Improvement of the ERA* **Ocean Forcing Product: Benefits from the Scatterometer** Constellation



Koninklijk Nederlands Meteorologisch Instituut Ministerie van Infrastructuur en Milieu



Institute of Marine Sciences



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SUMMARY





CAPTURE OCEANIC MESOESCALE

AIM

Address the growing demand for high resolution ocean wind forcing products – ERA*

HOW

Correcting known systematic differences between NWP and scatterometer winds, by means of a geo-located scatterometer-based corrections applied to NWP forecasts



SCATTEROMETER SAMPLING COMBINATION PER DAY



COLLOCATIONS • SCATT – NWP



SYSTEMATIC DIFFERENCES BETWEEN NWP AND SCATT



COLLOCATIONS

- ASCAT-A NWP
- 5-d Temporal Window



CORRECTION ERA-INTERIM SURFACE WINDS

$$SC(i, j, t_f) = 1 / M \sum_{t=1}^{M} u_{10s}^{SCAT}(i, j, t) - u_{10s}^{ERAi}(i, j, t)$$

N length of the temporal window (d);
k Scatterometer combinations
M is the number of scatt. and ERA collocations
Applied at every forecast time

$$u_{10s}^{ERA*}(i, j, t_f) = u_{10s}^{ERAi}(i, j, t_f) + SC(i, j, t_f)$$

- How long should the winds be accumulated?
- How many scatterometers?



QUALITATIVE ASSESSMENT OF DERIVED MAPS

ERA* vs. ERAinterim



Meridional wind component (v) 20130115 at 06 UTC



ERA* - ENCLOSED / SEMI-ENCLOSED SEAS



Zonal wind component (u) 20130115 at 06 UTC

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ERA* - WEST AFRICAN COAST



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ERA* PRODUCT VALIDATION: SPECTRAL ANALYSIS

January 2013

ABO – Zonal wind component (u)





ERA* PRODUCT VALIDATION: SPECTRAL ANALYSIS



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ERA* PRODUCT VALIDATION: VRMS REDUCTION

COLLOCATION - HSCAT LST (6 am/6 pm)



Statistics over 8-d periods



MAIN RESULTS

Due to the persistence of the bias between model and scatterometer data it is possible to add small scale information, i.e., include some of the physical processes that are missing or misrepresented in ERAi, and still keep the large scale circulation patterns.

2 ERA* shows a significant increase in small-scale true wind variability, persistent small scales are kept in SC, due to oceanic features such as wind changes over SST gradients and ocean currents.

3 Although the method is highly dependent on sampling, it shows potential, notably in the tropics.

4 Short temporal windows are preferred, to avoid over smoothing of the forcing fields.

⁵From the statistical and spectral analyses, the optimal configuration to introduce the oceanic mesoscale is the use of complementary scatterometers and a temporal window of two or three days.

⁶ ERA* effectively resolves spatial scales of about 50 km, substantially smaller than those resolved by global NWP output (about 150 km).

FUTURE WORK



Test the ABO configuration (N2 and N3) in regional ocean models.

2 Do verification in the ITCZ separately from the tropical band.

(3) Apply the recently available ERA5 data set.

(4) Test stability dependent corrections

New remote sensing position at ICM-CSIC! (contact: portabella@icm.csis.es)



UNPRECEDENTED SCATTEROMETER SYSTEMS IN ORBIT

7 SYSTEMS IN EARLY 2019

