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An Evaluation of CryoSat-2 SAR Mode Performance Around the UK Coasts

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Abstract Text:

One of the objectives of ESA's CryoSat Plus for Ocean (CP4O) project is to demonstrate the excellent retrieval of Level 2 ocean geophysical parameters from CryoSat-2. Within CP4O we have carried out a comparison of sea surface height from CryoSat-2, reprocessed by ESRIN, against tide gauges from the UK Tide Gauge Network. This work has the specific objective to assess the performance in the coastal zone, and complements validation work over the open ocean (both for height and significant wave height) done elsewhere.

We took updated corrections from the state-of-the-art RADS archive, computed the TWLE (total water level envelope, i.e. the sea level inclusive of ocean tides and atmospheric pressure and wind effect, a desirable quantity for validation), and then subset all segments of each pass within 50 km from a tide gauge, interpolating the tide gauge height (effectively a TWLE) on the time of the altimeter overpass to create match-up pairs.

We first present the results of our attempt to correlate TWLE data over these multiple segments with the measurements from each nearby tide gauge, taking into account the distance of the altimetric measurements from the coastline. Results are dominated by large offsets, variable from match-up to match-up. Screening the data further based on the retracking misfit does not remove this bias, whose causes and possible impact are discussed.

We then present an independent verification of the noise level in 20-Hz Cryosat-2 TWLEs and its variation as a function of distance from coast. The noise level is estimated by computing the absolute value of difference between consecutive TWLE values, as done in Passaro et al., Rem. Sens. Env, 2014. Remarkably, the median of that difference remains at ~5 cm up to 5Km from the coast, suggesting a noise level of that order for the 20-Hz data, which would correspond to ~1.1 cm for the 1-Hz data. At 3 km the median abs(diff) is ~7.3 cm.

Finally we repeated the same analysis for only those points with retracking misfit below a threshold of 3. The median stays virtually flat at ~5cm all the way to the coast but obviously the fraction of points passing the misfit condition decreases quickly (it is about 60% at 5 km from the coast, and less than 25% at 3 km).

These results demonstrate clearly that Cryosat-2 maintains an excellent performance of measurement well into in the coastal zone.

Session Selection: Progress in Satellite Altimetry over the Oceans and the Coastal Zone

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