

MM5 10-M WIND DIRECTION FORECAST SKILL OVER BAY OF BENGAL DURING SUMMER MONSOON PERIOD 2001

Pat J. Fitzpatrick, Gueorgui V. Mostovoi and Yongzuo Li
Engineering Research Center, MSU, Stennis Space Center, Mississippi
E-mail: mostovoi@erc.msstate.edu

Skill of 10-m wind direction forecasts produced by the PSU/NCAR mesoscale model (MM5, Dudhia, 2001) is estimated from June to August 2001. The same estimation methodology and the same MM5 configuration as described in a paper of Fitzpatrick et al. (2002) are used. The evaluation is made over Bay of Bengal. Over this region 10-m wind speed and direction retrieved from the microwave scatterometer QuikSCAT (QSCAT, 2001) measurements are available around 00Z and 12Z.

The distribution of 10-m wind direction bias error (model – observed) averaged for June-August 2001 is shown in Fig. 1a for 12 h and in Fig. 1b for 24 h forecast. In two regions behind Sri-Lanka MM5 and global NOGAPS (Hogan, Rosmond, 1991) model demonstrate a substantial positive wind bias ($> 40^\circ$). Both models predict surface flow directed more offshore than observed.

A relative improvement of MM5 10-m wind direction forecasts over NOGAPS in terms of the skill score based on absolute direction error (Fitzpatrick et al., 2002) is shown in Fig. 2a for 12h and Fig. 2b for 24 h forecast. One can see that MM5 produces positive skill mainly along NE India coastline (from 16N to 20N), close to the eastern edge of Sri Lanka and along the equatorial belt up to 5-6N. It is found that an absolute direction error depends on the wind speed value over coastal waters. The small direction errors are associated with relatively strong winds as shown in Fig. 3b. In contrast there is no any relationship between wind direction error and observed speed over an open Ocean (see Fig. 3c).

References

- Dudhia J. et. al., 2001: PSU/NCAR Mesoscale Modeling System Tutorial Class Notes and User's Guide: MM5 Modeling System Version 3. - Mesoscale & Microscale Meteorology Division NCAR.
- Hogan T., and T. Rosmond, 1991: The description of the Navy Operational Global Atmospheric Prediction System's spectral forecast model. *Mon. Wea. Rev.*, **119**, 1786-1815.
- Fitzpatrick P., Mostovoi G. & Li Y., 2002: MM5 10-m wind direction forecast skill over Bay of Bengal during spring 2001. *Research Activities in Atmospheric and Oceanic Modeling*, see current Report.
- QSCAT, 2001: Remote Sensing Systems' Database for Satellite Microwave Data. [Available online at <ftp://ftp.ssmi.com/QSCAT>].

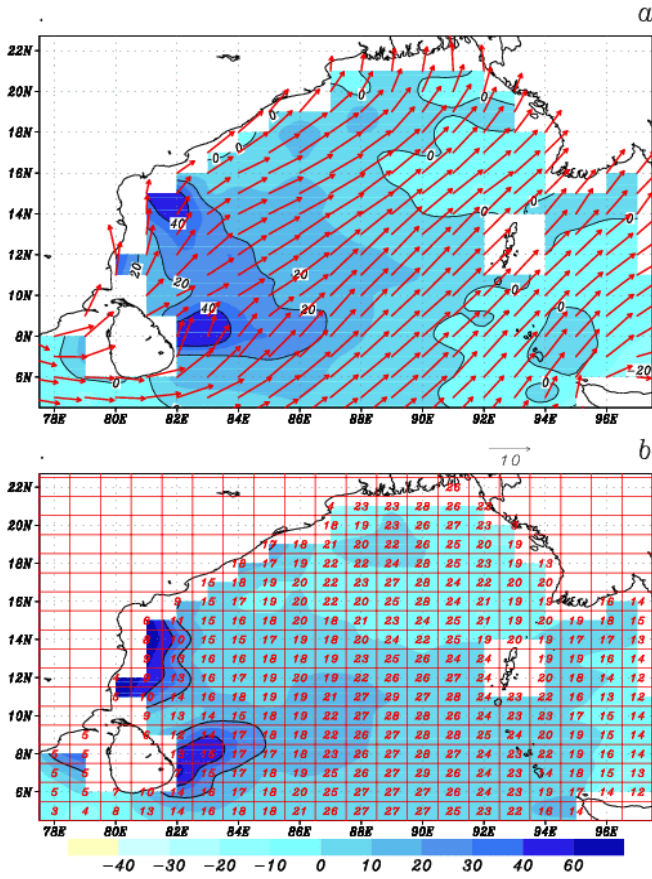


Fig. 1. Mean win direction bias for June-August 2001 MM5 (a) and skill NOGAPS (b) forecasts started at 00Z. Averaged QSCAT wind field is shown by arrows. Digits correspond to the number of cases used for averaging

