6.1	0.19
118	RU-Fy2	2018	5.66	1.37	6.48	0.79
119	SE-Deg	2014	11.24	1.98	5.02	-0.02
120	SE-Deg	2015	11.11	0.08	5.04	0.02
121	SE-Deg	2016	11.19	0.15	5.19	-0.01
122	SE-Deg	2017	NaN	NaN	4.19	0
123	SE-Deg	2018	9.42	0.09	5.49	-0.03
124	UK-LBT	2011	NaN	NaN	NaN	NaN
125	UK-LBT	2012	NaN	NaN	NaN	NaN
126	UK-LBT	2013	50.50	0.97	NaN	NaN
127	UK-LBT	2014	42.57	2.25	NaN	NaN
128	US-A03	2015	NaN	NaN	-6.65	NaN
129	US-A03	2016	NaN	NaN	-6.14	NaN

130	US-A03	2017	7.26	2.58	-4.48	NaN
131	US-A03	2018	4.35	0.62	-4.93	NaN
132	US-A10	2012	NaN	NaN	NaN	NaN
133	US-A10	2013	NaN	NaN	NaN	NaN
134	US-A10	2014	NaN	NaN	NaN	NaN
135	US-A10	2015	NaN	NaN	NaN	NaN
136	US-A10	2016	NaN	NaN	NaN	NaN
137	US-A10	2017	NaN	NaN	NaN	NaN
138	US-A10	2018	NaN	NaN	NaN	NaN
139	US-Atq	2013	NaN	NaN	-5.65	NaN
140	US-Atq	2014	1.80	0.19	-4.48	NaN
141	US-Atq	2015	1.75	0.11	-0.43	NaN
142	US-Atq	2016	1.75	0.00	NaN	NaN
143	US-Beo	2013	NaN	NaN	-2.67	NaN
144	US-Beo	2014	2.74	0.05	-4.95	NaN
145	US-Bes	2013	NaN	NaN	-6.01	NaN
146	US-Bes	2014	3.32	0.04	-5.69	NaN
147	US-Bes	2015	3.06	0.54	-6.24	NaN
148	US-Bi1	2016	NaN	NaN	15.62	NaN
149	US-Bi1	2017	NaN	NaN	17.17	NaN
150	US-Bi1	2018	0.69	0.29	16.82	NaN
151	US-Bi2	2017	0.86	0.20	20.42	NaN
152	US-Bi2	2018	1.69	0.29	17.12	NaN
153	US-BZB	2014	8.02	4.61	4.03	NaN
154	US-BZB	2015	7.52	0.82	3.9	NaN
155	US-BZB	2016	11.61	2.25	4.89	NaN
156	US-BZF	2014	6.61	0.63	4.32	NaN
157	US-BZF	2015	10.82	0.90	3.99	NaN
158	US-BZF	2016	NaN	NaN	5.93	NaN
159	US-BZS	2015	0.68	0.68	0.48	NaN
160	US-BZS	2016	0.89	0.27	0.67	NaN
161	US-CRT	2011	2.21	0.15	11.49	-0.92
162	US-CRT	2012	2.21	0.11	12.38	-1.45
163	US-DPW	2013	NaN	NaN	NaN	NaN
164	US-DPW	2014	58.91	0.69	NaN	NaN
165	US-DPW	2015	NaN	NaN	NaN	NaN
166	US-DPW	2016	43.60	1.29	NaN	NaN
167	US-DPW	2017	43.60	0.06	NaN	NaN
168	US-EDN	2018	-0.04	0.06	NaN	NaN
169	US-EML	2015	NaN	NaN	5.71	NaN
170	US-EML	2016	1.04	0.08	3.07	NaN
171	US-EML	2017	0.36	0.27	3.8	NaN
172	US-EML	2018	0.36	0.07	NaN	NaN
173	US-Ho1	2012	NaN	NaN	NaN	-0.43

174	US-Ho1	2013	-0.05	0.02	NaN	-0.33
175	US-Ho1	2014	-0.04	0.02	NaN	-0.38
176	US-Ho1	2015	-0.16	0.01	NaN	-0.48
177	US-Ho1	2016	-0.22	0.01	NaN	-0.57
178	US-Ho1	2017	-0.24	0.01	NaN	-0.56
179	US-Ho1	2018	-0.24	0.01	NaN	NaN
180	US-HRA	2017	-0.24	0.56	NaN	NaN
181	US-HRC	2017	-0.24	0.81	NaN	NaN
182	US-ICs	2014	NaN	NaN	-1.55	NaN
183	US-ICs	2015	NaN	NaN	-0.62	NaN
184	US-ICs	2016	NaN	NaN	-1.48	NaN
185	US-Ivo	2013	NaN	NaN	3.19	NaN
186	US-Ivo	2014	5.05	0.22	0.02	NaN
187	US-Ivo	2015	3.89	0.27	0.47	NaN
188	US-Ivo	2016	5.77	0.55	-1.01	NaN
189	US-LA1	2011	NaN	NaN	18.92	NaN
190	US-LA1	2012	12.68	0.63	24.23	NaN
191	US-LA2	2011	12.68	0.19	NaN	NaN
192	US-LA2	2012	48.42	1.57	23.09	NaN
193	US-LA2	2013	43.34	1.32	23.19	NaN
194	US-Los	2014	6.66	1.48	8.3	-0.06
195	US-Los	2015	5.51	0.40	5.65	-0.1
196	US-Los	2016	8.67	0.35	6.3	-0.07
197	US-Los	2017	6.00	0.33	5.5	-0.09
198	US-Los	2018	5.71	0.37	4.29	-0.19
199	US-MAC	2013	5.71	2.68	NaN	NaN
200	US-MAC	2014	26.37	1.69	23.18	-0.71
201	US-MAC	2015	15.40	0.85	23.29	-0.55
202	US-MRM	2012	0.30	0.19	11.16	NaN
203	US-MRM	2013	0.37	0.14	8.99	NaN
204	US-Myb	2010	NaN	NaN	NaN	0.95
205	US-Myb	2011	33.83	0.72	17.18	1.23
206	US-Myb	2012	64.20	0.58	16.25	1.12
207	US-Myb	2013	59.81	0.92	15.7	1.19
208	US-Myb	2014	58.97	0.68	11.27	1.24
209	US-Myb	2015	60.85	0.55	NaN	1.3
210	US-Myb	2016	45.72	0.48	NaN	1.22
211	US-Myb	2017	30.32	0.84	18.5	1.35
212	US-Myb	2018	29.33	0.55	17.05	1.19
213	US-NC4	2012	38.28	1.70	17.12	NaN
214	US-NC4	2013	18.60	3.88	NaN	NaN
215	US-NC4	2014	26.98	0.60	18.02	NaN
216	US-NC4	2015	23.37	2.30	16.27	NaN
217	US-NC4	2016	62.20	2.78	16.35	NaN

218	US-NGB	2012	NaN	NaN	NaN	NaN
219	US-NGB	2013	NaN	NaN	NaN	NaN
220	US-NGB	2014	NaN	NaN	NaN	NaN
221	US-NGB	2015	NaN	NaN	NaN	NaN
222	US-NGB	2016	NaN	NaN	NaN	NaN
223	US-NGB	2017	2.31	0.11	NaN	NaN
224	US-NGB	2018	2.52	0.22	NaN	NaN
225	US-NGC	2017	2.52	0.06	NaN	NaN
226	US-NGC	2018	2.52	0.05	NaN	NaN
227	US-ORv	2011	3.53	0.54	16.64	NaN
228	US-ORv	2012	9.11	0.45	14.23	NaN
229	US-ORv	2013	7.70	0.41	13.19	NaN
230	US-ORv	2014	8.46	0.26	12	NaN
231	US-ORv	2015	NaN	NaN	13.36	NaN
232	US-OWC	2015	NaN	NaN	22.11	0.9
233	US-OWC	2016	113.99	3.25	21.19	0.54
234	US-PFa	2010	NaN	NaN	NaN	NaN
235	US-PFa	2011	0.34	0.05	NaN	NaN
236	US-PFa	2012	0.30	0.04	NaN	NaN
237	US-PFa	2013	0.31	0.05	NaN	NaN
238	US-PFa	2014	NaN	NaN	NaN	NaN
239	US-PFa	2015	0.63	0.03	NaN	NaN
240	US-PFa	2016	0.85	0.02	NaN	NaN
241	US-PFa	2017	0.80	0.06	NaN	NaN
242	US-PFa	2018	NaN	NaN	NaN	NaN
243	US-Snd	2010	NaN	NaN	16.85	NaN
244	US-Snd	2011	NaN	NaN	14.96	NaN
245	US-Snd	2012	6.34	0.25	16.06	NaN
246	US-Snd	2013	6.04	0.48	16.59	-0.65
247	US-Snd	2014	3.23	0.36	17.52	-0.78
248	US-Snd	2015	3.23	0.21	NaN	NaN
249	US-Sne	2016	NaN	NaN	17.85	-0.2
250	US-Sne	2017	45.96	0.40	17.05	0.16
251	US-Sne	2018	39.63	0.66	16.83	0.09
252	US-Srr	2014	0.71	0.10	NaN	NaN
253	US-Srr	2015	0.88	0.11	NaN	NaN
254	US-Srr	2016	0.86	0.10	16.3	-0.18
255	US-Srr	2017	0.86	0.11	NaN	NaN
256	US-StJ	2016	9.55	1.04	11.66	-0.26
257	US-Tw1	2011	26.09	2.70	14.01	NaN
258	US-Tw1	2012	NaN	NaN	11.58	0.24
259	US-Tw1	2013	33.93	1.78	11.92	0.25
260	US-Tw1	2014	49.60	1.67	13.14	0.25
261	US-Tw1	2015	54.80	2.58	12.79	0.33

262	US-Tw1	2016	45.93	1.90	12.91	0.41
263	US-Tw1	2017	38.66	2.09	12.53	0.38
264	US-Tw1	2018	27.60	1.64	12.1	0.24
265	US-Tw3	2013	NaN	NaN	19.63	NaN
266	US-Tw3	2014	NaN	NaN	17.91	NaN
267	US-Tw4	2013	NaN	NaN	NaN	NaN
268	US-Tw4	2014	16.26	0.39	NaN	0.48
269	US-Tw4	2015	27.61	0.43	17.2	0.36
270	US-Tw4	2016	33.49	0.37	14.8	0.18
271	US-Tw4	2017	47.95	0.58	13.78	0.07
272	US-Tw4	2018	37.41	0.48	13.02	0.08
273	US-Tw5	2018	59.72	1.15	16.67	0.69
274	US-Twt	2009	NaN	NaN	17.66	-0.01
275	US-Twt	2010	9.87	1.15	15.67	-0.18
276	US-Twt	2011	12.32	4.92	14.95	-0.11
277	US-Twt	2012	8.12	0.51	16.05	-0.04
278	US-Twt	2013	12.64	0.48	15.98	-0.11
279	US-Twt	2014	17.02	0.97	17.44	-0.09
280	US-Twt	2015	14.43	0.38	17.04	-0.14
281	US-Twt	2016	11.07	0.59	16.44	-0.29
282	US-Twt	2017	11.07	0.31	NaN	NaN
283	US-Uaf	2011	0.32	0.04	-2.14	-0.17
284	US-Uaf	2012	NaN	NaN	-2.43	-0.18
285	US-Uaf	2013	NaN	NaN	-1.15	-0.18
286	US-Uaf	2014	NaN	NaN	-1.18	-0.13
287	US-Uaf	2015	NaN	NaN	-0.49	-0.12
288	US-Uaf	2016	0.68	0.05	-0.05	-0.1
289	US-Uaf	2017	0.58	0.06	1.09	-0.13
290	US-Uaf	2018	NaN	NaN	0.87	-0.13
291	US-WPT	2011	41.05	1.57	17.22	0.43
292	US-WPT	2012	54.96	1.71	14.27	0.28
293	US-WPT	2013	52.76	1.29	12.89	0.44

**Data from ID-Pag spans 365 days from June 2016 to June 2017. Annual methane flux for each year is the sum of these 365 days, with uncertainty being calculated separately for each year.*

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Year	Data year
Ann_Flux_g_C_m-2	Total annual methane flux (gC/m^2)
Ann_Flux_Uncertainty_g_C_m-2	Gap-filling and rancom uncertainty associated with annual flux (gC/m^2)
Mean_Soil_Temp_C	Annual mean soil temperature (degree C). For sites with multiple probes, we use the probe closest to the surface
Mean_Water_Table_Depth_m	Annual mean water table depth (m)

Table B3-A: Site metadata, select data, and DOI links

	SITE_ID	SITE_NAME	SITE_PERSONNEL	COUNTRY	LAT	LON	DATA_DOI	YEAR_START	YEAR_END	UTC_OFFSET	ORIGINAL_DATA_SOURCE
1	AT-Neu	Neustift	Georg Wohlfahrt	Austria	47.117	11.318	10.18140/FLX/1669365	2010	2012	1	EuroFlux
2	BR-Npw	Northern Pantanal Wetland	George Vourlitis	Brazil	-16.498	-56.412	10.18140/FLX/1669368	2013	2016	-4	AmeriFlux
3	BW-Gum	Guma	Carole Helfter	Botswana	-18.965	22.371	10.18140/FLX/1669370	2018	2018	2	EuroFlux
4	BW-Nxr	Nxaraga	Carole Helfter	Botswana	-19.548	23.179	10.18140/FLX/1669518	2018	2018	2	EuroFlux
5	CA-SCB	Scotty Creek Bog	Oliver Sonnentag, Manuel Helbig	Canada	61.309	-121.298	10.18140/FLX/1669613	2014	2017	-7	AmeriFlux
6	CA-SCC	Scotty Creek Landscape	Oliver Sonnentag, Manuel Helbig	Canada	61.308	-121.299	10.18140/FLX/1669628	2013	2016	-7	AmeriFlux
7	CH-Cha	Chamau	Nina Buchmann	Switzerland	47.210	8.410	10.18140/FLX/1669629	2012	2016	1	EuroFlux
8	CH-Dav	Davos	Nina Buchmann	Switzerland	46.815	9.856	10.18140/FLX/1669630	2016	2017	1	EuroFlux
9	CH-Oe2	Oensingen crop	Nina Buchmann	Switzerland	47.286	7.734	10.18140/FLX/1669631	2018	2018	1	EuroFlux
10	CN-Hgu	Hongyuan	Shuli Niu, Weinan Chen	China	32.845	102.590	10.18140/FLX/1669632	2015	2017	8	EuroFlux
11	DE-Dgw	Dagowsee	Torsten Sachs	Germany	53.151	13.054	10.18140/FLX/1669633	2015	2018	1	EuroFlux
12	DE-Hte	Huetelmoor	Gerald Jurasinski	Germany	54.210	12.176	10.18140/FLX/1669634	2011	2018	1	EuroFlux
13	DE-SfN	Schechenfilz Nord	Hans Peter Schmid	Germany	47.806	11.328	10.18140/FLX/1669635	2012	2014	1	EuroFlux
14	DE-Zrk	Zarnekow	Torsten Sachs	Germany	53.876	12.889	10.18140/FLX/1669636	2013	2018	1	EuroFlux
15	FI-Hyy	Hyytiala	Timo Vesala, Ivan Mammarella	Finland	61.847	24.295	10.18140/FLX/1669637	2016	2016	2	EuroFlux
16	FI-Lom	Lompolojankka	Annalea Lohila	Finland	67.997	24.209	10.18140/FLX/1669638	2006	2010	2	EuroFlux
17	FI-Si2	Siikaneva-2 Bog	Timo Vesala, Ivan Mammarella, Eeva-Stiina Tuittila	Finland	61.837	24.197	10.18140/FLX/1669639	2012	2016	2	EuroFlux
18	FI-Sii	Siikaneva	Timo Vesala, Ivan Mammarella, Eeva-Stiina Tuittila	Finland	61.833	24.193	10.18140/FLX/1669640	2013	2018	2	EuroFlux
19	FR-LGt	La Guette	Adrien Jacotot, Sébastien Gogo, Fatima Laggoun-Défarge, Laurent Perdereau	France	47.323	2.284	10.18140/FLX/1669641	2017	2018	1	EuroFlux

20	HK-MPM	Mai Po Mangrove	Derrick Lai, Jiangong Liu	Hong Kong	22.498	114.029	10.18140/FLX/1669642	2016	2018	8	EuroFlux
21	ID-Pag	Palangkaraya undrained forest	Takashi Hirano	Indonesia	-2.320	113.900	10.18140/FLX/1669643	2016	2017	7	EuroFlux
22	IT-BCi	Borgo Cioffi	Vincenzo Magliulo	Italy	40.524	14.957	10.18140/FLX/1669644	2017	2018	1	EuroFlux
23	IT-Cas	Castellaro	Giovanni Manca, Ignacio Goded, Carsten Gruening, Ana Meijide	Italy	45.070	8.718	10.18140/FLX/1669645	2009	2010	1	EuroFlux
24	JP-BBY	Bibai bog	Masahito Ueyama	Japan	43.323	141.811	10.18140/FLX/1669646	2015	2018	9	AsiaFlux
25	JP-Mse	Mase rice paddy field	Akira Miyata	Japan	36.054	140.027	10.18140/FLX/1669647	2012	2012	9	AsiaFlux
26	JP-SwL	Suwa Lake	Hiroki Iwata	Japan	36.047	138.108	10.18140/FLX/1669648	2016	2016	9	AsiaFlux
27	KR-CRK	Cheorwon Rice paddy	Youngryel Ryu, Minseok Kang	Korea	38.201	127.251	10.18140/FLX/1669649	2015	2018	9	AsiaFlux
28	MY-MLM	Maludam National Park	Angela C. I. Tang, Guan Xhuan Wong, Lulie Melling	Malaysia	1.454	111.149	10.18140/FLX/1669650	2014	2015	8	AsiaFlux
29	NL-Hor	Horstermeer	Han Dolman	Netherlands	52.240	5.071	10.18140/FLX/1669651	2007	2009	1	EuroFlux
30	NZ-Kop	Kopuatai	Dave Campbell	New Zealand	-37.388	175.554	10.18140/FLX/1669652	2012	2015	13	OzFlux
31	PH-RiF	Philippines Rice Institute flooded	Ma. Carmelita Alberto	Philippines	14.141	121.265	10.18140/FLX/1669653	2012	2014	8	EuroFlux
32	RU-Ch2	Chersky reference	Matthias Goeckede	Russia	68.617	161.351	10.18140/FLX/1669654	2014	2016	11	EuroFlux
33	RU-Che	Cherski	Matthias Goeckede	Russia	68.613	161.341	10.18140/FLX/1669655	2014	2016	11	EuroFlux
34	RU-Cok	Chokurdakh	Han Dolman	Russia	70.829	147.494	10.18140/FLX/1669656	2008	2016	11	EuroFlux
35	RU-Fy2	Fyodorovskoye dry spruce	Andrej Varlagin	Russia	56.448	32.902	10.18140/FLX/1669657	2015	2018	3	EuroFlux
36	SE-Deg	Degero	Matthias Peichl, Mats Nilsson	Sweden	64.182	19.557	10.18140/FLX/1669659	2014	2018	1	EuroFlux
37	UK-LBT	London_BT	Carole Helfter	UK	51.522	-0.139	10.18140/FLX/1670207	2011	2014	0	EuroFlux
38	US-A03	ARM-AMF3-Oliktok	Ryan Sullivan, David Cook, David Billesbach	USA	70.495	-149.882	10.18140/FLX/1669661	2015	2018	-9	AmeriFlux
39	US-A10	ARM-NSA-Barrow	Ryan Sullivan, David Cook, David Billesbach	USA	71.324	-156.615	10.18140/FLX/1669662	2012	2018	-9	AmeriFlux
40	US-Atq	Atqasuk	Donatella Zona	USA	70.470	-157.409	10.18140/FLX/1669663	2013	2016	-9	AmeriFlux

41	US-Beo	Barrow Environmental Observatory (BEO) tower	Donatella Zona	USA	71.281	-156.612	10.18140/FLX/1669664	2013	2014	-8	AmeriFlux
42	US-Bes	Barrow-Bes (Biocomplexity Experiment South tower)	Donatella Zona	USA	71.281	-156.597	10.18140/FLX/1669665	2013	2015	-8	AmeriFlux
43	US-Bi1	Bouldin Island Alfalfa	Dennis Baldocchi	USA	38.099	-121.499	10.18140/FLX/1669666	2016	2018	-8	AmeriFlux
44	US-Bi2	Bouldin Island corn	Dennis Baldocchi	USA	38.109	-121.535	10.18140/FLX/1669667	2017	2018	-8	AmeriFlux
45	US-BZB	Bonanza Creek Thermokarst Bog	Eugenie Euskirchen	USA	64.696	-148.321	10.18140/FLX/1669668	2014	2016	-9	AmeriFlux
46	US-BZF	Bonanza Creek Rich Fen	Eugenie Euskirchen	USA	64.704	-148.313	10.18140/FLX/1669669	2014	2016	-9	AmeriFlux
47	US-BZS	Bonanza Creek Black Spruce	Eugenie Euskirchen	USA	64.696	-148.324	10.18140/FLX/1669670	2015	2016	-9	AmeriFlux
48	US-CRT	Curtice Walter-Berger cropland	Jiquen Chen, Housen Chu	USA	41.628	-83.347	10.18140/FLX/1669671	2011	2012	-5	AmeriFlux
49	US-DPW	Disney Wilderness Preserve Wetland	Charless Ross Hinkle, Rosvel Bracho, Scott Graham, Brian Benscoter	USA	28.052	-81.436	10.18140/FLX/1669672	2013	2017	-5	AmeriFlux
50	US-EDN	Eden Landing Ecological Reserve	Patty Oikawa	USA	37.616	-122.114	10.18140/FLX/1669673	2018	2018	-8	AmeriFlux
51	US-EML	Eight Mile Lake Permafrost thaw gradient, Healy Alaska.	Ted Schuur	USA	63.878	-149.254	10.18140/FLX/1669674	2015	2018	-9	AmeriFlux
52	US-Ho1	Howland Forest (main tower)	Andrew Richardson, David Hollinger	USA	45.204	-68.740	10.18140/FLX/1669675	2012	2018	-5	AmeriFlux
53	US-HRA	Humnoke Farm Rice Field – Field A	Benjamin Runkle	USA	34.585	-91.752	10.18140/FLX/1669676	2017	2017	-6	AmeriFlux
54	US-HRC	Humnoke Farm Rice Field – Field C	Benjamin Runkle	USA	34.589	-91.752	10.18140/FLX/1669677	2017	2017	-6	AmeriFlux
55	US-ICs	Imnavait Creek Watershed Wet Sedge Tundra	Eugenie Euskirchen	USA	68.606	-149.311	10.18140/FLX/1669678	2014	2016	-9	AmeriFlux
56	US-Ivo	Ivotuk	Donatella Zona	USA	68.487	-155.750	10.18140/FLX/1669679	2013	2016	-9	AmeriFlux
57	US-LA1	Pointe-aux-Chenes Brackish Marsh	Ken Krauss	USA	29.501	-90.445	10.18140/FLX/1669680	2011	2012	-6	AmeriFlux
58	US-LA2	Salvador WMA Freshwater Marsh	Ken Krauss	USA	29.859	-90.287	10.18140/FLX/1669681	2011	2013	-6	AmeriFlux
59	US-Los	Lost Creek	Ankur Desai	USA	46.083	-89.979	10.18140/FLX/1669682	2014	2018	-6	AmeriFlux

