Degradation of the scatterometer wind data probably due to ships

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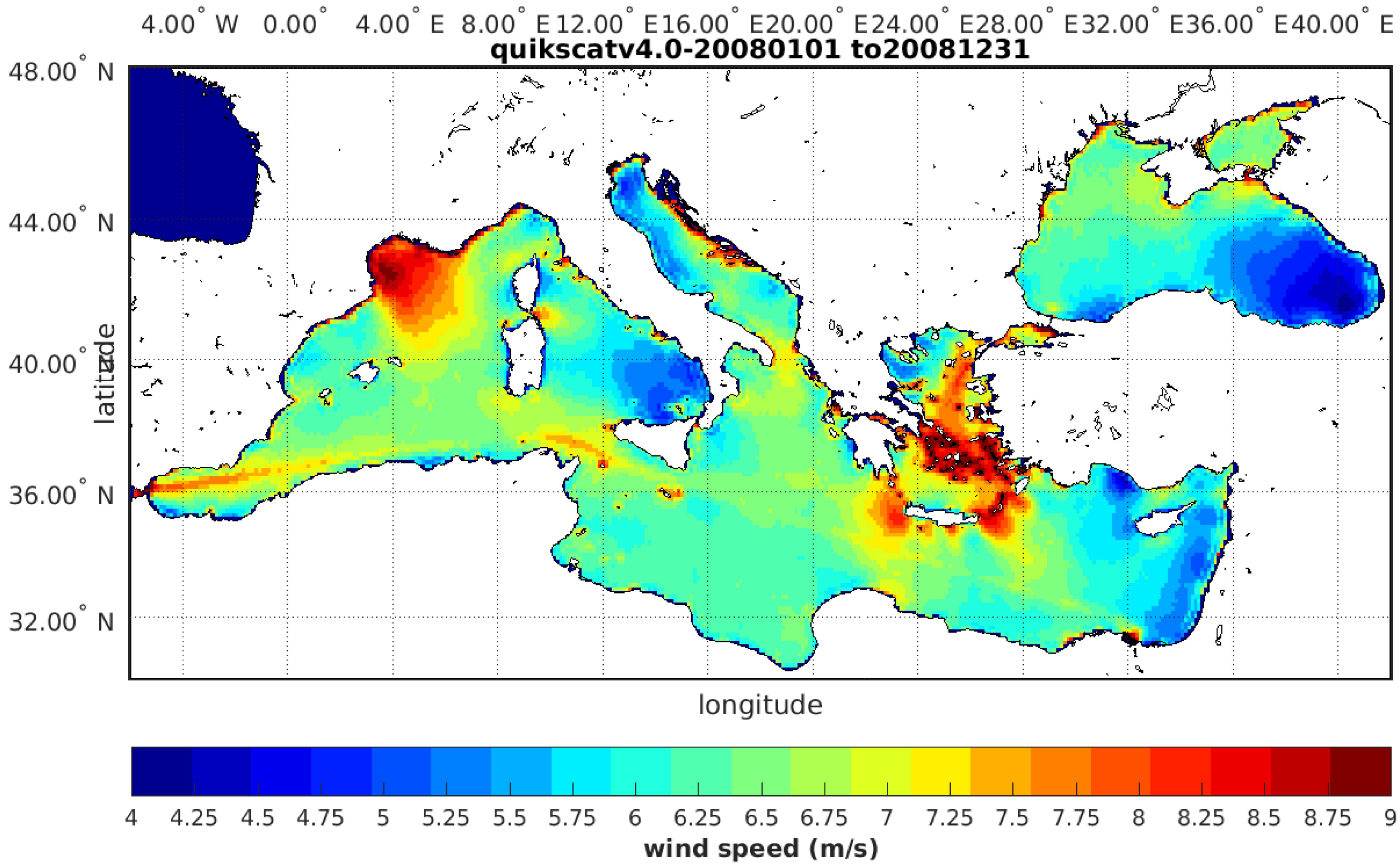
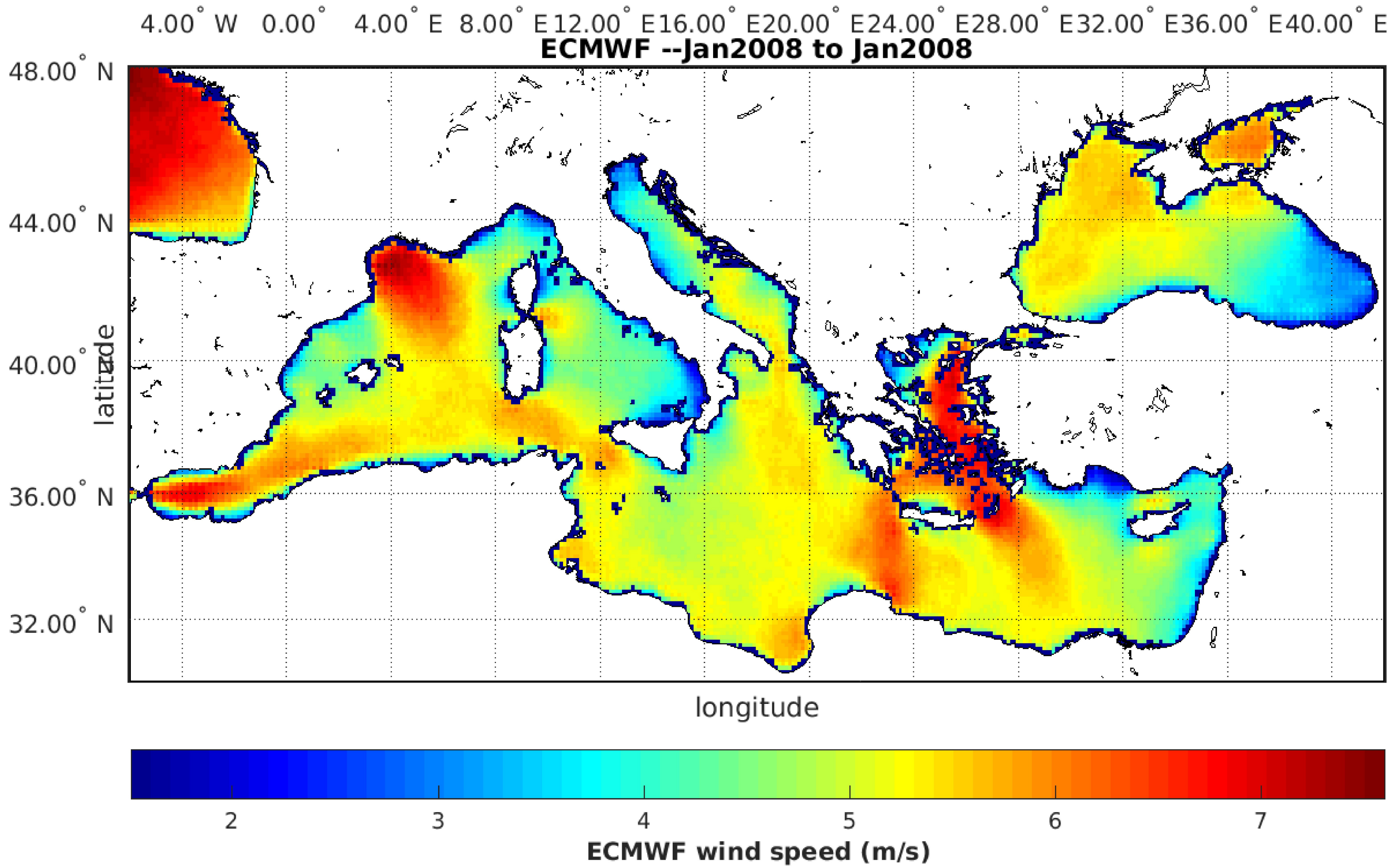
