Quality assessment of instantaneous profiles of the dynamic ocean topography

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The dynamic ocean topography (DOT) can be estimated following the apparently simple geodetic concept to subtract geoid heights from sea surface heights. In order to preserves the high along track resolution of satellite altimetry and to avoid an initial data gridding of sea surface heights a profile approach has been developed which (i) performs a spectral filter for the GRACE gravity field (ii) merges smoothed geoid profiles to the along-track sea level measurements of satellite altimetry and (iii) performs a low pass filtering of along track sea surface heights. In order to make the along track filtering of sea surface heights consistent with the spectrally smoothed geoid heights a filter correction is computed and applied to the altimeter data. The result of the profile approach is very encouraging and compares to more complex procedures of numerical modelling. In this paper it is investigated how the errors of geoid and sea surface propagate to the DOT-profiles. The geoid errors can be propagated from the standard deviations of gravity field coefficients or more rigorously if their full variance-covariance matrix is made available. The errors of the along-track sea surface heights can be characterized by an empirical auto-covariance function. The impact of the filter correction is also considered. After all the final quality of the instantaneous profiles of the DOT are characterized.