60	US-MAC	MacArthur Agro-Ecology	Jed Sparks, Sam Chamberlain	USA	27.163	-81.187	10.18140/FLX/1669683	2013	2015	-5	AmeriFlux
61	US-MRM	Marsh Resource Meadowlands Mitigation Bank	Karina Schäfer	USA	40.816	-74.044	10.18140/FLX/1669684	2012	2013	5	AmeriFlux
62	US-Myb	Mayberry Wetland	Dennis Baldocchi	USA	38.050	-121.765	10.18140/FLX/1669685	2010	2018	-8	AmeriFlux
63	US-NC4	NC_AlligatorRiver	Asko Noormets	USA	35.788	-75.904	10.18140/FLX/1669686	2012	2016	-5	AmeriFlux
64	US-NGB	NGEE Arctic Barrow	Margaret Torn	USA	71.280	-156.609	10.18140/FLX/1669687	2012	2018	-9	AmeriFlux
65	US-NGC	NGEE Arctic Council	Margaret Torn	USA	64.861	-163.701	10.18140/FLX/1669688	2017	2018	-9	AmeriFlux
66	US-ORv	Olentangy River Wetland Research Park	Gil Bohrer	USA	40.020	-83.018	10.18140/FLX/1669689	2011	2015	-5	AmeriFlux
67	US-OWC	Old Woman Creek	Gil Bohrer	USA	41.380	-82.512	10.18140/FLX/1669690	2015	2016	-5	AmeriFlux
68	US-PFa	Park Falls/WLEF	Ankur Desai	USA	45.946	-90.272	10.18140/FLX/1669691	2010	2018	-6	AmeriFlux
69	US-Snd	Sherman Island	Dennis Baldocchi	USA	38.037	-121.754	10.18140/FLX/1669692	2010	2015	-8	Ameriflux
70	US-Sne	Sherman Island Restored Wetland	Dennis Baldocchi	USA	38.037	-121.755	10.18140/FLX/1669693	2016	2018	-8	AmeriFlux
71	US-Srr	Suisun marsh - Rush Ranch	Lisamarie Windham-Myers	USA	38.201	-122.026	10.18140/FLX/1669694	2014	2017	-8	AmeriFlux
72	US-StJ	St Jones Reserve	Rodrigo Vargas	USA	39.088	-75.437	10.18140/FLX/1669695	2016	2016	-5	AmeriFlux
73	US-Tw1	Twitchell Wetland West Pond	Dennis Baldocchi	USA	38.107	-121.647	10.18140/FLX/1669696	2011	2018	-8	AmeriFlux
74	US-Tw3	Twitchell Alfalfa	Dennis Baldocchi	USA	38.116	-121.647	10.18140/FLX/1669697	2013	2014	-8	AmeriFlux
75	US-Tw4	Twitchell East End Wetland	Dennis Baldocchi	USA	38.103	-121.641	10.18140/FLX/1669698	2013	2018	-8	AmeriFlux
76	US-Tw5	East Pond Wetland	Dennis Baldocchi	USA	38.107	-121.643	10.18140/FLX/1669699	2018	2018	-8	AmeriFlux
77	US-Twt	Twitchell Island	Dennis Baldocchi	USA	38.109	-121.653	10.18140/FLX/1669700	2009	2017	-8	AmeriFlux
78	US-Uaf	University of Alaska, Fairbanks	Masahito Ueyama	USA	64.866	-147.856	10.18140/FLX/1669701	2011	2018	-9	AmeriFlux
79	US-WPT	Winous Point North Marsh	Jiquen Chen, Housen Chu	USA	41.465	-82.996	10.18140/FLX/1669702	2011	2013	-5	AmeriFlux

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
SITE_NAME	Site name determined by site personnel
SITE_PERSONNEL	People associated with site FLUXNET-CH4 data
COUNTRY	Site country
LAT	Latitude
LON	Longitude

DATA_DOI	DOI link for site FLUXNET-CH4 data
YEAR_START	Year data begins
YEAR_END	Year data ends
UTC_OFFSET	Site data offset from Coordinated Universal Time (in hours)
ORIGINAL_DATA_SOURCE	Regional network hosting the site methane data that was incorporated into FLUXNET-CH4

Table B3-B: Site metadata, select data, and DOI links

	SITE_ID	SITE_CLASSIFICATION	UPLAND_CLASS	IGBP	KOPPEN	MEAN_ANNUAL_TEMP_C_WORLDCLIM	MEAN_ANNUAL_PRECIP_MM_WORLDCLIM	MOSS_BROWN	MOSS_SPHAGNUM	AERENCHYMATOUS	ERI_SHRUB	TREE	DOM_VEG	IN_SEASONALITY_ANALYSIS
1	AT-Neu	Upland	Alpine meadow	GRA	Dfb	7.0	1029	0	0	1	0	0	aerenchymatous	0
2	BR-Npw	Swamp		WSA	Aw	25.2	1318	0	0	1	0	1	tree	0
3	BW-Gum	Swamp		WET	Bsh	23.1	459	0	0	1	0	1	aerenchymatous	0
4	BW-Nxr	Swamp		GRA	Bsh	23.5	433	0	0	1	0	1	aerenchymatous	0
5	CA-SCB	Bog		WET	Dfc	-2.8	414	0	1	1	1	0	moss_sphagnum	1
6	CA-SCC	Upland	Needleleaf forest	ENF	Dfc	-2.9	414	0	1	0	1	1	tree	0
7	CH-Cha	Upland	Grassland	GRA	Cfb	9.6	1194	0	0	1	0	0	aerenchymatous	0
8	CH-Dav	Upland	Needleleaf forest	ENF	ET	3.8	1053	1	0	0	1	1	tree	0
9	CH-Oe2	Upland	Crop - wheat	CRO	Cfb	9.1	1122	0	0	1	0	0	aerenchymatous	0
10	CN-Hgu	Upland	Alpine meadow	GRA	Cwc	2.8	702	0	0	1	0	0	aerenchymatous	0
11	DE-Dgw	Lake		WAT	Cfb	8.3	567	0	0	0	0	0	no vegetation	0
12	DE-Hte	Fen		WET	Dfb	8.5	584	0	0	1	0	0	aerenchymatous	1
13	DE-SfN	Bog		WET	Cfb	8.3	1123	0	1	1	1	1	tree	1
14	DE-Zrk	Fen		WET	Dfb	8.3	580	0	0	1	0	0	aerenchymatous	1
15	FI-Hyy	Upland	Needleleaf forest	ENF	Dfc	3.1	671	1	1	0	1	1	tree	0
16	FI-Lom	Fen		WET	Dfc	-1.0	512	1	1	1	1	0	aerenchymatous	1
17	FI-Si2	Bog		WET	Dfc	3.2	664	0	1	1	1	1	moss_sphagnum	1
18	FI-Sii	Fen		WET	Dfc	3.2	666	0	1	1	0	0	moss_sphagnum	1
19	FR-LGt	Fen		WET	Cfb	11.0	707	0	1	1	1	0	aerenchymatous	0
20	HK-MPM	Mangrove		EBF	Cfa	22.7	1991	0	0	1	0	1	aerenchymatous	0
21	ID-Pag	Swamp		EBF	Af	27.4	2386	0	0	1	0	1	tree	0
22	IT-BCi	Upland	Crop - corn	CRO	Csa	16.3	1035	0	0	1	0	0	aerenchymatous	0
23	IT-Cas	Rice		CRO	Cfa	12.3	773	0	0	1	0	0	aerenchymatous	0

24	JP-BBY	Bog		WET	Dfb	6.7	1153	0	1	1	1	0	aerenchymatous	1
25	JP-Mse	Rice		CRO	Cfa	14.1	1305	0	0	1	0	0	aerenchymatous	0
26	JP-SwL	Lake		WAT	Dfb	10.2	1141	0	0	1	0	0	aerenchymatous	0
27	KR-CRK	Rice		CRO	Dwa	9.9	1234	0	0	1	0	0	aerenchymatous	0
28	MY-MLM	Swamp		EBF	Af	26.9	3401	0	0	0	0	1	tree	0
29	NL-Hor	Drained	Grassland	GRA	Cfb	9.7	827	0	0	1	0	0	aerenchymatous	0
30	NZ-Kop	Bog		EBF	Cfb	13.9	1343	0	1	1	0	0	aerenchymatous	1
31	PH-RiF	Rice		CRO	Am	26.9	2010	0	0	1	0	0	aerenchymatous	0
32	RU-Ch2	Wet tundra		WET	Dfc	-12.3	172	0	0	1	1	0	aerenchymatous	1
33	RU-Che	Drained		WET	Dfc	-12.3	172	0	0	1	1	0	aerenchymatous	0
34	RU-Cok	Wet tundra		OSH	Dfc	-14.1	210	0	1	1	1	0	moss_sphagnum	0
35	RU-Fy2	Upland	Needleleaf forest	ENF	Dfb	4.3	694	0	1	0	1	1	tree	0
36	SE-Deg	Fen		GRA	Dfc	1.7	620	0	1	1	1	0	moss_sphagnum	1
37	UK-LBT	Upland	Urban	URB	Cfb	11.0	646	0	0	0	0	0	no vegetation	0
38	US-A03	Wet tundra		BSV	ET	-11.9	144	0	1	1	0	0	moss_sphagnum	0
39	US-A10	Wet tundra		BSV	ET	-12.0	107	0	1	1	0	0	moss_sphagnum	0
40	US-Atq	Wet tundra		WET	ET	-10.3	133	1	0	1	1	0	aerenchymatous	1
41	US-Beo	Wet tundra		WET	ET	-11.9	109	1	1	1	0	0	aerenchymatous	1
42	US-Bes	Wet tundra		WET	ET	-12.0	109	0	1	1	0	0	aerenchymatous	1
43	US-Bi1	Drained	Crop - alfalfa	CRO	Csa	15.5	382	0	0	1	0	0	aerenchymatous	0
44	US-Bi2	Drained	Crop - corn	CRO	Csa	15.5	380	0	0	1	0	0	aerenchymatous	0
45	US-BZB	Bog		WET	Dfd	-2.4	292	0	1	1	1	0	eri_shrub	1
46	US-BZF	Fen		WET	Dfd	-2.5	294	1	1	1	0	0	aerenchymatous	1
47	US-BZS	Upland	Needleleaf forest	ENF	Dfd	-2.4	292	1	0	0	0	1	tree	0
48	US-CRT	Upland	Crop - soy	CRO	Dfa	9.7	855	0	0	1	0	0	aerenchymatous	0
49	US-DPW	Marsh		WET	Cwa	22.1	1223	0	0	1	0	0	aerenchymatous	1

50	US-EDN	Salt marsh		WET	Csa	14.9	403	0	0	1	0	0	aerenchymatous	0
51	US-EML	Upland	Tundra	OSH	ET	-3.3	421	1	0	1	1	0	aerenchymatous	0
52	US-Ho1	Upland	Needleleaf forest	ENF	Dfb	5.7	1069	0	0	0	0	1	tree	0
53	US-HRA	Rice		CRO	Cfa	16.8	1290	0	0	1	0	0	aerenchymatous	0
54	US-HRC	Rice		CRO	Cfa	16.8	1290	0	0	1	0	0	aerenchymatous	0
55	US-ICs	Wet tundra		WET	ET	-8.9	242	0	0	1	1	0	aerenchymatous	1
56	US-Ivo	Wet tundra		WET	ET	-8.5	247	1	0	1	1	0	aerenchymatous	1
57	US-LA1	Salt marsh		WET	Cfa	20.4	1596	0	0	1	0	0	aerenchymatous	0
58	US-LA2	Marsh		WET	Cfa	20.0	1616	0	0	1	0	0	aerenchymatous	1
59	US-Los	Fen		WET	Dfb	4.1	833	0	0	1	1	1	eri_shrub	1
60	US-MAC	Drained	Grassland	WET	Cwa	22.7	1207	0	0	1	0	0	aerenchymatous	0
61	US-MRM	Salt marsh		WET	Cfa	12.0	1211	0	0	1	0	0	aerenchymatous	0
62	US-Myb	Marsh		WET	Csa	15.4	346	0	0	1	0	0	aerenchymatous	1
63	US-NC4	Swamp		WET	Cfa	16.5	1322	0	0	1	0	1	aerenchymatous	1
64	US-NGB	Wet tundra		SNO	ET	-11.9	109	0	1	1	0	0	moss_sphagnum	0
65	US-NGC	Wet tundra		GRA	ET	-3.1	413	0	1	1	1	0	eri_shrub	0
66	US-ORv	Marsh		WET	Cfa	11.0	954	0	0	1	0	0	aerenchymatous	1
67	US-OWC	Marsh		WET	Dfb	9.9	898	0	0	1	0	0	aerenchymatous	1
68	US-PFa	Upland	Mixed forest	MF	Dfb	4.3	826	0	0	0	0	1	tree	0
69	US-Snd	Drained	Grassland	GRA	Csa	15.5	340	0	0	1	0	0	aerenchymatous	0
70	US-Sne	Marsh		GRA	Csa	15.5	340	0	0	1	0	0	aerenchymatous	1
71	US-Srr	Salt marsh		WET	Csa	15.4	541	0	0	1	0	0	aerenchymatous	0
72	US-StJ	Salt marsh		WET	Cfa	13.0	1133	0	0	1	0	0	aerenchymatous	0
73	US-Tw1	Marsh		WET	Csa	15.4	371	0	0	1	0	0	aerenchymatous	1
74	US-Tw3	Drained	Crop - alfalfa	CRO	Csa	15.4	371	0	0	1	0	0	aerenchymatous	0

75	US-Tw4	Marsh		WET	Csa	15.4	370	0	0	1	0	0	aerenchymatous	1
76	US-Tw5	Marsh		WET	Csa	15.4	371	0	0	1	0	0	aerenchymatous	1
77	US-Twt	Rice		CRO	Csa	15.3	372	0	0	1	0	0	aerenchymatous	0
78	US-Uaf	Bog		ENF	Dwc	-2.8	298	1	1	1	1	1	moss_sphagnum	1
79	US-WPT	Marsh		WET	Dfa	9.9	881	0	0	1	0	0	aerenchymatous	1

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
SITE_CLASSIFICATION	Site classification based on literature description of sites
UPLAND_CLASS	For upland sites, category of upland type
IGBP	International Geosphere–Biosphere Programme (IGBP) ecosystem surface classification
KOPPEN	Koppen climate zone abbreviation
MEAN_ANNUAL_TEMP_C_WORLDCLIM	Mean annual precipitation from WorldClim2 Global Climate Data
MEAN_ANNUAL_PRECIP_MM_WORLDCLIM	Mean annual precipitation from WorldClim2 Global Climate Data
MOSS_BROWN	Presence/absence (1/0) brown moss. Presence/absence designated by Avni Malhotra using site-literature
MOSS_SPHAGNUM	Presence/absence (1/0) sphagnum moss. Presence/absence designated by Avni Malhotra using site-literature
AERENCHYMATOUS	Presence/absence (1/0) aerenchymatous vegetation. Presence/absence designated by Avni Malhotra using site-literature
ERI_SHRUB	Presence/absence (1/0) ericaceous shrubs. Presence/absence designated by Avni Malhotra using site-literature
TREE	Presence/absence (1/0) trees. Presence/absence designated by Avni Malhotra using site-literature
DOM_VEG	Dominant vegetation type in tower footprint. Dom_veg provided to Avni Malhotra by site personnel via sur
IN_SEASONALITY_ANALYSIS	Is site in freshwater wetland seasonality analysis? 1 = yes, 0 = no.

Table B3-C: Site metadata, select data, and DOI links

	SITE_ID	Mean_Air_Temp_C	Mean_Air_Temp_stdev_C	Ann_Flux_g_CH4-C_m-2	Ann_Flux_stdev_g_CH4-C_m-2	JFM_flux_g_CH4-C_m-2	JFM_flux_stdev_g_CH4-C_m-2	AMJ_flux_g_CH4-C_m-2	AMJ_flux_stdev_g_CH4-C_m-2	JAS_flux_g_CH4-C_m-2	JAS_flux_stdev_g_CH4-C_m-2	OND_flux_g_CH4-C_m-2	OND_flux_stdev_g_CH4-C_m-2
1	AT-Neu	6.60	0.51	0.32	0.09	0.03		0.05	0.04	0.16	0.07	0.09	0.01
2	BR-Npw	25.44	0.73	19.21	2.45	9.68	1.46	8.52	1.15	0.01	0.16	0.15	
3	BW-Gum	22.79		51.73				19.32					
4	BW-Nxr	23.06		47.32				8.88		16.90		18.09	
5	CA-SCB	-0.75	1.92	10.67	1.34			2.96	0.70	6.58	0.77	1.16	0.11
6	CA-SCC	-0.24	2.04	6.15	1.05			1.79	0.45	3.41	0.67		
7	CH-Cha	9.74	0.54	2.95	0.88	0.75	0.18	0.99	0.37	0.60	0.28	0.61	0.25
8	CH-Dav	4.37	0.09	1.21		0.28	0.05	0.37	0.21	0.13		0.24	
9	CH-Oe2	11.00		0.29						0.14		0.13	
10	CN-Hgu	3.77	1.31	0.82	0.01			0.23	0.04	0.28	0.15	0.15	
11	DE-Dgw	9.72	0.38	8.97	2.06	0.07	0.06	1.49	0.57	4.15	0.76	2.51	1.05
12	DE-Hte	10.04	0.54	48.11	7.41	2.98	0.72	17.18	3.66	24.28	4.07	6.17	1.46
13	DE-SfN	8.28	0.72	3.62		0.43	0.10	0.23		1.67	0.43	0.72	0.25
14	DE-Zrk	9.55	0.51	30.53	0.96	1.18	0.24	12.27	1.55	16.18	1.47	1.51	0.56
15	FI-Hyy	4.36								-0.02			
16	FI-Lom	-0.35	0.78	15.58	1.83	0.93	0.22	3.75	0.51	9.49	1.25	1.68	0.24
17	FI-Si2	5.14	0.84	9.74	0.67			2.71	0.59	5.83	1.15	1.19	0.08
18	FI-Sii	4.72	0.42	12.43	3.36	0.68	0.11	3.34	0.75	6.79	2.90	1.58	0.42
19	FR-LGt	11.07	0.37	2.45		0.02		1.09		0.85		0.29	
20	HK-MPM	23.75	0.10	11.09	0.51	0.97		2.33	0.52	5.56	0.34	2.95	0.26
21	ID-Pag	26.57	0.19	0.09	0.00	0.19		0.13		-0.24		0.05	
22	IT-BCi	16.69	0.39			-5.18						-2.69	
23	IT-Cas	12.58	0.58	21.62	5.40	0.60		5.59	3.71	15.31	2.24	0.42	0.12
24	JP-BBY	7.11	0.44	15.19	5.15	1.60	0.39	2.61	0.97	8.27	2.60	3.67	0.03
25	JP-Mse	13.75		9.50				1.59		7.42		0.45	
26	JP-SwL	11.67		66.68						39.86		18.53	
27	KR-CRK	10.96	0.46	27.92	1.81	0.92	0.15	8.81	0.92	16.69	1.77	1.25	0.11
28	MY-MLM	27.09	0.11	9.55		3.28		2.60	0.02	1.62		2.34	
29	NL-Hor	10.75	0.60										
30	NZ-Kop	13.68	0.28	17.34	4.46	3.99	0.84	3.03	1.63	3.63	0.52	5.87	0.30

31	PH-RiF	26.54	0.15	12.41		3.57	1.02	2.58	2.66	5.53	0.01	3.34	
32	RU-Ch2	-9.88	1.26	6.43	0.79	0.29		0.87	0.09	4.65	0.48	1.44	0.28
33	RU-Che	-9.77	1.25	4.09	0.22	0.37	0.00	0.47	0.08	2.18	0.12	1.19	0.04
34	RU-Cok	-12.38	0.92	4.45				0.74	0.09	3.42			
35	RU-Fy2	5.80	0.53	3.50	1.88	1.65	0.58	-0.27	0.04	-0.39	0.10	2.36	1.32
36	SE-Deg	2.57	0.77	10.74	0.88	0.59	0.55	3.30	0.29	5.70	0.78	1.44	0.09
37	UK-LBT	10.62	0.78	46.54	5.61	13.70	1.77	12.52		12.26	1.66	14.04	1.87
38	US-A03	-7.15	0.66	5.81	2.06			1.27	0.19	3.25	0.32		
39	US-A10									1.08			
40	US-Atq	-10.88	2.23	1.77	0.03	0.00		0.30	0.07	1.05	0.03	0.55	
41	US-Beo	-9.50	0.20	2.74		0.09		0.27		1.77		0.69	0.12
42	US-Bes	-10.46	0.21	3.19	0.18	0.09		0.58	0.26	2.20	0.18	0.71	
43	US-Bi1	13.87	1.20	0.69		0.45	0.43	-0.07	0.02	-0.13		0.17	0.05
44	US-Bi2	15.01	0.28	1.28	0.59	0.66		0.30	0.21	0.10	0.06	0.54	0.02
45	US-BZB	-0.62	0.55	9.05	2.23			2.41	0.39	6.06	1.43		
46	US-BZF	-0.31	0.55	8.72	2.98			3.21	2.77	6.35	2.24		
47	US-BZS	0.26	0.68	0.78	0.15			0.23	0.01	0.53	0.11		
48	US-CRT	11.32	0.91	2.21	0.00	0.58				0.26		0.59	
49	US-DPW	22.23	0.41	48.71	8.84	1.53	1.84	11.27	2.75	27.64	7.55	12.90	2.54
50	US-EDN	14.99		-0.04				-0.19		0.16			
51	US-EML	-1.72	3.76	0.59	0.39	-0.03	0.27	0.06	0.17	0.35	0.12	0.27	
52	US-Ho1	6.48	1.32	-0.16	0.09	-0.04	0.01	-0.03	0.02	-0.02	0.05	-0.07	0.02
53	US-HRA	19.36		-0.24				1.28		6.08			
54	US-HRC	20.23		-0.24				3.07		8.38			
55	US-ICs	-6.02	0.48							1.23	0.30		
56	US-Ivo	-8.27	0.54	4.90	0.95	0.70	0.02	0.80	0.05	2.55	0.54	1.26	0.42
57	US-LA1	24.12	0.42	12.68		0.68		2.27		7.58		1.39	1.08
58	US-LA2	20.34	4.43	34.81	19.34	4.27		14.50	2.18	21.72	2.75	6.96	0.79
59	US-Los	5.01	1.23	6.51	1.28	0.36	0.07	1.71	0.46	3.57	0.96	0.81	0.25
60	US-MAC	23.15	0.96	15.82	10.34	1.32	0.02	3.71	2.07	14.70	5.53	2.81	0.25
61	US-MRM	13.14	0.88	0.34	0.05	0.09		0.07	0.01	0.11	0.01		
62	US-Myb	15.53	0.58	47.88	14.90	4.51	1.99	14.12	5.54	22.04	7.87	6.52	3.17
63	US-NC4	16.74	0.85	33.89	17.41	0.80	0.18	5.70	1.62	20.41	9.80	6.77	2.19
64	US-NGB	-9.45	0.92	2.41	0.15			0.26	0.15	2.00	0.26		

