Response to the comments of the 1st reviewer (Dr. Alexander Minakov).

The original comments are in italic.

Mikhail Kaban and colleagues present in their paper an interesting study linking the seismicity distribution, mantle density structure and isostasy in Egypt and the southeastern Mediterranean region. They compile an extensive database of controlledsource and passive seismology data to constrain the crustal model. The conversion of global shear wave velocity model for the mantle is done using mineral physics constraints. The starting density model is further improved using the inversion of both gravity anomalies and residual topography. Their results show that the dense lithosphere in northern Egypt corresponds to a low-seismicity region whereas the less dense lithosphere in the northern Red Sea and the Gulf of Aqaba are more seismically active. The authors also find an intersting relation between isostatic anomalies and distribution of seismicity.

We are grateful to the reviewer for the positive evaluation of our work. His comments are very useful and help us to improve the manuscript.

The presentation of the paper can be improved. The first-order structure of the lithosphere: the regions of continental cratonic and extended/oceanic lithosphere is not easy grasp from the figures. The location of plate boundaries and continent-ocean boundaries would be very useful to show in the figures (both in Red Sea and Mediterranean). Would useful to emphasize which lithospheric plates are involved (Africa, Arabia, Sinai. . .). The figures can be improved. The small symbols for earthquakes are hardly seen (both in maps and cross-sections). Perhaps, zoomed plots for the seismically active regions can be included. The density perturbation plots are a bit confusing. *Perhaps, a couple of transects with absolute densities and seismic velocities can be shown. Could the location of transects located be added to the maps showing the distribution of seismic events*?

The figures will be improved according to the reviewer's suggestions. In the revised manuscript we will demonstrate locations of the main plate boundaries in the study area. We will also improve visibility of the earthquakes in all figures. The absolute densities will be shown instead of density perturbations in Figs. 5 and 7.

Detailed comments to address for improving the paper:

Page 2. Line 2. Â´n..compositional variationsÂ˙z in the mantle. What about compositional variations in the crust vs temperature Line 12. Which studies: controlled-source, ambient noise etc. please, detail.

This is described in details in the section 3.3 „Model of the crust".

Line 25. "..satellite and terrestrial data" including land areas (complementary to satellite radar altimetry).

This clarification is added.

Line 30. "1-2 parameters" what are these paramteres? Thicknesses, densities? Line 31-32. "..gravity approach". Do you mean inversion?

Yes, this is clarified in the revised manuscript.

Page 3. Line 1. "entirety" do you mean entire? Line 5. "marginally touches" ? do you mean "partly covers"?

Correct, this is clarified.

Line 6. "low seismicity in northern Egypt..". Why does it appear anomalous? Please, explain.

One of the main goals of this study is to explain the anomalously low seismicity in northern Egypt.

Line 9. "shear zones". Where are these shear zones located? Hardly can be seen in the figures..Please, show these shear zone more in the figure. Figure 1 can be improved to make visible earthquakes and faults.

This figure is improved according to the reviewer's suggestions.

Line 24 Do you mean Arabian Plate? Please, detail..

Yes, this is clarified.

Page 4. Figure is very busy. Perhaps, presenting zoomed northern Egypt would be useful. Please, show more clearly shear zones.. What are the "principal trends" of plate motion?

Following the reviewer's suggestion, we demonstrate a zoomed figure for northern Egypt.

Page 5 Line 23. "existing global dynamic models". Which one is used in this study?

This is clarified in the following parts of the paper.

Page 6. How do you find the isostatic topography? Do you do iterations? Do you have analytic formula?

Here we mention the isostatic gravity anomalies. Their computation is described in the following parts.

Page 7. Please, add COB and location and type of plate boundaries in the figure.

The figure is improved based on the reviewer's suggestions.

Page 8. "p-wave" velocity, "P-wave" velocity or "Vp" ? please, choose one.

P-wave velocity is used as a definition for the term Vp. This is clarified.

Page 9. Location of seismic determinations are confusing because of association with seismicity distribution. Could you improve it? Is the interpolation/extrapolation of crustal thickness based on singular measurements (e.g. southern part of figure)? Perhaps, would be necessary to blank the area beyond certain search radius of interpolation. Could you add an uncertainty estimate from kriging?

We clarify that these are seismic determinations of the crustal structure. It is difficult to estimate the overall accuracy of the Moho map because it is based on several existing models and even the accuracy of the existing seismic determinations is undefined. It is used as an initial approximation, which is adjusted then in the inversion.

