Updated Jason-3 wind speed and SSB solutions (2D and 3D)

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Objectives

➢ To update the Jason-3 wind speed (WS) estimates

➢ To compute Jason-3 versions (2D and 3D) of the empirical sea state bias (SSB) correction based on 1-year of data (cycles 5 to 41) to take into account the seasonal variations of the sea state parameter. The different solutions are developed with the collinear approach.

➢ To compare two sources of mean wave period (T02) data

- IFREMER WW3 products (F. Ardhuin):
- Meteo-France data in along-track files (L. Aouf & D. Vandemark):

➢ To compare MLE4 and Nelder-Mead (NM) retracking data in sea surface height (SSH) computation

Wind Speed

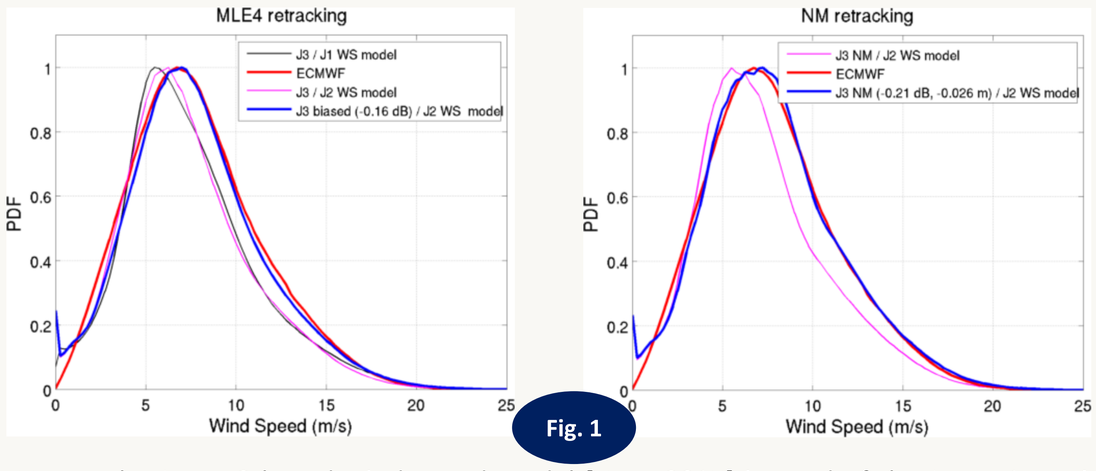


Fig. 1

➢ To use the Jason-2 based wind speed model [Tran, 2015] instead of the Jason-1 version [Collard, 2005]

➢ To apply biases:

- MLE4: application of bias on sigma0 (-0.16 dB)
- NM: application of bias on sigma0 (-0.21 dB) and on SWH (-0.026 m)

➢ Resulting histogram characteristics (shape and mean value) are closer to those observed from ECMWF data (Fig 1)

Sea State Bias 2D solution comparison

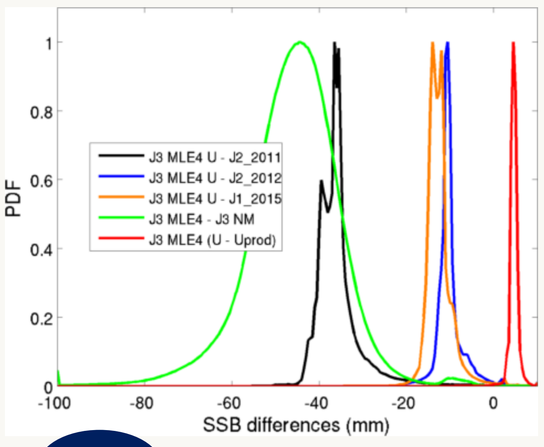


Fig. 2

- U for updated WS
- Uprod for WS in the GDR products
- J2_ 2011 for SSB in GDR_C products

➢ Very good agreement of Jason-3 MLE4 solution with both Jason-1 (v2015 in GDR_E products) and Jason-2 (v2012 from GDR_C products) versions with std of differences of ~3 mm (Fig 2)

➢ Main difference lies in the averaged values

➢ Differences between Jason-3 MLE4 and NM based solutions are large within [-8, -2] cm

T02 impact comparison and 3D SSB solutions

➢ IFREMER WW3 products (F. Ardhuin):

- ftp://ftp.ifremer.fr/ifremer/ww3/HINDCAST/GLOBAL/
- ECMWF surface wind forcing / grid of sea-ice cover / 3-hour step
- no assimilation of altimetric SWH

