Response to Referee #2

1. General comments

The study describes exemplarily the construction of a network linking plant traits and climatic drivers not only with a statistical background but by taking into account causal linkages. Using a Bayesian Network (BN), expert knowledge is introduced to evaluate the causal effects of climate variables for ecosystem functions. The main achievement and argument is that this type of analysis goes beyond usual statistical relationships which often fail to reveal indirect effects and trade-offs. Although this approach is appealing and from an ecological point of view very promising, the manuscript does not provide a proper validation of the method. The increasing availability of data such as collected within the FLUXNET community hopefully will further trigger new ways of exploring the connection of environmental conditions with the evolving plant community and at the same time allow to test and consolidate analysis tools. Here, the method would benefit from better methodological clarification, description of data use, validation and presentation of the results which are detailed below. The paper needs major revisions before publication.

Response: Thank you for your insightful comments, which have been very helpful in improving the manuscript. This manuscript will be revised in accordance with your comments. In terms of model validation, we will try to use k-fold cross-validation to measure the performance of the model in prediction. In terms of reproducibility, we will list the references supporting the links in BN and clarify the node discretization schemes to make the methodology section more detailed and transparent.

2. Specific comments

- The text includes various repetitions when stressing that the new method is superior to usual analyses. Please be more concise when making this point (e.g. in introduction and discussion) or more specific when certain aspects are described in detail (e.g. in results). The re-occurring statement is not strengthening the argument.

Response: Thank you for your insightful comments. We will improve the relevant descriptions.

- Although the data base for the BN is given in table 1 in detail, the choice of the variables does not become clear. Which variables were taken into account and why? Some variables are taken as is and some averaged. Please state as well the temporal resolutions of original variables and averages (why mean values and not medians?). Also the choice of the intervals for discretization (right column in table 1) is not motivated – please provide more detail and reasoning.

Response: Thank you for your insightful comments. We will describe in more detail the choice of variables and what these variables specifically represent, etc. We will also specify the basis for the discretization of each node (considering the distribution of values or the specific meaning of the thresholds). In addition, the use of different discretization schemes does have implications for causality and sensitivity analysis, which we will explain in more detail in the Discussion section.

- The interesting part of constructing the BN in section 2.2 is not transparent. On which basis is the expert knowledge extracted from Reichstein et al. (2014) and how is it transferred to the BN? When the authors main agenda is to promote their new analysis method, it would be good to give more insights in the process of finding the linkages that should be considered.

Response: Thank you for your insightful comments. We will add literature that has a description of how to transfer expert knowledge to BN, as well as adding more specific information on the impact of climate variables. We will make the methodology section more detailed and transparent.

- The result section would benefit from a better description of the results of both methods. Reducing the text with general statements should give enough space for guiding through figure 4 and highlighting the benefits of the second approach. How do you motivate this statement when e.g. comparing the results for AGB in the BN-plant-trait-climate in comparison to the BN-plant-trait?

Response: Thank you for your insightful comments. We will add more analytical and explanatory descriptions related to Figure 4, comparing the differences between the two BNs.

- One major concern is a validation. A presentation of a data-driven method without a validation can hardly be recommended for publication. Please not only provide one but also make clear which data are used for building the model, getting the results and performing the validation.

Response: Thank you for your insightful comments. Despite the limited amount of data, we will consider doing a k-fold cross-validation. The level of the highest probability of a node predicted by BN can be compared and validated against the actual values (e.g. reporting error matrix).

3. Technical remarks

L 20 and 31: The term ‘emphasized’ seems not appropriate in this context. Please be more specific what you mean here.

Response: It will be revised more specificly.

L 36: ‘Changes in climate change’ is misleading – please modify.

Response: It will be revised.

L 64: The sentence is very long and could be split into two.

Response: It will be revised.

L 67: Also very long sentence which makes me wonder, if you assume all relations in these systems to be causal, which they are of course not. Please clarify.

Response: It will be clarified.

L 96: Including the cumulative soil water index means that a variable is chosen which is already the result of precipitation and evapotranspiration. How do you deal with the interdependency of the variables?

Response: Here we follow the paradigm of a process-based or water balance approach, where ET is usually the output and precipitation is the forcing driver, and soil water comes from precipitation and contribute to ET with water supply.

Fig. 2: please explain the black dots in the figures.

Response: This is the position of each value on the horizontal axis. We will explain it.

L 142: Another very long sentence on a complex issue. A stepwise approach would increase readibility.

Response: It will be revised.

L 163: How do you evaluate the compilation as being ‘successful’? Which criteria are fulfilled?

Response: We can use the k-fold cross-validation described above to further evaluate the compilation of BN.

Fig. 4: Values and text in the figure are very small. Why did you choose ‘?’ as a separator between mean and standard deviation?

Response: We will make the text of this figure larger. '?' can be replaced by '±'.

L 190: As an example for the wish for a better presentation of the results please give more reasoning for the statement that climate variables ‘showed a role beyond plant traits’. Without an understandable link to the results shown, a sentence like this is appropriate in the discussion.

Response: We will discuss this issue in the discussion section.

L 224: The methods described in the caption and the text should be moved to the methods section! Here, please elaborate more on the explanation of the very valuable figure 6.

Response: We will place the method-related content from the caption in the methodology section. In addition, more analyses related to Fig. 6 can be mined and provided in the manuscript.

L 281: The idea of extending the causal linkages to the temporal dimension is intriguing but opens the problem of non-independent variables. Do you have an idea how to treat causally linked and dependent variables in this approach?

Response: Thank you for your insightful comments. Completely resolving the independence of the relationship between the temporal dimensions of these variables may be controversial. On the one hand, this independence may depend on the time scale of the study, and on the other hand, it may require us to add the control of the precipitation constraint (i.e., we can constrain our study aim to analyse the ET-VPD-CSWI relationship in time periods split by precipitation event because a precipitation event is enough to interrupt the extension of this relationship). We will add a discussion on this issue.

L 308: Although the conclusions are free to mention related issues which are not part of the study, I would recommend to replace this last point e.g. by the importance of your findings for the modeling community.

Response: Thank you for your insightful comments. It will be replaced.