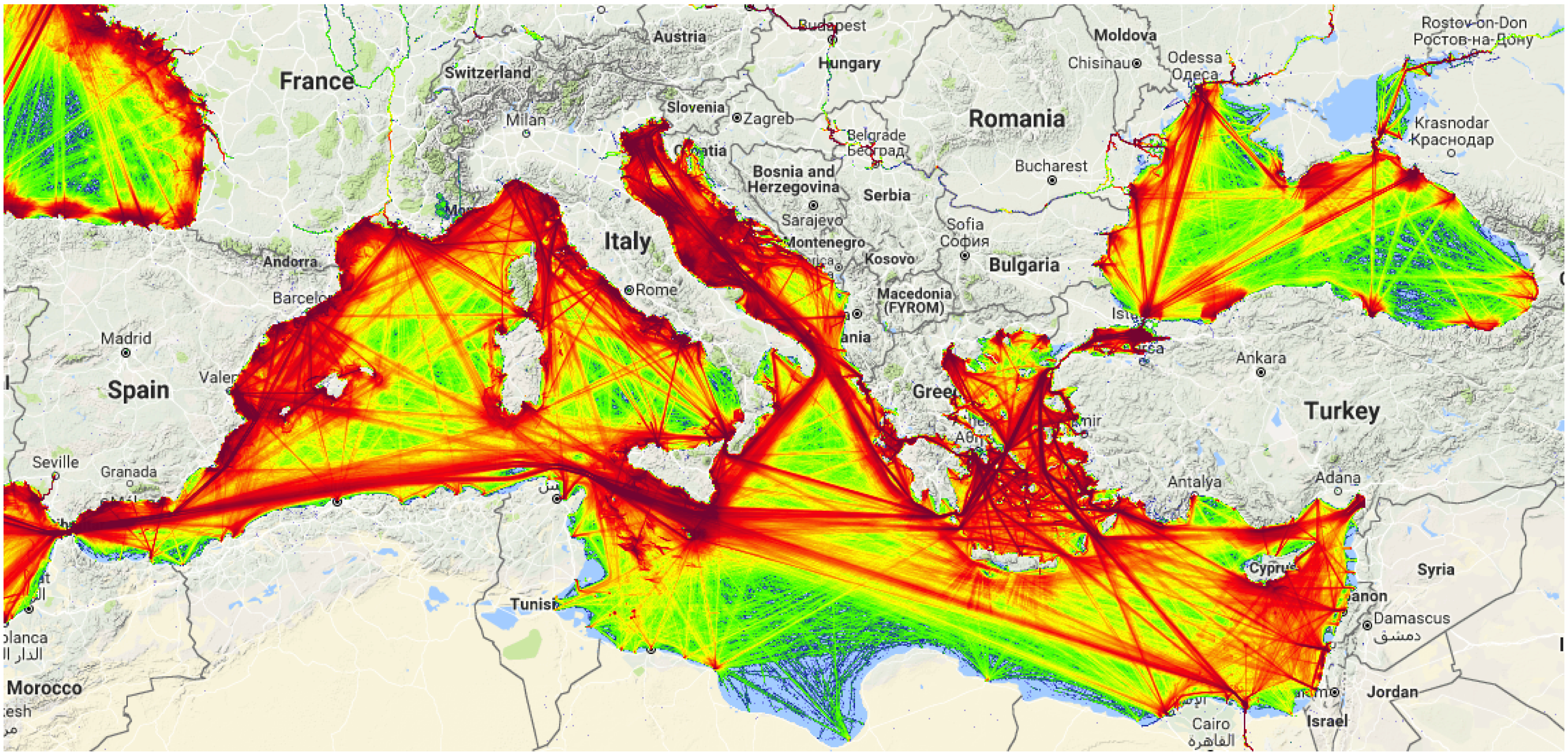
Mean wind field 2008: QuikScat



