

Interactive comment on “Atmospheric Circulation Changes and their Impact on Extreme Sea Levels around Australia” by Frank Colberg et al.

Anonymous Referee #2

Received and published: 4 September 2018

The paper by Colberg et al. investigates the performance of a medium resolution hydrodynamic model to simulate observed extreme sea levels (ESLs) for the Australian coastline and to estimate potential changes in ESLs as response to a future climate. Considering all individual water level components is computationally demanding especially with regards to scenario runs and this is why the authors conducted sensitivity analyses to estimate the effect of tides on total water levels. Their conclusion is that tide-surge interaction is strong (at least at some parts along the coast) for individual extremes but may be neglected for statistics over longer periods. For me, this is not very conclusive as potential changes in tides are also not taken into account. I understand somehow that changes in the met. forcing alone may be visible in a surge-only run and potential changes may (roughly) be inferred thereof but only if relative changes in

C1

the met. iduced component are investigated. Climate change will also affect the base water level (MSL) which has not been considered in your experiments, right? From SLR, the propagation of the surge will be affected influencing the timing (and hights) of surge events. Furthermore, also the tidal propagation may/will change with SLR having the potential to further increase water levels and partly compensate for the "mostly" negative trend in ESL changes you reported stemming from the met. only approach.

The period of 20 yrs you consider for the future climate conditions are too short to draw robust conclusions. Usually a period of 30yrs is used to estimate changes in the met. forcing. Please consieder extending your modelling or discuss why you chose this short period, how it affects your results.

The paper would benefit from improvements on the above mentioned aspects. Further specific comments are below:

page 3, line 30: 1' x 1', x missing

page 7, line 26: Due to computational constraints, we demonstrate that... From my point of view, this is not a good argumentation

page 9, line 8: BM covers 1981-2012, right? so the common period is '81-'99. Should be clear

page 9, line 18: Albany not shown in Figure 1

Fig1: Could be helpful to show the average tidal range (e.g. based on TPXO) over the entire area

Fig.2: Please define the dots (semi- and diurnal)

Fig.4: All R2s show values of ~ 1 . This is a bit misleading, as most stations over- and/or underestimate the extremes. Also the R2 is not mentioned

Fig. 6: Units missing; please highlight meaning of surge and residual again; for me, the figure shows a clear tide-surge interaction which cannot be neglected. Also for the

C2

largest events as e.g. in Rosslyn Bay or Darwin

Fig. 8: Portland not given in the Fig. , what is happening at the northern part (Milner Bay)

All figures would benefit from detailed captions.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2018-64>, 2018.