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Methodology of improved reference frame to improve the sea level challenge

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The determination of mean sea level (MSL) change using satellite altimeter data has been achieved using the precise orbits from Topex/Poseidon and other altimeter satellites. Several factors have contributed to the ability to perform this measurement sucessfully, one of the most important of which is the stability of the underlying reference frame in which the satellite orbits are computed and the altimeter data are analyzed. We examine several issues that pertain to reference frame modelling that might impact determination of MSL. For example, the Topex/Poseidon orbits on the Geophysical Data Records (GDR's) have included no model from time-variable gravity other than the longest wavelength zonal signal due to PGR (zonal rate in C20), and the secular rates in C21 and S21. In this paper we perform tests using Jason-1 GPS and SLR data and Topex SLR and DORIS data to assess the impact of including Center of Mass determinations, and time-variable gravity variations on MSL modelling. We also demonstrate the change in the Topex GDR orbits that resulted from the change from the CSR 95L02 reference frame to ITRF2000.