Mean wind field 2008: ECMWF



Ship routes in 2016



from www.marinetraffic.com

The methodologies for outliers detection

Since the effect of the ships on the scatterometer footprint seems to increase the wind speed, we addressed to the outliers detection techniques, used in a large spectrum of scientific and applicative branches (Hodge et al, 2004). Different methods bring to different results, which may not be validated as we do not know the number of ships per month per geographic location.

- Regional maxima (RM). Outlier if RM > of 20% of the mean of the nearest neighbours
- Area selections according to the wind speed range (AS). Outlier if area size < Area Threshold (6 to 9 pixels)
- Robust covariance, Kawahara filter, Weibull fitting, etc..

The main issue is to select and remove only local outliers, avoiding to destroy the outstanding spatial details provided by scatterometer data.

Ship routes in 2008: QuikScat

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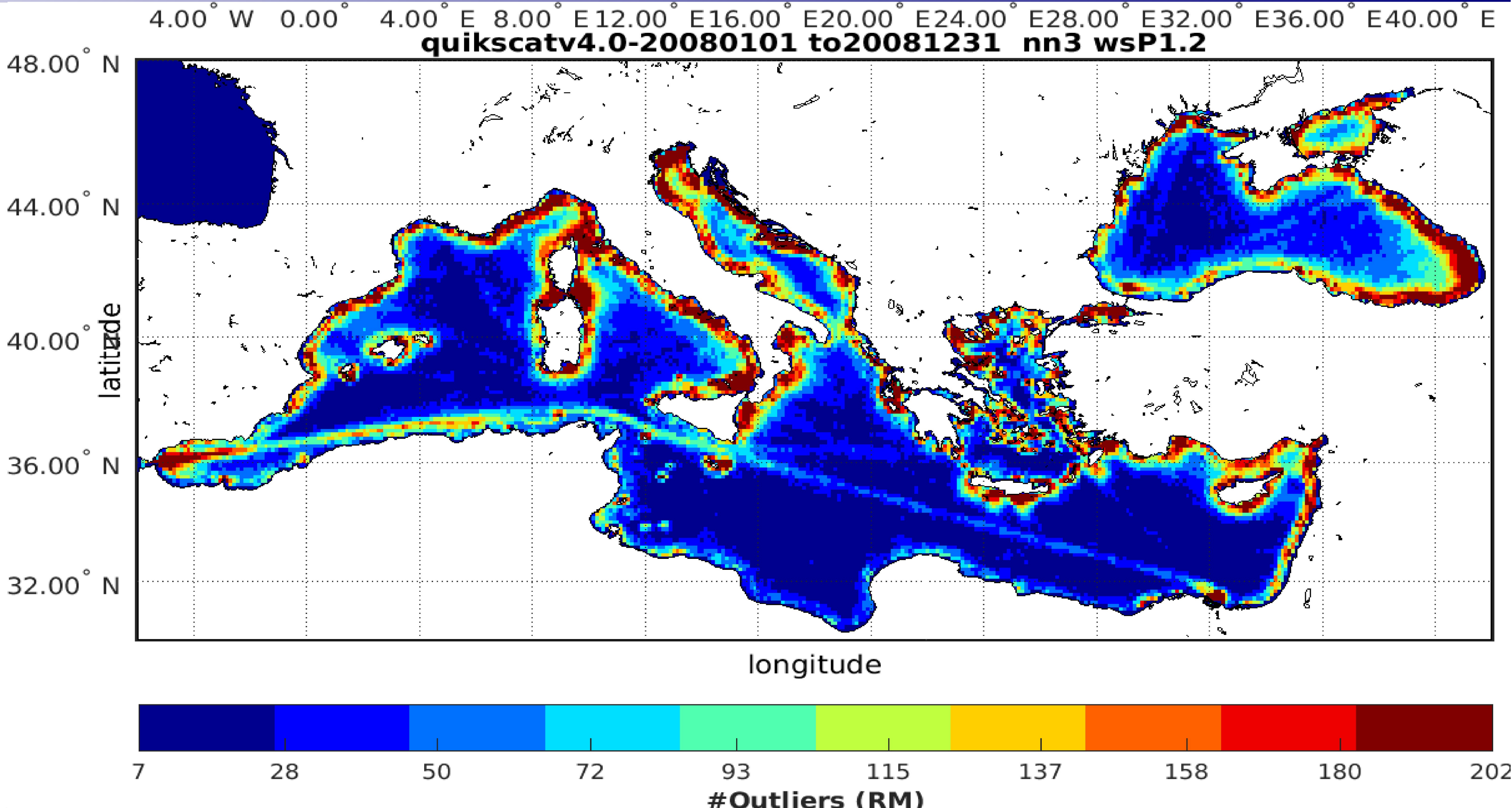
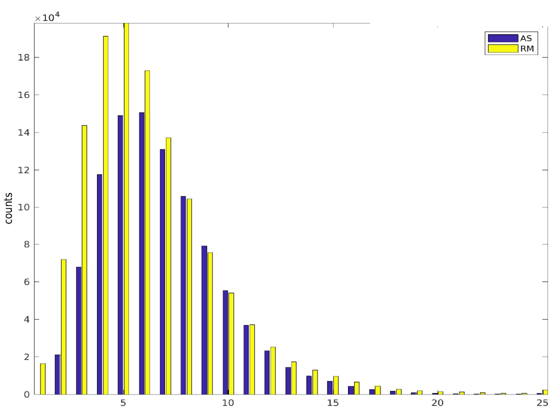
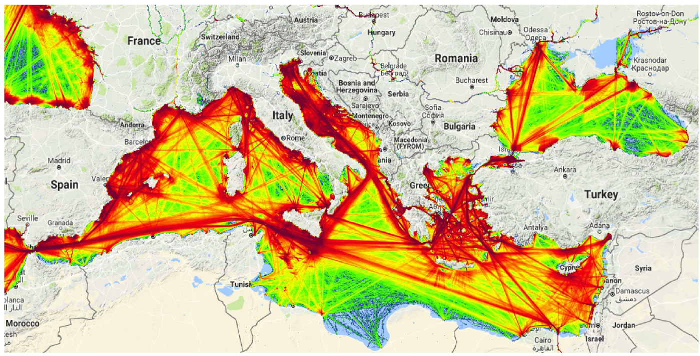
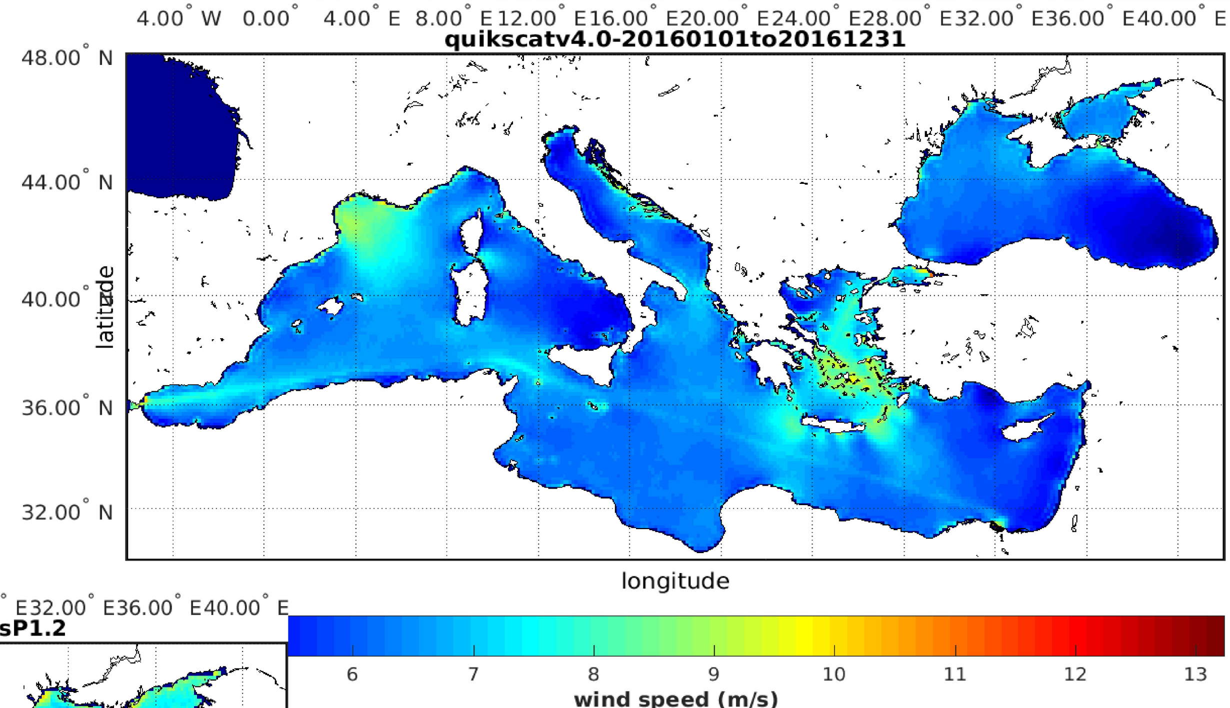