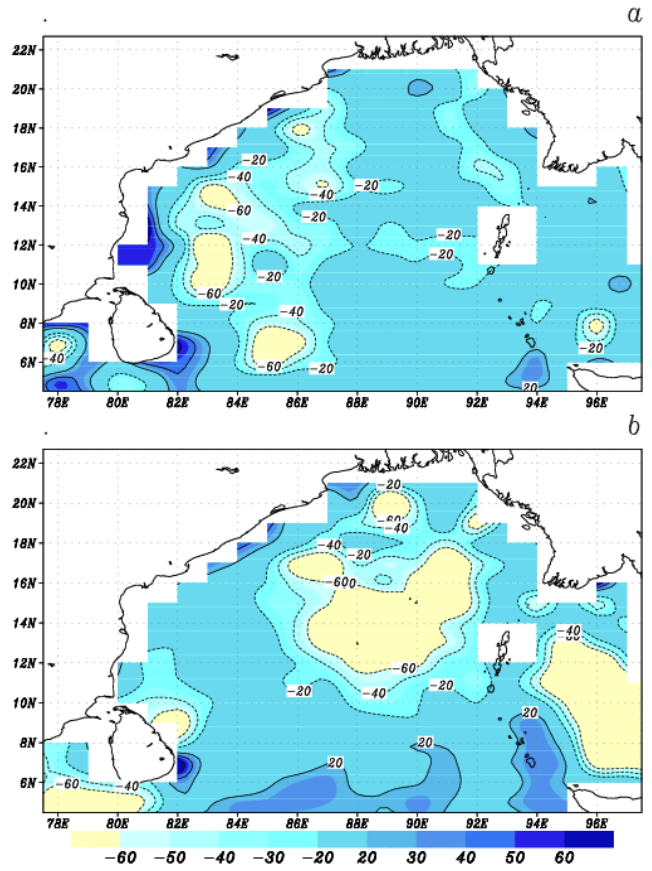


Fig. 2. Geographical distribution of MM5 10-m wind direction score against NOGAPS for 12 h (a) and for 24 h (b) forecasts.

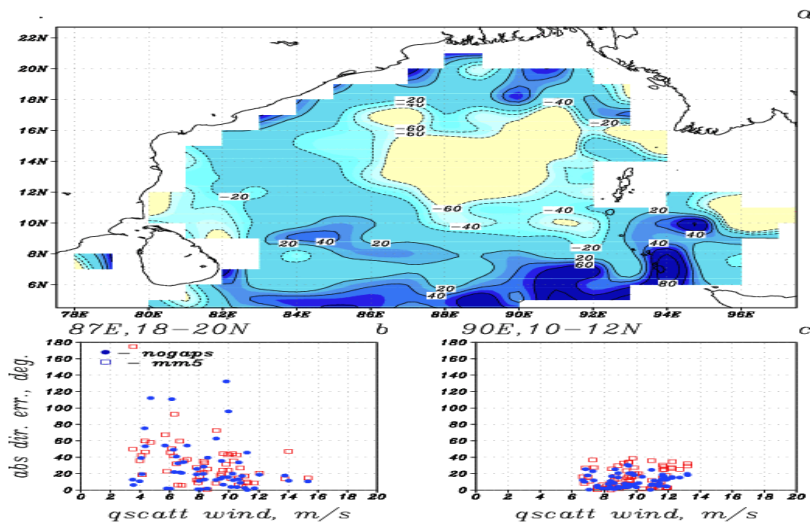


Fig. 3. Same as Fig. 2b, but only for cases with observed wind speed >9 m/s. Relationship between observed wind speed and absolute direction error for two sample regions: (86-87E, 18-20N) (b) and (90-91E, 10-12N) (c).