

Response to Reviewer 2

This manuscript describes the history and the current content and status of the Global Energy Balance Archive (GEBA); published research results based on GEBA data are presented and summarized.

The GEBA data set has become a widely used collection of surface energy fluxes, mainly for the surface irradiance. The data archive is hosted by the ETH Zürich, the data access has recently been modernized and automatized. The presentation and description of the data set, its access as well as the summary of research applications of GEBA data is timely and appropriate for publication in ESSD. I only have minor comments that the authors might want to consider before publication.

We thank the reviewer for his careful review and the constructive comments, which were very helpful to improve the manuscript.

In general the description of the content of the GEBA (Section 3) could be extended. In its current form it focuses on the downward shortwave radiation; i.e., presenting the quality checks, expected accuracy etc. Are quality checks also conducted for the other surface flux components? What is the expected accuracy of the other fluxes in the GEBA? Maybe some more details (and / or references to other published work) could be provided at least for some of these fluxes.

All energy fluxes (not only the downward shortwave radiation) entering GEBA undergo the “physical sanity” quality check, which requires the energy flux values to be within physically possible magnitudes. No further quality checks, however, are applied to the other components. The error estimation of non-radiative flux measurements carried out by various individuals is difficult and can be misleading, unless the data sources themselves provide the information of errors. Thus we do not provide uncertain error estimations, but instead document in GEBA the source information of the data, so that the interested users can make direct contact to the sources. Unlike in the Baseline Surface Radiation Network (BSRN), where strict quality standards and error estimations are imposed on the stations, GEBA compiles data measured by the entire community (various individuals, institutions and field projects) and as far back as possible, which are thus inevitably of variable accuracy.

We added a general statement as follows: “Since GEBA compiles data measured by the entire community as far back in time as possible and consists of heterogeneous data sources, their accuracy is inevitably variable.” and a specific statement for the non-radiative fluxes: “No assessments of the accuracy of the non-radiative fluxes on monthly timescales as stored in GEBA are available. While on these timescales the random errors of these components largely reduce, studies suggest an overall systematic error inferred from the non-closure of the energy balance on the order of 11-21% (Hendricks Franssen et al. 2010 and references therein)”.

The authors might want to consider adding a statement on possible updates of the GEBA. Are there any plans to include more recent data, once it becomes available? Is it possible for researchers / organisations to contribute their data to the GEBA?

We added a statement at the end of Section 3 as follows: “GEBA is currently an unfunded project. Therefore the update frequency of the data records (if available) may be irregular depending on the available resources at the host institute.” and we added to the description of the data source “In addition, researchers and institutions are encouraged to make their surface energy flux data available through GEBA. Please contact the first author in this case”.

Page 4, line 13; Figure 1: It appears that a substantial number of the ‘stations’ in the GEBA global irradiance record is derived from ship observations in the Arctic. Figure 1 suggests an extensive coverage of the Arctic with ‘observation sites’, which are likely mainly data from single cruises in the Arctic region, which are considered as individual ‘observation sites’, but provide only data for a short period (i.e., one month). I suggest to include in Figure 1 only those

stations with a minimum number of monthly data available, e.g., 12, to better characterize the actual data availability in the GEBA. The same hold for the number of 2500 stations given in the abstract and Section 3; maybe the number of stations with available data of more than 12 (or maybe even 24) months could be added.

The reviewer is correct, there are various observational records with short periods in GEBA (one or only few months), which stem from expeditions, field campaigns and ship cruises. To differentiate those from the longer (multiyear) records available in GEBA, we redraw Figure 1, following the suggestion of the reviewer. In Figure 1 we show now all locations that have at least one month of data (i.e. all GEBA locations) in red, while those locations with multiyear records (at least 3 years) are now overplotted in yellow. This allows to get an idea of the total coverage of GEBA data points, as well as the locations that can provide multiyear records.

We also revised the text in Section 3 as follows: “GEBA in its 2017 version contains 2500 worldwide distributed measurement locations shown in Figure 1, with about 500’000 monthly mean values (Table 1). 1155 of these locations provide multiyear records with at least 3 years of data (yellow symbols in Figure 1). “

Page 5, line 1: I suggest not to include an invalid URL in the manuscript, but rather mention that the GEBA can only be accessed under the new URL.

According to the reviewers’ suggestion we revised this sentence as follows: “Note that the URL address published in older documentations is no longer valid.”