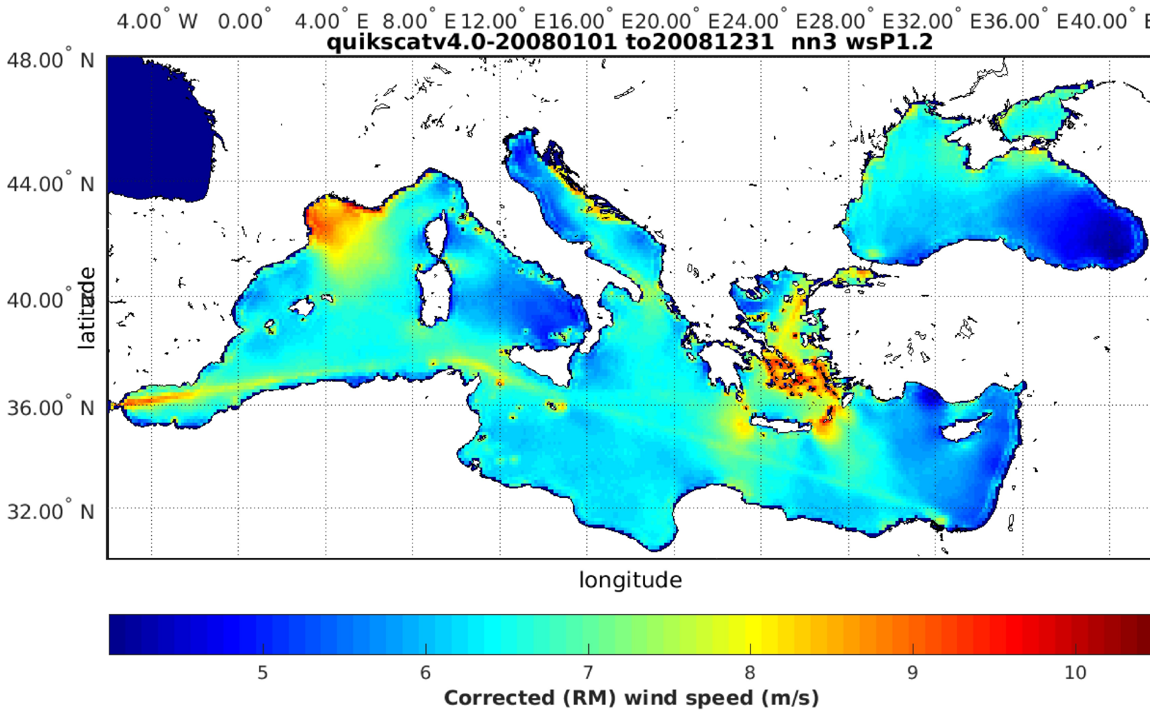




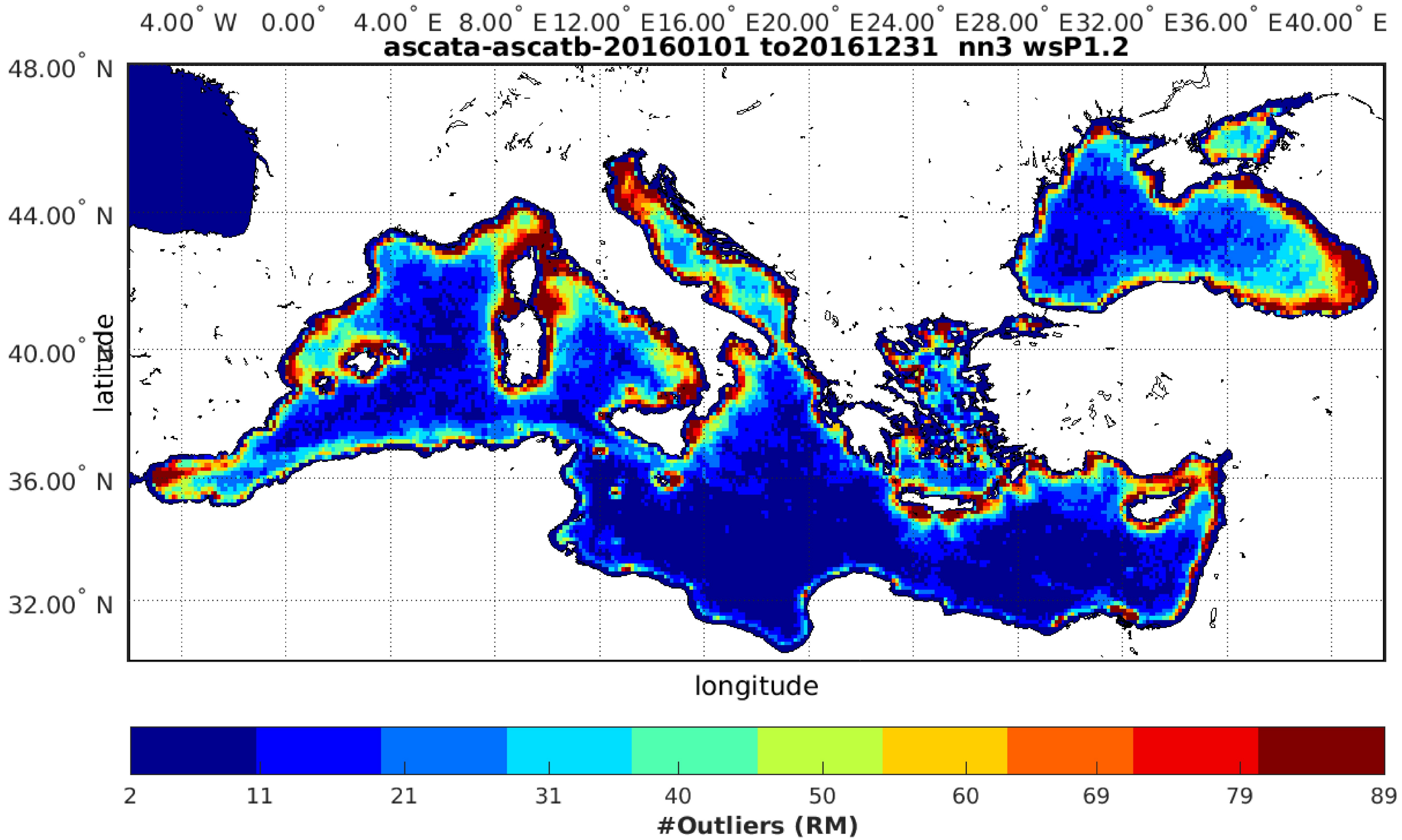
Ship routes in 2008: QuikScat

All the methods mitigate the effects of the ships but are unable to remove them.





