

## ***Interactive comment on “2-D reconstruction of past sea level (1950–2003) using tide gauge records and spatial patterns from a general ocean circulation model” by W. Llovel et al.***

**W. Llovel et al.**

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Major comments - 1st major comment (focus on the regional variability): this is now clearly stated in the paper - 2nd major comment (EOFs should not contain any non zero global average): we have carefully checked this point. The EOFs computed from the ocean model outputs do not contain any global mean trend (as expected since the ocean model has no global mean trend); we checked this by reconstructing the signal for each EOF mode and found zero global mean trend. We did the same computation for the reconstructed signal and also found no global mean trend. We have clearly mentioned this in the revised version.

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Detailed comments - Page 1111, line 3: we don't understand the comment as it is exactly what we try to say (e.g., that the spatial trend patterns are related to ENSO, NAO, PDO...). We have added a sentence to make this clearer. - Line 15 : corrected -Line 21: we removed the word 'improved' - Page 1112, line 24 : corrected -Page 1113, lines 15-20: the mean value is always removed before the computation; Moreover the EOFs do not contain any global mean trend. We checked this. This is briefly mentioned in this section and more developed at the end of section 4. - Page 1114, line 12-13: we simply chose a different approach. - Line 14 : correction done. - Page 1115, line 1-4: the recently quantified XBT biases were not accounted for because when the reanalysis was performed, the bias problem was not yet identified. We agree that this may have some impact on our result but redoing the whole assimilation process would be a huge effort (planned for the future). - Lines 10-15 : done -Page 1116, line 19 : done - Lines 20-28 : we added a brief discussion. - Page1117, line 1: we decided to use altimeter data over 1993-2003 only because the reconstruction ended in 2003. - Line 5: agreed. - Line 10 ...: the long term trend found in the first EOF represent regional multidecadal signal as a uniform mean trend has been removed. -Line 25-30: ok - Page 1118, line 12: as explained in the response to Reviewer 1, we made a mistake in the submitted version and included a wrong figure 6b. We are very sorry. With the correct version of figure 6b, the agreement between reconstructed spatial trends over 1993-2003 and observed (altimetry-based) trend patterns -uniform global mean trend removed- now agree resonably well (except in the north Atlantic around Greenland). - Fig.9: we agree that there is much dispersion.

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