Line 18. "initial density model". Sometimes absolute densities and density perturbations are interchanged in the text and formulas. Could you make it clear what you are talking about in each particular case?

We have clarified this issue.

Page 10. Line 17. The absolute densities would be important for computation of residual topography. Please, detail.

We agree that the residual topography depends on the absolute densities. However, the reference model chiefly influences the average level of this parameter, which is not interpreted in this study.

We consider only variations of the residual topography, which are less sensitive to absolute densities. This is clarified in the revised manuscript.

Page 11. Line 7. 1x1 degree resolution. What do you mean? Grid cell size? Line 9. Why 325 km depth? Please, explain why you chose with depth as a lower limit of the model.

Yes, this is the grid cell size. The 325 km depth is chosen based on our previous studies as a depth, which exceeds the maximal depth of the lithospheric roots. This is important since the inversion is performed globally. This is clarified in the revised manuscript.

Page 12. Line 6. "rho_ref". Does it refer to Table 1? Please, comment on the application of this formulation to oceanic domains..

In the description of the Eqs. 1 it is specified that " rho – rho_ref" is the relative density below sea level including water, which means that rho=rho_water at corresponding depths in the ocean.

Page 13. What is the difference between "t_res" and "t_dyn" do you use the different "B" operators to compute them. Do you obtain isostatic topography using the compensation depth of 325km given mantle density model? Do you iterate? Please, detail..

The dynamic topography is a part (chiefly long-wavelength) of the residual topography. In the mantle, we are already considering all dynamic effects, which depend on the viscosity of the mantle, but not a simple isostatic column as In Eqs. 1 for the crust. This is clarified in the text. We also add an additional reference to the original papers, where this method was initially introduced and fully tested.

Line 14. "The anomalies at the 45 km depth". What kind of anomalies (not clear)?

These are the density anomalies obtained in the inversion. This is clarified.

Page 14. Can you show a difference plot between starting and final density model? This would be very useful to appreciate the inversion results. How much the initial model was updated comparing various regions?
Page 15. Please, show a profile with absolute density/seismic velocity to better present the lithospheric structure. Please, show the location of transects and epicenters on the same map.

We have demonstrated in Fig. 7 in the revised manuscript the corrections together with the final density variations. In this figure we show absolute densities of the mantle. In the profiles we still keep their perturbations, which are essential for the interpretation. Also, the reference density in each layer is not adjusted in the inversion and therefore is somewhat arbitrary. This is clarified.

Page 15. Line 3. "vertical resolution". What resolution you are talking about? Do you have a reference for that?

The vertical resolution is limited by the model set-up in the inversion. This is clarified.

Page 17. Line 3. "neutral or slightly positive densities". Better small positive density anomalies. "Shallow Moho discontinuity..material". Do you mean this material is mantle rocks and located below the Moho?

Yes, we mean the material below the Moho. Both statements are changed accordingly.

Line 12. Please, replace "section" to "Profile" to denote transects in the text. Otherwise, to me it is confusing with the manuscripts sections.

We have replaced "section" to "profile" in the whole manuscript.

Line 31. Reference to "Steckler, M. and U. ten Brink 1986. Lithospheric strength variations as a control on new plate boundaries: examples from the northern Red Sea. Earth and Planetary Science Letters, v. 79, nos. 1 and 2, p. 120-132" would be useful here.

Thank you for this recommendation. We have added this reference.

Page 18. Line 1-3. What does it low and high density anomalies reflect? Temperature, different composition? Please, explain. Line 14. "mantle batholiths in the upper crust". Do you mean granite batholiths or mantle plumes? Please, explain.

In the first case, some additional data are required to explain this maximum. To clarify, we have changed "mantle batholiths" to "mantle intrusions".

Line 17-18. "Standard simple models . . . differ from the real density structure". "Models" and "structures" not exactly comparable things.. Line 23. "long-wavelength FIELD" do you mean gravity anomalies? What are these wavelengths that you are considering long?

We have changed to "Standard simple models . . .don't adequately describe the real density structure". The boundary wavelength corresponds to the maximum resolution of the density model (1x1 degree), therefore it is equal to approx. 222 km, which is clarified.

Line 24. Do you mean about 10 mGal variation?

Correct.

Page 19. Figure 9. Symbols are too small to be seen. Leave just "mGal" for colorbar. The plot is very busy the symbols are masked by the color of the background.

The figure is enlarged. We are obliged to keep the SI unit, however also add mGal for clarity.