Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2019-198-AC2, 2020

Earth System Science Data
Open Access Discussions

Interactive comment on "A remote sensing-based dataset to characterize the ecosystem functioning and functional diversity of a Biosphere Reserve: Sierra Nevada (SE Spain)" *by* Beatriz P. Cazorla et al.

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Received and published: 25 April 2020

Dear Reviewer,

Many thanks for your correspondence regarding our data description paper entitled "A remote sensing-based dataset to characterize the ecosystem functioning and functional diversity of a Biosphere Reserve: Sierra Nevada (SE Spain)". We thank you for all your constructive comments, which provided valuable insights to improve the conceptual and methodological robustness of our data and our manuscript. We are now

very pleased to send you the response to your comments and suggestions.

In our response below, please find our point-by-point responses (indicated with "R") presenting, in detail, how we have addressed the Reviewer comments ("C"). In the .pdf document attached, the Reviewer comments are reproduced in bold italic font and our responses are indicated in plain text, in addition, tables and figures are embedded in the main document. We numbered each comment and reply for ease of reference and indicated changes that will be made in the manuscript, which will be submitted after the open discussion.

Once again, we thank you for your time, constructive comments and suggestions. We hope to meet the expectations with this response, and that the Reviewer considers our data description manuscript suitable to be published in Earth System Science Data.

Sincerely,

The authors

C1. - * Are the data and methods presented new? -An interesting approach is presented for inter-annual heterogeneity; it is left open why for assessing the spatial variability a certain kernel size had been chosen

R1. - Thank you for your positive comment. Regarding kernel size, we chose a 4x4-pixel kernel as a balance between spatial resolution and saturation of the EFT richness variable. That is, using kernels of 2x2 and 3x3 pixels resulted in a high proportion of kernels that reached the highest possible richness value (4 and 9 EFT classes per kernel, respectively), so the EFT richness variable was highly saturated. Using kernels of 5x5 or greater number of pixels never saturated the maximum number of pixels in a kernel but resulted in too coarse outputs (grain size greater or equal to 5x5 pixeles). The 4x4 kernel offered the finest spatial resolution of the EFT richness map and was never saturated. In other words, the maximum EFT richness within a 4x4-pixel kernel that we registered was 13, but the potential maximum number could have been 4x4=16

(Fig. 1).

We will add in the text the justification for this choice, section 2.5, as follows: "We chose a 4x4-pixel window since it offered the finest spatial resolution without saturating the number of EFT classes per kernel (i.e. smaller sizes result in a high proportion of kernels with the maximum number of classes)". We can also add an appendix with the Fig. 1 included in this response letter.

Any richness measurement exercise depends on spatial scale (i.e., both grain and extent) of assessment (Arponen et al., 2012). Regarding grain, when using species distributions to identify hotspots, the actual values of species richness found in each cell will increase with grain from a dataset built at 1x1 km to a dataset built at 10x10 km. However the regional spatial patterns of species richness will not vary widely (Rahbek 2005). In our analysis, the maximum number of EFTs found in a kernel could also vary depending on the kernel size, as stated above. If we used smaller kernel sizes, we would find lower and saturated EFT richness values. By contrast, with a larger kernel size (e.g. 5x5), the observed patterns would be too coarse.

C2. - * Is there any potential of the data being useful in the future? -In principle yes, however, there are details missing, see next

R2. - Thank you very much for the comment, as shown by numerous works cited in the manuscript (section 4), ecological research based on spectral vegetation indices plays an important role in biodiversity conservation (Cabello et al., 2012; Pettorelli, 2016, 2018) and management (Pelkey et al., 2003; Cabello et al., 2016) and for the study of biodiversity and ecosystems responses to environmental changes (Pérez-Luque et al., 2015; Alcaraz-Segura et al., 2017). In particular, our dataset provides valuable information to the scientific community as an example of a novel and straightforward characterization of functional diversity at ecosystem level developed for an entire protected area. This approach can be exported to any protected area to help incorporate the ecosystem functional dimension into conservation practice. Since Sierra Nevada

Biosphere Reserve is a Long-Term Ecological Research site established 10 years ago (Zamora et al., 2016, 2017), our dataset compliments many others on biodiversity, climate, ecosystem services, hydrology, land-use changes and management practices in the area. This further increases the value of the data to the scientific community, since it makes now possible to explore the relationships between previous biodiversity and environmental data with the ecosystem functional data that we provide (section 4 in the manuscript).

