

Dear Dr Valcke,

Thank you for your comments on our resubmitted manuscript. We have taken all your comments into account and have revised the paper as follows:

1) Preliminary tests and conclusions

In your reply, you write: "There were 72 simulations performed during the optimization process. There were some step changes towards convergence to a skilful solution. Using TPXO on its native grid was one such step. These optimizations have led us to believe that friction modifications have negligible impact, tidal body force has a very small impact, open boundary configuration and bathymetry changes has a large impact."

Is this clearly stated in the manuscript? If so, can you point me to the exact lines? If not, can you add some text detailing those conclusions?

Lines 105-111 state the surprising result regarding the boundary conditions and no apparent need for flux adjustments (as a radiation condition).

The adjustable model parameters are now listed in lines 122-131 in a new way, as follows:

The model parameters (with final values in brackets) adjusted during the series of test runs included: 1) the bottom drag coefficient (0.003), 2) spatial variations of bottom drag (off), 3) bottom drag scheme (quadratic), 4) coastal depth (4 or 8m, see above), 5) horizontal viscosity ($350-2 \times 10^5 \text{m}^2 \text{s}^{-1}$, scaling with cell size), 6) bathymetry filtering (median), 7) flux adjustment timescale (not applicable, see above), 8) tidal potential forcing and tidal self-attraction/loading (using the method of Sakamoto et al., 2013) (off), 9) bathymetry data source (see above) and 10) interior relaxation to TPXO (off). These experiments proceeded in an ad-hoc search for closer agreement with the observations. Apart from this 'model tuning', no data assimilation was used with these model runs. Perhaps the most surprising results of these tests were that 1) flux adjustment was not needed (see above), 2) tidal potential forcing and self-attraction/loading did not reduce model error significantly (while nearly doubling the model cost), and 3) model errors were not overly sensitive to bottom friction.

Similarly, in your reply, you write that the impact of using minimum depths, which limits the wetting and drying, was tested in preliminary experiments, but I don't see where this would be stated (at least not in the 3rd paragraph on p.5 where wetting and drying is discussed).

You are correct, p5 is the only place this is mentioned, apart from where it appears briefly in lines 122-131 copied above.

2) Figure 3

Please make a clearer relation between the captions and the columns appearing in the insert; I suppose that “1) the whole model height field” refers to the column “model”, that “2) m =model at validation sites” refers to the column “@obs”, that “3) model error $m-o$ ” refers to the column “model-obs”; furthermore I think the column “615 obs” is not described in the captions.

This caption is now improved, thank you.

Figure 1 M2 height amplitude as a colour-fill map (the model) and points (observations), and inset as a quantity-quantity plot. Statistics listed are percentiles (%) of 1) at left, the model height field at all grid points, 2) the model at observation sites (hereafter m), 3) model error $m-o$ and 4) the observed values o (of which there are 615 within the area shown). At right are 1) $\langle |m-o| \rangle$, the mean of the absolute value of model error $m-o$, 2) $\langle m-o \rangle$, the mean error, and 3) $\langle m \rangle$ and $\langle o \rangle$ which are the means of m and o . A log scale is used, starting at 10cm, so not all points can be shown.

3) Root Sum Square

Can you define the Root Sum Square when you introduce it on p.9 and harmonize the wording? I.e. you write either “Root Sum Square” as in the abstract, “Root Sum of Squared” as on p.9, “root sum of squares” as in Table 2 and Table 4, “root sum squared” as on p.36.

We have now inserted a displayed equation, and used consistent wording, thank you.

4) Model grid

As asked by reviewer #2, can you add a figure with the model grid ? Fig.1 shows only the value of the grid spacing and Fig.2 the model depth.

As discussed by email, we don't think it is possible to draw a map showing polygons down to 1km or less when the map covers the whole of Australia.

5) p.5, l.85: change *dbdb2* for *DBDB2*

Done, thank you.

6) p.31, l 410-411: I think “there” should be removed in “since the modelled M2 amplitude there is nearly (within about 10%) as great as the observed value. “

Done, thank you.

