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Interactive comment on “Sea level variability in the Arctic Ocean observed by satellite altimetry” by P. Prandi et al.

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Received and published: 27 September 2012

I found this paper very interesting, although I agree with the reviewer that more detail is needed concerning the sampling limitations of the data used. I was particularly interested to see the spatial form of the interannual sea level variability on the Russian and Norwegian shelf sea region. Some years ago, while looking at the possible influence of Arctic ocean mass variability on global-scale gravity variations, I found (Hughes and Stepanov, 2004) that interannual variability seen using 50 years of Arctic tide gauge data was well correlated with the Arctic Oscillation Index, and appeared to be quite different from the mass variability in the deep Arctic basin which (in a model context) was poorly correlated with the index. That led me to suggest that the tide gauges were seeing a shelf-trapped mode which was quite distinct from the deep basin mode. It is nice

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to have the altimeter observations to confirm this. Before altimetry, there was much better spatial sampling by Russian tide gauges. I'm also interested in the deep basin variability. We found that the ocean bottom pressure variability was highly coherent across the entire Arctic (in a barotropic model, but subsequent analysis shows much the same in full 3D models). The sea level variability, on the other hand, shows much more spatial variation. This suggests that the sampling problems for bottom pressure and density variability are quite different.

Hughes, C. W., and V. N. Stepanov, 2004: Ocean dynamics associated with rapid J2 fluctuations: Importance of circumpolar modes and identification of a coherent Arctic mode. *J. Geophys. Res.* 109 C06002, doi: 10.1029/2003JC002176

Interactive comment on *Ocean Sci. Discuss.*, 9, 2375, 2012.

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