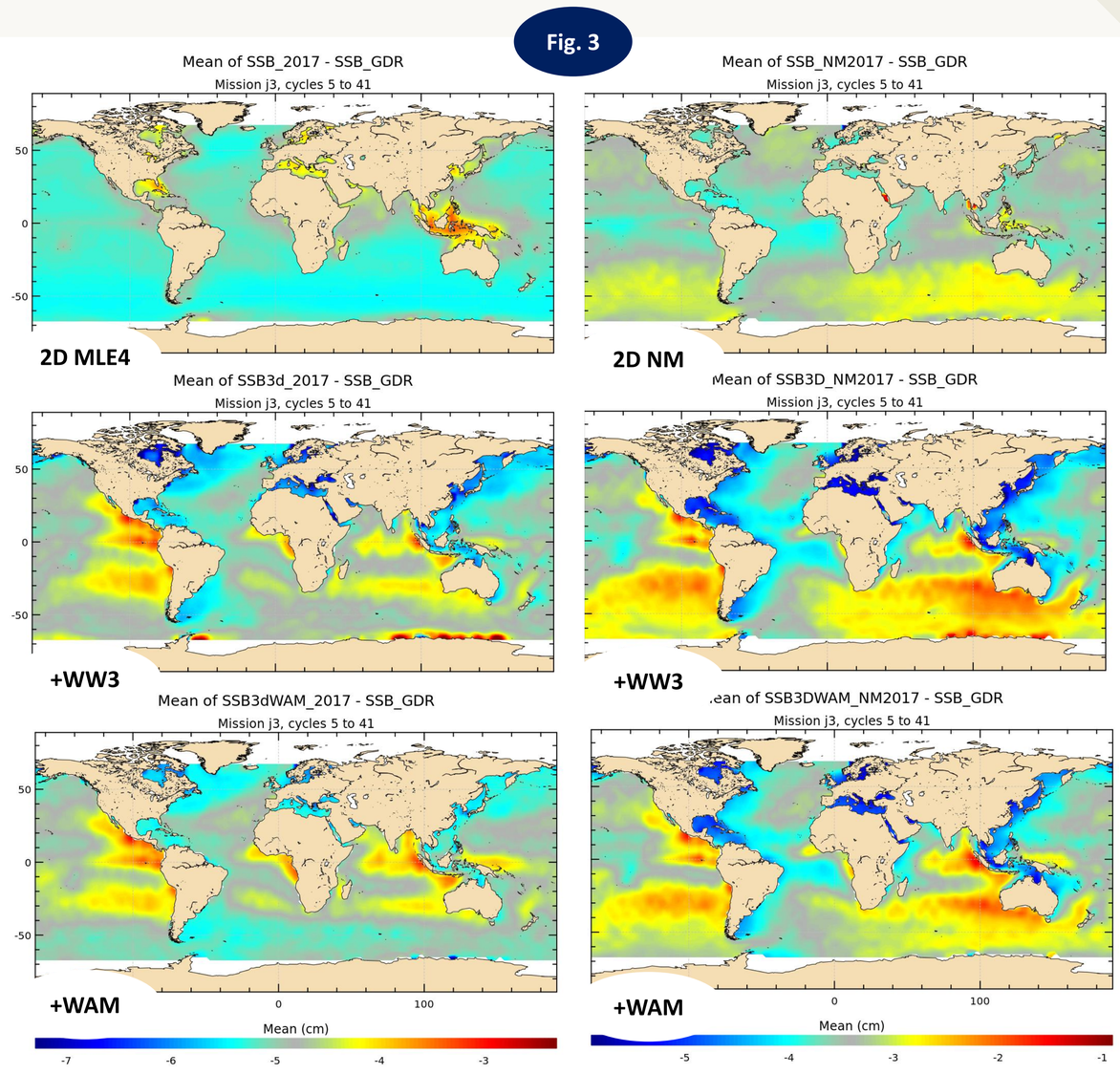
➢ Meteo-France data in along-track files (L. Aouf & D. Vandemark):

- http://tds-opal.sr.unh.edu/thredds/catalog/opal_ts/altimeter/wav_files/jason3/catalog.html
- ECMWF surface wind forcing / grid of sea-ice cover / 3-hour step
- with assimilation of altimetric SWH

