Review for Colleoni et al. (Geoscientific Model Development: gmd-2021-78):
PALEOSTRIPv1.0 - a user-friendly 3D backtracking software to reconstruct paleo-bathymetries

The authors present a MATLAB open-source software called PALEOSTRIPv1.0, which performs 1D, 2D and 3D backtracking of paleobathymetries. The robust and comparable calculation of paleobathymetries is an important factor in past climate reconstructions and providing the community with a widely accessible, comprehensive software package will prove incredible valuable step towards more detailed paleo-reconstructions.
For this review, I assessed the provided manuscript as well as the software package and manual attached to the software.
Overall, the manuscript is well written and gives a very detailed description of the process of calculating paleobathymetries. The example of the Ross Sea Embayment is clear and showcases the advantages of PALEOSTRIP clearly. Nevertheless, I like to advise the authors to amend some more information and resources for the profit of the users just starting working on paleobathymetric reconstructions, to avoid misconceptions and confusion. I detail these and some other comments below. Additionally, the text has some minor spelling and grammatical issues (especially when referring to software names), which should be rectified.

I recommend to accept the manuscript after minor revisions.

General comments on the manuscript:

1. *Backstripping vs. Backtracking:* Throughout the manuscript, the authors reiterate that there is a difference between backstripping and backtracking without clearly defining and distinguishing both at the beginning of the manuscript. A paragraph laying this groundwork as well as explaining to the reader the different usage is warranted. A constant mentioning of these similar concepts confuses the reader. I suggest, the authors define the process they are calculating with PALEOSTRIP at the beginning of the manuscript and use only one to the terms in the remainder of the manuscript, to avoid confusion.
2. *What can PALEOSTRIP provide & what can't it provide?*
   For any paleobathymetric reconstruction, it is important to clearly define which geological environments can be reconstructed with a given method. The authors mention various caveats, that every geological reconstruction holds, throughout the manuscript, but a central paragraph briefly summarizing limitations and advantages of PALEOSTRIP for the reader can help convey various matters, that the users need to be aware of. More technical aspects might also be a good addition to the manual:
   - Crustal Structure: Can PALEOSTRIP be used in areas underlain by oceanic crust or transitional crustal types, which might be common on wider continental margins? By including multiple β-factors and thermal subsidence various settings for the continental crust are available, which is great to reconstruct more complicated geological settings, but does this also translate to oceanic crust?
   - Dynamic Topography: Since PALEOSTRIP does not include a platekinematic component, the user needs to be careful to use appropriate dynamic topography models for the reconstruction time frame, since they are often related to a specific platekinematic model.
   - Lithological parameters: Could you point the readers to resources, where they might find general values to compare their lithological parameters (especially the decompaction coefficient) to, or use in case the area they are working in has not been cored?
   - Erosion and re-sedimentation: One crucial and difficult to quantify aspect of paleobathymetric reconstruction, especially in areas of polar continental shelves such as the example from the Ross Sea given here, is the removal of sediments by

advancing glaciers and potentially various stages of sedimentation prior to the current position. How does PALEOSTRIP deal with scenarios of multiple sedimentation cycles and how do the authors recommend users do account/correct/anticipate this process?

3. *Communication of new releases:* The authors mention various times throughout the manuscript as well as within the software manual that certain functionalities are likely to be developed in the future. How will the authors ensure, that they inform the community about new developments by themselves or other groups?

Specific comments on the manuscript:

Abstract: The abstract should include a brief explanation, why paleobathymetries are important and how they connect to paleomodels.

Introduction: L24 tectonic setting might not encompass all the different factors listed here. To underline the importance of paleobathymetric reconstructions, it would be useful to add brief examples on the processes and give the reader a window of how much bathymetry can actually change within certain timeframes.

L32/33 “overprinted information” what do the authors mean by this? Erosion and re-deposition?

L40 and following: This is a great overview on what is currently available for backstripping/tracking. This paragraph would be a great opportunity to emphasize, where the current gaps are, that PALEOSTRIP is closing.

Model framework and requirements:

I tested download and installation of the software package and am happy to report, that there were no issues on MATLAB2020. The interface is well done and easy to navigate. The example data worked and I could re-calculate the steps presented in the manuscript.

L73: incompatibility with GUIDE → this information might be more suitable for the manual.

Coordinate Systems: The resources mentioned here should also be added to the manual.

Input files: mention the examples attached to the software package.

PALEOSTRIP: Backtracking:

This entire paragraph is a detailed and very clear overview on the different steps of paleobathymetric reconstruction and various consequences to the seafloor development. Several caveats the user needs to account for are mentioned throughout the text. As already detailed above, I would recommend a summary paragraph explaining the advantages and limitations of PALEOSTRIP to be included here.

PALEOSTRIP Grid Interpolation:

The various details described here are very convoluted. This paragraph might profit from a careful re-write. During the final editing, Fig. 4 needs to be as close as possible to the describing text to convey the information needed.

PALEOSTRIP validation:

Although the reader can quickly refer to DeSantis et al. 1999, it would be practical, to reiterate how the used lithological parameters have been measured on DSDP 273 (logging along core, discreet samples…).

L369 and following: The authors compare PALEOSTRIP and Flex-Decomp pointing out a good fit and some understandable discrepancies. What would be considered a good fit and what kind of error margins can be assumed for this kind of reconstruction? A brief overview on potential error sources and error margins

should be added to aid with maximum/minimum scenarios and raise awareness in the user community.

Case study: example of the Ross Sea

The example of the Ross Sea illustrates the different processes of the software package and does not draw on specialist knowledge of the region. Although, this manuscript is not designed to interpret the paleobathymetry of the Ross Sea, a little bit more detail to the results might be useful to fully see the physical settings at play. In my opinion, this does not necessarily require a lot of additional text, but can be conveyed with some changes to the attached figures (see comments to figures below).

Figures:

General comment:

Some of the figures use red and green, which might create inaccessibility issues for visually impaired readers.

Fig. 2: With a clear definition of backtracking vs. backstacking, the caption can be decluttered.

Fig. 3: Clear conceptual figure! I suggest to add this diagram to the manual as well.

Fig. 4: This figure immensely helped with my understanding of the paragraph on *PALEOSTRIP Grid Interpolation.* In the final edit, this figure needs to be set as closely as possible to this crucial paragraph.

Fig. 5: Colour scale and km-scale are difficult to see on the blue background. Users unfamiliar with the Ross Sea might profit from indicating the basement highs, which are emerging in the reconstruction.

Fig. 6: Axis description on panel A differs from other panels and should be homogenized for better comparability.

Fig. 9/10/11: Please change the used colour scale to be able to differentiate between both ends (currently both high and low end of the scale saturate in the red). Given, that the text states, that a certain portion of the embayment becomes subaerial, this should easily be visible in Fig. 10 & 11 (maybe use same colour scale as in Fig. 5?)