C3a. - * Are methods and materials described in sufficient detail? - No. Why is the kernel size 4x4?

R3a. - Thank you very much for raising this question. Please, see R1, where we justify the choice of that kernel size. In addition, we will add in the text the justification for this choice, section 2.5, as we indicated in R1.

C3b.- * How have borderline pixels be processed with the kernel? (kernel processed raster layer have same extension)

R3b. - Thank you for this warning. We will specify this process in the manuscript in section 2.5 as follows: "Note that since we only classified MODIS pixels within the protected area, the 4x4-pixel sliding windows along the borderline of the protected area that contained pixels outside it (classified as NoData) could probably contain a lower EFT richness value in the dataset than in reality."

In addition, if the editor and referees consider the next paragraph useful, we can explain that to avoid pixels outside the protected area with NoData values being considered as a distinct class when calculating EFT richness, we processed as follows: 1) first, we built a 0-1 mask by rasterizing the vector boundaries of the study area to the same pixel size and projection of the MOD13Q1 product; 2) second, we used the same kernel used for EFT richness to obtain those kernels with pixels along the border where NoData could artificially increase richness by 1; 3) then, we subtracted this last output to the original non-corrected EFT richness image to correct the artificial increase of richness due to NoData values outside the borders.

C4.- * How variable are the quartile boundaries (could you name a standard deviation?)

R4. - Thank you very much for the suggestion, we believe that adding this information to the manuscript will add value to the data. To know how variable the quartiles were, we will show the quartiles of each year, their interannual mean, their interannual standard deviation, and their interannual coefficient of variation (Table 1/Fig.4 in this document). The variability among years or Coefficient of Variation (CV) was around 5% for EVI_mean quartiles and lower than 11% for EVI_SD quartiles, increasing in the uppest quartiles (Table 1).

Having such interannual variability in the quartiles shows the influence that climate fluctuations (e.g. dry or wet years) have on vegetation greenness. As we will further explain in the manuscript, we developed a fixed-classification approach with fixed limits between classes for the entire period so that our EFT classification was capable of capturing such inter-annual changes. Adapting the limits between classes to each year would not make possible to compare the classification across years.

C5.- * Are any references/citations to other data sets or articles missing or inappropriate? -reference/URL to the database REDIAM is missing, also, which particular datasets have been employed from it; by what data got the MODIS data clipped/masked?

R5. - Thank you for pointing out the missing reference. The MODIS data were clipped by the shapefile with the boundaries of Sierra Nevada protected area obtained from REDIAM, the public repository of environmental information of the Andalusian government. The REDIAM URL will be added to the manuscript: http://www.juntadeandalucia.es/medioambiente/RENPA.

C6.- * Is the article itself appropriate to support the publication of a data set? - yes with respect to gain an understanding of the data. The article does not provide necessary

information to re-use the data: the legend for EFTs is part of Fig 2; the values of the EFTs do not correspond to the values in the TIFs (there they are 1-64 encoded)

R6. - Thank you very much for pointing out this confusing issue. The legend in Figure 2d of the manuscript has numerical values (from 1 to 64) and their corresponding EFT codes (from 1=Aa1 to 64=Dd4) (Fig. 2). The .TIFs files only include the numerical coding from 1 to 64 since it is not possible to store alphanumeric (string or character) information in .TIF. However, the corresponding alphanumeric codes can be easily consulted in the legend. We will clearly explain this in the manuscript (section 2.4) and include it in the corresponding metadata files: " The EFT alphanumeric code (Aa1 to Dd4) corresponding to the numeric code (1 to 64) in the .TIF files is contained in the legend of Figure 2d".

C7.- * Check the data quality: Is the data set accessible via the given identifier? -yes Is the data set complete? -yes Are error estimates and sources of errors given (and discussed in the article)? - well, not error but there is no reference to variability eg the means of internal quartiles given

R7. - Please, see the responses R4, R29a and R29c, where we explained how we handled the variability in the quartiles, which will be included in the new version of the manuscript.

C8. - * Are the accuracy, calibration, processing, etc. state of the art? - The article employes community-"standard" pre-processed data; however, it does not provide accuracy information of intermediate processing steps. Also, the derivation of spatial heterogeneity, the chosen size of the kernel and how this affects the results is not discussed

R8. - Accuray information of the intermediate steps of the process are documented in the R4, R29a, R29c, R1 and R3b, in addition, the effect of kernel size on our results will be added and discussed in the new version of the manuscript.