Ship routes in 2016: ASCAT-a,b

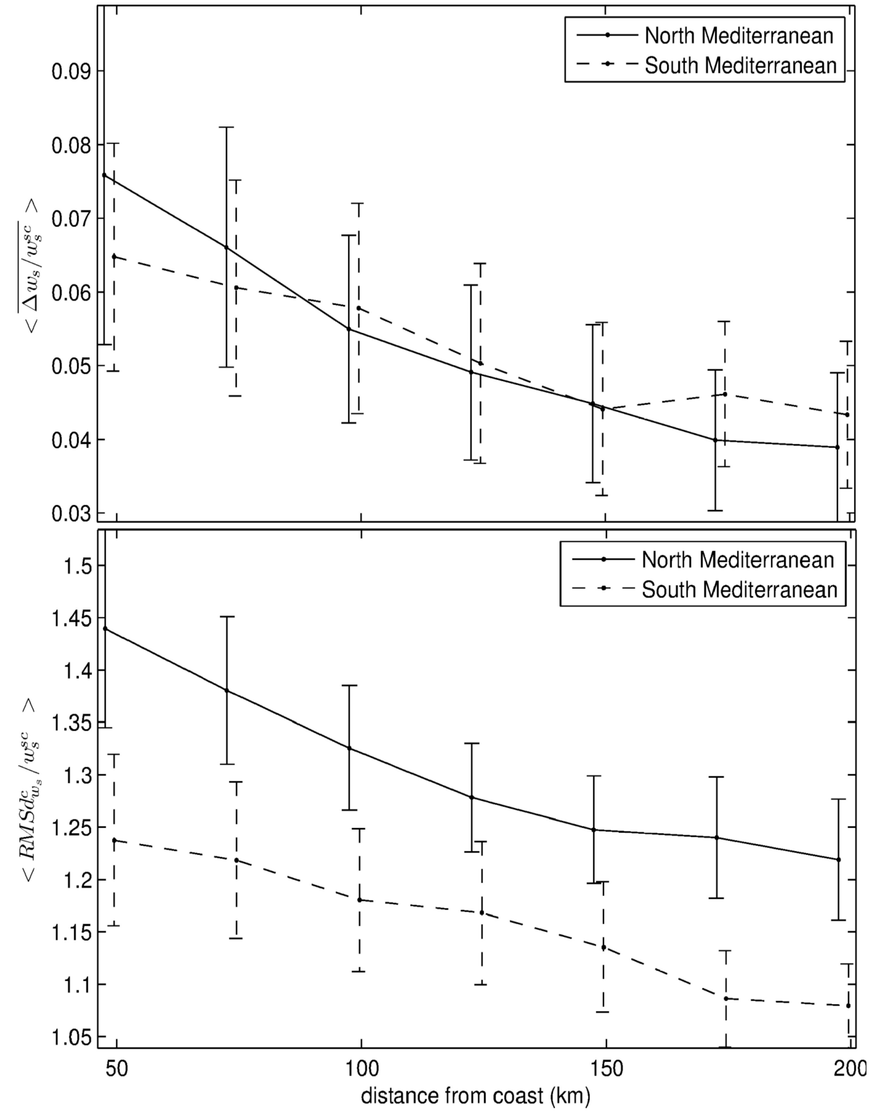


For the ASCAt data the ship contamination is less evident but still present

Some consequence of degradation

Normalised bias

Normalised RMSc



Zecchetto and Accadia: Diagnostics of T1279 ECMWF analysis winds in the Mediterranean Basin by comparison with ASCAT 12.5 km winds, Quarterly Journal of the Royal Meteorological Society, 140: 2506–2514, 2014

Final remarks

- Evidence of non geophysical features in the scatterometer mean wind fields
- Necessity to clean the scatterometer data from these spurious winds
- different methodologies of outliers detection evidenced similar features which are similar to the main ship routes
- No one of the methodologies of outliers detection used are able to provide robust results: the resulting mean fields still show features linked to the ship routes both in the open ocean and along coast
- The presence of spurious data may influence the use of the scatterometer data