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Reassessing sea level change rates in the Mediterranean Sea in the age of altimetry

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Consistent long-term satellite-based data-sets of sea surface elevation exist nowadays to study sea level variability, globally and at regional scales. Two of them are suitable for climate-related studies: one produced in the framework of the European Space Agency (ESA)-funded Sea Level Climate Change Initiative (SL_CCI); the other offered by the European Copernicus Climate Change Service (C3S). Both data-sets cover the global ocean since 1993 to 2015 (SL_CCI) and to present (C3S) at spatial resolution of 0.25 x 0.25 degrees. The first is obtained by merging data from all the available satellite altimetry missions. The second one relies only on a couple of simultaneous altimetry missions at a time to provide stable long-term variability estimates of sea level, is constantly updated and has resolution 0.125 x 0.125 degrees in the Mediterranean Sea.
Previous studies have investigated the relationship between satellite-derived absolute sea level change rates and tide gauge observations of relative sea level change in littoral zones of the Mediterranean basin [Fenoglio-Mark, L., 2002; Fenoglio-Mark et al., 2012]. Other studies made use also of global positioning system measurements of vertical land motion in addition to tide gauge and satellite altimetry data [Rocco F.V., 2015; Zerbini et al., 2017]. Vignudelli et al., [2018] highlighted the difficulty of deriving spatially-

consistent information on the sea level rates at regional scale in the Adriatic Sea. Other studies have claimed the possibility to merge locally isolated information into a coherent regional picture using a linear inverse problem approach [Wöppelmann and Marcos, 2012]: such approach has been successfully applied to a number of tide gauges in the Adriatic Sea [De Biasio et al., 2020]. The approach tested in the Adriatic Sea is going to be extended to the Mediterranean and major findings will be presented at conference.
The motivation of this study is that industrial areas are widely spread along the littoral zone of the southern Europe, and residential settlements are densely scattered along the coasts of the Mediterranean Sea. Not least, a strongly rooted seaside tourism is one of the main economic resources of the region, which is particularly exposed to the sea level variability of both natural and anthropogenic origin. A well known example of such a exposition is Venice (northern Italy) which has been recently hit by the second-highest tide in recorded history (November 2019), and is being protected against storm surges by the MOSE barrier since October 2020. Therefore, a re-analyses of the actual sea level rates with novel methodologies that take into account a better usage of all available observations is key to understand the future coastal sea level changes and their relative importance.

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