C9.- * Are common standards used for comparison? - the resulting data are not compared Is the data set significant – unique, useful, and complete? -The data set is useful

R9. - Thank you for your encouraging comments.

C10.- * Consider article and data set: Are there any inconsistencies within these, implausible assertions or data, or noticeable problems which would suggest the data are erroneous (or worse). - using a kernel to derive values I would have expected that the resulting layer is smaller in size than the input layer, unless some "mirroring" is done to extend the input layer in size. The article does not provide any information on how this was handled

R10. - The output layer has the same size as the input layer because the kernel assigns to each pixel the value of EFT richness by counting how many different EFTs there are in the surrounding 4x4 pixels, therefore the output resolution and layer size is the same. To provide information on how this was handled, we will add a sentence explaining it in section 2.5, in addition to the kernel size justification (R1), as follows: "EFT richness was calculated for each year by counting the number of different EFTs in a 4×4-pixel moving window around each pixel (top-left center pixel of the 4x4 Kernel) (modified from Alcaraz-Segura et al., 2013). Each MODIS pixel received a richness value derived from counting how many different EFTs there were in the surrounding 4x4 pixels. We chose a 4x4-pixel window since it offered the finest spatial resolution without saturating the number of EFT classes per kernel (i.e. smaller sizes result in a high proportion of kernels with the maximum number of classes). This is the reason why all images in the dataset have the same number of columns and rows".

Also, we have explained the handling of the kernel in the R1, R3a, R3b.

C11.- * If possible, apply tests (e.g. statistics). - looking up the TIFs with standard GIS software(QGis) did not reveal any problems. The histograms of values seem ok, although because of missing legend they could not be really interpreted

R11.- Please, see R6 for explanation of .TIFs values and legend.

C12.- * Is the data set itself of high quality? Check the presentation quality: Is the data set usable in its current format and size? -yes, the GeoTIFF is a well accepted and documented file format Are the formal metadata appropriate? - No, I am unable to discover any formal metadata. The GeoTIFF come with some metadata in their header, but do require specialized software for extraction, eg. of the bounding box or employed projection. additional TFW file would be readable with common editors. Additional formal metadata is missing.

R12. - We will made a Data Management Plan with the formal metadata of our dataset as in this example: https://dmptool.org/plans/8278/export.pdf As the reviewer points out, our .TIFs files already contain this metadata: raster information (columns and rows, number of bands, cell size, uncompressed size, format, source type, pixel type, pixel depth, NoData value, pyramids, compression, status), extension (top, left, right, bottom), spatial reference (angular unit, datum) and statistics (build parameters, min, max, mean, std dev.). Thus, considering the available metadata and the very time-consuming effort that represents reprocessing all data with an additional .tfw file along with the metadata contained in each archive .TIF, we consider that a document on metadata such as the Data Plan Management could give the necessary information in terms of metadata. However, if the reviewer and editor still think that we should provide one .TFW file per .TIF, we can reprocess all the data to make it.

C13.- * Check the publication: Is the length of the article appropriate? - given, that it is a data publication, the article dwells much on discussion of the application/biodiversity/structure but is much shorter when it comes to describing data and methodology

R13.- Thank you for your comment. As already stated in other responses, in the new version of the manuscript, which will be submitted after the open discussion, we will expand the description of the data and methodology.

C14.- * Is the overall structure of the article well structured and clear? -yes Is the language consistent and precise? -there are a few language errors but the article is language wise in good shape

R14. - We are very thankful for the Reviewer's encouraging remarks! To improve remaining language errors, we will thoroughly review English grammar and spelling.

C15.- * Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? - Eq.3 uses X any Y without explicit definition; this equation does not provide additional information content

R15. - Equation 3 refers to the Jaccard index: J(X,Y) = |X âĹľ Y| / |X âĹł Y| , where the Jaccard index for two data sets (X = set 1; Y =set 2) is equal to the size of the intersection divided by the size of the union of the data sets. In the new manuscript, we will give the explicit definition of X and Y in the same way as in this response.

C16.- * Are figures and tables correct and of high quality? Quality is mostly acceptible, in Fig.2, part 3 the legend is hardly readable

R16.- Thanks for the advice, we will increase the quality of the legend in Figure 2 of the manuscript.

C17.- * Finally: By reading the article and downloading the data set, would you be able to understand and (re-)use the data set in the future? -No, eg. the EFT type as encoded in the TIFs cannot be interpreted

R17.- Please, see R6.

