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Since the first altimeter missions and the improvements performed in the accuracy of sea surface height measurements from 1992 onwards, the importance of global quality assessment of altimeter data has been increasing. Global CalVal studies usually assess this performance by the analysis of internal consistency and cross-comparison between all missions. In this study, in-situ measurements are used as a complementary approach to analyze the altimetry errors, especially for climate scales.

Two types of in-situ measurements are considered: tide gauges and Argo profiling floats. Tide gauge data derived from several networks (GLOSS/CLIVAR, PSMSL) provide sea-level heights with a physical content comparable with altimetry sea level estimates. They cover the whole altimeter period but only on coastal areas. Therefore, Argo profiles are complementary data since they are more evenly spread out in the open ocean, but with enough spatial coverage since 2004 only. However, they measure vertical profiles of temperature and salinity, providing only the steric contribution to the total sea level content measured by altimeters. The mass contribution can be estimated from the GRACE data from 2003 onwards.

In this study, in-situ measurements are compared with altimeter sea level for the main altimeter missions: Jason-1, Jason-2, Envisat and CryoSat. If altimeter time series are long enough, tide gauge data provide a relevant estimation of the global Mean Sea Level (MSL) drift calculated for all the missions. Meanwhile, Argo profiles are able to detect MSL drifts at basin scales thanks to better ocean coverage. Correlation, variance differences between altimeter and in-situ sea level are also estimated accurately, separating the temporal scales (high, medium, low frequencies). Comparisons with sea level products merging all the altimeter missions together have also been performed using several datasets, among which the AVISO delayed-time Sea Level Anomaly grids.
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