To the T. Ruedas

Many thanks for the referee's valuable comments and his/her time spent in reviewing our paper (SE-2016-12). I would like to mention that in the revised paper, all the points have been taken into consideration. Following, I refer the comments made by the referee with their corresponding answers as italic font. The changes are highlighted in the revised paper (in yellow color).

1. First of all, the copy I was able to download has no figures, which makes it difficult to assess the results in more detail. The authors mention that their inclusion of the depth dependence of gravity is a special feature of their study, but I do not see any substantial discussion of what is gained through it. It is true that in the case of Earth, depth dependence of g is not usually considered, simply because g is almost constant through the mantle. I am perplexed that the authors derive their depth dependence from a paper from Bullen (1939) and do not even mention PREM (Dziewonski & Anderson, PEPI, 1981), which is probably still the default reference to use if one doesn't derive the gravity profile self-consistently from the model. If I plot the eq. 13 they derived from Bullen, it turns out that it is almost constant down to ca. 2500 km depth but deviates strongly from PREM in the lowermost mantle; it yields a g value of 15 m/sˆ2 at the CMB, while PREM hardly exceeds 10.5. I would expect this to promote instabilities rising from the CMB much more easily than it should be according to PREM, and I wonder what this effect does to their models.

Response: *We uploaded the Figures' file in the system, but unfortunately, figures were not included in the final online file of our article.*

About the reference used for variation of gravitational acceleration in mantle (i.e. Bullen, 1939), we should say that there is a maximum difference of 1.8% between the data provided by Bullen (1939) and Dziewonski and Anderson (1981). Thus, using gravitational acceleration data of each reference would lead to similar results. However, in order to inform the readers of our paper about the newer data of this parameter, we add this reference in the final version of our paper (refer to page 13 of the revised paper):

> *... Also, one can refer to the gravitational acceleration data of Dziewonski and Anderson (1981) which provide a comprehensive data set on the variation of gravitational acceleration in mantle.*

The variable $y = \tilde{y} / H$ *in Equation (13) is dimensionless. Thus, it should be evaluated in the range of 0 to 1. If the values of Eq. (13) are calculated in the range of 0 to 1, one can see that the maximum of gravitational acceleration will be around* $10.14 \mathrm{m s^{-2}}$. *Thus, it should not cause any instability in the solution procedure.*

Best,

M. Norouzi