

Comment on ‘Lower Bounds to Future Sea-Level Rise’

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Abstract

The paper *Lower Bounds to Future Sea-Level Rise* (Parker, 2013) bears many similarities to an earlier one (Parker et al., 2013). In particular, the first pair of equations in both papers are almost identical and wrong, as pointed out by Hunter (2013). In addition, a crucial statement in the Abstract suggests that present observations of sea-level rise show no acceleration and therefore cast doubt on present projections of sea-level rise; this conclusion has previously been shown to be false (Hunter and Brown, 2013). It should be noted that this is by no means a comprehensive exploration of all the possible errors in Parker’s paper.

PARKER’S EQUATION (1)

Parker (2013) states that *sea levels are supposed (IPCC, 2007) to follow over the period 1990 to 2100 an exponential curve*, given by Parker’s Equation (1), which is identical to Equation (1) of Parker et al. (2013), and is:

$$y = y_0 + Ae^{R_0 x} \quad (1)$$

This shows projected sea level (y) increasing as an exponential function of time (x), with y_0 , R_0 and A being constants. As pointed out by Hunter (2013), the projections of IPCC (2007) do not follow Parker’s Equation (1), but are instead based on complex atmosphere-ocean general circulation models (AOGCMs), and models of land ice (Meehl et al., 2007). Parker et al. (2013) in fact gave examples of projections which they claimed to follow Equation (1), but Hunter (2013) showed that the projections clearly did not. Parker’s Equation (1) is simply a fabrication by the author.

PARKER’S EQUATION (2)

Parker (2013) states that *the most popular models used to estimate the impacts of climate-change are very simplistic assumption as in Rahmstorf (2007)*. This appears to be an incorrect transcription of the version give by Parker et al. (2013), which was *the most popular models used to estimate the impacts of climate-change are based on very simplistic assumption, as for example Rahmstorf (2007)*. However, as indicated above and by Hunter (2013), this completely ignores the AOGCMs, and models of land ice, which together are used to generate the sea-level projections of the Intergovernmental Panel on Climate Change (IPCC). Parker (2013) then implies that the Rahmstorf model is represented by his Equation (2), which is:

$$\frac{dSLR}{dt} \equiv \frac{dT}{dt} \equiv \frac{dCO_{2-a}}{dt} \quad (2)$$

where t is time, SLR is the sea-level rise, T is ‘temperature’ (presumably global-average air temperature) and CO_{2-a} is the ‘anthropogenic emission of carbon dioxide’.

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This is similar to Equation (2) of Parker et al. (2013):

$$\frac{dSLR}{dt} = \frac{dCO_{2-a}}{dt} \quad (3)$$

but with the addition of the middle term involving T , and with the '=' replaced by '≡' (the reason for which is obscure).

As pointed out by Hunter (2013), these equations bear little relation to the equations solved by Rahmstorf (2007) which were:

$$\frac{dH}{dt} = a(T - T_0) \quad (4)$$

and an integrated version of this equation.

Here, H is the global mean sea level, t is time, a is a proportionality constant, T is the global temperature, and T_0 is an equilibrium temperature value. In other words, the model of Rahmstorf (2007) relates sea-level rise to the time-integral of global-average temperature, and not directly to global-average temperature, and nor to 'anthropogenic emission of carbon dioxide'. Rahmstorf (2007) doesn't even mention the words 'carbon dioxide'. Parker's Equation (2) is again a fabrication.

THE CLAIM OF NO OBSERVED ACCELERATION

In the Abstract, Parker claims that *there has been so far no sign in any measured quantity of the positive acceleration predicted by the climate models since the 1990*. Parker has made this claim previously (e.g. Boretti, 2012, noting that Alberto Boretti changed his name to Albert Parker around 2012). The flaw in Parker's claim is that in this paper (and in his earlier ones) he has failed to provide any quantitative estimation of the acceleration of the sea-level projections for the period since 1990, nor to examine how uncertainties inherent in estimates of observed acceleration would affect his claim. Hunter and Brown (2013) summarised the situation as:

...Boretti crucially ignored the uncertainty in his estimates of sea-level acceleration. When such uncertainties are considered, observational evidence of present sea-level acceleration provides no evidence which would, at present, cast doubt on the 1990-2100 projections of the IPCC AR4¹, or the common and well-founded expectation that sea level could rise by at least 500 mm during the 21st century. Boretti's claims lack any robust quantitative support.

In other words, observations of sea-level rise over the past two decades are quite consistent with the projections of the IPCC AR4 (Meehl et al., 2007).

CONCLUSIONS

This Comment is by no means a comprehensive exploration of all the possible errors in Parker's paper. However, it indicates three major flaws. Firstly, the first two equations are without foundation; as noted in a Comment (Hunter, 2013) on an earlier paper (Parker et al., 2013) which contained the same errors, the equations were just 'made up' by the author(s).

Secondly, the claim (in the Abstract) that there is *no sign ...of the positive acceleration predicted by the climate models since the 1990* is spurious. When both the acceleration of the modelled sea-level rise since 1990 and the uncertainties inherent in estimates of observed acceleration are considered, it has been concluded (Hunter and Brown, 2013) that observations of sea-level rise over the past two decades are quite consistent with the projections of the IPCC AR4 (Meehl et al., 2007).

¹AR4' refers to the Fourth Assessment of the IPCC.

REFERENCES

- Boretti, A., 2012. Is there any support in the long term tide gauge data to the claims that parts of Sydney will be swamped by rising sea levels? *Coastal Engineering* 64 (0), 161 – 167.
- Hunter, J., 2013. Comment on ‘sea-level trend analysis for coastal management’ by A. Parker, M. Saad Saleem and M. Lawson. *Ocean and Coastal Management* (in press).
- Hunter, J., Brown, M., 2013. Discussion of Boretti, A., ‘Is there any support in the long-term gauge data to the claims that parts of Sydney will be swamped by rising sea levels?’, *Coastal Engineering*, 64, 161-167, June 2012. *Coastal Engineering* 75, 1–3.
- IPCC, 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Meehl, G., Stocker, T., Collins, W., Friedlingstein, P., Gaye, A., Gregory, J., Kitoh, A., Knutti, R., Murphy, J., Noda, A., Raper, S., Watterson, I., Weaver, A., Zhao, Z.-C., 2007. Global climate projections. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K., Tignor, M., Miller, H. (Eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, Ch. 10, pp. 747–845.
- Parker, A., 2013. Lower bounds to future sea-level rise. *International Journal of Ocean and Climate Systems* 4 (3), 197–212.
- Parker, A., Saleem, M. S., Lawson, M., 2013. Sea-level trend analysis for coastal management. *Ocean and Coastal Management* 73, 63.
- Rahmstorf, S., 2007. A semi-empirical approach to projecting future sea-level rise. *Science* 315 (5810), 368–370.

