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Estimating the errors in global and regional mean sea level trends from Jason-1 and T/P altimetry

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The global Mean Sea Level (MSL) derived from satellite altimetry (TOPEX/Poseidon and Jason-1) is now used as the reference for climate studies. Using improved altimeter data updated with the best geophysical corrections, a global rate of 3.1 mm/yr is obtained over the 15 year period from 1993 to 2007 (MSL AVISO website http://www.jason.oceanobs.com/msl) when the post glacial rebound is not taken into account. Besides, the regional sea level trends bring out an inhomogeneous repartition of the ocean elevation with local MSL slopes ranging from +/- 10 mm/year. In this study, we have analyzed and estimated the different errors which can impact the global and regional MSL trends. The potential drifts detected in the orbit models and in the geophysical corrections-as wet troposphere and atmospheric corrections-are the main sources of error impacting the MSL trends. The use of different orbit solutions provided by JPL, CNES and GSFC allowed to estimate the MSL slope uncertainty, highlighting a north/south hemispheric effect on the regional MSL slope close to +/- 2 mm/yr. Concerning the geophysical corrections, a similar method is applied using different meteorological models (NCEP, ECMWF, ERA40). It brings out a global MSL slope error close to 0.3 mm/year. Other sources of slope discrepancies have been identified and estimated: the error due to the Sea Surface Height (SSH) bias at the connection point between Jason-1 and TOPEX/Poseidon MSL series, but also between Side-A and Side-B TOPEX altimeters. The SSH bias is indeed associated with an error leading directly to an error on the MSL trend calculation. Finally, the combination of all errors provides an error estimate of global and regional MSL trends. Taking into account the covariance of each error through an inverse method

allows to calculate a more realistic overall error budget.