65	US-NGC	1.21	0.82	2.52	0.00					0.86	0.41		
66	US-ORv	12.20	0.92	7.20	2.51	0.88	0.10	2.55	0.93	3.14	1.16	0.99	0.17
67	US-OWC	13.02	1.72	113.99				31.03		66.03	10.07	9.81	
68	US-PFa	5.42	1.24	0.54	0.25	0.15	0.05	0.39	0.19	0.00	0.00		
69	US-Snd	14.76	1.16	4.71	1.71	2.00	1.79	1.11	0.74	1.35	0.61	1.74	1.14
70	US-Sne	15.04	0.45	42.80	4.48	2.44	0.71	14.95	5.12	12.61	10.68	4.71	3.54
71	US-Srr	15.93	0.45	0.83	0.08	0.09	0.06	0.31	0.04	0.42	0.09	0.08	0.07
72	US-StJ	13.96		9.55				1.40		5.24		2.92	
73	US-Tw1	15.16	0.74	39.51	11.03	4.92	1.91	10.13	3.74	18.02	4.08	7.11	2.49
74	US-Tw3	16.04	0.87									0.29	
75	US-Tw4	15.52	0.56	32.54	11.74	4.39	1.75	9.49	4.83	12.78	6.07	5.89	1.83
76	US-Tw5	15.03		59.72				21.49		29.78		8.45	
77	US-Twt	14.26	1.71	12.07	2.75	3.07	1.10	1.05	0.59	5.49	3.15	1.73	0.40
78	US-Uaf	-2.87	1.03	0.53	0.19			0.07		0.33	0.12		
79	US-WPT	11.40	0.99	49.59	7.48	1.66	0.22	16.31	3.99	28.75	3.05	3.26	0.12

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Mean_Air_Temp_C	Mean annual air temperature, calculated from flux tower variable TA_F (C)
Ann_Flux_g_CH4-C_m-2	Mean annual methane flux (g CH4-C/m2/year)
JFM_flux_g_CH4-C_m-2	Mean methane flux in January, February, March (gCH4-C/m2/year)
AMJ_flux_g_CH4-C_m-2	Mean methane flux in April, May, June (gCH4-C/m2/year)
JAS_flux_g_CH4-C_m-2	Mean methane flux in July, August, September (gCH4-C/m2/year)
OND_flux_g_CH4-C_m-2	Mean methane flux in October, November, December (gCH4-C/m2/year)
Mean_Air_Temp_stdev_C	Standard deviation of annual air temperature (C)
Ann_Flux_stdev_g_CH4-C_m-2	Standard deviation of annual methane flux (gCH4-C/m2/year)
JFM_flux_stdev_g_CH4-C_m-2	Standard deviation of methane flux in January, February, March (gCH4-C/m2/year)
AMJ_flux_stdev_g_CH4-C_m-2	Standard deviation of methane flux in April, May, June (gCH4-C/m2/year)
JAS_flux_stdev_g_CH4-C_m-2	Standard deviation of methane flux in July, August, September (gCH4-C/m2/year)
OND_flux_stdev_g_CH4-C_m-2	Standard deviation of methane flux in October, November, December (gCH4-C/m2/year)

Table B3-D: Site metadata, select data, and DOI links

	SITE_ID	SOIL_TEMP_PROBE_DEPTHS
1	AT-Neu	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.2cm;
2	BR-Npw	
3	BW-Gum	
4	BW-Nxr	
5	CA-SCB	TS_1 = 0cm; TS_2 = -0.02cm; TS_3 = -0.04cm; TS_4 = -0.08cm; TS_5 = -0.16cm; TS_6 = -0.32cm; TS_7 = -0.64cm ;TS_8 = -1.28cm;
6	CA-SCC	TS_1 = -0.1cm; TS_2 = -0.15cm; TS_3 = -0.2cm; TS_4 = -0.25cm; TS_5 = -0.3cm; TS_6 = -0.5cm; TS_7 = -0.6cm; TS_8 = -0.7cm;
7	CH-Cha	TS_1 = -0.01cm; TS_2 = -0.02cm; TS_3 = -0.04cm; TS_4 = -0.07cm; TS_5 = -0.1cm; TS_6 = -0.15cm; TS_7 = -0.25cm; TS_8 = -0.4cm; TS_9 = -0.95cm;
8	CH-Dav	TS_1 = -0.05cm; TS_2 = -0.15cm; TS_3 = -0.5cm;
9	CH-Oe2	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.15cm; TS_5 = -0.3cm; TS_6 = -0.5cm;
10	CN-Hgu	
11	DE-Dgw	
12	DE-Hte	TS_1 = 0cm; TS_2 = -0.1cm; TS_3 = -0.2cm;
13	DE-SfN	TS_1 = -0.02cm; TS_3 = -0.1cm; TS_4 = -0.2cm; TS_5 = -0.5cm;
14	DE-Zrk	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.2cm; TS_4 = -0.3cm; TS_5 = -0.5cm;
15	FI-Hyy	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.12cm; TS_4 = -0.25cm; TS_5 = -0.5cm;
16	FI-Lom	TS_1 = -0.07cm; TS_2 = -0.3cm; TS_3 = -0.5cm;
17	FI-Si2	TS_1 = -0.05cm; TS_2 = -0.2cm; TS_3 = -0.35cm; TS_4 = -0.5cm; TS_1 = -0.05cm; TS_2 = -0.2cm; TS_3 = -0.35cm; TS_4 = -0.5cm;
18	FI-Sii	before 2016(TS_1 = -0.05cm; TS_2 = -0.2cm; TS_3 = -0.35cm; TS_4 = -0.5cm; TS_2 = -0.2cm; TS_3 = -0.35cm; TS_4 = -0.5cm) after 2017 (TS_1 = 0cm; TS_2 = -0.5cm; TS_3 = -0.1cm; TS_4 = -0.15cm; TS_5 = -0.25cm; TS_6 = -0.45cm; TS_7 = -0.95cm)
19	FR-LGt	TS_1 = -0.02cm; TS_2 = -0.05cm; TS_3 = -0.1cm; TS_4 = -0.2cm; TS_5 = -0.4cm;
20	HK-MPM	
21	ID-Pag	TS_1 = -0.05cm;
22	IT-BCi	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.3cm; TS_4 = -0.5cm; TS_5 = -1cm;
23	IT-Cas	TS_1 = -0.05cm; TS_2 = -0.3cm; TS_3 = -0.5cm;
24	JP-BBY	TS_1 = -0.183cm; TS_2 = -0.233cm; TS_3 = -0.283cm; TS_4 = -0.383cm; TS_5 = -0.483cm;
25	JP-Mse	TS_1 = -0.01cm; TS_2 = -0.025cm; TS_3 = -0.05cm; TS_4 = -0.1cm; TS_5 = -0.2cm; TS_6 = -0.4cm;
26	JP-SwL	
27	KR-CRK	TS_1 = -0.05cm; TS_2 = -0.15cm;
28	MY-MLM	TS_1 = -0.05cm;
29	NL-Hor	TS_1 = -0.01cm; TS_2 = -0.02cm; TS_3 = -0.04cm; TS_4 = -0.05cm; TS_5 = -0.1cm; TS_6 = -0.15cm; TS_7 = -0.25cm; TS_8 = -0.4cm; TS_9 = -0.6cm;
30	NZ-Kop	TS_1 = -0.5cm; TS_2 = -0.1cm; TS_3 = -0.2cm;
31	PH-RiF	

32	RU-Ch2	TS_1 = -0.04cm; TS_2 = -0.08cm; TS_3 = -0.16cm;
33	RU-Che	TS_1 = -0.04cm; TS_2 = -0.08cm; TS_3 = -0.16cm;
34	RU-Cok	
35	RU-Fy2	
36	SE-Deg	TS_1 = -0.02cm; TS_2 = -0.05cm; TS_3 = -0.1cm; TS_4 = -0.15cm; TS_5 = -0.3cm; TS_6 = -0.5cm;
37	UK-LBT	
38	US-A03	TS_1 = -0.025cm; TS_2 = -0.1cm; TS_3 = -0.3cm;
39	US-A10	TS_1 = -0.025cm; TS_2 = -0.1cm; TS_3 = -0.3cm;
40	US-Atq	
41	US-Beo	
42	US-Bes	
43	US-Bi1	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
44	US-Bi2	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
45	US-BZB	TS_1 = -0.075cm; TS_2 = -0.05cm;
46	US-BZF	TS_1 = -0.075cm; TS_2 = -0.05cm;
47	US-BZS	
48	US-CRT	
49	US-DPW	
50	US-EDN	TS_1 = -0.25cm; TS_2 = -0.15cm; TS_3 = -0.05cm; TS_4 = 0cm; TS_5 = 0.05cm; TS_6 = 0.1cm; TS_7 = 0.2cm; TS_8 = 0.3cm;
51	US-EML	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.2cm; TS_4 = -0.4cm;
52	US-Ho1	TS_1 = -0.05cm; TS_2 = -0.1cm;
53	US-HRA	
54	US-HRC	
55	US-ICs	TS_1 = -0.075cm; TS_2 = -0.05cm;
56	US-Ivo	TS_1 = -0.05cm; TS_2 = -0.1cm; TS_3 = -0.15cm; TS_4 = -0.3cm; TS_5 = -0.4cm;
57	US-LA1	TS = -0.1cm;
58	US-LA2	TS = -0.1cm;
59	US-Los	TS_1 = 0cm; TS_2 = -0.05cm; TS_3 = -0.1cm; TS_4 = -0.2cm; TS_5 = -0.5cm;
60	US-MAC	
61	US-MRM	
62	US-Myb	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
63	US-NC4	TS_1 = -0.05cm; TS_2 = -0.2cm;
64	US-NGB	
65	US-NGC	

66	US-ORv	TS_1 = -0.08cm;
67	US-OWC	TS_1 = -0.05cm; TS_2 = -0.3cm;
68	US-PFa	
69	US-Snd	TS_1 = -0.08cm; TS_2 = -0.16cm; TS_3 = nancm; TS_4 = nancm; TS_5 = nancm; TS_6 = nancm;
70	US-Sne	TS_1 = -0.01cm; TS_2 = -0.02cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
71	US-Srr	
72	US-StJ	TS_2 = -0.05cm; TS_3 = -0.1cm;
73	US-Tw1	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
74	US-Tw3	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
75	US-Tw4	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
76	US-Tw5	TS_1 = -0.02cm; TS_2 = -0.1cm; TS_3 = -0.02cm; TS_4 = -0.08cm; TS_5 = -0.16cm;
77	US-Twt	TS_1 = -0.02cm; TS_2 = -0.04cm; TS_3 = -0.08cm; TS_4 = -0.16cm; TS_5 = -0.32cm;
78	US-Uaf	TS_1 = -0.09cm; TS_2 = -0.183cm; TS_3 = -0.283cm; TS_4 = -0.367cm; TS_5 = -0.5cm; TS_6 = -0.6cm; TS_7 = -0.75cm; TS_8 = -0.925cm; TS_9 = -1cm;
79	US-WPT	TS_1 = -0.1cm; TS_2 = -0.3cm;

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
SOIL_TEMP_PROBE_DEPTHS	Depth of soil temperature probe (m), with negative values being under the surface

Table B4: Bioclimatic predictor data used in the Principal Component Analysis (PCA)

	SITE_ID	Enhanced_Vegetation_Index_(EVI)	Wong_Simple_Ratio_Water_Index_(SRWI)	Latent_Heat_(LE)	Mean_Annual_Temperature_(MAT)
1	BR-Npw	0.31	0.86	87.6	25.3
2	BW-Gum	0.28	0.87	60.9	23
3	BW-Nxr	0.22	0.82	52.6	23.5
4	CA-SCB	0.16	1.2	27.4	-2.7
5	DE-Hte	0.28	1.01	40.2	8.6
6	DE-SfN	0.41	1.03	48.5	8.2
7	DE-Zrk	0.33	1.05	42.5	8.2
8	FI-Lom	0.2	1.27	23.6	-1.5
9	FI-Si2	0.27	1.12	31.6	3.3
10	FI-Sii	0.27	1.12	31.6	3.3
11	FR-LGt	0.4	0.97	50	10.8
12	ID-Pag	0.5	1.1	119.7	27.2
13	JP-BBY	0.25	1.21	45.4	6.5
14	MY-MLM	0.42	1.17	116.6	26.9
15	NZ-Kop	0.53	1.06	71.2	13.9
16	RU-Ch2	-0.01	1.25	20	-12.1
17	RU-Cok	0.04	1.18	16.8	-14.2
18	SE-Deg	0.27	1.12	29	2
19	US-A03	-0.07	1.28	16.1	-11.4
20	US-Atq	-0.1	1.31	16.9	-10.2
21	US-BZB	0.17	1.09	26	-2.8
22	US-BZF	0.17	1.09	26	-2.8
23	US-DPW	0.32	0.88	71.8	22.2
24	US-ICs	-0.04	1.3	18.5	-8.8
25	US-Ivo	-0.08	1.34	18.4	-7.7
26	US-LA2	0.37	0.98	69.9	20
27	US-Los	0.29	1.1	46.6	4
28	US-Myb	0.23	0.86	51	15.5
29	US-NC4	0.34	0.96	68.4	16.5
30	US-NGC	0.1	1.24	22.3	-3.2
31	US-ORv	0.32	0.99	50.8	10.6
32	US-OWC	0.27	1.05	55.8	9.9
33	US-Sne	0.23	0.86	51	15.5
34	US-Tw1	0.26	0.91	51	15.5
35	US-Tw4	0.26	0.91	51	15.5
36	US-Tw5	0.26	0.91	51	15.5
37	US-Uaf	0.22	1.1	25.3	-2.8
38	US-WPT	0.27	0.96	55.8	9.8

Column Descriptions

SITE_ID — Site identification code as assigned by regional flux

Enhanced_Vegetation_Index_(EVI)	Enhanced vegetation index (unitless) from MOD13A3 (Didan 2015), 2001-2018 monthly data
Wong_Simple_Ratio_Water_Index_(SRWI)	Simple Ratio Water Index (unitless) from MOD09A1 (Vermote 2015), ~2001-2018 monthly data
Latent_Heat_(LE)	Latent heat in W m-2 from FLUXCOM (Jung et al., 2019), 2003-2013 monthly data
Mean_Annual_Temperature_(MAT)	Mean annual temperature (C) from BioClim (Fick & Hijman 2017), 2001-2018 monthly data

References

1 Didan, K. MOD13A3 MODIS/Terra vegetation Indices Monthly L3 Global 1km SIN Grid V006 [Data set]. NASA EOSDIS Land Processes DAAC. 2015.

2 Fick, S.E. & R.J. Hijmans. WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. International Journal of Climatology, 37(12): 4302-4315. 2017.

3 Jung, M., Koirala, S., Weber, U., Ichii, K., Gans, F., Camps-Valls, G., Papale, D., Schwalm, C., Tramontana, G., & Reichstein, M. The FLUXCOM ensemble of global land-atmosphere energy fluxes. Scientific Data, 6(74). doi:10.1038/s41597-019-0076-8. 2019.

4 Vermote. E. MOD09A1 MODIS Surface Reflectance 8-Day L3 Global 500m SIN Grid V006. NASA EOSDIS Land Processes DAAC. http://doi.org/10.5067/MODIS/MOD09A1.006 (Terra). 2015.

Table B5-A Timesat output for FCH4, GPP_DT, TA, and TS (TS from shallowest probe at each site)

	SITE_ID	Year	Start_FCH4_(DOY)	End_FCH4_(DOY)	Base_value_FCH4_(nmolCH4/m2/s)	Ampl_FCH4_(nmolCH4/m2/s)	Peak_FCH4_(DOY)	Peak_value_FCH4_(nmolCH4/m2/s)
1	AT-Neu	2010	NaN	NaN	NaN	NaN	NaN	NaN
2	AT-Neu	2011	NaN	NaN	NaN	NaN	NaN	NaN
3	AT-Neu	2012	NaN	NaN	NaN	NaN	NaN	NaN
4	BR-Npw	2014	NaN	NaN	NaN	NaN	NaN	NaN
5	BR-Npw	2015	NaN	NaN	NaN	NaN	NaN	NaN
6	BR-Npw	2016	192.7	345.8	-2.0	154.8	270.0	152.8
7	BW-Gum	2018	34.1	151.1	132.9	186.2	89.0	319.1
8	BW-Gum	2019	230.4	NaN	134.2	202.1	281.9	336.3
9	BW-Nxr	2018	65.1	NaN	29.2	208.7	287.5	237.9
10	CA-SCB	2014	138.8	299.1	17.5	72.3	222.4	89.8
11	CA-SCB	2015	NaN	NaN	NaN	NaN	NaN	NaN
12	CA-SCB	2016	109.2	290.4	11.8	82.0	207.9	93.8
13	CA-SCB	2017	119.0	300.4	14.0	58.9	221.5	72.9
14	CA-SCC	2013	NaN	NaN	NaN	NaN	203.4	44.8
15	CA-SCC	2014	128.4	313.1	3.1	40.1	215.0	43.3
16	CA-SCC	2015	98.0	303.9	1.7	54.6	210.9	56.3
17	CA-SCC	2016	102.7	NaN	1.7	NaN	208.0	59.6
18	DE-Dgw	2015	NaN	NaN	NaN	NaN	NaN	NaN
19	DE-Dgw	2016	NaN	NaN	NaN	NaN	NaN	NaN
20	DE-Dgw	2017	NaN	NaN	NaN	NaN	NaN	NaN
21	DE-Hte	2011	NaN	NaN	NaN	NaN	NaN	NaN
22	DE-Hte	2012	82.6	330.1	20.3	201.8	205.5	222.1
23	DE-Hte	2013	101.9	NaN	29.9	NaN	201.1	378.7
24	DE-Hte	2014	NaN	338.5	38.3	NaN	204.8	314.1
25	DE-Hte	2015	75.1	322.4	29.2	277.7	202.0	306.9
26	DE-Hte	2016	83.9	289.7	21.5	347.8	202.0	369.3
27	DE-Hte	2017	90.0	304.5	18.3	272.7	194.0	290.9
28	DE-Hte	2018	85.6	258.1	21.0	322.0	196.0	343.0
29	DE-SfN	2012	79.6	340.7	4.3	10.2	217.0	14.5

30	DE-SfN	2013	NaN	NaN	2.7	3.0	301.9	5.7
31	DE-SfN	2014	NaN	NaN	NaN	NaN	NaN	NaN
32	DE-Zrk	2013	NaN	NaN	NaN	NaN	NaN	NaN
33	DE-Zrk	2014	NaN	NaN	NaN	NaN	NaN	NaN
34	DE-Zrk	2015	87.0	273.0	9.3	242.5	208.7	251.9
35	DE-Zrk	2016	107.9	274.0	9.9	224.2	187.3	234.2
36	DE-Zrk	2017	110.0	270.1	11.2	203.6	190.0	214.8
37	DE-Zrk	2018	88.1	261.0	8.5	250.8	196.0	259.2
38	FI-Lom	2006	142.8	288.8	7.8	111.0	215.1	118.9
39	FI-Lom	2007	139.3	270.6	10.9	165.0	214.5	175.9
40	FI-Lom	2008	134.0	284.8	10.8	127.7	211.5	138.5
41	FI-Lom	2009	121.5	291.0	12.1	132.3	215.0	144.4
42	FI-Lom	2010	137.1	282.8	13.4	101.6	214.0	115.0
43	FI-Si2	2012	NaN	NaN	NaN	NaN	220.6	80.0
44	FI-Si2	2013	NaN	NaN	NaN	NaN	211.1	77.4
45	FI-Si2	2014	NaN	280.7	7.2	NaN	212.8	111.1
46	FI-Si2	2015	NaN	309.5	9.5	NaN	212.0	72.2
47	FI-Si2	2016	NaN	NaN	NaN	NaN	NaN	NaN
48	FI-Sii	2013	123.8	307.6	7.2	104.3	202.5	111.5
49	FI-Sii	2014	118.8	NaN	2.3	NaN	215.1	112.7
50	FI-Sii	2015	NaN	NaN	NaN	NaN	236.0	112.7
51	FI-Sii	2016	114.5	311.3	8.9	121.1	214.0	130.0
52	FI-Sii	2017	118.9	300.4	6.5	57.1	203.0	63.6
53	FI-Sii	2018	116.3	295.1	7.5	53.8	187.0	61.3
54	HK-MPM	2016	NaN	NaN	NaN	NaN	NaN	NaN
55	HK-MPM	2017	NaN	NaN	NaN	NaN	NaN	NaN
56	HK-MPM	2018	NaN	NaN	NaN	NaN	NaN	NaN
57	ID-Pag	2016	274.1	NaN	-2.8	5.1	NaN	2.3
58	JP-BBY	2015	166.7	NaN	18.3	NaN	237.7	71.4
59	JP-BBY	2016	NaN	324.9	18.3	105.7	244.3	124.0
60	JP-BBY	2017	138.5	323.1	15.2	130.1	236.0	145.3
61	JP-BBY	2018	NaN	332.1	17.8	74.7	221.0	92.6
62	JP-Mse	2012	NaN	NaN	NaN	NaN	NaN	NaN
63	KR-CRK	2015	NaN	NaN	NaN	NaN	NaN	NaN

64	KR-CRK	2016	NaN	NaN	NaN	NaN	NaN	NaN
65	KR-CRK	2017	NaN	NaN	NaN	NaN	NaN	NaN
66	KR-CRK	2018	NaN	NaN	NaN	NaN	NaN	NaN
67	MY-MLM	2014	229.6	562.4	15.5	19.8	64.2	35.3
68	MY-MLM	2015	NaN	NaN	NaN	NaN	NaN	NaN
69	NZ-Kop	2012	-94.5	227.6	36.9	28.3	176.2	65.2
70	NZ-Kop	2013	7.2	251.5	21.1	61.7	182.0	82.8
71	NZ-Kop	2014	10.0	228.4	22.6	42.7	161.0	65.2
72	NZ-Kop	2015	-8.5	NaN	23.0	34.7	150.0	57.8
73	PH-RiF	2012	154.2	303.9	4.0	62.9	239.1	66.9
74	PH-RiF	2013	304.1	455.0	5.3	54.0	380.3	59.3
75	PH-RiF	2014	133.9	265.7	6.1	121.8	178.3	127.9
76	PH-RiF	2015	NaN	NaN	3.8	56.3	NaN	60.1
77	RU-Ch2	2014	150.8	312.2	0.7	70.2	216.5	70.9
78	RU-Ch2	2015	153.3	NaN	8.0	NaN	209.0	56.1
79	RU-Ch2	2016	NaN	NaN	NaN	NaN	218.8	68.3
80	RU-Che	2014	NaN	NaN	NaN	NaN	NaN	NaN
81	RU-Che	2015	NaN	NaN	NaN	NaN	NaN	NaN
82	RU-Che	2016	NaN	NaN	NaN	NaN	NaN	NaN
83	SE-Deg	2014	NaN	NaN	NaN	80.8	204.2	91.7
84	SE-Deg	2015	103.3	318.7	5.1	73.7	211.3	78.8
85	SE-Deg	2016	102.5	324.1	4.3	74.3	205.3	78.7
86	SE-Deg	2017	NaN	NaN	NaN	NaN	NaN	NaN
87	SE-Deg	2018	117.2	327.6	6.9	50.9	192.0	57.8
88	US-Atq	2013	NaN	NaN	NaN	NaN	NaN	NaN
89	US-Atq	2014	145.7	328.7	0.9	13.2	215.0	14.1
90	US-Atq	2015	153.3	264.0	1.0	18.6	193.2	19.6
91	US-Beo	2013	NaN	NaN	NaN	NaN	NaN	NaN
92	US-Beo	2014	157.0	356.3	0.4	23.0	211.4	23.4
93	US-Bes	2013	NaN	NaN	NaN	NaN	NaN	NaN
94	US-Bes	2014	157.3	312.6	0.6	34.3	206.5	34.9
95	US-Bes	2015	146.8	283.8	0.6	35.0	193.1	35.7
96	US-BZB	2014	NaN	NaN	NaN	NaN	226.9	67.5
97	US-BZB	2015	NaN	NaN	NaN	NaN	219.4	68.4

