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Interactive comment on "Comparing tide gauge observations to regional patterns of sea-level change (1961–2003)" *by* A. B. A. Slangen et al.

S. Dangendorf

soenke.dangendorf@uni-siegen.de

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Dear Colleagues,

I have a short remark regarding the tide gauge data you have used in your very interesting manuscript. I had a first quick view on the manuscript and saw that you have downloaded the annual MSL data from the PSMSL data base. For the tide gauge in the German Bight (probably Cuxhaven) it is important to notice that the PSMSL record contains a mix of mean sea level (MSL) and mean tide level (MTL) (see also PSMSL tide gauge documentation). This is important to be considered, because both are totally different in the region due to the considerable deformation of the tide (shallow water effects). As you have recognized in your manuscript on page 177-178 "there are four TGs with values 3.1-4.7mm/yr, spread between the German Bight and the Bre-

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tagne in France, which cannot be explained by the models". Whereas I can also not explain the high values at the other stations, the huge trend for the German Bight can be fully explained by inhomogeneities in the record you used. Due to the deformation of tides, the MTL values deviate largely from the MSL values (Wahl et al., 2010) in the region. Since in the German Bight only tidal high and low water levels are available for most tide gauges before the 1990s, one has to correct the data to merge it into a homogeneous time series; one way of doing this is to apply the so called k-factor technique as it has been used by my colleague Thomas Wahl for a set of 13 tide gauge records in the German Bight (Wahl et al., 2011). The records have been extensively studied recently (e.g. the Cuxhaven record in Dangendorf et al. 2013). To illustrate the inhomogeneities in the PSMSL record I have compared it to our time series in Fig.1. As you can see, both records agree fairly well in the 1990s where they are both based on hourly (or even higher frequency) values. However, before that time the PSMSL record is based on MTL values introducing an artificial jump in the time series (of $\sim$ 9cm). When computing linear trends this leads to artificial high estimates, which are not supported by the 'real' MSL reconstruction (4.72 mm/yr in the PSMSL record compared to 1.28mm/yr in the fwu record).

I will send you the MSL time series separately by email, so that you can consider it in your study instead. It probably only has a very minor or even no influence on your main message, but I think it is important to mention.

All the best, Sönke Dangendorf

References:

Dangendorf, S., Mudersbach, C., Wahl, T., Jensen, J. (2013): Characteristics of intra-, interannual and decadal sea level variability and the role of meteorological forcing: The long record of Cuxhaven, Ocean Dynamics, 63, 209-224

Wahl, T., Jensen, J., Frank, T. (2010): On analysing sea level rise in the German Bight since 1844, Nat. Hazards Earth Syst. Sci., 10, 171-179.

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Wahl, T., Jensen, J., Frank, T., Haigh, I.D. (2011): Improved estimates of mean sea level changes in the German Bight over the last 166 years, Ocean Dynamics Volume 61, Number 5, 701-7015, DOI: 10.1007/s10236-011-0383-x.

Interactive comment on Earth Syst. Dynam. Discuss., 5, 169, 2014.

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Interactive Comment

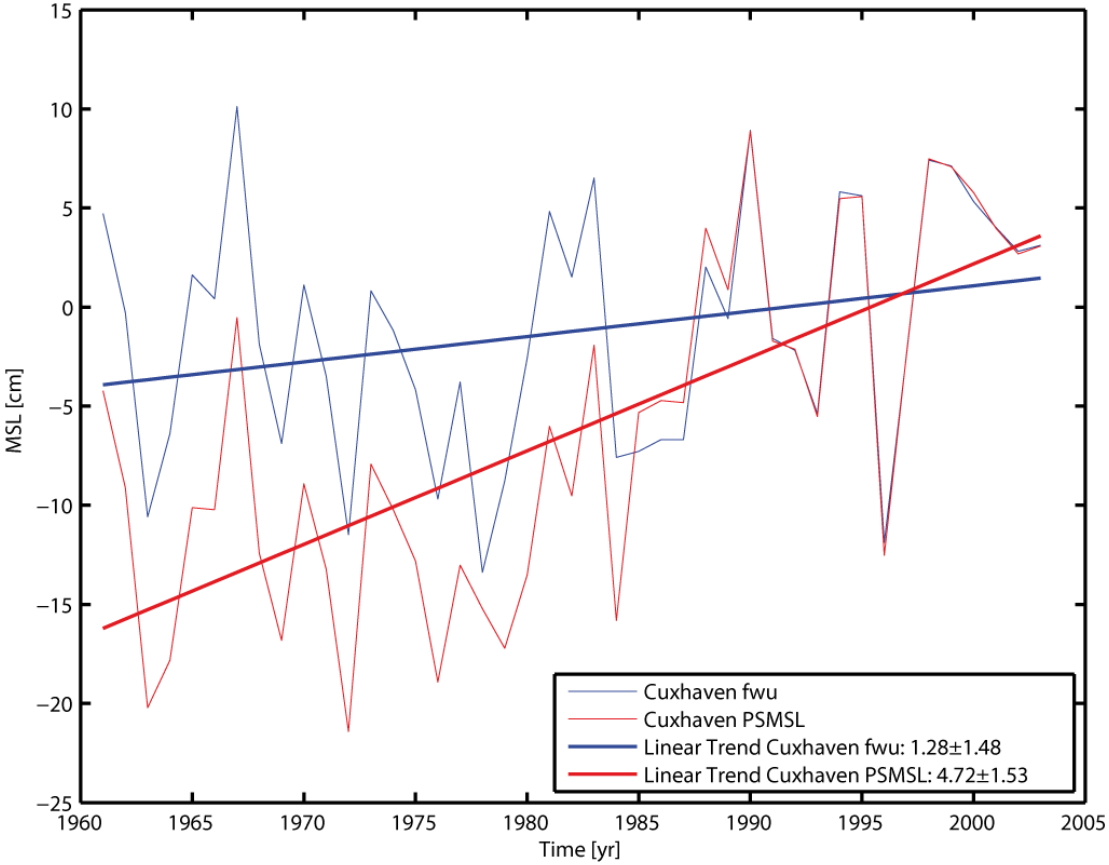

Fig. 1.

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