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# Topographic correction and covariance function modelling over the non-homogenous topography

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The 6 years of CryoSat-2 satellite altimetry data can be potentially used to extract the high frequency components of the Earth gravity field beyond the Global Geopotential Models (GGMs) which corresponds to a resolution of 9.2 Km at the degree 2160. Using the conventional remove-compute-restore (only considering the GGMs) technique, the theoretical assumption of homogeneity and isotropy in the Least Square Collocation (LSC) algorithm is not always satisfied in the coastal regions and mountainous regions. High resolution bathymetry data (e.g., SRTM30, correspond to the spatial resolution of around 1 Km) is used to account for the strong correlation in the short wavelength (1$\sim$10 km) gravity features with topography and bathymetry. Hence, the Topographic Correction (TC) is a critical step in the reduction of the gravity functionals (e.g., height anomaly and gravity anomaly), to comply with the theoretical assumption of LSC.
Previous studies show that the terrain correction performance w.r.t. residual gravity anomalies are slightly different w.r.t the residual height anomalies over the shallow regions close to the coast (or regions including islands). And unexpectedly terrain correction using residual terrain models (RTM) are not reducing the signal, but adding additional signal when computed w.r.t. the height anomalies. This should be examined when the (sea level) height anomalies are to be reduced by TC and further the marine gravity field is derived using LSC. In this work, the TC computation (both w.r.t. the height anomalies and gravity) will be conducted in several regions (patches) around Mediterranean, Chile, islands of Indonesia where the true gravity data is available for validation. Since the variance (magnitude) of the residual height anomalies are much smaller than that of gravity anomalies, and the noise variance are significant in the altimetry products, a further (modified) covariance fitting/modelling approach dedicated to the height anomalies will be developed for future applications.