98	US-BZB	2016	NaN	NaN	NaN	NaN	226.1	98.4
99	US-BZF	2014	NaN	NaN	NaN	NaN	231.6	57.7
100	US-BZF	2015	NaN	NaN	NaN	NaN	179.0	87.0
101	US-BZF	2016	NaN	NaN	NaN	NaN	220.1	119.1
102	US-BZS	2015	NaN	NaN	NaN	NaN	NaN	NaN
103	US-BZS	2016	NaN	NaN	NaN	NaN	NaN	NaN
104	US-DPW	2013	151.7	364.0	16.4	395.0	240.7	411.4
105	US-DPW	2014	98.9	332.5	34.5	338.0	228.9	372.4
106	US-DPW	2015	NaN	376.3	25.0	NaN	248.6	247.3
107	US-DPW	2016	84.2	389.2	23.5	184.3	237.0	207.8
108	US-HRA	2017	NaN	NaN	NaN	NaN	NaN	NaN
109	US-HRC	2018	NaN	NaN	NaN	NaN	NaN	NaN
110	US-ICs	2014	NaN	NaN	NaN	NaN	NaN	NaN
111	US-ICs	2015	NaN	NaN	NaN	NaN	NaN	NaN
112	US-ICs	2016	138.2	302.1	0.2	18.0	200.5	18.2
113	US-Ivo	2013	NaN	400.0	1.9	29.9	238.9	31.9
114	US-Ivo	2014	158.5	301.8	6.7	30.0	226.8	36.7
115	US-Ivo	2015	156.8	278.0	6.9	19.4	231.1	26.3
116	US-Ivo	2016	164.7	352.4	6.1	32.5	232.0	38.7
117	US-LA1	2012	NaN	NaN	NaN	NaN	NaN	NaN
118	US-LA2	2012	62.8	NaN	38.8	225.7	229.2	264.5
119	US-LA2	2013	NaN	NaN	25.1	193.2	216.2	218.3
120	US-Los	2014	127.1	309.8	4.0	35.1	219.3	39.1
121	US-Los	2015	143.4	324.4	3.2	34.6	220.7	37.8
122	US-Los	2016	143.8	310.1	3.3	75.8	193.6	79.1
123	US-Los	2017	134.1	255.2	3.6	58.3	185.0	61.9
124	US-Los	2018	143.0	288.8	3.0	52.4	191.0	55.4
125	US-MAC	2013	NaN	NaN	NaN	NaN	NaN	NaN
126	US-MAC	2014	NaN	NaN	NaN	NaN	NaN	NaN
127	US-MAC	2015	NaN	NaN	NaN	NaN	NaN	NaN
128	US-Myb	2010	NaN	NaN	NaN	NaN	NaN	NaN
129	US-Myb	2011	72.4	369.3	18.3	174.2	253.5	192.5
130	US-Myb	2012	97.2	345.3	18.9	366.6	214.7	385.5
131	US-Myb	2013	46.8	336.3	39.0	265.4	220.2	304.3

132	US-Myb	2014	57.4	334.7	37.1	276.9	206.0	314.0
133	US-Myb	2015	23.7	330.0	21.6	285.7	201.0	307.3
134	US-Myb	2016	36.9	306.0	21.9	216.0	191.0	237.9
135	US-Myb	2017	175.8	332.2	30.5	191.7	235.0	222.2
136	US-Myb	2018	33.1	322.6	28.8	99.3	169.0	128.1
137	US-NC4	2012	132.9	307.9	9.5	323.8	232.2	333.3
138	US-NC4	2013	97.2	365.1	4.3	113.3	240.7	117.5
139	US-NC4	2014	110.6	332.3	-0.1	181.8	253.9	181.6
140	US-NC4	2015	68.4	414.1	-0.8	122.5	245.0	121.7
141	US-NC4	2016	128.4	350.6	2.7	373.6	259.0	376.2
142	US-ORv	2011	NaN	297.3	7.3	15.2	178.5	22.4
143	US-ORv	2012	120.1	269.1	8.3	65.2	189.7	73.4
144	US-ORv	2013	72.4	308.4	9.0	27.4	189.4	36.4
145	US-ORv	2014	87.6	292.2	9.1	32.4	201.0	41.5
146	US-ORv	2015	86.0	NaN	8.9	38.5	170.0	47.4
147	US-OWC	2015	NaN	NaN	NaN	NaN	NaN	NaN
148	US-OWC	2016	NaN	NaN	NaN	NaN	219.2	882.8
149	US-Sne	2016	NaN	NaN	NaN	NaN	NaN	NaN
150	US-Sne	2017	76.2	337.1	14.9	244.2	187.8	259.0
151	US-Sne	2018	60.6	341.6	21.4	168.3	222.6	189.8
152	US-Srr	2014	NaN	NaN	NaN	NaN	NaN	NaN
153	US-Srr	2015	NaN	NaN	NaN	NaN	NaN	NaN
154	US-Srr	2016	NaN	NaN	NaN	NaN	NaN	NaN
155	US-Srr	2017	NaN	NaN	NaN	NaN	NaN	NaN
156	US-StJ	2016	NaN	NaN	NaN	NaN	NaN	NaN
157	US-Tw1	2011	140.5	352.4	36.3	104.5	233.8	140.8
158	US-Tw1	2012	NaN	309.6	28.1	243.5	242.9	271.6
159	US-Tw1	2013	33.4	307.1	42.2	114.3	218.0	156.5
160	US-Tw1	2014	174.6	331.5	65.3	253.2	240.0	318.5
161	US-Tw1	2015	62.3	330.3	63.8	204.1	207.0	267.9
162	US-Tw1	2016	32.3	323.8	48.5	160.0	221.0	208.5
163	US-Tw1	2017	27.8	305.0	43.1	138.1	226.0	181.1
164	US-Tw1	2018	155.0	314.9	38.7	127.5	228.0	166.3
165	US-Tw4	2014	93.8	461.3	27.4	36.5	226.8	63.8

166	US-Tw4	2015	114.5	334.1	39.8	86.5	228.2	126.3
167	US-Tw4	2016	42.8	357.1	43.2	101.8	215.6	144.9
168	US-Tw4	2017	110.7	318.8	55.1	201.2	222.0	256.3
169	US-Tw4	2018	63.0	237.3	53.0	165.1	173.0	218.1
170	US-Tw5	2018	NaN	331.9	26.5	339.3	196.9	365.8
171	US-Twt	2009	NaN	NaN	NaN	NaN	NaN	NaN
172	US-Twt	2010	NaN	NaN	NaN	NaN	NaN	NaN
173	US-Twt	2011	NaN	NaN	NaN	NaN	NaN	NaN
174	US-Twt	2012	NaN	NaN	NaN	NaN	NaN	NaN
175	US-Twt	2013	NaN	NaN	NaN	NaN	NaN	NaN
176	US-Twt	2014	NaN	NaN	NaN	NaN	NaN	NaN
177	US-Twt	2015	NaN	NaN	NaN	NaN	NaN	NaN
178	US-Twt	2016	NaN	NaN	NaN	NaN	NaN	NaN
179	US-Uaf	2011	157.6	NaN	0.8	2.1	242.0	2.8
180	US-Uaf	2012	151.8	NaN	0.7	1.6	265.9	2.3
181	US-Uaf	2013	167.0	NaN	0.8	1.4	267.0	2.2
182	US-Uaf	2014	182.2	NaN	0.9	3.2	247.0	4.1
183	US-Uaf	2015	176.0	NaN	0.8	3.5	245.0	4.3
184	US-Uaf	2016	184.7	NaN	0.9	7.3	248.0	8.2
185	US-Uaf	2017	182.0	NaN	0.9	6.0	248.0	6.8
186	US-Uaf	2018	158.5	NaN	0.9	4.9	250.0	5.8
187	US-WPT	2011	103.5	294.1	5.6	355.3	207.1	360.9
188	US-WPT	2012	90.0	296.5	9.0	380.5	195.6	389.5
189	US-WPT	2013	72.5	297.0	7.5	343.3	220.0	350.8

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Year	Data year
Start_FCH4_(DOY)	Season start for elevated methane fluxes (DOY), point "f" in Figure 1
End_FCH4_(DOY)	Season end for elevated methane fluxes (DOY), point "h" in Figure 1
Base_value_FCH4_(nmolCH4/m2/s)	Baseline methane flux during non-elevated season (nmol CH4 /m2/ s), average of points "a" and "b" in Figure 1

Ampl_FCH4_(nmolCH4/m2/s)	Amplitude of methane flux during elevated flux season (nmol CH4/m2/s), difference between point "e" in Figure 1 and Base_value_FCH4
Peak_FCH4_(DOY)	Day of maximum elevated methane flux (DOY), point "g" in Figure 1
Peak_value_FCH4_(nmolCH4/m2/s)	Maximum value of methane flux (nmol CH4/m2/s), point "e" in Figure 1

Table B5-B Timesat output for FCH4, GPP_DT, TA, and TS (TS from shallowest probe at each site)

	SITE_ID	Year	Start_GPP_DT_(DOY)	End_GPP_DT_(DOY)	Base_value_GPP_DT_(µmol CO2/m2/s)	Ampl_GPP_DT_(µmolCO2/m2/s)	Peak_GPP_DT_(DOY)	Peak_value_GPP_DT_(µmol CO2/m2/s)
1	AT-Neu	2010	61.39	332.24	-0.22	9.75	175.90	9.53
2	AT-Neu	2011	76.71	303.74	0.18	11.36	167.90	11.54
3	AT-Neu	2012	84.67	305.48	0.29	9.75	179.00	10.04
4	BR-Npw	2014	59.47	367.83	2.03	5.10	242.90	7.13
5	BR-Npw	2015	61.54	385.15	2.05	5.15	228.00	7.20
6	BR-Npw	2016	83.78	375.61	2.44	4.74	203.00	7.19
7	BW-Gum	2018	NaN	NaN	NaN	NaN	NaN	NaN
8	BW-Gum	2019	NaN	NaN	NaN	NaN	NaN	NaN
9	BW-Nxr	2018	NaN	NaN	NaN	NaN	NaN	NaN
10	CA-SCB	2014	127.53	266.07	0.10	2.69	210.00	2.79
11	CA-SCB	2015	60.15	275.15	0.10	3.35	199.40	3.45
12	CA-SCB	2016	123.04	277.07	0.05	3.66	191.90	3.71
13	CA-SCB	2017	113.78	274.63	0.04	2.99	202.00	3.02
14	CA-SCC	2013	126.43	273.72	0.20	3.21	198.80	3.41
15	CA-SCC	2014	130.06	269.31	0.30	3.22	194.30	3.52
16	CA-SCC	2015	104.41	269.97	0.28	4.54	196.90	4.82
17	CA-SCC	2016	106.89	284.75	0.09	3.67	191.00	3.76
18	DE-Dgw	2015	13.43	348.62	0.04	0.40	227.30	0.44
19	DE-Dgw	2016	31.35	294.27	0.04	0.49	167.60	0.52
20	DE-Dgw	2017	80.56	293.50	0.04	0.46	191.00	0.50
21	DE-Hte	2011	111.70	280.46	0.05	6.87	170.10	6.92
22	DE-Hte	2012	122.64	296.52	0.31	7.11	200.10	7.42
23	DE-Hte	2013	133.51	293.97	0.29	6.10	206.40	6.39
24	DE-Hte	2014	37.51	277.70	0.27	5.50	160.00	5.77
25	DE-Hte	2015	127.82	303.30	0.27	5.35	191.00	5.61
26	DE-Hte	2016	117.96	328.49	0.16	5.39	184.00	5.55
27	DE-Hte	2017	123.83	301.59	0.11	5.71	177.00	5.82
28	DE-Hte	2018	121.03	334.06	0.06	6.99	190.00	7.05
29	DE-SfN	2012	-13.79	320.94	0.37	4.34	168.10	4.71

30	DE-SfN	2013	64.35	316.65	0.31	3.96	198.00	4.27
31	DE-SfN	2014	43.97	335.84	0.41	4.10	193.00	4.51
32	DE-Zrk	2013	110.23	283.50	0.09	4.30	186.30	4.39
33	DE-Zrk	2014	86.61	309.76	0.06	3.56	180.40	3.62
34	DE-Zrk	2015	99.44	264.19	0.10	3.54	186.60	3.64
35	DE-Zrk	2016	90.31	301.90	0.13	4.38	218.00	4.51
36	DE-Zrk	2017	92.93	303.86	0.11	4.07	180.00	4.18
37	DE-Zrk	2018	105.21	314.58	0.06	6.90	212.00	6.96
38	FI-Lom	2006	147.75	261.40	0.06	5.89	197.40	5.95
39	FI-Lom	2007	145.82	257.55	0.06	6.36	197.90	6.43
40	FI-Lom	2008	151.61	258.87	0.06	7.24	200.00	7.30
41	FI-Lom	2009	147.57	262.55	0.02	6.55	197.00	6.57
42	FI-Lom	2010	153.94	262.64	0.03	6.39	199.00	6.41
43	FI-Si2	2012	33.66	276.85	0.07	1.52	209.00	1.59
44	FI-Si2	2013	106.78	338.07	0.13	1.63	182.90	1.76
45	FI-Si2	2014	40.93	290.00	0.13	2.19	146.00	2.32
46	FI-Si2	2015	113.24	267.77	0.13	1.93	197.00	2.06
47	FI-Si2	2016	43.90	284.85	0.13	1.85	166.00	1.98
48	FI-Sii	2013	118.98	282.46	-0.03	3.70	185.70	3.67
49	FI-Sii	2014	100.30	294.41	0.00	2.43	199.70	2.44
50	FI-Sii	2015	84.64	321.89	0.06	2.63	204.30	2.69
51	FI-Sii	2016	118.70	284.09	0.09	3.43	200.00	3.52
52	FI-Sii	2017	117.46	290.52	0.05	3.04	206.00	3.09
53	FI-Sii	2018	113.63	295.59	0.04	2.32	185.00	2.36
54	HK-MPM	2016	NaN	NaN	NaN	NaN	NaN	NaN
55	HK-MPM	2017	NaN	NaN	NaN	NaN	NaN	NaN
56	HK-MPM	2018	NaN	NaN	NaN	NaN	NaN	NaN
57	ID-Pag	2016	NaN	NaN	NaN	NaN	NaN	NaN
58	JP-BBY	2015	123.64	304.32	0.23	5.32	203.40	5.56
59	JP-BBY	2016	114.13	302.43	0.03	7.94	203.20	7.98
60	JP-BBY	2017	119.90	300.38	0.03	7.58	199.80	7.61
61	JP-BBY	2018	96.26	311.58	0.01	5.44	217.00	5.45
62	JP-Mse	2012	144.63	266.88	0.63	9.81	209.70	10.44
63	KR-CRK	2015	134.99	267.83	0.10	10.68	202.10	10.78

64	KR-CRK	2016	137.21	262.37	0.06	12.44	198.80	12.50
65	KR-CRK	2017	143.28	266.25	0.13	12.20	193.50	12.33
66	KR-CRK	2018	138.97	263.80	0.17	10.96	198.00	11.13
67	MY-MLM	2014	179.97	437.86	8.48	2.67	272.60	11.16
68	MY-MLM	2015	194.24	NaN	8.76	8.31	271.10	17.07
69	NZ-Kop	2012	38.67	334.88	1.33	2.50	194.80	3.83
70	NZ-Kop	2013	58.12	351.65	1.50	2.61	190.00	4.10
71	NZ-Kop	2014	42.25	355.00	1.41	2.78	209.00	4.18
72	NZ-Kop	2015	44.32	366.21	1.19	3.28	193.00	4.47
73	PH-RiF	2012	NaN	NaN	NaN	NaN	NaN	NaN
74	PH-RiF	2013	NaN	NaN	NaN	NaN	NaN	NaN
75	PH-RiF	2014	NaN	NaN	NaN	NaN	NaN	NaN
76	PH-RiF	2015	NaN	NaN	NaN	NaN	NaN	NaN
77	RU-Ch2	2014	142.91	252.79	0.02	5.10	210.30	5.11
78	RU-Ch2	2015	157.47	247.95	-0.02	5.00	202.60	4.97
79	RU-Ch2	2016	145.27	257.90	-0.04	4.15	201.50	4.11
80	RU-Che	2014	161.74	258.77	0.14	5.51	206.90	5.65
81	RU-Che	2015	157.04	250.25	0.01	5.39	203.30	5.40
82	RU-Che	2016	140.55	258.30	-0.10	6.94	188.60	6.84
83	SE-Deg	2014	115.38	285.94	0.02	2.78	196.30	2.79
84	SE-Deg	2015	113.50	278.71	0.02	2.69	203.40	2.70
85	SE-Deg	2016	118.80	290.27	0.02	2.32	195.50	2.35
86	SE-Deg	2017	121.86	276.14	0.02	2.45	199.00	2.47
87	SE-Deg	2018	118.54	276.63	0.00	1.72	188.00	1.72
88	US-Atq	2013	33.24	256.46	0.03	3.05	161.70	3.09
89	US-Atq	2014	139.11	244.88	0.09	1.77	194.30	1.86
90	US-Atq	2015	132.75	243.97	0.08	3.41	191.00	3.48
91	US-Beo	2013	39.33	285.28	0.01	0.88	159.80	0.88
92	US-Beo	2014	88.23	261.54	0.02	1.99	200.00	2.02
93	US-Bes	2013	49.45	269.44	0.04	0.84	187.90	0.87
94	US-Bes	2014	174.64	262.25	0.04	1.60	220.70	1.64
95	US-Bes	2015	160.53	248.82	0.04	2.53	198.40	2.57
96	US-BZB	2014	NaN	NaN	NaN	NaN	NaN	NaN
97	US-BZB	2015	NaN	NaN	NaN	NaN	NaN	NaN

98	US-BZB	2016	NaN	NaN	NaN	NaN	NaN	NaN
99	US-BZF	2014	132.71	201.27	0.18	5.84	167.50	6.01
100	US-BZF	2015	129.12	258.65	0.16	6.93	187.50	7.10
101	US-BZF	2016	128.63	227.99	0.18	9.14	175.00	9.32
102	US-BZS	2015	NaN	NaN	NaN	NaN	NaN	NaN
103	US-BZS	2016	NaN	NaN	NaN	NaN	NaN	NaN
104	US-DPW	2013	NaN	NaN	NaN	NaN	NaN	NaN
105	US-DPW	2014	55.72	332.08	0.65	4.60	183.50	5.24
106	US-DPW	2015	53.69	372.93	0.73	4.77	174.80	5.50
107	US-DPW	2016	71.21	343.87	0.85	4.83	197.00	5.68
108	US-HRA	2017	131.27	244.82	0.39	20.14	183.10	20.53
109	US-HRC	2018	135.69	237.65	1.34	18.79	182.20	20.13
110	US-ICs	2014	150.35	253.40	0.21	3.46	201.60	3.66
111	US-ICs	2015	142.83	263.16	0.15	4.42	189.90	4.57
112	US-ICs	2016	154.39	245.71	0.12	3.22	192.80	3.34
113	US-Ivo	2013	149.10	257.98	0.06	3.85	201.90	3.91
114	US-Ivo	2014	151.63	257.85	0.11	3.63	199.10	3.73
115	US-Ivo	2015	121.66	248.35	0.07	3.97	187.10	4.03
116	US-Ivo	2016	154.70	254.51	0.09	5.30	194.00	5.39
117	US-LA1	2012	-7.96	216.91	0.49	2.29	142.80	2.78
118	US-LA2	2012	46.97	334.04	0.34	5.64	146.80	5.98
119	US-LA2	2013	93.73	335.84	0.31	6.94	166.30	7.25
120	US-Los	2014	131.45	288.06	-0.01	6.65	198.20	6.64
121	US-Los	2015	130.36	288.12	0.11	6.26	201.50	6.37
122	US-Los	2016	130.87	291.48	0.17	7.17	198.20	7.33
123	US-Los	2017	136.00	292.41	0.13	7.38	199.00	7.51
124	US-Los	2018	134.97	285.61	0.13	7.17	199.00	7.29
125	US-MAC	2013	NaN	378.12	2.50	5.43	222.70	9.45
126	US-MAC	2014	47.02	334.19	2.51	9.17	180.70	11.68
127	US-MAC	2015	46.53	356.65	2.92	5.92	154.10	8.84
128	US-Myb	2010	28.65	305.24	0.56	1.41	183.40	1.97
129	US-Myb	2011	200.41	367.27	0.28	3.62	265.50	3.89
130	US-Myb	2012	88.45	331.93	-0.06	13.68	204.50	13.62
131	US-Myb	2013	47.39	341.89	-0.12	7.95	200.00	7.83

132	US-Myb	2014	86.80	310.73	0.16	8.20	168.00	8.36
133	US-Myb	2015	76.10	323.19	0.17	7.31	202.00	7.47
134	US-Myb	2016	24.11	328.43	0.00	4.03	176.00	4.03
135	US-Myb	2017	67.46	395.16	-0.24	5.79	202.00	5.55
136	US-Myb	2018	83.66	331.31	-0.25	10.50	201.00	10.25
137	US-NC4	2012	NaN	NaN	NaN	NaN	NaN	NaN
138	US-NC4	2013	94.35	304.81	0.78	6.97	181.00	7.75
139	US-NC4	2014	97.51	354.46	0.64	6.09	173.70	6.73
140	US-NC4	2015	92.03	315.08	0.74	9.73	185.00	10.47
141	US-NC4	2016	99.57	326.98	0.92	8.22	183.00	9.14
142	US-ORv	2011	88.77	316.45	-0.06	7.39	180.40	7.33
143	US-ORv	2012	93.50	303.39	0.27	9.29	181.00	9.55
144	US-ORv	2013	107.62	305.23	0.36	10.11	192.40	10.46
145	US-ORv	2014	109.31	299.17	0.24	10.14	190.00	10.38
146	US-ORv	2015	105.01	301.56	0.27	9.64	194.00	9.91
147	US-OWC	2015	NaN	301.35	0.26	6.72	151.30	6.98
148	US-OWC	2016	116.05	309.20	0.30	6.44	204.00	6.73
149	US-Sne	2016	-21.79	306.16	0.34	7.99	190.30	8.34
150	US-Sne	2017	NaN	NaN	NaN	NaN	NaN	NaN
151	US-Sne	2018	84.63	370.31	0.32	2.43	202.00	2.75
152	US-Srr	2014	47.02	307.53	0.78	6.04	175.60	6.83
153	US-Srr	2015	35.50	320.88	0.33	7.96	158.60	8.29
154	US-Srr	2016	44.76	318.87	0.38	8.86	170.80	9.24
155	US-Srr	2017	56.75	309.79	0.30	10.46	185.00	10.76
156	US-StJ	2016	120.72	280.75	1.30	12.01	193.80	13.31
157	US-Tw1	2011	NaN	NaN	NaN	NaN	NaN	NaN
158	US-Tw1	2012	102.12	325.54	0.00	12.83	216.10	12.83
159	US-Tw1	2013	98.35	338.02	-0.18	13.11	208.40	12.93
160	US-Tw1	2014	95.66	326.27	0.12	10.46	208.00	10.58
161	US-Tw1	2015	105.53	344.13	0.26	9.88	215.00	10.13
162	US-Tw1	2016	91.82	313.13	-0.01	10.10	209.00	10.09
163	US-Tw1	2017	93.36	329.76	-0.04	11.26	214.00	11.22
164	US-Tw1	2018	119.04	363.78	-0.02	12.73	217.00	12.70
165	US-Tw4	2014	160.04	363.23	0.00	4.70	236.60	4.70

