

Interactive comment on “Ionian Abyssal Plain: A window into the Tethys oceanic lithosphere” by Anke Dannowski et al.

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Review of the manuscript “Ionian Abyssal Plain: A window into the Tethys oceanic lithosphere” by Dannowski et al.

Dannowski et al. present a newly acquired seismic refraction/reflection seismic profile through the abyssal plain of the Ionian Basin. The nature of the crust (oceanic vs thinned continental) under this basin has long been debated and has major implications for tectonic/geodynamic reconstructions of the Central Mediterranean area. The authors modelled seismic velocities and gravity along this profile and characterized a 5-6 km-thick sedimentary sequence lying on a 6-7 km-thick oceanic crust beneath the Ionian Abyssal Plain. The deformation front of the Calabrian wedge is also imaged

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along their multichannel seismic profile. Their results support the idea that the Ionian Basin is an old oceanic basin that opened in late Palaeozoic/early Mesozoic time during breakup of the Pangea.

I find this paper very interesting and well suited for publication in Solid Earth, however some precisions/clarifications especially in the methodology and discussion would considerably improve the manuscript, as commented below.

Detailed comments are annotated directly on the manuscript (please see attached PDF).

General comments:

1. Method and limitations

The modelling method is very shortly described in section 3.3 (see comments on the text p5). This should be improved and limitations/uncertainties of the model should be discussed, otherwise it is difficult to assess its validity.

2. Seismic velocities / oceanic nature of the crust

The authors refer well to previous studies but it was not clear to me after reading section 5.3 (especially lines 11-16 p10), what were the exact arguments to “univocally confirm” the oceanic nature of the crust, as said in the abstract, and to refute a possible continental crust with intruded mantle material? It would help if the authors could clearly compare what are the seismic velocities in case of thinned continental crust, including possible exhumed serpentinized mantle or lower continental crust if the continental margin was hyper-extended, and in case of oceanic crust, and present more clearly what’s new and univocal in their results.

3. Description and interpretation of the sedimentary units and their deformation

- The description of phases/picks in section 3.3 is difficult to follow and should be improved. The quality of Figure 3 was too low, the names of the phases are difficult to

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read. It would help to add a clear list of the phases names and colours on the side of the seismic sections. Table 1 should also come here in the text.

- The authors mentioned Tortonian “syn-tectonic” reflectors on Figure 2 but do not refer to this tectonic event later in the text. I suppose they refer to the tectonic inversion mentioned by Gallais et al. 2011, as they draw the thrusts of Gallais et al. on Figure 1. Could the authors identify those thrusts on the profile and/or relate them with the contractional deformation observed in the northern part of the profile?

- The paragraph on those folds (section 5.1) is not clear and should be improved. I think the authors could exploit much more Figure 2 and describe very nicely the deformation front of the Calabrian wedge there (see comments on the text p 9), which for me was a surprise. I didn’t expect it to be visible so much south on the abyssal plain.

4. Tectonic implications

There is confusion in the text when the authors mention a “rigid” connection between Adria and Africa. In the abstract and conclusion, the authors wrote that if the crust would be thinned-continental (rather than oceanic), it would imply a “strong” or “rigid” connection of Adria with Africa, but it’s the other way around.

The oceanic lithosphere shows (almost) no deformation and is therefore considered to be “rigid” compared to the continental lithosphere (especially thinned). So the interpretation that the Ionian crust is oceanic goes in the direction that Adria has a “rigid” connection with Africa since the end of oceanic spreading, so since the early Mesozoic. This has implications for the reconstructions of the past motion of the Adriatic plate relative to Africa, as a “rigid” connection does not allow for (much) relative motion between the two plates and therefore would imply that Adria was a “rigid” promontory of Africa. Nevertheless, the contractional deformation affecting the crust observed by Gallais et al. 2011 (mentioned above), is very interesting as it shows that the Ionian crust – even if oceanic – has deformed/is deforming and is therefore not that “rigid” after all, at least in Neogene time due to the approaching subduction zones (see dis-

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cussion in Le Breton et al. 2017 and Gallais et al. 2011; similar deformation along the Indian oceanic lithosphere have been described by Delescluse et al. 2008). Such tectonic implications should be better discussed in the text.

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Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2018-123/se-2018-123-RC2-supplement.pdf>

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2018-123>, 2018.

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