C18.- * Uniqueness: It should not be possible to replicate the experiment or observation on a routine basis. - all resulting data can be reproduced as the primary source is generally available. However, the derivation needs expertise with GIS/remote sensing software, and a target audience of ecologists is usually easier reached with data products which are deemed useful for such clientele

R18. - Our goal providing this dataset is to give the scientific community an example of how to derive valuable information of the functional diversity at ecosystem level for an entire protected area. We provide this dataset for the LTER site of Sierra Nevada Biosphere Reserve so that other researchers and managers can use it without the need for remote sensing expertise. However, we provide all the information and data sources to be reproducible by those experts who wish to reproduce it in this or any other area of the world.

C19.- * The introduced methods are not trivial nor obvious, however, would benefit from a discussion why certain approaches had been taken (kernel size eg.)

R19. - Please, see R1, R3b.

C20.- * The data seem complete. All derived data sets are provided (annual data), also the summary data. In theory one could re-calculate all results (if eg. interval boundaries were to be now known, EVI_max).

R20. - The intervals of months to define each season and therefore EVI_max were as follows: January to March = 4 - Winter. April to June = 1 - Spring. July to September = 2 - Summer. October to December = 3 - Autumn.

This information is important to appear in the manuscript to ensure its reproducibility, therefore it will be added in the next version.

C21.- * I would request information on hardware and software used to derive products (algorithmic deviations)

R21. - Most of processing was carried out in the Google Earth Engine (GEE) platform. GEE combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities. We used the main Javascript programming interface to build the algorithms and requests to GEE servers. More information in https://earthengine.google.com/faq/ and https://developers.google.com/earth-engine/. Only inter-annual variability was processed with IDL software (short for Interactive

Data Language). IDL is commonly used for interactive processing of large amounts of data, including image processing. The syntax includes many constructs from Fortran and some from C. More information in https://www.harrisgeospatial.com/Software-Technology/IDL..

C22.- * Also, to reproduce the data information on masking/clipping the covered regions is necessary but absent. (which dataset, which method)

R22. - The data were clipped with the shapefile of the Sierra Nevada Biosphere Reserve boundaries, whose layer is available at REDIAM, (see R5). The method applied to extract the data was clipping MODIS data with the shapefile that delimited the Biosphere Reserve.

Technical details:

C23.- * line24: imagery do not provide a continuous characterization as reflectance is integrated per pixel

R23. - We agree with the reviewer, imagery does not provide a continuous characterization as reflectance is integrated per pixel, however this sentence refers to spatially explicit information (i.e. covering the whole territory). Therefore, as the sentence can be confusing, we will change the term by "spatially explicit" and we will rewrite the sentence as follows: "Nowadays, the use of satellite imagery provides useful methods to produce a spatially explicit characterization of ecosystem functioning and processes at regional scales".

C24.- * line 26: from 2001 to 2018

R24. - We will change "since" for "from", thank you for correcting this mistake.

C25.- * line 79 not the EFT approach has exp. grown but the application of EFT approaches

R25. - Thank you for your suggestion. We will change the sentence to "Since the

concept appeared in 2001 (Paruelo et al., 2001), the EFT approach (or equivalent approaches) applications has exponentially grown to characterize functional heterogeneity from local to global scales (...)."

C26.- * line 137 EFT seasonal curve: the term has not been introduced properly; I presume it refers to the 23 measurements taken per year, please clarify

R26.- Yes, the seasonal curve refers to the 23 measurements per year. We will change the sentence to as follows: "These attributes were calculated from the EVI seasonal curve or annual dynamics (i.e. 23 measures per year)".

C27.- * line 146: one cannot understand the present derivation as the methodology is referred to another article; worse, the authors write of a "similar" approach without making clear how/where they differ

R27. - We note that it is similar to other articles and explain next what it is. The calculation of EFTs does not differ methodologically from the article mentioned, but methodological novelties from the concept are explained in the following sections (2.5, 2.6).

C28.- * line 147 EVI_DMAX: unclear, whether you chose the intervals according to the definition of the seasons or you derived them and they turned out to coincide with the seasons; please clarify

R28. - We chose the intervals of EVI_DMAX according to the definition of the seasons. Please, see R20. To clarify it in the manuscript, we will change the sentence as follows: "For EVI_DMAX, the four intervals according to the definition of the four seasons of the year: January to March = Winter, April to June= Spring, July to September = Summer, October to December = Autumn".