166	US-Tw4	2015	57.22	335.89	0.01	8.11	213.00	8.13
167	US-Tw4	2016	76.15	311.33	0.17	8.22	185.00	8.39
168	US-Tw4	2017	100.19	332.90	0.14	8.76	214.00	8.90
169	US-Tw4	2018	98.39	337.78	0.04	11.84	206.00	11.88
170	US-Tw5	2018	115.94	321.33	1.77	6.68	231.10	8.45
171	US-Twt	2009	149.98	293.01	0.20	12.46	212.00	12.66
172	US-Twt	2010	141.10	311.91	0.10	13.71	224.40	13.81
173	US-Twt	2011	158.51	288.69	0.12	14.22	215.90	14.34
174	US-Twt	2012	166.84	308.78	0.21	12.31	233.00	12.52
175	US-Twt	2013	138.24	272.38	0.27	16.71	202.00	16.98
176	US-Twt	2014	148.14	281.40	0.16	15.01	205.00	15.17
177	US-Twt	2015	137.11	277.23	0.17	11.52	218.00	11.68
178	US-Twt	2016	169.14	289.90	0.29	13.80	224.00	14.08
179	US-Uaf	2011	114.56	283.49	0.12	6.04	196.90	6.17
180	US-Uaf	2012	88.03	271.24	0.18	6.58	187.30	6.76
181	US-Uaf	2013	124.13	271.61	0.22	5.79	192.10	6.01
182	US-Uaf	2014	84.63	269.30	0.14	5.32	188.00	5.46
183	US-Uaf	2015	90.52	264.29	0.09	5.17	196.00	5.25
184	US-Uaf	2016	103.06	270.75	0.14	4.66	192.00	4.80
185	US-Uaf	2017	102.29	275.58	0.14	6.10	198.00	6.25
186	US-Uaf	2018	111.65	291.46	0.04	5.60	190.00	5.64
187	US-WPT	2011	134.98	285.59	0.24	7.43	206.10	7.67
188	US-WPT	2012	129.04	293.67	0.06	6.97	205.90	7.03
189	US-WPT	2013	134.87	278.12	0.05	6.20	200.90	6.24

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Year	Data year
Start_GPP_DT_(DOY)	Season start for elevated GPP_DT (DOY), point "f" in Figure 1
End_GPP_DT_(DOY)	Season end for elevated GPP_DT fluxes (DOY), point "h" in Figure 1
Base_value_GPP_DT_(µmolCO2/m2/s)	Baseline GPP_DT flux during non-elevated season (µmol CO2/m2/s), average of points "a" and "b" in Figure 1

Ampl_GPP_DT_(µmolCO2/m2/s)	Amplitude of GPP_DT flux during elevated flux season (µmol CO2/m2/s), difference between point "e" in Figure 1 and Base_value_GPP_DT
Peak_GPP_DT_(DOY)	Day of maximum elevated GPP_DT flux (DOY), point "g" in Figure 1
Peak_value_GPP_DT_(µmolCO2/m2/s)	Maximum value of GPP_DT flux (µmol CO2/m2/s), point "e" in Figure 1

Table B5-C Timesat output for FCH4, GPP_DT, TA, and TS (TS from shallowest probe at each site)

	SITE_ID	Year	Start_TA_(DOY)	End_TA_(DOY)	Base_value_TA_(C)	Ampl_TA_(C)	Peak_TA_(DOY)	Peak_value_TA_(C)
1	AT-Neu	2010	43.17	351.66	-4.84	20.94	195.90	16.10
2	AT-Neu	2011	18.47	359.91	-5.08	20.55	198.50	15.47
3	AT-Neu	2012	38.03	366.62	-5.57	22.35	197.20	16.78
4	BR-Npw	2014	NaN	NaN	NaN	NaN	NaN	NaN
5	BR-Npw	2015	NaN	NaN	NaN	NaN	NaN	NaN
6	BR-Npw	2016	7.49	348.67	19.56	7.53	211.00	27.10
7	BW-Gum	2018	NaN	NaN	NaN	NaN	NaN	NaN
8	BW-Gum	2019	NaN	NaN	NaN	NaN	NaN	NaN
9	BW-Nxr	2018	NaN	NaN	NaN	NaN	NaN	NaN
10	CA-SCB	2014	60.23	335.31	-23.33	41.29	197.40	17.96
11	CA-SCB	2015	45.11	360.83	-21.75	39.11	186.40	17.37
12	CA-SCB	2016	49.77	335.79	-18.88	37.28	193.90	18.40
13	CA-SCB	2017	64.68	327.30	-18.45	35.95	201.00	17.50
14	CA-SCC	2013	67.57	338.23	-21.08	39.13	203.80	18.05
15	CA-SCC	2014	54.14	337.83	-22.27	40.98	196.70	18.72
16	CA-SCC	2015	46.41	359.38	-20.09	37.86	187.10	17.77
17	CA-SCC	2016	47.31	350.23	-18.76	37.65	194.00	18.89
18	DE-Dgw	2015	72.47	347.56	2.18	16.25	203.80	18.42
19	DE-Dgw	2016	64.46	324.69	1.34	17.37	205.40	18.71
20	DE-Dgw	2017	43.79	375.32	-0.17	18.47	202.20	18.30
21	DE-Hte	2011	NaN	NaN	NaN	NaN	NaN	NaN
22	DE-Hte	2012	50.34	352.49	0.77	17.03	207.60	17.80
23	DE-Hte	2013	83.53	365.30	1.64	17.09	202.50	18.73
24	DE-Hte	2014	48.71	352.47	2.86	15.82	213.00	18.68
25	DE-Hte	2015	57.62	366.35	2.59	15.33	211.00	17.92
26	DE-Hte	2016	67.53	323.10	2.75	16.01	211.00	18.76
27	DE-Hte	2017	58.94	370.07	1.81	16.22	212.00	18.02
28	DE-Hte	2018	74.55	368.02	0.91	19.14	203.00	20.05
29	DE-SfN	2012	54.86	355.18	-2.09	20.25	196.30	18.16
30	DE-SfN	2013	64.64	344.04	-0.35	18.57	202.80	18.22
31	DE-SfN	2014	NaN	NaN	NaN	NaN	NaN	NaN

32	DE-Zrk	2013	NaN	NaN	NaN	NaN	NaN	NaN
33	DE-Zrk	2014	NaN	NaN	NaN	NaN	NaN	NaN
34	DE-Zrk	2015	49.71	355.39	2.13	15.33	203.40	17.46
35	DE-Zrk	2016	63.30	323.76	1.85	16.45	204.00	18.31
36	DE-Zrk	2017	45.25	372.48	0.47	17.44	205.00	17.91
37	DE-Zrk	2018	75.77	358.90	-0.10	18.78	190.00	18.68
38	FI-Lom	2006	72.49	355.63	-12.19	26.67	195.00	14.48
39	FI-Lom	2007	56.24	372.50	-11.01	22.60	193.40	11.59
40	FI-Lom	2008	73.45	348.05	-10.36	22.30	200.40	11.95
41	FI-Lom	2009	56.72	356.29	-13.61	27.09	205.00	13.48
42	FI-Lom	2010	54.81	346.00	-16.10	27.81	200.00	11.71
43	FI-Si2	2012	70.38	349.74	-6.91	22.72	199.10	15.81
44	FI-Si2	2013	88.15	369.48	-5.99	23.74	188.60	17.76
45	FI-Si2	2014	53.29	350.42	-4.39	21.50	200.30	17.11
46	FI-Si2	2015	39.64	359.19	-5.00	19.39	212.00	14.39
47	FI-Si2	2016	42.62	345.02	-6.72	23.17	199.00	16.45
48	FI-Sii	2013	89.28	363.91	-5.74	22.24	189.10	16.50
49	FI-Sii	2014	52.05	339.85	-4.36	21.52	200.90	17.15
50	FI-Sii	2015	34.40	357.72	-5.42	19.66	209.50	14.25
51	FI-Sii	2016	55.00	320.65	-5.24	20.90	195.00	15.66
52	FI-Sii	2017	61.62	377.27	-6.32	20.93	208.00	14.61
53	FI-Sii	2018	74.22	378.66	-8.98	27.37	195.00	18.39
54	HK-MPM	2016	53.59	378.86	15.97	13.27	198.10	29.24
55	HK-MPM	2017	49.13	357.32	16.27	13.07	215.60	29.34
56	HK-MPM	2018	42.11	383.02	15.25	14.05	199.00	29.30
57	ID-Pag	2016	NaN	NaN	NaN	NaN	NaN	NaN
58	JP-BBY	2015	56.18	355.66	-5.30	25.89	209.50	20.58
59	JP-BBY	2016	46.06	348.04	-7.13	28.01	212.00	20.89
60	JP-BBY	2017	44.65	361.65	-7.47	28.20	208.70	20.73
61	JP-BBY	2018	45.63	367.94	-7.55	27.12	210.00	19.57
62	JP-Mse	2012	54.48	351.81	1.48	24.59	219.90	26.08
63	KR-CRK	2015	NaN	NaN	NaN	NaN	NaN	NaN
64	KR-CRK	2016	NaN	NaN	NaN	NaN	NaN	NaN
65	KR-CRK	2017	NaN	NaN	NaN	NaN	NaN	NaN

66	KR-CRK	2018	NaN	NaN	NaN	NaN	NaN	NaN
67	MY-MLM	2014	17.51	365.80	25.97	1.95	179.40	27.91
68	MY-MLM	2015	NaN	NaN	NaN	NaN	NaN	NaN
69	NZ-Kop	2012	50.84	347.05	9.12	9.72	219.90	18.84
70	NZ-Kop	2013	39.31	352.93	9.31	8.28	209.60	17.60
71	NZ-Kop	2014	53.45	352.71	9.08	9.68	215.00	18.76
72	NZ-Kop	2015	51.01	357.77	8.55	10.41	212.00	18.96
73	PH-RiF	2012	NaN	NaN	NaN	NaN	NaN	NaN
74	PH-RiF	2013	NaN	NaN	NaN	NaN	NaN	NaN
75	PH-RiF	2014	NaN	NaN	NaN	NaN	NaN	NaN
76	PH-RiF	2015	NaN	NaN	NaN	NaN	NaN	NaN
77	RU-Ch2	2014	62.07	339.91	-31.58	46.02	208.40	14.44
78	RU-Ch2	2015	54.09	340.02	-34.37	47.59	204.40	13.23
79	RU-Ch2	2016	56.44	373.19	-34.38	48.39	201.90	14.00
80	RU-Che	2014	61.35	339.96	-31.54	45.92	208.00	14.37
81	RU-Che	2015	53.19	340.10	-34.28	47.55	204.30	13.26
82	RU-Che	2016	55.88	372.30	-34.29	48.37	201.70	14.08
83	SE-Deg	2014	69.57	327.67	-5.24	21.42	201.00	16.18
84	SE-Deg	2015	29.69	352.18	-7.38	19.31	213.90	11.93
85	SE-Deg	2016	54.69	331.26	-7.34	20.99	197.10	13.65
86	SE-Deg	2017	61.87	353.17	-8.35	21.32	210.00	12.98
87	SE-Deg	2018	74.36	373.70	-11.34	26.53	193.00	15.18
88	US-Atq	2013	NaN	NaN	NaN	NaN	NaN	NaN
89	US-Atq	2014	70.05	360.75	-25.81	32.20	203.40	6.38
90	US-Atq	2015	84.07	347.24	-26.07	34.70	196.70	8.63
91	US-Beo	2013	NaN	NaN	NaN	NaN	NaN	NaN
92	US-Beo	2014	63.26	351.27	-22.70	25.61	203.20	2.91
93	US-Bes	2013	NaN	NaN	NaN	NaN	NaN	NaN
94	US-Bes	2014	76.62	357.34	-24.74	26.57	208.30	1.83
95	US-Bes	2015	82.66	344.05	-25.16	29.49	203.30	4.32
96	US-BZB	2014	65.05	339.25	-17.12	32.08	189.60	14.95
97	US-BZB	2015	52.17	340.04	-17.27	33.86	181.60	16.58
98	US-BZB	2016	35.70	321.04	-16.88	33.52	192.50	16.64
99	US-BZF	2014	64.65	341.50	-16.78	31.98	190.50	15.20

100	US-BZF	2015	52.19	340.98	-16.93	33.41	181.50	16.48
101	US-BZF	2016	34.60	321.31	-16.57	33.21	194.00	16.63
102	US-BZS	2015	46.24	343.61	-17.41	34.59	180.20	17.18
103	US-BZS	2016	32.55	320.26	-15.91	33.02	193.80	17.11
104	US-DPW	2013	59.45	361.72	16.30	10.86	220.80	27.16
105	US-DPW	2014	38.66	326.75	15.99	11.79	210.30	27.78
106	US-DPW	2015	33.62	381.23	15.93	9.98	211.80	25.91
107	US-DPW	2016	45.53	367.09	15.72	12.81	203.00	28.53
108	US-HRA	2017	NaN	NaN	NaN	NaN	NaN	NaN
109	US-HRC	2018	NaN	NaN	NaN	NaN	NaN	NaN
110	US-ICs	2014	NaN	NaN	NaN	NaN	NaN	NaN
111	US-ICs	2015	NaN	NaN	NaN	NaN	NaN	NaN
112	US-ICs	2016	68.13	328.76	-16.90	26.34	196.80	9.44
113	US-Ivo	2013	93.13	360.42	-23.36	36.20	193.60	12.84
114	US-Ivo	2014	69.00	341.89	-21.44	30.70	193.50	9.26
115	US-Ivo	2015	90.83	326.77	-21.52	31.94	188.60	10.42
116	US-Ivo	2016	90.00	339.98	-21.61	31.33	197.00	9.72
117	US-LA1	2012	31.05	302.54	19.07	8.85	177.60	27.92
118	US-LA2	2012	35.18	316.87	16.70	11.55	197.40	28.25
119	US-LA2	2013	71.41	321.17	15.91	13.32	210.60	29.23
120	US-Los	2014	58.01	365.46	-14.20	33.10	195.40	18.89
121	US-Los	2015	50.36	367.57	-10.76	29.37	203.50	18.60
122	US-Los	2016	39.16	356.37	-9.11	29.07	209.40	19.96
123	US-Los	2017	30.73	345.36	-9.80	28.09	212.00	18.29
124	US-Los	2018	69.61	336.03	-9.75	29.76	197.00	20.02
125	US-MAC	2013	NaN	NaN	NaN	NaN	NaN	NaN
126	US-MAC	2014	42.39	323.96	17.10	9.77	211.20	26.87
127	US-MAC	2015	39.48	328.01	16.94	9.62	200.60	26.56
128	US-Myb	2010	NaN	NaN	NaN	NaN	NaN	NaN
129	US-Myb	2011	31.10	331.80	8.15	12.63	223.60	20.78
130	US-Myb	2012	16.54	358.52	7.18	13.47	214.90	20.66
131	US-Myb	2013	24.44	342.29	7.26	13.44	197.00	20.70
132	US-Myb	2014	11.52	353.52	8.78	12.76	211.00	21.54
133	US-Myb	2015	-0.97	325.62	8.88	13.12	228.00	21.99

134	US-Myb	2016	-3.34	351.73	7.96	12.97	208.00	20.93
135	US-Myb	2017	27.35	345.82	8.30	13.88	214.00	22.19
136	US-Myb	2018	44.40	332.57	9.03	11.46	218.00	20.49
137	US-NC4	2012	57.32	339.28	9.01	17.49	208.70	26.50
138	US-NC4	2013	69.27	352.37	6.79	19.01	204.60	25.79
139	US-NC4	2014	49.17	367.68	5.41	18.30	206.30	23.71
140	US-NC4	2015	64.43	392.18	6.92	19.42	202.00	26.33
141	US-NC4	2016	53.97	350.61	8.14	19.07	215.00	27.21
142	US-ORv	2011	63.96	358.28	0.50	25.07	195.20	25.57
143	US-ORv	2012	32.88	351.31	0.84	24.92	195.90	25.76
144	US-ORv	2013	51.21	355.78	-2.44	25.94	203.60	23.50
145	US-ORv	2014	51.30	370.00	-4.35	27.96	196.00	23.61
146	US-ORv	2015	62.52	393.56	-4.58	27.87	199.00	23.29
147	US-OWC	2015	NaN	NaN	NaN	NaN	NaN	NaN
148	US-OWC	2016	56.19	365.00	2.20	22.65	211.80	24.85
149	US-Sne	2016	NaN	NaN	NaN	NaN	NaN	NaN
150	US-Sne	2017	9.23	344.35	7.29	14.52	217.90	21.80
151	US-Sne	2018	49.63	357.43	7.14	13.97	220.90	21.11
152	US-Srr	2014	50.56	337.45	10.74	10.06	217.30	20.80
153	US-Srr	2015	4.98	323.35	9.49	12.20	235.30	21.69
154	US-Srr	2016	-6.23	346.21	8.26	11.70	211.90	19.96
155	US-Srr	2017	17.23	346.39	7.94	13.42	216.00	21.36
156	US-StJ	2016	67.33	347.07	3.01	23.37	214.00	26.37
157	US-Tw1	2011	59.53	328.03	7.82	13.46	222.10	21.28
158	US-Tw1	2012	18.52	356.80	6.67	14.88	216.30	21.56
159	US-Tw1	2013	29.27	344.79	7.09	14.34	196.80	21.43
160	US-Tw1	2014	14.74	349.77	8.52	13.61	204.00	22.13
161	US-Tw1	2015	7.05	324.07	8.19	13.45	222.00	21.63
162	US-Tw1	2016	4.40	350.56	7.22	13.89	203.00	21.11
163	US-Tw1	2017	25.14	343.29	7.24	15.12	206.00	22.36
164	US-Tw1	2018	50.84	337.80	7.43	13.37	211.00	20.80
165	US-Tw4	2014	15.67	348.81	8.65	13.44	206.80	22.09
166	US-Tw4	2015	5.29	324.60	8.49	13.42	224.80	21.90
167	US-Tw4	2016	2.66	347.62	7.58	14.06	201.00	21.64

168	US-Tw4	2017	30.79	337.78	7.88	15.11	208.00	22.99
169	US-Tw4	2018	44.48	331.60	8.26	13.08	213.00	21.33
170	US-Tw5	2018	76.28	338.55	9.15	12.61	208.50	21.76
171	US-Twt	2009	NaN	NaN	NaN	NaN	NaN	NaN
172	US-Twt	2010	NaN	NaN	NaN	NaN	NaN	NaN
173	US-Twt	2011	NaN	NaN	NaN	NaN	NaN	NaN
174	US-Twt	2012	NaN	NaN	NaN	NaN	NaN	NaN
175	US-Twt	2013	NaN	NaN	NaN	NaN	NaN	NaN
176	US-Twt	2014	NaN	NaN	NaN	NaN	NaN	NaN
177	US-Twt	2015	NaN	NaN	NaN	NaN	NaN	NaN
178	US-Twt	2016	NaN	NaN	NaN	NaN	NaN	NaN
179	US-Uaf	2011	59.01	330.80	-23.42	38.45	191.90	15.02
180	US-Uaf	2012	43.13	317.75	-23.94	38.57	192.30	14.63
181	US-Uaf	2013	64.43	344.15	-22.12	39.63	195.90	17.51
182	US-Uaf	2014	49.85	342.99	-20.55	34.19	190.00	13.65
183	US-Uaf	2015	51.31	346.65	-19.52	34.90	182.00	15.38
184	US-Uaf	2016	27.33	325.47	-20.83	36.13	193.00	15.31
185	US-Uaf	2017	59.18	357.64	-22.10	38.30	191.00	16.20
186	US-Uaf	2018	35.38	354.57	-21.58	36.74	196.00	15.16
187	US-WPT	2011	62.29	362.57	-1.13	26.31	199.10	25.18
188	US-WPT	2012	34.86	355.23	-0.44	25.53	198.40	25.09
189	US-WPT	2013	64.19	341.07	-1.92	24.49	205.00	22.57

Column Description

SITE_ID	Site identification code as assigned by regional flux data network
Year	Data year
Start_TA_(DOY)	Season start for elevated TA (DOY), point "f" in Figure 1
End_TA_(DOY)	Season end for elevated TA (DOY), point "h" in Figure 1
Base_value_TA_(C)	Baseline TA during non-elevated season (C), average of points "a" and "b" in Figure 1
Ampl_TA_(C)	Amplitude of TAduring elevated temperature season (C), difference between point "e" in Figure 1 and Base_value_TA
Peak_TA_(DOY)	Day of maximum elevated TA (DOY), point "g" in Figure 1
Peak_value_TA_(C)	Maximum value of TA (C) point "e" in Figure 1

Table B5-D Timesat output for FCH4, GPP_DT, TA, and TS (TS from shallowest probe at each site)

	SITE_ID	Year	Probe_name	Soil_temp_depth_m	Start_TS_(DOY)	End_TS_(DOY)	Base_value_TS_(C)	Ampl_TS_(C)	Peak_TS_(DOY)	Peak_value_TS_(C)
1	AT-Neu	2010	TS_1	-0.05	61.32	339.44	0.15	17.54	200.90	17.70
2	AT-Neu	2011	TS_1	-0.05	51.04	328.84	0.40	16.37	201.00	16.77
3	AT-Neu	2012	TS_1	-0.05	61.12	341.88	0.73	17.57	202.90	18.30
4	BR-Npw	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
5	BR-Npw	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
6	BR-Npw	2016	TS_1	NaN	18.41	343.22	22.41	5.98	188.00	28.40
7	BW-Gum	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
8	BW-Gum	2019	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9	BW-Nxr	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
10	CA-SCB	2014	TS_1	0.00	105.94	292.18	-0.63	20.62	196.60	19.99
11	CA-SCB	2015	TS_1	0.00	106.92	287.14	-0.39	17.23	186.80	16.84
12	CA-SCB	2016	TS_1	0.00	101.64	284.09	-0.31	19.07	193.20	18.77
13	CA-SCB	2017	TS_1	0.00	107.44	289.72	-0.25	17.67	198.00	17.42
14	CA-SCC	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
15	CA-SCC	2014	TS_1	-0.10	123.36	287.06	-0.55	15.64	203.00	15.09
16	CA-SCC	2015	TS_1	-0.10	113.88	285.22	-0.28	16.26	189.20	15.98
17	CA-SCC	2016	TS_1	-0.10	108.09	260.12	-0.33	18.37	190.90	18.04
18	DE-Dgw	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
19	DE-Dgw	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
20	DE-Dgw	2017	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
21	DE-Hte	2011	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
22	DE-Hte	2012	TS_3	-0.20	76.96	344.01	4.98	12.26	215.50	17.23
23	DE-Hte	2013	TS_3	-0.20	60.92	377.99	3.96	11.99	207.90	15.95
24	DE-Hte	2014	TS_1	0.00	NaN	327.83	8.52	8.34	205.60	16.87
25	DE-Hte	2015	TS_1	0.00	62.92	360.55	5.17	11.67	187.40	16.84
26	DE-Hte	2016	TS_1	0.00	71.87	NaN	4.94	12.36	175.60	17.30
27	DE-Hte	2017	TS_1	0.00	61.55	343.32	4.50	11.76	186.00	16.26
28	DE-Hte	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
29	DE-SfN	2012	TS_1	-0.02	NaN	372.59	0.00	23.55	206.50	15.29
30	DE-SfN	2013	TS_1	-0.02	55.84	381.50	0.92	13.62	216.40	14.54
31	DE-SfN	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

