

ASCAT higher resolution winds closer to the coast

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The EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF) produces a near-real time high resolution (5.7 km) ASCAT wind product already for several years, with development status. The level 2 swath grid is not regular, as for the 25 km and 12.5 km products, but the grid is based on the positioning of the full resolution radar beam 'slices' of the ASCAT mid beams. This leads to an average Wind Vector Cell spacing of on average 5.7 km (6-km product), but the spacing slightly varies across the ASCAT swaths.

The 12.5 km OSI SAF ASCAT winds have been upgraded for coastal wind retrievals in 2022 and they now make full use of the Land Contribution Ratio which is present in the level 1b data. Close to the coast, a land correction is applied. The land contribution is subtracted from the total backscatter, such that only the contribution from the sea remains. This yields better quality coastal winds, and the coastal gap having no ASCAT winds is reduced from approximately 20 km to ~10 km. Recently the same land correction has been implemented for the 6 km ASCAT winds.

1. Land correction

Figure A shows example wind fields with and without land correction. The full resolution backscatter 'slices' are corrected before averaging them to a Wind Vector Cell beam σ_0 value. Assuming that land contribution and sea contribution in a WVC are constant, a straight regression line can be fit when plotting σ_0 vs. land fraction (Figure B), and the land contribution can be subtracted.

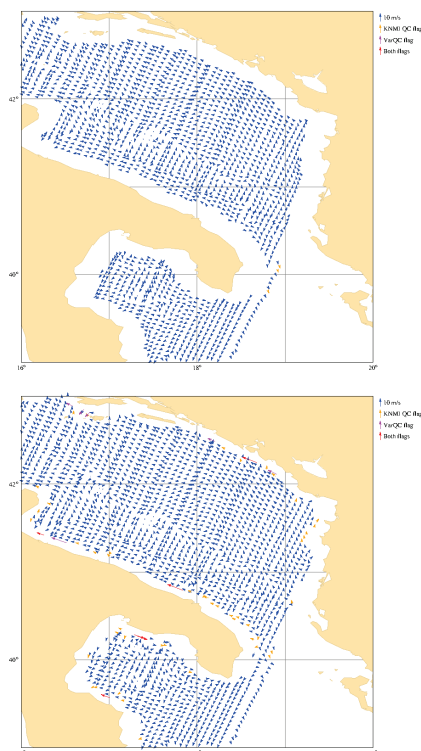


Figure A. ASCAT 6 km wind field over the Mediterranean, without (top) and with (bottom) land correction.

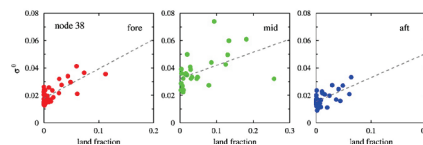


Figure B. Example of land correction by regression.

2. Quality Control

Figure C shows that the 'new' coastal WVCs, obtained after land correction, sometimes show unrealistic high wind speeds (> 15 m/s), these winds have passed Quality Control but this should not happen. Some of these WVCs can be associated with large negative MLE values;

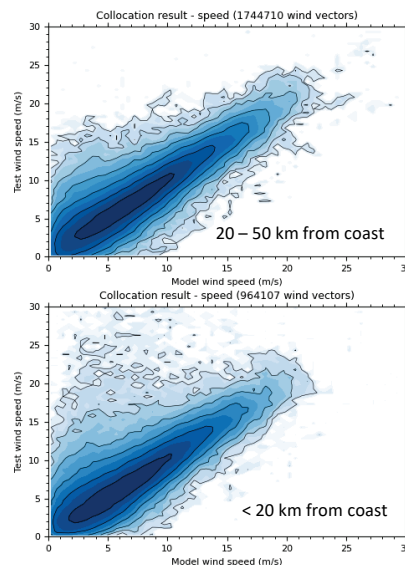


Figure C. ASCAT 6 km coastal wind speeds (including land correction, QC passed, land fraction > 0) vs. ECMWF operational model wind speed forecasts. Top plot: WVCs also available in the product without land correction. Bottom plot: winds that are available only in the land corrected product.

the ASCAT wind processor currently only rejects WVCs with positive Maximum Likelihood Estimator values, i.e., triplets located far inside the GMF 'cone'. A test was done to include a check on negative MLEs, only for coastal winds; the (absolute) MLE threshold value for QC is identical to the threshold value for positive MLEs. This significantly reduces the number of spurious winds, see Figure D. The price is a reduction of the number of accepted WVCs by ~3.8%. Including negative MLE screening in the 12.5 km wind product near the coast appears to improve QC as well, although the improvement is less obvious.

3. Future

Coastal scatterometer wind retrieval is challenging, not only due to land contributions, but also due to e.g. tidal effects and ship reflections. The latter also may disturb retrievals away from the coast. A way forward may be to remove slices having σ_0 values of e.g. more than twice the average view value (i.e., outliers) before averaging to a WVC view, for coastal and non-coastal WVCs. First tests show encouraging results, leading to lower fractions of QC-rejected WVCs.

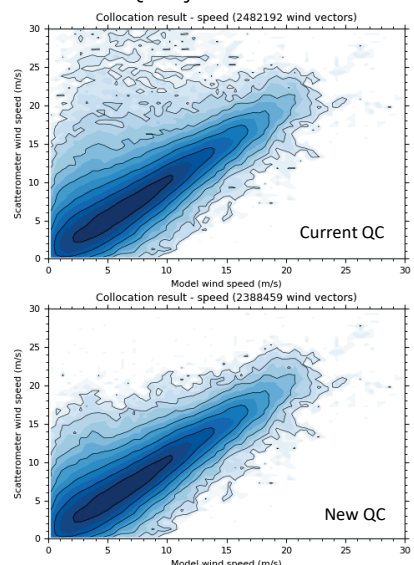


Figure D. ASCAT 6 km coastal wind speeds (including land correction, QC passed, land fraction > 0) vs. ECMWF operational model wind speed forecasts. Top plot: current QC method, only large positive MLEs are rejected. Bottom plot: large negative MLEs are rejected as well.