C29a.- * line 149-150: the derivation of quartile borders was understandable only after consulting the reference. How stable are the boundaries, that is, provide a standard deviation for each mean

R29a.- We will better explain how we used quartiles to define the limits between classes to make this manuscript self-standing and independent from our previous works. Regarding the stability of quartile boundaries across years, please, see our response R4. Table 1 in this letter indicates the quartile value for each year and the interannual mean that we used to set the limits between classes. In addition, it also contains the interannual standard deviation and coefficient of variation as indicators of the interannual variability associated with each mean (please, see R4 and R29c).

C29b.- Table 1: values cannot be reproduced nor checked, e.g. EVI_Mean_2001_C006_MOD13Q1_Pixel232.tif shows values between 11.5-4471.9 (QGis), table 1 reports 75% values are less than 0.241 EVI_mean:

R29b.- We thank the Reviewer for this useful comment so we can avoid misinterpretations from the readership. As the Reviewer points out, the .TIFs of EVI_Mean and EVI_SD files have values potentially ranging from 0 to 10,000, as indicated in line 131 of the manuscript as follows: "Values of EVI*10,000 are given as real numbers between 0 and 10,000". This is because the original EVI data ranged between those values to occupy less disk space. However, in the quartile table EVI_Mean and EVI_SD values were divided by 10,000, and therefore potentially ranging from 0 to 1.

We will include in the metadata and in the data management plan that in the EVI_Mean and EVI_SD .TIF files, values are multiplied by 10,000. We will also add the following information in the table heading (line 646): "Table 1. EFAs range used for identification of EFTs in Sierra Nevada. For EVI_DMAX, the four intervals agreed with the four seasons of the year. For EVI_mean and EVI_sSD, we extracted the first, second, and third quartiles for each year and then calculated the inter-annual mean of each quartile (their average over the 18-year period). The values of both EVI_mean and EVI_sSD are multiplied by 10,000 in the .TIF files to save disk space".

C29c. problem with "sealed" class boundaries: derivation relies on mean of a 18y period. If say, you want to show the time series of 2001-2020, would you need to do

the derivation of the boundaries or "extrapolate" from 2018?

R29c.- We developed a fixed-classification approach with "sealed" or fixed limits between classes for the entire period so that our EFT classification could detect inter-annual changes. Adapting the limits between classes to each year would not make it possible to compare the classification across years. For example, if there is a macro fire in 2020 over that burns the entire protected area, our use of fixed limits between classes will allow us to detect changes in EFTs in 2020 due to fire (most pixeles would be classified as low productivity "A__ class"). However, if the limits between classes were adapted to each year, we would not detect in 2020 the effect of fire.

We determined the minimum number of years that are needed to reach stability in the quartile boundaries among classes. For each quartile, we plotted the maximum inter-annual coefficient of variation (Y axis) among the n consecutive years considered, with n ranging from n= 2 years to n=18 years against the number of years considered (X axis) (i.e. maximum value of the coefficient of variation among all possible combinations of two consecutive years, three consecutive years, four, five, etc. throughout the 2001-2018 period (Fig. 3). The three EVI_Mean quartiles tend to stabilize around an interannual coefficient of variation of 5%, which requires around 14 years of study period. The three EVI_SD quartiles tend to stabilize around an interannual coefficient of variation of 10%, which requires around 17 years of study period. Hence, the 18-year study period provided in this dataset would be enough to serve as a reference situation for this protected area. Thus, using the referee example, it would not be necessary to derive the quartiles boundaries again for the year 2020, since our 18-year study period is representative enough to extrapolate quartiles to the new year. We will include this analysis (including Fig. 3 in an appendix) and the referee example in the new version.

C30. - * Table 1, EVI_Max: values of 1-4 do not correspond to values found in TIFs (1-12)

R30. - The values of the ecosystem functional attributes appear with their original values, in the case of EVI_max they are the months, i.e. as EVI mean and EVI SD are not grouped in 4, EVI mmax is not either. The values from 1 to 4 appear once we make the classification in groups to build the EFTs, but not in the EFAs map. We believe that providing the peak time with all months rather than the peak season (which is provided in the EFT map) is valuable, as it gives us greater yearly detail of the month of the phenology.

C31.- * line 159: justification for a 4x4 kernel? Why not 3x3 or 5x5? Could the kernel be dependend on the question being asked? How have borderline pixels be processed/why eg share richness and inter-annual mode the same borders?

