Some remarks, which replace a large annotated document. Line numbers refer to egusphere-2022-1328-ATC1.pdf, which is the document with tracked changes.

-> means "replace by". Most corrections are minor.

L71: Neglecting self-gravity is repeated on l. 74 and 'self-gravity' should be replaced by 'self-gravitation', throughout the manuscript.

l 86: typo at 10^{21}

l 152: -> 'have the possibility'

l 199, 201: ELRA method is discussed twice.

l. 218: Does Blank et al. present more than one GIA FE model? If not write "The GIA FE model from [...]"

l. 227: Not sure if 'divided in' should be replaced by 'devided into'

l 231: '[...] has to be stored'. This should be explained more clearly.

l 237: Why only a few centuries?

l 273ff: This is an important information and should be given already in the introduction.

l 286: -> 'by 2 cm over 1000 yr'. How many percent are these?

l 287ff: 'GIA model', 'FE model' and 'GIA FE model' should be distinguished in the discussion.

l. 304: You should refer already at the beginning of the sentence to Table 1. Furthermore, write 'one value for density [...]'

Some times you write 'Table' sometimes 'table'

 Some suggestions for Table 1:

Table 1: Material properties of the GIA model. The top of upper mantle 2 is at 100 km depth for the 1D simulation and at 35 km for the 3D simulation.

Earth layer	Depth [km]	Number of FE layers in model	Density [kg/m³]	Young's modulus [Pa]	Viscosity [Pa·s]
Top layer~~Crust~~	$0 - 35^{(3D)}/100^{(1D)}$	1	3037	$0.50605\cdot10^{11}$	$1\cdot10^{44}$
Shallow upper~~Upper~~ mantle ~~1~~	$35^{(3D)}/100^{(1D)} - 420$	3/4	3438	$0.70363\cdot10^{11}$	1D/3D variable
Upper mantle ~~2~~	420 - 670	2	3871	$1.05490\cdot10^{11}$	$1\cdot10^{21}$
Lower mantle	670 - 2891	2	4978	$2.28340\cdot10^{11}$	$5\cdot10^{21}$
Core	2891 - 6371	1	10750	$1\cdot10^{-20}$	0

I do not agree with this nomenclature. The upper part is the upper mantle and the lower one often called the transition zone.

what is an FE layer?

325

2.2.2 Rheology and seismic models   *depends*

l. 327: -> 'load depends on [...]'

l. 354: -> 'of depth in the mantle [...]'

l 355: -> 'global velocity anomalies'

l. 366: -> 'The two rheology models'

l. 369: Refer already here to the respective sub-figures

l. 391: -> 'On the other hand [...]' and '10^{23} '

Figure 3: The numbers in (a) are tricky to read.

Figure 4: I would not phrase the GIA model being deformed. Why do you not call it "deformation state" and the rounded box "mean surface deformation". Furthermore, from (5) it is not clear if for the deformation state also the mean of the two last time steps is chosen. If not, the dashed line should start from "Run GIA model".

Is it possible to illustrate the different time stepping of ice/solid earth/coupling in the figure?

l. 464: What do you mean by '(quasi-)'?

Table 2: Can you add a further column where the respective number of coupling times is listed? In the caption, write 'Coupling time steps'

A further table would help, where the time consumption of the different model compartments is listed. From my current understanding the bottleneck seems to be the restart which has to be used more often, if the coupling time step is reduced.

l. 517: -> 'sensitivity to gounding [...]'

l 579: -> 'differs by [...]' also at other places in the text.

l. 607ff: I suggest to reread this paragraph, and reduce the use of 'different' a bit.

l 642: -> 'et al. (2017)'

l 643: -> 'Ross embayment'

l 679: -> 'Fig. 7b, c, e, f'

l 682: -> In which direction does the groundingline move, (advancing or retreating)?

l. 690ff: What about the effect of climate forcing for the process? I guess that the climate forcing is slower during the vaxing phase, and in consequence the response does follow more an equilibrium behaviour, which is independent from the the rheology.

l 770: km^3.