32	DE-Zrk	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
33	DE-Zrk	2014	TS_1	-0.05	54.79	361.65	4.36	13.93	202.30	18.29
34	DE-Zrk	2015	TS_1	-0.05	58.29	359.29	4.28	13.24	215.50	17.52
35	DE-Zrk	2016	TS_1	-0.05	72.81	332.00	4.28	14.93	200.40	19.20
36	DE-Zrk	2017	TS_1	-0.05	69.10	351.44	4.40	14.72	199.00	19.12
37	DE-Zrk	2018	TS_1	-0.05	84.47	336.14	4.83	12.32	203.00	17.14
38	FI-Lom	2006	TS_1	-0.07	114.15	290.83	-0.11	13.42	204.80	13.31
39	FI-Lom	2007	TS_1	-0.07	126.84	302.05	0.11	13.05	200.00	13.16
40	FI-Lom	2008	TS_1	-0.07	135.62	296.74	0.16	12.73	202.90	12.88
41	FI-Lom	2009	TS_1	-0.07	117.16	291.86	0.14	11.73	214.00	11.87
42	FI-Lom	2010	TS_1	-0.07	129.91	318.54	0.05	12.13	208.00	12.18
43	FI-Si2	2012	TS_1	-0.05	NaN	323.46	0.00	19.85	204.60	16.02
44	FI-Si2	2013	TS_1	-0.05	106.90	341.05	-0.05	16.04	199.40	15.98
45	FI-Si2	2014	TS_1	-0.05	104.63	331.10	-0.04	17.07	208.50	17.03
46	FI-Si2	2015	TS_1	-0.05	76.49	352.34	-0.87	16.31	211.00	15.44
47	FI-Si2	2016	TS_1	-0.05	102.64	329.42	-0.88	16.48	206.00	15.60
48	FI-Sii	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
49	FI-Sii	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
50	FI-Sii	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
51	FI-Sii	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
52	FI-Sii	2017	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
53	FI-Sii	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
54	HK-MPM	2016	TS_2	NaN	NaN	566.87	0.00	7.79	219.80	28.92
55	HK-MPM	2017	TS_2	NaN	NaN	NaN	0.00	8.73	218.50	29.13
56	HK-MPM	2018	TS_2	NaN	NaN	NaN	0.00	7.23	204.90	28.66
57	ID-Pag	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
58	JP-BBY	2015	TS_1	-0.18	87.83	340.83	0.94	21.59	218.10	22.53
59	JP-BBY	2016	TS_1	-0.18	80.75	330.60	0.36	22.19	217.80	22.55
60	JP-BBY	2017	TS_1	-0.18	80.38	347.77	0.20	21.75	213.80	21.95
61	JP-BBY	2018	TS_1	-0.18	78.28	355.38	0.50	20.38	222.00	20.88
62	JP-Mse	2012	TS_1	-0.01	60.38	348.86	2.15	23.76	211.80	25.91
63	KR-CRK	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
64	KR-CRK	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
65	KR-CRK	2017	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

66	KR-CRK	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
67	MY-MLM	2014	TS	NaN	NaN	358.37	25.06	3.97	194.50	29.03
68	MY-MLM	2015	TS	NaN	27.32	NaN	25.57	1.97	172.70	27.55
69	NZ-Kop	2012	TS_1	-0.50	62.54	360.29	8.30	8.39	219.80	16.70
70	NZ-Kop	2013	TS_1	-0.50	45.63	367.00	8.41	7.64	210.50	16.04
71	NZ-Kop	2014	TS_1	-0.50	56.88	365.68	8.16	8.79	219.00	16.95
72	NZ-Kop	2015	TS_1	-0.50	56.49	371.82	7.73	9.36	214.00	17.09
73	PH-RiF	2012	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
74	PH-RiF	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
75	PH-RiF	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
76	PH-RiF	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
77	RU-Ch2	2014	TS_1	-0.04	138.76	263.76	-0.13	14.42	206.60	14.29
78	RU-Ch2	2015	TS_1	-0.04	143.88	269.56	-0.14	13.97	193.30	13.83
79	RU-Ch2	2016	TS_1	-0.04	126.98	273.54	-0.16	11.64	200.20	11.48
80	RU-Che	2014	TS_1	-0.04	138.05	267.57	-0.12	15.04	208.00	14.92
81	RU-Che	2015	TS_1	-0.04	143.85	274.68	-0.17	14.81	193.70	14.64
82	RU-Che	2016	TS_1	-0.04	126.72	274.03	-0.19	12.95	200.40	12.76
83	SE-Deg	2014	TS_1	-0.02	111.85	303.55	-0.53	17.22	201.60	16.69
84	SE-Deg	2015	TS_1	-0.02	104.25	310.59	-0.28	15.20	207.20	14.91
85	SE-Deg	2016	TS_1	-0.02	108.14	306.39	-0.19	14.88	200.30	14.68
86	SE-Deg	2017	TS_1	-0.02	133.38	326.87	-0.20	12.35	215.00	12.15
87	SE-Deg	2018	TS_1	-0.02	111.67	310.21	-0.17	14.70	198.00	14.52
88	US-Atq	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
89	US-Atq	2014	TS_1	NaN	10.75	139.53	-0.20	8.07	61.00	7.86
90	US-Atq	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
91	US-Beo	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
92	US-Beo	2014	TS_1	NaN	155.09	270.13	-0.04	4.87	211.10	4.83
93	US-Bes	2013	TS_1	NaN	143.22	261.99	-0.05	5.65	201.30	5.60
94	US-Bes	2014	TS_1	NaN	151.79	282.29	-0.10	3.92	198.50	3.82
95	US-Bes	2015	TS_1	NaN	140.45	270.98	-0.11	4.76	195.30	4.65
96	US-BZB	2014	TS_1	-0.08	123.11	298.35	-0.44	15.35	215.80	14.91
97	US-BZB	2015	TS_1	-0.08	107.82	295.60	-0.38	14.04	210.20	13.67
98	US-BZB	2016	TS_1	-0.08	125.09	292.39	-0.33	16.39	214.30	16.06
99	US-BZF	2014	TS_1	-0.08	96.05	322.79	-1.56	16.12	205.40	14.56

100	US-BZF	2015	TS_1	-0.08	108.39	331.07	-1.20	14.88	197.50	13.68
101	US-BZF	2016	TS_1	-0.08	95.50	315.89	-1.03	17.18	205.10	16.15
102	US-BZS	2015	TS_1	NaN	116.48	275.22	-0.07	4.87	202.90	4.79
103	US-BZS	2016	TS_1	NaN	119.07	278.90	-0.05	5.58	208.40	5.54
104	US-DPW	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
105	US-DPW	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
106	US-DPW	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
107	US-DPW	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
108	US-HRA	2017	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
109	US-HRC	2018	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
110	US-ICs	2014	TS_1	-0.08	147.27	263.08	-0.08	5.47	205.60	5.39
111	US-ICs	2015	TS_1	-0.08	141.61	255.70	-0.02	6.12	195.20	6.10
112	US-ICs	2016	TS_1	-0.08	146.75	265.86	-0.05	5.67	206.20	5.62
113	US-Ivo	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
114	US-Ivo	2014	TS_1	-0.05	136.92	264.34	-0.20	10.84	195.70	10.64
115	US-Ivo	2015	TS_1	-0.05	139.42	257.06	-0.14	14.86	185.60	14.72
116	US-Ivo	2016	TS_1	-0.05	133.60	262.43	-0.10	8.90	197.30	8.80
117	US-LA1	2012	TS_1	-0.10	29.15	331.44	15.59	13.50	197.20	29.08
118	US-LA2	2012	TS_1	-0.10	36.65	336.05	15.04	14.35	193.20	29.39
119	US-LA2	2013	TS_1	-0.10	65.79	377.93	14.70	16.06	201.50	30.76
120	US-Los	2014	TS_1	0.00	136.18	417.40	1.95	8.26	244.30	10.22
121	US-Los	2015	TS_1	0.00	148.23	422.27	2.43	7.76	258.70	10.19
122	US-Los	2016	TS_1	0.00	135.20	415.75	2.47	8.08	255.10	10.56
123	US-Los	2017	TS_1	0.00	141.15	414.62	1.89	7.45	256.00	9.34
124	US-Los	2018	TS_1	0.00	169.83	421.79	1.46	7.42	260.00	8.88
125	US-MAC	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
126	US-MAC	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
127	US-MAC	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
128	US-Myb	2010	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
129	US-Myb	2011	TS_3	-0.08	NaN	329.50	12.12	8.86	231.70	20.98
130	US-Myb	2012	TS_3	-0.08	35.60	372.21	9.39	10.96	216.10	20.36
131	US-Myb	2013	TS_3	-0.08	34.38	354.74	9.25	11.28	210.90	20.52
132	US-Myb	2014	TS_3	-0.08	26.04	365.88	9.64	12.28	210.00	21.93
133	US-Myb	2015	TS_3	-0.08	17.34	340.72	9.77	11.85	212.00	21.62

134	US-Myb	2016	TS_3	-0.08	5.05	357.82	9.61	11.19	201.00	20.80
135	US-Myb	2017	TS_3	-0.08	27.31	352.90	9.86	13.10	214.00	22.96
136	US-Myb	2018	TS_3	-0.08	36.27	326.10	10.20	10.72	207.00	20.92
137	US-NC4	2012	TS_1	-0.05	42.43	336.03	7.87	15.75	215.40	23.62
138	US-NC4	2013	TS_1	-0.05	59.96	368.85	6.92	16.83	210.50	23.74
139	US-NC4	2014	TS_1	-0.05	54.42	362.34	6.73	16.81	208.50	23.54
140	US-NC4	2015	TS_1	-0.05	68.13	387.31	8.27	16.06	205.00	24.33
141	US-NC4	2016	TS_1	-0.05	52.97	351.38	9.41	15.04	220.00	24.45
142	US-ORv	2011	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
143	US-ORv	2012	TS	NaN	57.42	352.55	4.36	20.61	203.90	24.97
144	US-ORv	2013	TS	NaN	63.67	356.74	2.93	19.98	210.80	22.90
145	US-ORv	2014	TS	NaN	68.11	364.96	2.11	20.17	205.30	22.28
146	US-ORv	2015	TS	NaN	68.77	387.78	1.77	21.26	206.00	23.04
147	US-OWC	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
148	US-OWC	2016	TS_1	-0.05	0.00	0.00	0.00	0.00	211.20	23.91
149	US-Sne	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
150	US-Sne	2017	TS_1	-0.01	46.07	337.92	10.33	13.14	212.70	23.47
151	US-Sne	2018	TS_1	-0.01	48.41	325.09	10.28	12.15	217.30	22.43
152	US-Srr	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
153	US-Srr	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
154	US-Srr	2016	TS_1	NaN	NaN	326.29	10.03	10.71	200.50	20.74
155	US-Srr	2017	TS_1	NaN	11.34	346.85	7.22	13.71	199.50	20.93
156	US-StJ	2016	TS_2	-0.05	68.37	347.38	4.05	16.22	213.70	20.27
157	US-Tw1	2011	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
158	US-Tw1	2012	TS_1	-0.02	50.54	359.96	5.99	11.52	225.20	17.51
159	US-Tw1	2013	TS_1	-0.02	35.80	337.57	4.39	14.59	206.60	18.97
160	US-Tw1	2014	TS_1	-0.02	41.23	395.41	6.67	10.89	208.30	17.56
161	US-Tw1	2015	TS_1	-0.02	50.66	342.55	9.02	7.83	235.00	16.85
162	US-Tw1	2016	TS_1	-0.02	34.57	361.06	8.78	7.94	218.00	16.72
163	US-Tw1	2017	TS_1	-0.02	41.17	343.75	7.55	10.22	228.00	17.77
164	US-Tw1	2018	TS_1	-0.02	60.47	327.43	6.70	10.42	222.00	17.12
165	US-Tw4	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
166	US-Tw4	2015	TS_1	-0.02	15.93	327.22	10.04	11.56	199.40	21.60
167	US-Tw4	2016	TS_1	-0.02	9.56	358.75	8.16	11.29	201.70	19.45

168	US-Tw4	2017	TS_1	-0.02	38.35	347.31	8.07	11.52	211.90	19.59
169	US-Tw4	2018	TS_1	-0.02	58.11	344.87	8.00	10.93	218.00	18.93
170	US-Tw5	2018	TS_1	-0.02	NaN	414.83	0.00	8.89	222.20	18.37
171	US-Twt	2009	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
172	US-Twt	2010	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
173	US-Twt	2011	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
174	US-Twt	2012	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
175	US-Twt	2013	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
176	US-Twt	2014	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
177	US-Twt	2015	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
178	US-Twt	2016	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
179	US-Uaf	2011	TS_1	-0.09	86.20	372.46	-12.29	21.95	199.60	9.67
180	US-Uaf	2012	TS_1	-0.09	73.77	338.53	-11.83	20.86	202.40	9.03
181	US-Uaf	2013	TS_1	-0.09	109.63	395.51	-10.08	20.52	200.40	10.44
182	US-Uaf	2014	TS_1	-0.09	76.07	365.40	-10.94	19.94	206.00	9.00
183	US-Uaf	2015	TS_1	-0.09	80.99	423.19	-9.77	19.76	190.00	10.00
184	US-Uaf	2016	TS_1	-0.09	77.38	315.75	-7.74	19.13	198.00	11.39
185	US-Uaf	2017	TS_1	-0.09	84.88	380.17	-7.39	19.08	196.00	11.69
186	US-Uaf	2018	TS_1	-0.09	96.04	333.33	-5.60	17.72	199.00	12.11
187	US-WPT	2011	TS_1	-0.10	80.95	342.17	5.27	19.27	202.60	24.54
188	US-WPT	2012	TS_1	-0.10	40.29	345.57	3.70	21.60	197.40	25.30
189	US-WPT	2013	TS_1	-0.10	74.61	340.47	3.73	18.23	207.20	21.96

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Year	Data year
Probe_name	Temperature probe name as given in data files
Soil_temp_depth_m	Depth of soil temperature probe (m), with negative values being under the surface
Start_TS_(DOY)	Season start for elevated TS (DOY), point "f" in Figure 1
End_TS_(DOY)	Season end for elevated TS (DOY), point "h" in Figure 1
Base_value_TS_(C)	Baseline TS during non-elevated season (C), average of points "a" and "b" in Figure 1
Ampl_TS_(C)	Amplitude of TS during elevated temperature season (C), difference between point "e" in Figure 1 and Base_value_TS

Peak_TS_(DOY)	Day of maximum elevated TS (DOY), point "g" in Figure 1
Peak_value_TS_(C)	Maximum value of TS (C) point "e" in Figure 1

Table B6: Timesat output for all soil temperature probes

	SITE_ID	Year	Probe_name	Soil_temp_depth_m	Start_TS_(DOY)	End_TS_(DOY)	Base_value_TS_(C)	Ampl_TS_(C)	Peak_TS_(DOY)	Peak_value_TS_(C)
1	AT-Neu	2010	TS_1	-0.05	61.32	339.44	0.15	17.54	200.9	17.7
2	AT-Neu	2011	TS_1	-0.05	51.04	328.84	0.40	16.37	201	16.77
3	AT-Neu	2012	TS_1	-0.05	61.12	341.88	0.73	17.57	202.9	18.3
4	BR-Npw	2016	TS_1	NaN	18.41	343.22	22.41	5.982	188	28.4
5	CA-SCB	2014	TS_1	0	105.94	292.18	-0.63	20.62	196.6	19.99
6	CA-SCB	2014	TS_2	-0.02	105.15	294.06	-0.74	20.42	197.5	19.68
7	CA-SCB	2014	TS_3	-0.04	112.00	294.38	0.05	19.07	199.6	19.11
8	CA-SCB	2014	TS_5	-0.16	123.21	317.72	-1.38	18.6	205.3	17.23
9	CA-SCB	2015	TS_1	0	106.92	287.14	-0.39	17.23	186.8	16.84
10	CA-SCB	2015	TS_2	-0.02	107.06	287.40	-0.42	17.08	187.4	16.66
11	CA-SCB	2015	TS_3	-0.04	107.45	289.83	-0.51	16.81	188.9	16.3
12	CA-SCB	2015	TS_5	-0.16	114.95	305.55	-0.39	15.84	195.7	15.45
13	CA-SCB	2016	TS_1	0	101.64	284.09	-0.31	19.07	193.2	18.77
14	CA-SCB	2016	TS_2	-0.02	101.81	284.11	-0.30	18.96	193.5	18.66
15	CA-SCB	2016	TS_3	-0.04	102.22	285.19	-0.30	18.6	194.3	18.3
16	CA-SCB	2016	TS_5	-0.16	101.16	298.99	-0.24	16.99	201.1	16.74
17	CA-SCB	2017	TS_1	0	107.44	289.72	-0.25	17.67	198	17.42
18	CA-SCB	2017	TS_2	-0.02	107.22	288.88	-0.25	17.59	198	17.33
19	CA-SCB	2017	TS_3	-0.04	108.58	289.29	-0.26	17.28	199	17.02
20	CA-SCB	2017	TS_5	-0.16	116.34	300.28	-0.24	14.95	214	14.71
21	CA-SCC	2014	TS_1	-0.1	123.36	287.06	-0.55	15.64	203	15.09
22	CA-SCC	2014	TS_2	-0.15	114.89	287.71	-0.83	14.49	200.8	13.66
23	CA-SCC	2014	TS_3	-0.2	111.36	288.63	-0.69	11.52	194.9	10.84
24	CA-SCC	2014	TS_4	-0.25	129.50	287.24	-0.22	8.612	207.4	8.391
25	CA-SCC	2014	TS_5	-0.3	142.36	287.99	-0.10	6.329	212.1	6.225
26	CA-SCC	2015	TS_1	-0.1	113.88	285.22	-0.28	16.26	189.2	15.98
27	CA-SCC	2015	TS_2	-0.15	113.05	284.18	-0.24	14.56	192.8	14.32
28	CA-SCC	2015	TS_3	-0.2	111.76	285.45	-0.22	12.71	199.1	12.48
29	CA-SCC	2015	TS_4	-0.25	120.81	287.09	-0.16	10.08	204.8	9.922
30	CA-SCC	2015	TS_5	-0.3	131.92	285.42	-0.09	7.705	209.2	7.616
31	CA-SCC	2016	TS_1	-0.1	108.09	260.12	-0.33	18.37	190.9	18.04
32	CA-SCC	2016	TS_2	-0.15	108.96	260.19	-0.30	17.31	192.1	17.01
33	CA-SCC	2016	TS_3	-0.2	110.49	260.44	-0.26	15.4	194.1	15.14
34	CA-SCC	2016	TS_4	-0.25	119.21	260.34	-0.20	13.38	200.2	13.18
35	CA-SCC	2016	TS_5	-0.3	130.75	261.73	-0.12	10.03	202.2	9.906
36	DE-Hte	2012	TS_3	-0.2	76.96	344.01	4.98	12.26	215.5	17.23
37	DE-Hte	2013	TS_3	-0.2	60.92	377.99	3.96	11.99	207.9	15.95
38	DE-Hte	2014	TS_1	0	NaN	327.83	8.52	8.342	205.6	16.87
39	DE-Hte	2015	TS_1	0	62.92	360.55	5.17	11.67	187.4	16.84
40	DE-Hte	2016	TS_1	0	71.87	NaN	4.94	12.36	175.6	17.3
41	DE-Hte	2017	TS_1	0	61.55	343.32	4.50	11.76	186	16.26
42	DE-SfN	2012	TS_1	-0.02	NaN	372.59	0.00	23.55	206.5	15.29
43	DE-SfN	2012	TS_3	-0.1	NaN	366.65	1.64	12.91	219.7	14.55

44	DE-SfN	2012	TS_4	-0.2	NaN	367.40	4.86	7.276	242.7	12.14
45	DE-SfN	2012	TS_5	-0.5	NaN	367.40	4.86	7.276	242.7	12.14
46	DE-SfN	2013	TS_1	-0.02	55.84	381.50	0.92	13.62	216.4	14.54
47	DE-SfN	2013	TS_3	-0.1	60.45	384.77	1.56	12.5	221.1	14.06
48	DE-SfN	2013	TS_4	-0.2	83.55	394.53	3.62	8.417	243.4	12.04
49	DE-SfN	2013	TS_5	-0.5	83.55	394.53	3.62	8.417	243.4	12.04
50	DE-Zrk	2014	TS_1	-0.05	54.79	361.65	4.36	13.93	202.3	18.29
51	DE-Zrk	2014	TS_2	-0.1	59.27	366.51	4.87	12.65	207.3	17.52
52	DE-Zrk	2014	TS_3	-0.2	62.95	371.30	5.53	11.5	211.7	17.03
53	DE-Zrk	2014	TS_4	-0.3	67.45	375.14	6.05	10.4	216.5	16.45
54	DE-Zrk	2014	TS_5	-0.5	72.50	378.95	6.57	9.359	221	15.93
55	DE-Zrk	2015	TS_1	-0.05	58.29	359.29	4.28	13.24	215.5	17.52
56	DE-Zrk	2015	TS_2	-0.1	62.61	364.99	4.79	12	219.8	16.8
57	DE-Zrk	2015	TS_3	-0.2	66.01	369.78	5.42	10.87	223.7	16.29
58	DE-Zrk	2015	TS_4	-0.3	70.47	374.40	5.93	9.771	228	15.7
59	DE-Zrk	2015	TS_5	-0.5	74.71	378.76	6.43	8.751	232.2	15.19
60	DE-Zrk	2016	TS_1	-0.05	72.81	332.00	4.28	14.93	200.4	19.2
61	DE-Zrk	2016	TS_2	-0.1	76.31	337.37	4.79	13.6	204.4	18.39
62	DE-Zrk	2016	TS_3	-0.2	79.73	343.16	5.43	12.33	208.1	17.77
63	DE-Zrk	2016	TS_4	-0.3	83.58	347.57	5.94	11.14	212	17.09
64	DE-Zrk	2016	TS_5	-0.5	87.15	354.22	6.40	10.07	216	16.47
65	DE-Zrk	2017	TS_1	-0.05	69.10	351.44	4.40	14.72	199	19.12
66	DE-Zrk	2017	TS_2	-0.1	73.29	356.52	4.91	13.33	204	18.23
67	DE-Zrk	2017	TS_3	-0.2	77.19	362.40	5.56	12.02	208	17.58
68	DE-Zrk	2017	TS_4	-0.3	82.20	367.20	6.04	10.8	212	16.84
69	DE-Zrk	2017	TS_5	-0.5	86.22	372.96	6.48	9.675	217	16.15
70	DE-Zrk	2018	TS_1	-0.05	84.47	336.14	4.83	12.32	203	17.14
71	DE-Zrk	2018	TS_2	-0.1	86.60	342.59	5.30	11.27	208	16.57
72	DE-Zrk	2018	TS_3	-0.2	87.68	348.07	5.89	10.25	212	16.14
73	DE-Zrk	2018	TS_4	-0.3	89.82	354.77	6.31	9.308	217	15.61
74	DE-Zrk	2018	TS_5	-0.5	92.01	360.46	6.69	8.412	222	15.11
75	FI-Lom	2006	TS_1	-0.07	114.15	290.83	-0.11	13.42	204.8	13.31
76	FI-Lom	2006	TS_2	-0.3	117.21	307.88	0.27	12.01	214.1	12.28
77	FI-Lom	2006	TS_3	-0.5	128.82	329.03	1.06	9.071	225.8	10.13
78	FI-Lom	2007	TS_1	-0.07	126.84	302.05	0.11	13.05	200	13.16
79	FI-Lom	2007	TS_2	-0.3	134.00	321.03	0.42	11.5	207.5	11.92
80	FI-Lom	2007	TS_3	-0.5	138.37	348.03	1.06	8.873	221.1	9.936
81	FI-Lom	2008	TS_1	-0.07	135.62	296.74	0.16	12.73	202.9	12.88
82	FI-Lom	2008	TS_2	-0.3	141.46	318.74	0.58	10.62	209.6	11.2
83	FI-Lom	2008	TS_3	-0.5	146.70	349.21	1.17	8.214	221.2	9.382
84	FI-Lom	2009	TS_1	-0.07	117.16	291.86	0.14	11.73	214	11.87
85	FI-Lom	2009	TS_2	-0.3	123.51	314.51	0.67	9.692	221	10.36
86	FI-Lom	2009	TS_3	-0.5	133.69	336.65	1.30	7.896	233	9.193
87	FI-Lom	2010	TS_1	-0.07	129.91	318.54	0.05	12.13	208	12.18
88	FI-Lom	2010	TS_2	-0.3	138.09	338.24	0.52	9.962	218	10.48
89	FI-Lom	2010	TS_3	-0.5	147.34	359.95	1.19	7.344	231	8.532
90	FI-Si2	2012	TS_1	-0.05	NaN	323.46	0.00	19.85	204.6	16.02

