Solid Earth Discussions

Solid Earth Discuss., referee comment RC3
https://doi.org/10.5194/se-2021-117-RC3, 2022

Comment on se-2021-117

Anonymous Referee #2

Referee comment on "Interpolation of magnetic anomalies over an oceanic ridge region using an equivalent source technique and crust age model constraint" by Duan Li et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-117-RC3, 2022

General comment on manuscript se-2021-117 by Li et al.

The manuscript deals with the application of a dual-layer equivalent source technique to magnetic anomaly data in order to improve their interpolation in areas where data are insufficient. The authors choose to test their method in an oceanic ridge region along the Southeast Indian Ridge. This approach has been successfully applied in the past by the authors (Li et al., 2020) to improve the accuracy of prediction of the three components of the magnetic field. In this case the authors use the same method over oceanic ridge regions that, from the geological point of view, are characterized by complex geometry where acting different processes and where the magnetic properties of the source rocks are extremely variable and poorly known. We have very few information on the sources that produces the magnetic anomalies in the oceanic ridge region

The manuscript is well organized and the figures are clear although in some case too small to read and appreciate the values (Fig. 3e). I do not judge the method, that could be successfully applied to obtain useful magnetic anomaly map in area with a non uniform data coverage, but I suggest to the authors to better clarify and discuss some points.

- As also reported by the other reviewer, the decision to use as constraint the model crustal age that is originally retrieved by magnetic data is at least controversial. If is true that other interpolation methods suffer the scattered data, the need to use constraints or a priori information in regions so complex could introduce additional errors. In addition to the dividing line of crust age, what other parameters concerning the magnetization of the source body did you use as a priori information?
- About the synthetic model experiment, the magnetic properties in terms of susceptibility (or magnetic remanence) of the cells are not specified. Moreover, I do not understand how the background magnetic field was calculated. In this geological setting which is for the authors the source of this long wavelength? How the use of the deeper layer improve the synthetic model results? Is it necessary to add it to the

model?

- About the real data example, what magnetic properties did you get from the inversion of observed data? I do not understand if the obtained values are similar for both shallow and deep layers. This information imply the knowledge of the nature of the deep source or the origin of the background magnetic field. I suggest to discuss what represent the background magnetic field in the oceanic ridge region.
- I suggest to clarify how the authors chose the sizes of the model cells in both the synthetic and the real example. How the sizes of the cells influence the results? In particular, it is not clear the reasons behind the choice of the deeper layer; cells with size of 80 km*80km*40 km seem too big. Moreover, this level has been localized, as said by the authors, at the depth of the Curie point but in the oceanic ridge region the Curie point is shallow and cells with 40 km of thickness would fall in the mantle where the temperature is certainly higher than the Curie point (see Li et al., 2017, A global reference model of Curie-point depths based on EMAG2, Scientific Reports, 7).
- In the chapter 3 of supplementary materials have been reported the sizes of the cells used in the experiment. Being different from those reported in the text I do not understand if they refer to the synthetic model or to the real model. I suggest to clarify this point.