DIFFERENCES IN MEAN SEA LEVEL TRENDS DERIVED FROM TOPEX AND ERS-2 ALTIMETRY

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Satellite altimetry gives an unique opportunity to assess global mean sea level (MSL) changes. The scope of this study is to investigate the reliability of such estimates by the comparison of MSL trends originating from two different missions (Topex and ERS-2). The altimeter data is processed using harmonized state of the art correction models. For ERS-2 a new orbit incorporating recent GRACE data has been chosen. Harmonization was not possible for the ionosphere-correction (dual frequency for Topex, IRI95 for ERS-2), the wet troposphere-correction (radiometer for both), and the EM-bias.

MSL have been calculated every 35 days for the global oceans (60°S to 60°N), the northern oceans (20°N to 60°N), the southern oceans (60°S to 20°S), and the tropical oceans (20°S to 20°N). For further analyses the period from May 1995 to December 1999 was chosen due to the availability of reliable data for both missions. While Topex data suggest a global MSL trend of 3.5 mm/year for this period ERS-2 data gives an estimate of 1.6 mm/year only. A closer investigation of the MSL in the different regions shows that these differences originate mainly from the tropical band. The contribution of this region to the global MSL trend is 1.1 mm/year according to Topex but -1.8 mm/year according to ERS-2. This geographical pattern implies that the data can not be simply calibrated against e.g. a global set of tide gauges.

The most probable sources of the inconstencies in the data are errors in the ionospheric and the wet tropospheric correction models for one or both missions. The comparison of the wet tropospheric corrections at ERS-2 and Topex cross-over points clearly shows increasing differences between the measurements of the two radiometers. This suggests that yet uncompensated drifts of one or even both radiometers lead to the unacceptable differences in the estimation of MSL trends. Further work on the calibration of the radiometers is hence crucial for studies of MSL changes based
on altimeter data. In addition, an EOF-analysis of the mapped sea level differences between Topex and ERS-2 suggests that the ionospheric corrections also need to be reconsidered.