

Interactive comment on “Effects of the basin dynamics on sea level rise in the Black Sea” by A. A. Kubryakov et al.

Anonymous Referee #2

Received and published: 27 October 2016

This paper investigates changes in the Black Sea circulation as evidenced by altimetry. These changes are linked, as expected, with the wind forcing which is then used to reconstruct this variability for a period before altimetry started. The work is interesting but not presented carefully and detailed enough and includes a number of significant omissions and misinterpretations. Therefore it cannot be published in its present form. It will require rethinking and rewriting so major revision is recommended. But there is merit in it and can become a useful addition to the existing literature after careful consideration.

Suggested changes: 1. The title would have been better if it was something like “Inter-annual and decadal changes in the circulation of Black Sea as evidenced from altimetry”. The suggested sea level trends are neither basin wide trends nor coastal trends. 2. lines 8-10: altimetry does not measure at coastal areas. Either tide-gauges should

C1

be used to substantiate a difference between coastal and open-sea sea level variance or this statement should be changed. 3. Lines 11-14: If the explanation concerns the period 1993-2014 the relevant forcing should be the same not a different time period. 4. Lines 16-19: How do you know that the variability is “well reconstructed” for the period before altimetry as you have no data? 5. Lines 18-19: Why do tide gauges need corrections for what happens away from the coast? They provide direct measurements of sea level. In any case as altimetry does not provide information closer to ~30km from the coast this suggestion is erroneous. 6. There is significant literature concerning sea level rise for the Black Sea (for example Stanev et al., 2000; 2002; Tsimplis et al, 2004 and Volkov and Landerer- which is referenced) discuss sea level rise in the Black Sea and assessing mass addition to the basin as well as steric effects. These are more relevant than a general discussion of what causes global sea level rise. 7. Section 2 data. Need to describe the dataset properly. While there is a paper (Volkov and Landerer, 2015) which argues that the altimetry data set can be used as is in the Black Sea with the imposed DAC for pressure and wind, their argument is based on comparison with tide gauges and their finding that such a correction does not improve the agreement with tide gauges in RMS terms of monthly values. This does not necessarily mean that there are no “trends” is the pressure and wind fields which are artificially and in a spatially coherent manner added as a correction to the sea level field through DAC. Thus in, my view, the physical argument that the constraints imposed by the Turkish Straits to water exchange do not permit the use of DAC is the correct one. The argument about RMS change can only partly justify the use of correction and probably not in the context of trends. In addition to the doubts I have in relation to the atmospheric correction it is unclear which other corrections are used and what is their uncertainty. Do the data have a GIA correction and how large it is? While it is not likely to be large it will provide confidence to the data process to express it clearly. 8. The general uncertainties on the altimetry trends need also to be addressed. While the uncertainty for global trends has been stated to be 0.4-0.6 mm/yr (with one exception of 0.9 mm/yr) several statements about larger uncertainties in regional trends exist. An

C2

uncertainty of 1 mm/yr would render some of the suggested spatial variance in trends insignificant though of course there are some strong gradients demonstrated. 9. The same point about uncertainty and trends holds for all the physical parameters used. Trends are stated without much consideration of their significance. 10. My understanding of the circulation features of the black Sea suggests strong seasonality. This paper does not deal with this at all. Are these trends consistent during the year or are they an expression of strengthening of seasonal circulation? This requires extra work. 11. The figures should demonstrate the limitations of altimetry by leaving the 30-40 km near the coast blank rather than closing the contouring. This is done for figures 6b,c and d but not for Fig 6a or any other contour plot. With the Black Sea at around 260km at its narrowest having 60-80 km of information lost is a significant percentage of area. 12. The straight lines at Figure, 5 and 7b (trends) are not persuasive. A step change seems also a good alternative.

Interactive comment on Ocean Sci. Discuss., doi:10.5194/os-2016-69, 2016.