Solid Earth Discussions

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Reply on CC1

Mikael Evain et al.

Author comment on "Crustal structure of the East African Limpopo margin, a strike-slip rifted corridor along the continental Mozambique Coastal Plain and North Natal Valley" by Mikael Evain et al., Solid Earth Discuss., https://doi.org/10.5194/se-2020-209-AC1, 2021

We thank Christian Olaf Mueller for his interest in our preprint and for acknowledging the valuable inputs that our work brings to the current debate regarding the initial stages of Gondwana break-up along eastern African margins. However, his thorough and critical comment badly dissimulate his own - and his co-authors - actions to systematically prevent the publication or cut off any scientific discussion regarding any evidences that could provide alternatives to their recently published model, i.e. Mueller & Jokat (2019). We therefore profoundly regret Christian Olaf Mueller's call for the rejection of our manuscript and wish to provide the Solid Earth community an early non exhaustive reply in order to balance some of the main concerns provided in this comment.

As Christian Olaf Mueller well noticed our manuscript is indeed one of many contributions from a large project called PAMELA (PAssive Margins Exploration Laboratories). This project was conducted by TOTAL and IFREMER and in collaboration with Université de Bretagne Occidentale, Université Rennes 1, Université Pierre and Marie Curie, CNRS, Univ. of Lisboa and IFPEN. Among the 7 scientific cruises conducted within the scope of the project, the Moz3-5 cruise acquired in 2016 new geophysical and geological data (bathymetry, piston cores, water column, sub-bottom profiles, gravity, magnetism, dredges, wide angle and reflection seismic) that represent a total of 193 Ocean Bottom Sismometers (OBS) records over 7 wide-angle seismic profiles on the southern-Mozambique margins. Four of these profiles were extended on land by the deployment of 125 additional land seismic stations. At present and as far as we know, this area is now one of the most covered in the world by deep wide-angle seismic data, with several crossing profiles to prevent over-interpretation on a single profile. The processing of this huge datasets also involved many people further preventing over-interpretation from one person over several profiles. We further had access, thanks to our collaboration with Schlumberger and Total, to a tremendous amount of industrial profiles over the entire study area that had to be digested. As it now widely accepted by the community, results from such large experiment are published in the form of several manuscripts in order to facilitate the review process, narrow and focus the scientific finding and message each article conveys but also to reward every scientist involved in the processing and interpretation which for each profile represent a huge amount of work.

Christian Olaf Mueller's main comment and general critic is that our manuscript '*gives the impression that the data interpretation is somehow biased, without discussing alternative*

approaches'. Underlying this comment is the critic that our manuscript takes the party of the presence of continental crust underlying the entire North Natal Valley (NNV) and Mozambique Coastal Plain (MCP) and does not sufficiently discuss alternative hypothesis regarding the crustal nature of these domains. Therefore, Christian Olaf Mueller recommend the discussion in our manuscript concentrate on these points rather than presenting a geodynamic evolution of the break-up. He further recommends to include additional data from the PAMELA project objecting that they are disseminated in other manuscripts, under review or inaccessible to the reader.

We are happy to recommend to Christian Olaf Mueller the reading of the two new detailed articles. He et al. (Marine Geology, 2021) analyses the acoustic basement structure and explains why it has to be dissociated from the Mozambique Ridge further south. Lepretre et al (JGR, 2021) further details the arguments in favor of the presence of continental crust that were already introduced in Moulin et al. (Terra Nova, 2020). These two articles present the results of two 600km long wide-angle crossing profiles. Such amphibious profiles are paramount while discussing the crustal nature across a margin.

Finally we would like to remind Christian Olaf Mueller that the Moz3-5 survey was dedicated to resolve major concerns regarding the crustal nature of the MCP/NNV as highlighted by Thompson et al (2019) who did a critical assessment of previous kinematic models that overlaps Antarctica with the MCP, including the model (Leinweber & Jokat 2011, 2012) on which he based is own (Mueller & Jokat, 2019).

'*I would highly appreciate if prior to geodynamic modeling, at first an unbiased study of the seismic refraction data is performed and subsequently(!) a break-up model is developed*'. Well, hopefully this reply should have clarified that such work has now been done, is published and available to anyone and that most of the issues raised regarding the NNV/MCP have already been discussed. Our manuscript is therefore well supported to tackle and propose an alternative break-up model along the Limpopo Margin and we will take full account of the remaining minor concerns in its revised version.

With our regards,

Mikael Evain on behalf of all co-authors.

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The wide-angle and MCS Seismic data from Pamela-MOZ3-5 are available at: http://dx.doi.org/10.17600/16001600, http://dx.doi.org/10.17600/16009500 or by writing to the author, as it is specified in Moulin et al (2020).