

# ***Interactive comment on “A multi collocation method for coastal zone observations with applications to SENTINEL-3a altimeter wave height data” by Johannes Schulz-Stellenfleth and Joanna Staneva***

## **Anonymous Referee #2**

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The paper deals with relevant methodology to assess measurement and model errors when data are scattered in space. This is important, particularly to help validation of satellite data which due to its nature, it is difficult to obtain in-situ measurements precisely at same geographical location. The paper is presented in an organized manner, where first a standard approach (triple collocation method) is presented, then the extended method is shown and tested first with synthetic data and subsequently with real data. With the rapid increase of available data (in-situ measurements, satellites and models) this method is expected to be helpful on the assessment and identification

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of error bars. For this reason, I consider the paper is worth of publishing considering some suggestions for discussions and improvements which would help readers to put the paper more in context. It seems that the authors want to give special focus on “coastal zone” as this is in the title, however the paper is missing more discussions about the method in the coastal zones, for example the implication of the assumptions for distance selected and the type of interpolation. Although the authors mention the heterogeneity of the coastal zone, probably this heterogeneity is not linear and interpolation methods might be difficult to apply if not considered the physical processes involved in the area where the different measurements come from. Within this context a discussion on what is the implication of the footprint of satellite for this method and in the coastal zone. This together with the performance during high sea states. A quantification of “high sea state” should also be given.

Specific comments: Line 17 page missing “s” in “in-situ wave observations” Line5 page2, please specify the time resolution of HF radar Line 3 page 3, as mention above, the direct application to coastal zone is not completely explored. Please specify what are the requirements considered when saying “special requirements of the coast in mind” Line 12, page 3, related to “the question about accuracy of error estimate. . . . Sentinel3a.” Is this solved in this paper? A short conclusion and recommendation should be added Line 15, page 3. Add “The interpolation of numerical model data to given observation locations is usually less critical if spatial resolution is appropriate” Lines 1:4, page 4. The assumption of linear combination might be not applicable in coastal zone. Line 12, page 4. The assumption of 10 km might be questionable and will have a strong impact in the coastal zone. As mentioned above more discussions would be beneficial Line 3, page 5. Please define variable “T” Line 5 page 7, Can you change the sentence to “Therefore the uncertainties of the estimated vector. . .”? Line 20, page 8, change “scaling factors” for “scaling parameters” to have a consistent nomenclature (see i.e. line 16 page 8) Line 12 page9, change “For the analysis is. . .” by “For the analysis in..” Line 24, page 9. Please mention the water depth of buoys Page 10, related to table 3. The table 3 is not clear. Please describe each

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column in the table caption. Why first column appears as “stdv” as column 4, 5 and 6 and units are different. By looking at table 3 it should be easy to see the “truth errors” and also the ones obtained by the Monte Carlo simulation Line 6, page 11 Equation 41, and all the equations. Be sure all parameters are defined explicitly. It seems not defined. Line 2-3 page 12, does this mean that satellite data are not “very” applicable for storm conditions near the coast? Please discuss Line 20, page 12. Please indicate if water level variations are considered in the wave model Line 23 page 13. Is “This is an important question” better as “This is an important result”? Line 30, page 13 Add “stochastic” before “error” to make it clearer. Same in line 26 of page 14 Line 26 page 15. Referring to “(red dots)” , please refer to corresponding figure Equation 50 and 51 use nomenclature (e.g. 62150) which should be introduced earlier, maybe in section of measurements if such specific naming convention is relevant. Line 7 page 17, introduce naming “north” and “south” to the locations Line 13 page 19. Replace “. . . was relatively small and allowed to..” by “. . . was relatively small, however it allowed . . .” Line 16 page 19, please specify range of “higher sea states” and also with its relation to varying footprint and implications for coastal applications Caption of table 2 is missing the description of the mean (third column) Figure 3. Is it necessary to show 2 symbols in the legends of the subplots? Caption of figure 4. Mention that the red dashed line only indicates the zero

A reference that is worth to consider to include: Kaighin A. McColl et al. (2014) Extended triple collocation: estimating errors and correlation coefficients with respect to an unknown target. *Geophysical Research Letters*.

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