Response to reviewers

The TropD software package: Standardized methods for calculating Tropical Width Diagnostics

Adam et al.

As noted by the topical editor, the list of authors has been updated in the latest version of the paper and now includes Dr. Alison Ming.

Executive comment by Astrid Kerkweg:
Please add a version number for the software package TropD in the title upon your revised submission to GMD
A version identifier was added to the title (v1)

We thank the reviewers for their comments. A detailed response is provided below.

Reviewer 1
This work presents a framework in MATLAB programming language to calculate the tropical width using the eight most common methods and metrics for this purpose. The package of code called TropD includes not only the source files where all methods covered in the article were implemented, but also includes examples, data and documentation.
TropD is provided under an open source licenses, so it can be used and modified without restrictions. In this way, users can adapt it to their own studies, making a significant contribution to the scientific community.
The article clearly explains each method implemented in the code package TropD. Each important function is implemented in a separate file with multiple options for its execution and its interface is properly documented. An example code and validation data are included to evaluate the use of TropD.
No significant shortcomings were found in the implementation of this code package. The source code is clear and well organized. All variables are documented and the comments included in the code make this code easy to understand. Therefore, I have no suggestions for improving the code package presented in this work.
Thanks for the kind words.

Reviewer 2
This paper describes a software package that implements eight commonly-used methodologies for the calculation of metrics of the tropical width. A set of optional parameters is made available for some methodologies. The code is written in the widely used MATLAB programming language, and its purpose is to provide standardized calculation methodologies for commonly used diagnostics of the tropical width, helping in the comparison of the results from different studies.
The paper is well written and the software functions well described. A sensitivity analysis for the different methodologies is presented to justify the choice of the default options. Because the basic operators applied in the metric calculations are nonlinear, the metric calculations do not commute in space and in time. The authors discussed this in the manuscript. However, there is another effect of nonlinearity that the authors did not discuss. The input data for the software are zonal-mean variables in a latitude pressure grid. For example, in the TBP method, the zonal-mean tropopause is calculated by applying the WMO lapse rate criteria to the isobaric zonal mean temperature. I wonder if

the results will be the same when the zonal mean tropopause parameters are obtained by zonally averaging the respective values calculated at each longitude.
Indeed, as the reviewer suggests, for some metrics, the metric derived from a zonal-mean field may differ from the zonal average of the metric applied per longitude. However, as stated in Section 2.1, TropD is designed to be applied on zonal-mean fields. This is because the methodologies for zonally varying indices of the tropical width require more research, potentially followed by modifications of the code and methods. We may address this issue and incorporate methodologies for zonally-varying metrics of the tropical width in later versions of TropD.

I have more two minor comments:
pg. 3, line 16: ”(ii) In cases where multiple zero-crossing latitudes exist, the first zero crossing along the input interval is chosen.”
Because the data grid is ordered from the South Pole to the North Pole, the first zero-crossing latitude in the SH is far from the equator than the first zero-crossing latitude in the NH. Is it right?
A clarification note was added to section 2.2 (latitude of zero crossing). The comment reads: "The metric functions described below automatically order the input interval lat such that the first latitude of zero crossing in each hemisphere corresponds to the most equatorward zero crossing."

Fig. 9: It will be useful to call the attention for the different vertical scales used in Figs. 9a,b and 9c,d.
The caption of Fig. 9 was edited to note the differences between the vertical scales of the STJ:core and STJ:adjusted methods