

## ***Interactive comment on “Density structure and isostasy of the lithosphere in Egypt and their relation to seismicity” by Mikhail K. Kaban et al.***

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The authors present a regional study of the lithosphere underneath Egypte. The density structure is studied by combining gravity data with other geophysical information of the crust and upper mantle. The motivation of the study is to see if there is a relation between the observed seismicity and the density structure of the subsurface. I find this an interesting approach and application for the presented gravity field modelling done in the study. And in my opinion this relation could even be relatively more addressed. The study is performed with a well documented methodology. I believe this paper could become interesting after some improvements:

My suggestions for improvement:

C1

R1: Transparency of data and methods. I find the data and models used should be more explicitly discussed. This would give a better understanding of the robustness of the presented model. on page 5 line 19-20, data from Stolk et al. (2013) is used. But what data is this in Egypte (location, value, uncertainty.) page 6 line 4 "available seismic models" -> which models? page 7 line 5 "...several regional datasets" -> which ones and how did this affect the model? line 8 "... various data-sets..." similar questions? page 11 line 9-10: which seismic model is used for the deep Earth and how does it relate to Schaeffer and Lebedev (2013) model? Is it compatible? And by removing the deep Earth, is only the gravity field of the mantle anomalies removed or also the dynamic signal due to the mantle convection? How is this related to your later isostasy study? page 13 line 6-8 "The technical details... (2015a, Supplementary)", could this be described in a few line, such that the reader does not have to go to this other literature. It will improve the readability of the manuscript. Page 19 line 11-12 "many other factors controlling seismicity" -> which are?

R2: Overall, I find the authors could elaborate and discuss more on their findings, because this is the most interesting part of the paper. Some examples: page 12 line 20 "however, they have several principal differences" -> which are, please discuss them. page14 Figure 7 shows the densities in the upper mantle. I miss the discussion between figure 5, where also densities of the upper mantle are shown. Why are there differences and what can they teach use about the subsurface. And maybe to keep the comparison fair, similar depths and wavelength bandwidths should be used, because now it is difficult to compare the quantitative differences. Could the differences tell use about different compositions in the upper mantle?

R3: One of the most interesting issues is the relation of the seismicity to the (non-)isostasy. I find this should get more attention in the manuscript, only after page 18 I read about it. One of the conclusions is (page 19 lines 7-13) is that seismicity occurs in zones with high gradients. Would it be better to plot the gravity gradients and find out? Maybe use invariant of gradients, this would remove the reference frame

C2

dependencies, or another method? It would back-up this conclusion.

Minor comments:

m1 table 1: might be better to use a graph, because than it is better to compare to other literature that uses graphs. Or might be good to use both.

m2: Figure 2, please add to what degree and order is used in this figure in the caption.

m3 Figures with longitude and latitude: I miss the labels in many of the maps.

m4 Figure 8: Why was the Moho not inserted in this figure. It would be a good addition to the cross-sections and give the reader a better understanding of the constructed model.

m5: page 5 line 21: how does the uncertainty in the empirical relationships of Christensen and Mooney 1995 affect your results?

m6: textual detail: page 13 line 18 and 21 "as mentioned above" was used twice. Also, this is a bit ambiguous, is it about the sentence, section, or whole paper above this line.

m7: page 18 line 23: "long-wavelength field" -> field. Nad what is meant with long-wavelength, specify with d/o.

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