R31. - Please see R1 and R3b.

C32.- * line 359: database is maintained

R32. - Thanks for the correction, we will change it in the manuscript.

C33.- * line 360: please include a reference/URL to the database REDIAM, also, indicate which datasets of REDIAM have been included in your work

R33. - The data obtained from REDIAM was the shapefile with the boundaries of Sierra Nevada, which URL will be added to the manuscript: http://www.juntadeandalucia.es/medioambiente/RENPA.

C34.- * Fig 2.1; https://lpdaac.usgs.gov/products/mod13q1v006/ states 250m GSD, not 230m.

R34.- We strongly agree, but the 250m measure refers to the nickname of the dataset, not to the actual spatial resolution of the MOD13Q1 pixel, which is 231.65635826395828 m/pixel at the equator. We will explain this in the text and metadata.

C35.- * Fig 2.2: the mean is not the area under the curve, but the area normalized by the range; there is no curve at all but 23 discrete values/year

R35.- That's right, thank you, this was also pointed out by Reviewer 1. We will rewrite this sentence as follows: "EFAs were: the annual mean or the cumulative EVI, an estimator of annual productivity (EVI_mean), the EVI seasonal coefficient of variation, i.e. the differences between the minimum and the maximum EVI values, a descriptor of seasonality (EVI_sSD), and the date of maximum EVI, an indicator of phenology (EVI_DMAX)".

C36.- * Fig 2.4: the legend is crucial for reusing data but is not provided as individial data (eg. numerical values corresponding to a class, or pseudo color code for GoogleEarth); at present, the TIF files for eg EFTs show values between 1-64; how to map to your classes?

R36. - Please see R6.

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Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2019-198/essd-2019-198-AC2-supplement.pdf

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-198, 2020.

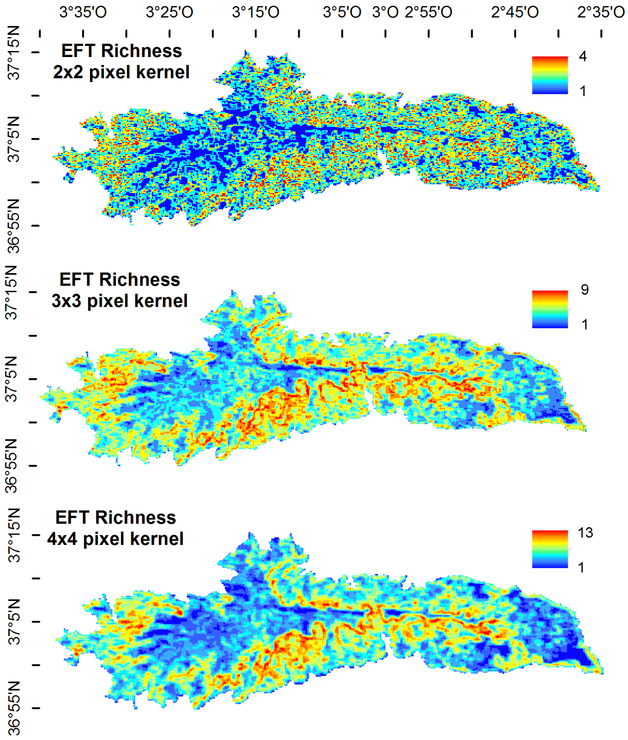

Fig. 1. EFT Richness for 2x2, 3x3 and 4x4-pixel kernel sizes. A 4x4-pixel kernel was chosen since it offered the finest spatial resolution that did not saturate the number of EFT classes per kernel.

A-D: Productivity (increasing)
a-d: Seasonality (decreasing)
1-4: Phenology (Sp-Sm-Au-Wi)

1) Aa1	17) Ba1	33) Ca1	49) Da1
2) Aa2	18) Ba2	34) Ca2	50) Da2
3) Aa3	19) Ba3	35) Ca3	51) Da3
4) Aa4	20) Ba4	36) Ca4	52) Da4
5) Ab1	21) Bb1	37) Cb1	53) Db1
6) Ab2	22) Bb2	38) Cb2	54) Db2
7) Ab3	23) Bb3	39) Cb3	55) Db3
8) Ab4	24) Bb4	40) Cb4	56) Db4
9) Ac1	25) Bc1	41) Cc1	57) Dc1
10) Ac2	26) Bc2	42) Cc2	58) Dc2
11) Ac3	27) Bc3	43) Cc3	59) Dc3
12) Ac4	28) Bc4	44) Cc4	60) Dc4
13) Ad1	29) Bd1	45) Cd1	61) Dd1
14) Ad2	30) Bd2	46) Cd2	62) Dd2
15) Ad3	31) Bd3	47) Cd3	63) Dd3
16) Ad4	32) Bd4	48) Cd4	64) Dd4

Fig. 2. EFT legend with numerical values (from 1 to 64) and their corresponding EFT codes (from 1=Aa1 to 64=Dd4).