91	FI-Si2	2012	TS_2	-0.2	103.64	333.52	-0.04	15.75	217.5	15.71
92	FI-Si2	2012	TS_3	-0.35	105.57	NaN	0.00	19.38	230.6	15.09
93	FI-Si2	2012	TS_4	-0.5	110.87	NaN	0.00	17.26	237.5	14.66
94	FI-Si2	2013	TS_1	-0.05	106.90	341.05	-0.05	16.04	199.4	15.98
95	FI-Si2	2013	TS_2	-0.2	102.57	356.13	0.23	14.91	207.3	15.14
96	FI-Si2	2013	TS_3	-0.35	NaN	376.47	0.00	18.26	209.6	14.23
97	FI-Si2	2013	TS_4	-0.5	NaN	392.35	0.00	16.71	216.4	13.48
98	FI-Si2	2014	TS_1	-0.05	104.63	331.10	-0.04	17.07	208.5	17.03
99	FI-Si2	2014	TS_2	-0.2	107.82	359.78	0.59	15.33	215.3	15.92
100	FI-Si2	2014	TS_3	-0.35	112.02	385.94	0.99	13.61	222.2	14.61
101	FI-Si2	2014	TS_4	-0.5	118.24	400.15	1.59	12.01	229.1	13.59
102	FI-Si2	2015	TS_1	-0.05	76.49	352.34	-0.87	16.31	211	15.44
103	FI-Si2	2015	TS_2	-0.2	80.08	364.72	-0.41	14.83	218	14.42
104	FI-Si2	2015	TS_3	-0.35	82.01	374.79	0.12	13.27	225	13.39
105	FI-Si2	2015	TS_4	-0.5	88.25	382.37	0.84	11.7	233	12.53
106	FI-Si2	2016	TS_1	-0.05	102.64	329.42	-0.88	16.48	206	15.6
107	FI-Si2	2016	TS_2	-0.2	102.16	361.04	-0.77	16.02	212	15.25
108	FI-Si2	2016	TS_3	-0.35	103.15	383.82	-0.63	14.7	219	14.07
109	FI-Si2	2016	TS_4	-0.5	104.76	399.01	-0.20	13.36	227	13.16
110	HK-MPM	2016	TS_2	NaN	NaN	566.87	0.00	7.789	219.8	28.92
111	HK-MPM	2016	TS_3	NaN	NaN	373.06	20.56	7.386	227.3	27.95
112	HK-MPM	2017	TS_2	NaN	NaN	NaN	0.00	8.726	218.5	29.13
113	HK-MPM	2017	TS_3	NaN	69.55	364.53	19.53	8.572	233.6	28.1
114	HK-MPM	2018	TS_2	NaN	NaN	NaN	0.00	7.231	204.9	28.66
115	HK-MPM	2018	TS_3	NaN	64.82	383.39	19.17	8.406	221.4	27.58
116	JP-BBY	2015	TS_1	-0.183	87.83	340.83	0.94	21.59	218.1	22.53
117	JP-BBY	2015	TS_2	-0.233	90.59	340.99	1.34	20.9	219.9	22.25
118	JP-BBY	2015	TS_3	-0.283	90.34	341.60	1.58	20.42	221.4	22
119	JP-BBY	2015	TS_4	-0.383	96.01	341.35	2.39	19.09	225.1	21.48
120	JP-BBY	2015	TS_5	-0.483	95.83	341.49	2.91	18.09	228.9	21
121	JP-BBY	2016	TS_1	-0.183	80.75	330.60	0.36	22.19	217.8	22.55
122	JP-BBY	2016	TS_2	-0.233	82.30	335.40	0.67	21.64	220.8	22.3
123	JP-BBY	2016	TS_3	-0.283	84.28	332.64	0.99	21.1	222	22.09
124	JP-BBY	2016	TS_4	-0.383	89.00	332.43	1.76	19.92	225.6	21.68
125	JP-BBY	2016	TS_5	-0.483	94.29	331.91	2.44	18.83	228.9	21.27
126	JP-BBY	2017	TS_1	-0.183	80.38	347.77	0.20	21.75	213.8	21.95
127	JP-BBY	2017	TS_2	-0.233	84.54	347.79	0.82	21.02	214.6	21.83
128	JP-BBY	2017	TS_3	-0.283	86.19	347.10	1.06	20.56	216.3	21.62
129	JP-BBY	2017	TS_4	-0.383	92.20	346.01	1.97	19.34	218.5	21.31
130	JP-BBY	2017	TS_5	-0.483	98.15	345.18	2.70	18.34	221	21.03
131	JP-BBY	2018	TS_1	-0.183	78.28	355.38	0.50	20.38	222	20.88
132	JP-BBY	2018	TS_2	-0.233	83.55	357.60	1.48	19.23	224	20.7
133	JP-BBY	2018	TS_3	-0.283	85.93	355.90	1.69	18.78	225	20.47
134	JP-BBY	2018	TS_4	-0.383	95.89	351.34	2.81	17.25	229	20.07
135	JP-BBY	2018	TS_5	-0.483	103.83	349.39	3.63	16.1	232	19.73
136	JP-Mse	2012	TS_1	-0.01	60.38	348.86	2.15	23.76	211.8	25.91
137	MY-MLM	2014	TS	NaN	NaN	358.37	25.06	3.968	194.5	29.03

138	MY-MLM	2015	TS	NaN	27.32	NaN	25.57	1.973	172.7	27.55
139	NZ-Kop	2012	TS_1	-0.5	62.54	360.29	8.30	8.394	219.8	16.7
140	NZ-Kop	2012	TS_2	-0.1	65.53	362.35	8.45	8.093	222.1	16.54
141	NZ-Kop	2012	TS_3	-0.2	68.77	365.64	8.73	7.243	228.2	15.98
142	NZ-Kop	2013	TS_1	-0.5	45.63	367.00	8.41	7.635	210.5	16.04
143	NZ-Kop	2013	TS_2	-0.1	47.60	370.98	8.54	7.486	212.3	16.03
144	NZ-Kop	2013	TS_3	-0.2	52.74	377.20	8.82	6.87	217.8	15.69
145	NZ-Kop	2014	TS_1	-0.5	56.88	365.68	8.16	8.79	219	16.95
146	NZ-Kop	2014	TS_2	-0.1	59.45	367.47	8.29	8.512	221	16.8
147	NZ-Kop	2014	TS_3	-0.2	62.93	372.48	8.55	7.792	226	16.34
148	NZ-Kop	2015	TS_1	-0.5	56.49	371.82	7.73	9.355	214	17.09
149	NZ-Kop	2015	TS_2	-0.1	58.32	374.74	7.87	9.063	217	16.93
150	NZ-Kop	2015	TS_3	-0.2	62.67	378.44	8.19	8.217	222	16.4
151	RU-Ch2	2014	TS_1	-0.04	138.76	263.76	-0.13	14.42	206.6	14.29
152	RU-Ch2	2014	TS_2	-0.08	146.08	262.11	-0.14	13.03	206.5	12.9
153	RU-Ch2	2014	TS_3	-0.16	155.95	264.51	-0.05	4.581	210.5	4.535
154	RU-Ch2	2015	TS_1	-0.04	143.88	269.56	-0.14	13.97	193.3	13.83
155	RU-Ch2	2015	TS_2	-0.08	147.34	265.69	-0.10	12.3	195.7	12.2
156	RU-Ch2	2015	TS_3	-0.16	159.93	266.60	-0.04	3.995	205.2	3.96
157	RU-Ch2	2016	TS_1	-0.04	126.98	273.54	-0.16	11.64	200.2	11.48
158	RU-Ch2	2016	TS_2	-0.08	133.92	272.58	-0.10	10.06	203.2	9.964
159	RU-Ch2	2016	TS_3	-0.16	147.99	275.45	-0.04	4.042	217.7	4.001
160	RU-Che	2014	TS_1	-0.04	138.05	267.57	-0.12	15.04	208	14.92
161	RU-Che	2014	TS_2	-0.08	149.72	263.67	-0.09	8.959	206.6	8.873
162	RU-Che	2014	TS_3	-0.16	154.97	265.49	-0.07	7.006	210.3	6.938
163	RU-Che	2015	TS_1	-0.04	143.85	274.68	-0.17	14.81	193.7	14.64
164	RU-Che	2015	TS_2	-0.08	149.49	267.08	-0.06	8.336	197.9	8.273
165	RU-Che	2015	TS_3	-0.16	154.48	271.03	-0.04	5.942	202.4	5.9
166	RU-Che	2016	TS_1	-0.04	126.72	274.03	-0.19	12.95	200.4	12.76
167	RU-Che	2016	TS_2	-0.08	137.01	273.70	-0.07	7.076	205.4	7.01
168	RU-Che	2016	TS_3	-0.16	142.51	275.62	-0.05	5.498	211.8	5.451
169	SE-Deg	2014	TS_1	-0.02	111.85	303.55	-0.53	17.22	201.6	16.69
170	SE-Deg	2014	TS_2	-0.05	119.11	308.12	-0.31	13.23	207.4	12.93
171	SE-Deg	2014	TS_3	-0.1	125.46	315.55	-0.10	12.54	212	12.44
172	SE-Deg	2014	TS_4	-0.15	134.61	321.20	0.29	11.63	215.6	11.93
173	SE-Deg	2014	TS_5	-0.3	126.75	330.85	0.52	11.61	220	12.13
174	SE-Deg	2014	TS_6	-0.5	130.62	341.66	0.89	11.33	223.1	12.21
175	SE-Deg	2015	TS_1	-0.02	104.25	310.59	-0.28	15.2	207.2	14.91
176	SE-Deg	2015	TS_2	-0.05	110.64	312.57	0.09	13.86	209.5	13.95
177	SE-Deg	2015	TS_3	-0.1	112.94	321.41	0.41	12.94	212.9	13.36
178	SE-Deg	2015	TS_4	-0.15	115.72	329.21	0.60	11.94	216.6	12.54
179	SE-Deg	2015	TS_5	-0.3	118.31	339.17	0.90	11.08	220.5	11.98
180	SE-Deg	2015	TS_6	-0.5	121.80	347.97	1.30	10.19	224.6	11.48
181	SE-Deg	2016	TS_1	-0.02	108.14	306.39	-0.19	14.88	200.3	14.68
182	SE-Deg	2017	TS_1	-0.02	133.38	326.87	-0.20	12.35	215	12.15
183	SE-Deg	2018	TS_1	-0.02	111.67	310.21	-0.17	14.7	198	14.52
184	US-Atq	2014	TS_1	NaN	10.75	139.53	-0.20	8.068	61	7.864

185	US-Atq	2014	TS_2	NaN	18.00	137.32	-0.08	4.191	74.3	4.109
186	US-Atq	2014	TS_3	NaN	28.49	138.48	-0.03	2.366	83.5	2.334
187	US-Beo	2014	TS_1	NaN	155.09	270.13	-0.04	4.874	211.1	4.829
188	US-Beo	2014	TS_2	NaN	168.62	270.60	-0.02	2.94	219.6	2.922
189	US-Beo	2014	TS_3	NaN	170.53	269.49	-0.02	3.128	219.9	3.104
190	US-Bes	2013	TS_1	NaN	143.22	261.99	-0.05	5.649	201.3	5.602
191	US-Bes	2013	TS_2	NaN	150.57	267.49	-0.04	6.744	205.7	6.706
192	US-Bes	2013	TS_3	NaN	146.03	267.28	-0.06	8.248	202.3	8.187
193	US-Bes	2014	TS_1	NaN	151.79	282.29	-0.10	3.924	198.5	3.822
194	US-Bes	2015	TS_1	NaN	140.45	270.98	-0.11	4.763	195.3	4.65
195	US-Bes	2015	TS_2	NaN	148.76	269.64	-0.11	5.512	202.8	5.401
196	US-Bes	2015	TS_3	NaN	146.77	271.72	-0.16	7.182	197.8	7.027
197	US-BZB	2014	TS_1	-0.075	123.11	298.35	-0.44	15.35	215.8	14.91
198	US-BZB	2014	TS_2	-0.05	115.15	292.07	-0.59	15.49	209.9	14.9
199	US-BZB	2015	TS_1	-0.075	107.82	295.60	-0.38	14.04	210.2	13.67
200	US-BZB	2015	TS_2	-0.05	98.63	293.17	-0.67	14.56	203.5	13.9
201	US-BZB	2016	TS_1	-0.075	125.09	292.39	-0.33	16.39	214.3	16.06
202	US-BZB	2016	TS_2	-0.05	109.89	290.95	-0.74	16.89	211.7	16.15
203	US-BZF	2014	TS_1	-0.075	96.05	322.79	-1.56	16.12	205.4	14.56
204	US-BZF	2014	TS_2	-0.05	112.68	322.83	-1.22	15.9	208.3	14.68
205	US-BZF	2015	TS_1	-0.075	108.39	331.07	-1.20	14.88	197.5	13.68
206	US-BZF	2015	TS_2	-0.05	111.46	336.09	-1.12	14.83	200.2	13.72
207	US-BZF	2016	TS_1	-0.075	95.50	315.89	-1.03	17.18	205.1	16.15
208	US-BZF	2016	TS_2	-0.05	100.12	317.57	-0.90	17.72	206	16.81
209	US-BZS	2015	TS_1	NaN	116.48	275.22	-0.07	4.866	202.9	4.792
210	US-BZS	2015	TS_2	NaN	97.29	283.75	-0.27	8.135	187.7	7.862
211	US-BZS	2015	TS_3	NaN	105.93	272.47	-0.13	10.61	193.1	10.47
212	US-BZS	2016	TS_1	NaN	119.07	278.90	-0.05	5.584	208.4	5.535
213	US-BZS	2016	TS_2	NaN	87.59	278.96	-0.25	12.09	203.1	11.84
214	US-BZS	2016	TS_3	NaN	98.29	277.92	-0.16	11.67	198.8	11.51
215	US-ICs	2014	TS_1	-0.075	147.27	263.08	-0.08	5.467	205.6	5.39
216	US-ICs	2014	TS_2	-0.05	147.13	262.66	-0.01	6.41	205.1	6.402
217	US-ICs	2015	TS_1	-0.075	141.61	255.70	-0.02	6.12	195.2	6.098
218	US-ICs	2015	TS_2	-0.05	140.38	256.88	-0.02	7.07	193.1	7.047
219	US-ICs	2016	TS_1	-0.075	146.75	265.86	-0.05	5.67	206.2	5.623
220	US-ICs	2016	TS_2	-0.05	146.79	265.67	-0.05	6.654	206.1	6.599
221	US-Ivo	2014	TS_1	-0.05	136.92	264.34	-0.20	10.84	195.7	10.64
222	US-Ivo	2014	TS_1	-0.4	136.92	264.34	-0.20	10.84	195.7	10.64
223	US-Ivo	2014	TS_2	-0.1	142.52	266.53	-0.16	9.908	195.5	9.744
224	US-Ivo	2014	TS_3	-0.15	144.98	262.74	-0.19	6.761	204.8	6.574
225	US-Ivo	2014	TS_4	-0.3	166.58	262.05	-0.03	4.068	214.3	4.034
226	US-Ivo	2015	TS_1	-0.05	139.42	257.06	-0.14	14.86	185.6	14.72
227	US-Ivo	2015	TS_1	-0.4	139.42	257.06	-0.14	14.86	185.6	14.72
228	US-Ivo	2015	TS_2	-0.1	141.20	256.70	-0.09	11.99	189.1	11.9
229	US-Ivo	2015	TS_3	-0.15	145.76	260.99	-0.07	6.85	199.1	6.785
230	US-Ivo	2015	TS_4	-0.3	158.88	259.63	-0.03	4.032	208.2	3.997
231	US-Ivo	2016	TS_1	-0.05	133.60	262.43	-0.10	8.895	197.3	8.796

232	US-Ivo	2016	TS_1	-0.4	133.60	262.43	-0.10	8.895	197.3	8.796
233	US-Ivo	2016	TS_2	-0.1	139.70	264.19	-0.04	6.76	202.2	6.719
234	US-Ivo	2016	TS_3	-0.15	153.78	269.47	-0.05	4.305	211.5	4.253
235	US-Ivo	2016	TS_4	-0.3	171.24	271.03	-0.01	2.644	221.2	2.631
236	US-LA1	2012	TS_1	-0.1	29.15	331.44	15.59	13.5	197.2	29.08
237	US-LA2	2012	TS_1	-0.1	36.65	336.05	15.04	14.35	193.2	29.39
238	US-LA2	2013	TS_1	-0.1	65.79	377.93	14.70	16.06	201.5	30.76
239	US-Los	2014	TS_1	0	136.18	417.40	1.95	8.263	244.3	10.22
240	US-Los	2015	TS_1	0	148.23	422.27	2.43	7.761	258.7	10.19
241	US-Los	2016	TS_1	0	135.20	415.75	2.47	8.083	255.1	10.56
242	US-Los	2017	TS_1	0	141.15	414.62	1.89	7.451	256	9.343
243	US-Los	2018	TS_1	0	169.83	421.79	1.46	7.419	260	8.883
244	US-Myb	2011	TS_3	-0.08	NaN	329.50	12.12	8.859	231.7	20.98
245	US-Myb	2011	TS_4	-0.16	NaN	333.87	12.36	8.288	235.8	20.65
246	US-Myb	2011	TS_5	-0.32	NaN	338.98	12.72	7.56	241.4	20.28
247	US-Myb	2011	TS_1	-0.02	NaN	326.62	11.96	9.156	229.3	21.12
248	US-Myb	2012	TS_3	-0.08	35.60	372.21	9.39	10.96	216.1	20.36
249	US-Myb	2012	TS_4	-0.16	40.39	375.48	9.90	10.23	220.7	20.13
250	US-Myb	2012	TS_5	-0.32	47.39	379.29	10.56	9.212	227.2	19.78
251	US-Myb	2012	TS_1	-0.02	29.91	372.10	8.98	11.77	214.4	20.74
252	US-Myb	2013	TS_3	-0.08	34.38	354.74	9.25	11.28	210.9	20.52
253	US-Myb	2013	TS_4	-0.16	40.07	359.02	9.87	10.41	215	20.28
254	US-Myb	2013	TS_5	-0.32	45.10	363.81	10.53	9.441	221.9	19.97
255	US-Myb	2013	TS_1	-0.02	NaN	355.11	8.47	12.24	208.2	20.7
256	US-Myb	2014	TS_3	-0.08	26.04	365.88	9.64	12.28	210	21.93
257	US-Myb	2014	TS_4	-0.16	38.09	364.15	10.74	11.23	211	21.97
258	US-Myb	2014	TS_5	-0.32	44.34	366.12	11.25	10.25	218	21.5
259	US-Myb	2015	TS_3	-0.08	17.34	340.72	9.77	11.85	212	21.62
260	US-Myb	2015	TS_4	-0.16	12.76	339.04	10.79	10.84	221	21.63
261	US-Myb	2015	TS_5	-0.32	18.83	343.94	11.35	9.93	226	21.28
262	US-Myb	2016	TS_3	-0.08	5.05	357.82	9.61	11.19	201	20.8
263	US-Myb	2016	TS_4	-0.16	3.39	356.20	9.84	10.87	208	20.72
264	US-Myb	2016	TS_5	-0.32	12.02	360.46	10.73	9.627	214	20.36
265	US-Myb	2017	TS_3	-0.08	27.31	352.90	9.86	13.1	214	22.96
266	US-Myb	2017	TS_4	-0.16	28.29	357.41	9.92	12.74	215	22.66
267	US-Myb	2017	TS_5	-0.32	36.79	360.41	10.85	11.23	223	22.08
268	US-Myb	2017	TS_1	-0.02	62.79	325.72	12.70	10.71	216.8	23.41
269	US-Myb	2018	TS_3	-0.08	36.27	326.10	10.20	10.72	207	20.92
270	US-Myb	2018	TS_4	-0.16	41.30	332.83	10.47	10.35	209	20.82
271	US-Myb	2018	TS_5	-0.32	48.43	336.09	11.18	9.293	215	20.47
272	US-Myb	2018	TS_1	-0.02	38.38	344.86	10.05	11.93	200.3	21.98
273	US-NC4	2012	TS_1	-0.05	42.43	336.03	7.87	15.75	215.4	23.62
274	US-NC4	2013	TS_1	-0.05	59.96	368.85	6.92	16.83	210.5	23.74
275	US-NC4	2014	TS_1	-0.05	54.42	362.34	6.73	16.81	208.5	23.54
276	US-NC4	2015	TS_1	-0.05	68.13	387.31	8.27	16.06	205	24.33
277	US-NC4	2016	TS_1	-0.05	52.97	351.38	9.41	15.04	220	24.45
278	US-ORv	2012	TS	NaN	57.42	352.55	4.36	20.61	203.9	24.97

