

## ***Interactive comment on “On the differences between two semi-empirical sea-level models for the last two millennia” by M. Vermeer et al.***

**S. Jevrejeva**

sveta@pol.ac.uk

Received and published: 9 October 2012

Authors perform the test for two semi-empirical models with specific objective to reproduce local proxy sea level record from North Carolina and conclude which one is the best. However, these models do not design to simulate local sea levels, both models could be used to simulate global sea level.

My question: is the local North Carolina proxy sea level the same as global sea level? It seems to me that NC proxy sea level is a local sea level. There is no evidence to suggest that NC sea level is the same as global sea level (figure 3 in Kemp et al, 2011).

1. Assessment of the 20th century NC proxy sea level.

I have analysed Figure 2c from Kemp et al, 2011 (PNAS) and from that figure I have  
C1836

calculated sea level rise of  $29 \pm 5$  cm since 1900. According to the IPCC report (2007), the 20th century sea level rise was  $17 \pm 5$  cm. It seems that NC sea level curve (original curve, not K11 simulation) is overestimating the 20th century sea level rise by 12 cm (if we assume global sea level rise 17 cm as 100%, 29 cm is 170 % of sea level rise during the 20th century). The rate of sea level rise since 1900 is almost 3 mm/yr and in fact authors mentioned similar rate (3.0-3.3mm/yr) in their early paper (Kemp et al, 2009) utilizing the same original data sets.

a. Authors mentioned  $24 \pm 5$  cm sea level rise during the 20th century in their paper. I would like to see some clarification in this issue, because it is not the same as i can see from figure 2c (Kemp et al, 2011) and not the rates of sea level rise during the 20th century from the same original data in Kemp et al, 2009.

b. Error bars in NC proxy sea level curve during the 20th century are optimistic and do not accommodate changes observed by instrumental records (for example,  $17 \pm 5$  cm by IPCC (2007)). In fact, error bars for the whole proxy record are optimistic.

During the 20th century NC proxy sea level shows 70% higher sea level rise than observed global sea level. This systematic bias could propagate back in time and there is no evidence that past sea level from NC is the same as the global.

2. Assessment of the NC proxy sea level over the past 2000 years.

Figure 3, in Kemp et al, 2011, demonstrates that there are noticeable differences between the NC proxy sea level and other proxies (different locations, different techniques).

I would like to see a figure, which combine the global sea level rise estimates from different authors (figure 3 in Kemp et al, 2011) and outputs (sea level simulations) from Vermeer et al., 2012 (K11) and Grinsted et al, 2010 (G10) models. I wonder what is the agreement between sea level proxies using corals or archaeological indicators and sea level simulations by K11 and G10 over the past 2000 yrs.

I wonder how well K11/G10 would reproduce sea level from Southern Cook Islands or Iceland (figure 3, Kemp et al, 2011).

My main point is the NC proxy sea level is not global sea level and results from the tests in this paper are not good enough to make any conclusion about the performance of these models.

References:

Kemp, A.C., B.P. Horton, S.J. Culver, D.R. Corbett, O. van de Plassche, W.R. Gehrels, B.C. Douglas and A. C. Parnell (2009). Timing and magnitude of recent accelerated sea-level rise (North Carolina, United States). *Geology* 37 (11): 1035-1038.

Kemp AC, et al. (2011) Climate related sea-level variations over the past two millennia. *Proc Natl Acad Sci USA* 108:11017–11022.

---

Interactive comment on *Clim. Past Discuss.*, 8, 3551, 2012.