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Improvement of global and regional mean sea level derived from satellite altimetry multi missions

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With the satellite altimetry missions, the global mean sea level (GMSL) has been calculated on a continual basis since January 1993. 'Verification' phases, during which the satellites follow each other in close succession (Topex/Poseidon–Jason-1, then Jason-1–Jason-2), help to link up these different missions by precisely determining any bias between them. Envisat, ERS-1 and ERS-2 are also used, after being adjusted on these reference missions, in order to compute Mean Sea Level at high latitudes (higher than 66°N and S), and also to improve spatial resolution by combining all these missions together.
The global mean sea level (MSL) deduced from TOPEX/Poseidon, Jason-1 and Jason-2 provide a global rate of 3.2 mm from 1993 to 2010 applying the post glacial rebound (MSL aviso website http://www.jason.oceanobs.com/msl). Besides, the regional sea level trends bring out an inhomogeneous repartition of the ocean elevation with local MSL slopes ranging from + 8 mm/yr to - 8 mm/year.
A study published in 2009 [Ablain et al., 2009] has shown that the global MSL trend unceratainty was estimated at +/-0.6 mm/year with a confidence interval of 90%. The main sources of errors at global and regional scales are due to the orbit calculation and the wet troposphere correction. But others sea-level components have also a significant impact on the long-term stability of MSL as for instance the stability of instrumental parameters and the atmospheric corrections.
Thanks to recent studies performed in the frame of the SALP project (supported by CNES) and Sea-level Climate Change Initiative project (supported by ESA), strong improvements have been provided for the estimation of the global and regional MSL trends. In this paper, we propose to describe them; they concern the orbit calculation thanks to new gravity fields, the atmospheric corrections thanks to ERA-interim reanalyses, the wet troposphere corrections thanks to the stability improvement, and also empirical corrections allowing us to link regional time series together better. These improvements are described at global and regional scale for all the altimetry missions.