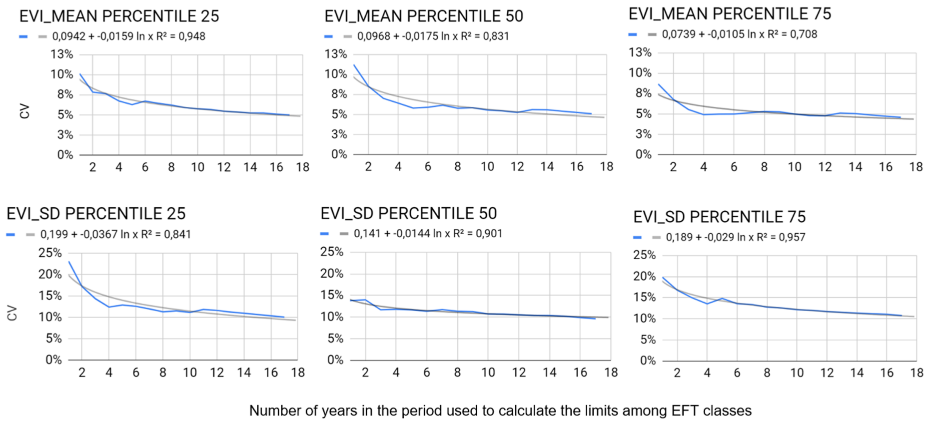

Figure 3. Stabilization of the interannual coefficient of variation (CV) of the limits (quartiles) among Ecosystem Functional Type (EFT) classes as the number of years included in the study period increases. For each quartile, we plotted the maximum interannual CV (Y axis) among the n consecutive years considered, with n ranging from n=2 to n=8 (X axis). The quartiles of EVI_Mean (our surrogate for productivity) required at least 14 years to stabilize around 5% of CV. The quartiles of EVI_SD (our surrogate for seasonality) required at least 17 years to stabilize around 10% of CV.

Fig. 3.

Table 1. Annual quartile boundaries (percentil P25, percentil P50, percentil P75) for EVI_mean and EVI_SD and summary of the period (Interannual mean, Standard Deviation (SD) and Coefficient of Variation (CV)).

YEAR	EVI_mean P25	EVI_mean P50	EVI_mean P75	EVI_SD P25	EVI_SD P50	EVI_SD P75
2001	0.133	0.187	0.245	0.030	0.044	0.063
2002	0.139	0.190	0.243	0.031	0.042	0.057
2003	0.130	0.184	0.242	0.031	0.046	0.068
2004	0.142	0.197	0.251	0.032	0.047	0.068
2005	0.123	0.168	0.222	0.023	0.039	0.056
2006	0.126	0.174	0.229	0.030	0.046	0.066
2007	0.142	0.184	0.232	0.028	0.038	0.051
2008	0.133	0.176	0.229	0.029	0.042	0.062
2009	0.133	0.180	0.235	0.032	0.048	0.070
2010	0.139	0.190	0.242	0.034	0.048	0.072
2011	0.149	0.200	0.258	0.032	0.045	0.069
2012	0.139	0.187	0.238	0.027	0.037	0.052
2013	0.142	0.197	0.258	0.032	0.044	0.063
2014	0.130	0.184	0.241	0.026	0.037	0.056
2015	0.139	0.194	0.245	0.030	0.042	0.060
2016	0.134	0.182	0.233	0.024	0.036	0.054
2017	0.142	0.187	0.238	0.030	0.039	0.057
2018	0.145	0.206	0.264	0.032	0.047	0.068
Interannual mean	0.137	0.187	0.241	0.030	0.043	0.062
Interannual SD	0.007	0.009	0.011	0.003	0.004	0.006
Interannual CV (%)	5.001	5.103	4.593	10.040	9.597	10.745

Fig. 4. Table 1