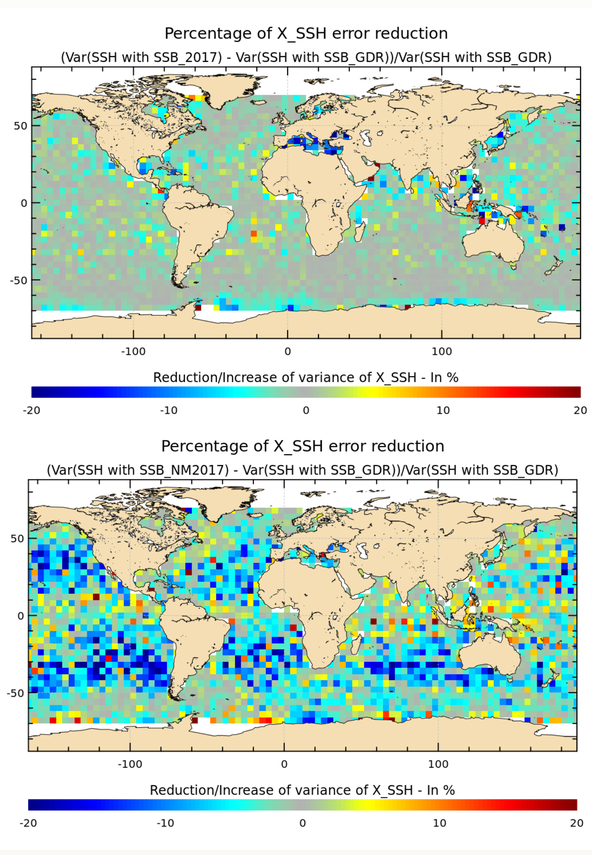
➢ Some differences are observed in term of amplitudes between the two estimations of T02(Fig not shown) leading to differences between different SSB estimations in Fig 3. The color scale is the same for all maps but it is centered on the averaged difference value of each map. The reference model used for all six map comparisons is the 2011 Jason-2 model used today in the Jason-3 GDR product.

➢ the T02 data source change slightly the 3D solutions except around Antarctica where some errors with the IFREMER-WW3 data leak into the SSB estimations(red patterns of difference)

Fig. 3



Variance differences @ crossovers



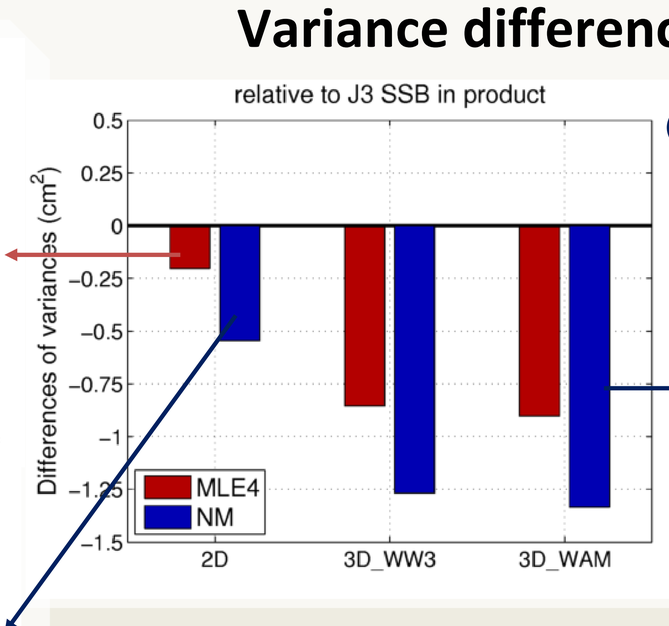
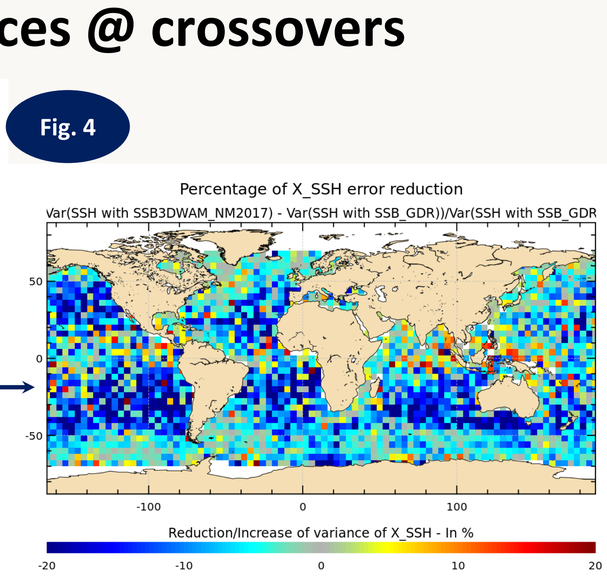


Fig. 4



➢ Differences observed on the maps in Fig 3 lead to differences in the variance reduction comparison provided in Fig 4 from crossover dataset.

➢ For either the MLE4- or NM-based solution set, it is always the 3D version that uses the MF-WAM data that shows the larger improvement.

➢ Larger improvement is observed when the SSB solution is homogeneous with the retracked range as expected. The mid-latitude areas are clearly pointed out in the Fig 4 maps.

Conclusion

➢ Jason-3 wind speed estimates can be improved by using the Jason-2 based wind speed model [Tran, 2015] and by applying some biases. They will display histogram characteristics (shape and mean value) closer to those observed from ECMWF data.

➢ 3D sea state bias solution based on MF-WAM data seems to be a good candidate to improve the sea surface height estimations.

OSTST meeting, October 23 - 27, 2017