279	US-ORv	2013	TS	NaN	63.67	356.74	2.93	19.98	210.8	22.9
280	US-ORv	2014	TS	NaN	68.11	364.96	2.11	20.17	205.3	22.28
281	US-ORv	2015	TS	NaN	68.77	387.78	1.77	21.26	206	23.04
282	US-OWC	2016	TS_1	-0.05	0.00	0.00	0.00	0	211.2	23.91
283	US-Sne	2017	TS_1	-0.01	46.07	337.92	10.33	13.14	212.7	23.47
284	US-Sne	2017	TS_2	-0.02	41.06	341.82	10.76	12.66	205.7	23.41
285	US-Sne	2017	TS_3	-0.08	42.89	343.85	11.04	12.17	208.5	23.22
286	US-Sne	2017	TS_4	-0.16	46.36	346.18	11.39	11.79	211	23.18
287	US-Sne	2017	TS_5	-0.32	50.59	350.46	11.98	10.7	216	22.67
288	US-Sne	2018	TS_1	-0.01	48.41	325.09	10.28	12.15	217.3	22.43
289	US-Sne	2018	TS_2	-0.02	33.91	331.01	10.55	11.34	210.2	21.89
290	US-Sne	2018	TS_3	-0.08	36.76	331.50	10.87	10.63	212.1	21.5
291	US-Sne	2018	TS_4	-0.16	35.64	335.45	11.23	10.09	220.1	21.32
292	US-Sne	2018	TS_5	-0.32	49.09	335.94	11.88	9.045	218	20.92
293	US-Srr	2016	TS_1	NaN	NaN	326.29	10.03	10.71	200.5	20.74
294	US-Srr	2017	TS_1	NaN	11.34	346.85	7.22	13.71	199.5	20.93
295	US-StJ	2016	TS_2	-0.05	68.37	347.38	4.05	16.22	213.7	20.27
296	US-StJ	2016	TS_3	-0.1	68.38	347.38	5.84	14.1	213.7	19.94
297	US-Tw1	2012	TS_1	-0.02	50.54	359.96	5.99	11.52	225.2	17.51
298	US-Tw1	2012	TS_2	-0.04	48.02	358.76	6.14	11.32	227	17.46
299	US-Tw1	2012	TS_3	-0.08	50.07	367.92	5.18	12.31	222.1	17.49
300	US-Tw1	2012	TS_4	-0.16	49.05	367.52	5.31	12.19	224.5	17.5
301	US-Tw1	2012	TS_5	-0.32	-79.10	347.23	7.89	9.513	225.3	17.4
302	US-Tw1	2013	TS_1	-0.02	35.80	337.57	4.39	14.59	206.6	18.97
303	US-Tw1	2013	TS_2	-0.04	36.08	337.66	4.39	14.57	206.8	18.96
304	US-Tw1	2013	TS_3	-0.08	36.81	338.09	4.40	14.54	207.5	18.94
305	US-Tw1	2013	TS_4	-0.16	37.57	338.82	4.41	14.59	208.4	19.01
306	US-Tw1	2013	TS_5	-0.32	38.64	340.06	4.46	14.62	209.6	19.07
307	US-Tw1	2014	TS_1	-0.02	41.23	395.41	6.67	10.89	208.3	17.56
308	US-Tw1	2014	TS_2	-0.04	41.86	397.14	6.70	10.85	208.6	17.55
309	US-Tw1	2014	TS_3	-0.08	43.55	400.01	6.78	10.72	209.8	17.49
310	US-Tw1	2014	TS_4	-0.16	45.61	404.82	6.88	10.56	211.3	17.44
311	US-Tw1	2014	TS_5	-0.32	49.62	416.29	7.09	10.24	213.9	17.33
312	US-Tw1	2015	TS_1	-0.02	50.66	342.55	9.02	7.831	235	16.85
313	US-Tw1	2015	TS_2	-0.04	52.00	342.38	9.09	7.706	235	16.8
314	US-Tw1	2015	TS_3	-0.08	55.61	341.98	9.26	7.385	238	16.64
315	US-Tw1	2015	TS_4	-0.16	59.57	342.95	9.51	6.972	240	16.48
316	US-Tw1	2015	TS_5	-0.32	69.39	345.18	10.00	6.208	246	16.21
317	US-Tw1	2016	TS_1	-0.02	34.57	361.06	8.78	7.943	218	16.72
318	US-Tw1	2016	TS_2	-0.04	35.49	362.19	8.86	7.837	219	16.69
319	US-Tw1	2016	TS_3	-0.08	38.58	363.10	9.04	7.546	221	16.59
320	US-Tw1	2016	TS_4	-0.16	44.73	365.88	9.33	7.14	223	16.47
321	US-Tw1	2016	TS_5	-0.32	56.22	370.54	9.86	6.35	229	16.21
322	US-Tw1	2017	TS_1	-0.02	41.17	343.75	7.55	10.22	228	17.77
323	US-Tw1	2017	TS_2	-0.04	41.75	344.56	7.61	10.11	229	17.72
324	US-Tw1	2017	TS_3	-0.08	42.61	345.02	7.75	9.803	231	17.55
325	US-Tw1	2017	TS_4	-0.16	45.05	347.17	7.97	9.368	234	17.34

326	US-Tw1	2017	TS_5	-0.32	48.82	349.23	8.38	8.5	240	16.88
327	US-Tw1	2018	TS_1	-0.02	60.47	327.43	6.70	10.42	222	17.12
328	US-Tw1	2018	TS_2	-0.04	61.54	327.44	6.75	10.36	223	17.1
329	US-Tw1	2018	TS_3	-0.08	64.60	328.44	6.85	10.18	225	17.03
330	US-Tw1	2018	TS_4	-0.16	67.67	329.40	7.01	9.925	227	16.93
331	US-Tw1	2018	TS_5	-0.32	75.09	331.40	7.31	9.459	230	16.77
332	US-Tw4	2015	TS_1	-0.02	15.93	327.22	10.04	11.56	199.4	21.6
333	US-Tw4	2015	TS_3	-0.08	20.21	329.78	10.48	10.96	202.3	21.44
334	US-Tw4	2015	TS_4	-0.16	23.88	332.52	10.86	10.42	205.7	21.28
335	US-Tw4	2015	TS_5	-0.32	29.16	338.59	11.49	9.449	212.4	20.94
336	US-Tw4	2016	TS_1	-0.02	9.56	358.75	8.16	11.29	201.7	19.45
337	US-Tw4	2016	TS_3	-0.08	13.17	360.06	8.67	10.58	205.7	19.25
338	US-Tw4	2016	TS_4	-0.16	15.94	362.56	9.11	9.991	209.2	19.11
339	US-Tw4	2016	TS_5	-0.32	21.05	367.55	9.91	8.876	216.2	18.78
340	US-Tw4	2017	TS_1	-0.02	38.35	347.31	8.07	11.52	211.9	19.59
341	US-Tw4	2017	TS_3	-0.08	42.12	351.81	8.45	10.91	215.3	19.36
342	US-Tw4	2017	TS_4	-0.16	46.03	354.70	8.83	10.35	218.6	19.18
343	US-Tw4	2017	TS_5	-0.32	53.54	361.37	9.52	9.275	224.9	18.79
344	US-Tw4	2018	TS_1	-0.02	58.11	344.87	8.00	10.93	218	18.93
345	US-Tw4	2018	TS_3	-0.08	63.91	349.15	8.38	10.41	222	18.79
346	US-Tw4	2018	TS_4	-0.16	67.95	352.10	8.71	9.862	225	18.57
347	US-Tw4	2018	TS_5	-0.32	75.31	357.88	9.33	8.8	231	18.13
348	US-Tw5	2018	TS_1	-0.02	NaN	414.83	0.00	8.894	222.2	18.37
349	US-Tw5	2018	TS_2	-0.1	NaN	401.00	0.00	12.32	204.4	22.24
350	US-Tw5	2018	TS_3	-0.02	NaN	414.83	0.00	8.894	222.2	18.37
351	US-Tw5	2018	TS_4	-0.08	NaN	423.43	0.00	7.898	227.3	18.14
352	US-Tw5	2018	TS_5	-0.16	NaN	430.15	0.00	7.531	230	17.94
353	US-Uaf	2011	TS_1	-0.09	86.20	372.46	-12.29	21.95	199.6	9.667
354	US-Uaf	2012	TS_1	-0.09	73.77	338.53	-11.83	20.86	202.4	9.028
355	US-Uaf	2013	TS_1	-0.09	109.63	395.51	-10.08	20.52	200.4	10.44
356	US-Uaf	2014	TS_1	-0.09	76.07	365.40	-10.94	19.94	206	8.999
357	US-Uaf	2015	TS_1	-0.09	80.99	423.19	-9.77	19.76	190	9.998
358	US-Uaf	2016	TS_1	-0.09	77.38	315.75	-7.74	19.13	198	11.39
359	US-Uaf	2017	TS_1	-0.09	84.88	380.17	-7.39	19.08	196	11.69
360	US-Uaf	2018	TS_1	-0.09	96.04	333.33	-5.60	17.72	199	12.11
361	US-WPT	2011	TS_1	-0.1	80.95	342.17	5.27	19.27	202.6	24.54
362	US-WPT	2011	TS_2	-0.3	NaN	347.04	6.38	16.62	209.7	23.01
363	US-WPT	2012	TS_1	-0.1	40.29	345.57	3.70	21.6	197.4	25.3
364	US-WPT	2012	TS_2	-0.3	44.91	354.96	4.52	19.21	203.8	23.72
365	US-WPT	2013	TS_1	-0.1	74.61	340.47	3.73	18.23	207.2	21.96
366	US-WPT	2013	TS_2	-0.3	77.62	352.35	4.32	16.69	211.7	21.01

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data
Year	Data year
Probe_name	Temperature probe name as given in data files

Soil_temp_depth_m	Depth of soil temperature probe (m), with negative values
Start_TS_(DOY)	Season start for elevated TS (DOY), point "f" in Figure 1
End_TS_(DOY)	Season end for elevated TS (DOY), point "h" in Figure 1
Base_value_TS_(C)	Baseline TS during non-elevated season (C), average of points
Ampl_TS_(C)	Amplitude of TS during elevated temperature season (C), difference between point "e" in Figure 1 and Base_value_TS
Peak_TS_(DOY)	Day of maximum elevated TS (DOY), point "g" in Figure 1
Peak_value_TS_(C)	Maximum value of TS (C) point "e" in Figure 1

Table B7 - Soil temperature probe depths (m)

	SITE_ID	Year	Probe name	Soil_temp_depth_m	Additional_notes
1	AT-Neu		TS_1	-0.05	
2	AT-Neu		TS_2	-0.1	
3	AT-Neu		TS_3	-0.2	
4	BR-Npw		TS_1		
5	BR-Npw		TS_2		
6	BW-Gum		no data		
7	BW-Nxr		no data		
8	CA-SCB		TS_1	0	
9	CA-SCB		TS_2	-0.02	
10	CA-SCB		TS_3	-0.04	
11	CA-SCB		TS_4	-0.08	
12	CA-SCB		TS_5	-0.16	
13	CA-SCB		TS_6	-0.32	
14	CA-SCB		TS_7	-0.64	
15	CA-SCB		TS_8	-1.28	
16	CA-SCC		TS_1	-0.1	
17	CA-SCC		TS_2	-0.15	
18	CA-SCC		TS_3	-0.2	
19	CA-SCC		TS_4	-0.25	
20	CA-SCC		TS_5	-0.3	
21	CA-SCC		TS_6	-0.5	
22	CA-SCC		TS_7	-0.6	
23	CA-SCC		TS_8	-0.7	
24	CH-Cha		TS_1	-0.01	
25	CH-Cha		TS_2	-0.02	
26	CH-Cha		TS_3	-0.04	
27	CH-Cha		TS_4	-0.07	
28	CH-Cha		TS_5	-0.1	
29	CH-Cha		TS_6	-0.15	
30	CH-Cha		TS_7	-0.25	
31	CH-Cha		TS_8	-0.4	
32	CH-Cha		TS_9	-0.95	
33	CH-Dav		TS_1	-0.05	
34	CH-Dav		TS_2	-0.15	
35	CH-Dav		TS_3	-0.5	
36	CH-Dav		TS_4	-	
37	CH-Dav		TS_5	-	
38	CH-Dav		TS_6	-	
39	CH-Oe2		TS_1	-0.05	
40	CH-Oe2		TS_2	-0.1	
41	CH-Oe2		TS_3	-0.15	
42	CH-Oe2		TS_4	-	
43	CH-Oe2		TS_5	-0.3	
44	CH-Oe2		TS_6	-0.5	

45	CH-Oe2		TS_7	-
46	CN-Hgu		TS	
47	DE-Dgw		no data	
48	DE-Hte		TS_1	0
49	DE-Hte		TS_2	-0.1
50	DE-Hte		TS_3	-0.2
51	DE-SfN		TS_1	-0.02
52	DE-SfN		TS_3	-0.1
53	DE-SfN		TS_4	-0.2
54	DE-SfN		TS_5	-0.5
55	DE-Zrk		TS_1	-0.05
56	DE-Zrk		TS_2	-0.1
57	DE-Zrk		TS_3	-0.2
58	DE-Zrk		TS_4	-0.3
59	DE-Zrk		TS_5	-0.5
60	FI-Hyy		TS_1	-0.02
61	FI-Hyy		TS_2	-0.04
62	FI-Hyy		TS_3	-0.12
63	FI-Hyy		TS_4	-0.25
64	FI-Hyy		TS_5	-0.5
65	FI-Lom		TS_1	-0.07
66	FI-Lom		TS_2	-0.3
67	FI-Lom		TS_3	-0.5
68	FI-Si2		TS_1	-0.05
69	FI-Si2		TS_2	-0.2
70	FI-Si2		TS_3	-0.35
71	FI-Si2		TS_4	-0.5
72	FI-Sii	pre 2016	TS_1	-0.05
73	FI-Sii	pre 2016	TS_2	-0.2
74	FI-Sii	pre 2016	TS_3	-0.35
75	FI-Sii	pre 2016	TS_4	-0.5
76	FI-Sii	after 2017	TS_1	0
77	FI-Sii	after 2017	TS_2	-0.5
78	FI-Sii	after 2017	TS_3	-0.1
79	FI-Sii	after 2017	TS_4	-0.15
80	FI-Sii	after 2017	TS_5	-0.25
81	FI-Sii	after 2017	TS_6	-0.45
82	FI-Sii	after 2017	TS_7	-0.95
83	FR-LGt		TS_1	-0.02
84	FR-LGt		TS_2	-0.05
85	FR-LGt		TS_3	-0.1
86	FR-LGt		TS_4	-0.2
87	FR-LGt		TS_5	-0.4
88	HK-MPM		TS_1	
89	HK-MPM		TS_2	
90	HK-MPM		TS_3	
91	ID-Pag		TS_1	-0.05

92	IT-BCi	TS_1	-0.05
93	IT-BCi	TS_2	-0.1
94	IT-BCi	TS_3	-0.3
95	IT-BCi	TS_4	-0.5
96	IT-BCi	TS_5	-1
97	IT-Cas	TS_1	-0.035
98	IT-Cas	TS_2	-0.075
99	IT-Cas	TS_3	-0.15
100	JP-BBY	TS_1	-0.183
101	JP-BBY	TS_2	-0.233
102	JP-BBY	TS_3	-0.283
103	JP-BBY	TS_4	-0.383
104	JP-BBY	TS_5	-0.483
105	JP-Mse	TS_1	-0.01
106	JP-Mse	TS_2	-0.025
107	JP-Mse	TS_3	-0.05
108	JP-Mse	TS_4	-0.1
109	JP-Mse	TS_5	-0.2
110	JP-Mse	TS_6	-0.4
111	JP-SwL	no data	
112	KR-CRK	TS_1	-0.05
113	KR-CRK	TS_2	-0.15
114	MY-MLM	TS_1	-0.05
115	NL-Hor	TS_1	-0.01
116	NL-Hor	TS_2	-0.02
117	NL-Hor	TS_3	-0.04
118	NL-Hor	TS_4	-0.05
119	NL-Hor	TS_5	-0.1
120	NL-Hor	TS_6	-0.15
121	NL-Hor	TS_7	-0.25
122	NL-Hor	TS_8	-0.4
123	NL-Hor	TS_9	-0.6
124	NZ-Kop	TS_1	-0.5
125	NZ-Kop	TS_2	-0.1
126	NZ-Kop	TS_3	-0.2
127	PH-RiF	TS_1	
128	RU-Ch2	TS_1	-0.04
129	RU-Ch2	TS_2	-0.08
130	RU-Ch2	TS_3	-0.16
131	RU-Che	TS_1	-0.04
132	RU-Che	TS_2	-0.08
133	RU-Che	TS_3	-0.16
134	RU-Cok	no data	
135	RU-Fy2	TS_1	
136	RU-Fy2	TS_2	
137	RU-Fy2	TS_3	
138	RU-Fy2	TS_4	

139	RU-Fy2	TS_5	
140	SE-Deg	TS_1	-0.02
141	SE-Deg	TS_2	-0.05
142	SE-Deg	TS_3	-0.1
143	SE-Deg	TS_4	-0.15
144	SE-Deg	TS_5	-0.3
145	SE-Deg	TS_6	-0.5
146	UK-LBT	no data	
147	US-A03	TS_1	-0.025
148	US-A03	TS_2	-0.1
149	US-A03	TS_3	-0.3
150	US-A10	TS_1	-0.025
151	US-A10	TS_2	-0.1
152	US-A10	TS_3	-0.3
153	US-Atq	TS_1	
154	US-Atq	TS_2	
155	US-Atq	TS_3	
156	US-Beo	TS_1	
157	US-Beo	TS_2	
158	US-Beo	TS_3	
159	US-Bes	TS_1	
160	US-Bes	TS_2	
161	US-Bes	TS_3	
162	US-Bi1	TS_1	-0.02
163	US-Bi1	TS_2	-0.04
164	US-Bi1	TS_3	-0.08
165	US-Bi1	TS_4	-0.16
166	US-Bi1	TS_5	-0.32
167	US-Bi2	TS_1	-0.02
168	US-Bi2	TS_2	-0.04
169	US-Bi2	TS_3	-0.08
170	US-Bi2	TS_4	-0.16
171	US-Bi2	TS_5	-0.32
172	US-BZB	TS_1	-0.075
173	US-BZB	TS_2	-0.05
174	US-BZF	TS_1	-0.075
175	US-BZF	TS_2	-0.05
176	US-BZS	TS_1	
177	US-BZS	TS_2	
178	US-BZS	TS_3	
179	US-CRT	TS_1	
180	US-DPW	no data	
181	US-EDN	TS_1	-0.25
182	US-EDN	TS_2	-0.15
183	US-EDN	TS_3	-0.05
184	US-EDN	TS_4	0
185	US-EDN	TS_5	0.05

186	US-EDN	TS_6	0.1
187	US-EDN	TS_7	0.2
188	US-EDN	TS_8	0.3
189	US-EML	TS_1	-0.05
190	US-EML	TS_2	-0.1
191	US-EML	TS_3	-0.2
192	US-EML	TS_4	-0.4
193	US-Ho1	TS_1	-0.05
194	US-Ho1	TS_2	-0.1
195	US-HRA	no data	-0.02
196	US-HRC	no data	-0.02
197	US-ICs	TS_1	-0.075
198	US-ICs	TS_2	-0.05
199	US-Ivo	TS_1	-0.05
200	US-Ivo	TS_2	-0.1
201	US-Ivo	TS_3	-0.15
202	US-Ivo	TS_4	-0.3
203	US-Ivo	TS_5	-0.4
204	US-LA1	TS	-0.1
205	US-LA2	TS	-0.1
206	US-Los	TS_1	0
207	US-Los	TS_2	-0.05
208	US-Los	TS_3	-0.1
209	US-Los	TS_4	-0.2
210	US-Los	TS_5	-0.5
211	US-MRM	TS_1	
212	US-MRM	TS_2	
213	US-Myb	TS_1	-0.02
214	US-Myb	TS_2	-0.04
215	US-Myb	TS_3	-0.08
216	US-Myb	TS_4	-0.16
217	US-Myb	TS_5	-0.32
218	US-NC4	TS_1	-0.05
219	US-NC4	TS_2	-0.2
220	US-NGB	no data	
221	US-NGC	no data	
222	US-ORv	TS_1	-0.08
223	US-OWC	TS_1	-0.05
224	US-OWC	TS_2	-0.3
225	US-PFa		
226	US-Snd	TS_1	-0.08
227	US-Snd	TS_2	-0.16
228	US-Snd	TS_3	
229	US-Snd	TS_4	
230	US-Snd	TS_5	
231	US-Snd	TS_6	
232	US-Sne	TS_1	-0.01

233	US-Sne	TS_2	-0.02	
234	US-Sne	TS_3	-0.08	
235	US-Sne	TS_4	-0.16	
236	US-Sne	TS_5	-0.32	
237	US-Srr	TS_1		
238	US-Srr	TS_2		
239	US-Srr	TS_3		
240	US-Srr	TS_4		
241	US-Srr	TS_5		
242	US-StJ	TS_2	-0.05	
243	US-StJ	TS_3	-0.1	
244	US-Tw1	TS_1	-0.02	
245	US-Tw1	TS_2	-0.04	
246	US-Tw1	TS_3	-0.08	
247	US-Tw1	TS_4	-0.16	
248	US-Tw1	TS_5	-0.32	
249	US-Tw3	TS_1	-0.02	
250	US-Tw3	TS_2	-0.04	
251	US-Tw3	TS_3	-0.08	
252	US-Tw3	TS_4	-0.16	
253	US-Tw3	TS_5	-0.32	
254	US-Tw4	TS_1	-0.02	
255	US-Tw4	TS_2	-0.04	
256	US-Tw4	TS_3	-0.08	
257	US-Tw4	TS_4	-0.16	
258	US-Tw4	TS_5	-0.32	
259	US-Tw5	TS_1	-0.02	
260	US-Tw5	TS_2	-0.1	
261	US-Tw5	TS_3	-0.02	
262	US-Tw5	TS_4	-0.08	
263	US-Tw5	TS_5	-0.16	
264	US-Twt	TS_1	-0.02	
265	US-Twt	TS_2	-0.04	
266	US-Twt	TS_3	-0.08	
267	US-Twt	TS_4	-0.16	
268	US-Twt	TS_5	-0.32	
269	US-Uaf	TS_1	-0.09	average of 3 depths: -0.15, -0.02, -0.1
270	US-Uaf	TS_2	-0.183333	average of 3 depths: -0.3, -0.05, -0.2
271	US-Uaf	TS_3	-0.283333	average of 3 depths: -0.45, -0.1, -0.3
272	US-Uaf	TS_4	-0.366667	average of 3 depths: -0.5, -0.2, -0.4
273	US-Uaf	TS_5	-0.5	average of 2 depths: -0.7, -0.3
274	US-Uaf	TS_6	-0.6	average of 2 depths: -0.8, -0.4
275	US-Uaf	TS_7	-0.75	average of 2 depths: -1, -0.5
276	US-Uaf	TS_8	-0.925	average of 2 depths: -1.25, 0.6,
277	US-Uaf	TS_9	-1	
278	US-WPT	TS_1	-0.1	
279	US-WPT	TS_2	-0.3	

Column Descriptions

SITE_ID	Site identification code as assigned by regional flux data network
Year	When relevant, information about time-span of probe location. If
Probe_name	Temperature probe name as given in data files
Soil_temp_depth_m	Depth of soil temperature probe (m), with negative values being under
Additional_notes	When relevant, additional information about site