Global NWP Superensemble from multimodels

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Florida State University maintains a real time global NWP superensemble from multimodels following the works of Krishnamurti et al. (2000, 2001, 2003). The multimodels include day 1 through day 6 of forecast from 7 forecast models namely ECMWF model (European Centre for Medium-Range Weather Forecasts 2.5 deg res.) GFS model (National Centers for Environmental Prediction USA, NCEP) JMA Global Spectral Model (Japan Meteorological Agency, JMA) GEM model (Canadian Meteorological Centre, CMC/RPN) NOGAPS (Fleet Numerical Meteorology and Oceanography Center, FNMOC/NRL) GASP model (Australian Bureau of Meteorology, BMRC) and FSU Global Spectral Model (Florida State University, FSU). This superensemble is constructed from multimodel data at a horizontal grid resolution of T126 (120 waves triangular truncations) which carried a transform grid separation of roughly 90 Km). This procedure entails a training phase (covering the past forecast of same 120 recent days) and a real time forecast phase. One forecast per day at 12 UTC is issued by Florida State University. The training phase extracts the error statistics of the member models and those are used to arrive at a consensus forecast called the Superensemble. In the enclosed illustrations (Fig. 1) the recent diagnostic and probabilistic skill scores, RMS errors, anomaly correlations and equitable threat scores and bias (for precipitation) are evaluated on a regular basis to examine the NWP forecast skills regionally and globally for the member model of the suite, ensemble mean and of the multimodel superensemble. The salient aspects of this forecast are that the FSU superensemble invariably provides the best global and regional forecasts up to 6 days. The threat scores for light (2mm/day) as well as heavy rains (5mm/day) are best provided by this system. The same is seen for the RMS errors and anomaly correlations for all variables (500 hPa geopotential heights and MSLP are shown in Figure 1). Enclosed diagram illustrates the anomaly correlation and the RMS errors for the sea level pressure (a) and (b), 500 hPa level geopotential heights (c) and (d), equitable threat score and BIAS calculated for the 2mm/day and 5 mm/day threshold (e through h) for the month of June (2005) over the globe.

Basically forecasts for all these elements show very high skills for the multimodel superensemble that is shown by the dark bars. These carry the highest anomaly correlation and the lowest RMS errors for each of the forecast days. Here the skills for 7 of the best models are compared with the superensemble (far right) and ensemble means (shown next to the superensemble). The results of the superensemble appear clearly better than those of the ensemble mean. The most striking results are the large improvements in the anomaly correlation from the multimodel superensemble, values as high as 0.90 to 0.94 on day 4 of the forecast are worth noting.

References

1. Krishnamurti, T.N., C.M. Kishtawal, T. LaRow, D. Bachiochi, Z. Zhang, C.E. Williford, S. Gadgil and S. Surendran, 2000: Multimodel superensemble forecasts for weather and seasonal climate. *J. Climate*, **13**, 4196-4216.
2. Krishnamurti, T.N., S. Surendran, D.W. Shin, R.J. Correa-Torres, T.S.V. Vijaya Kumar, C.E. Williford, C. Kummerow, R.F. Adler, J. Simpson, R. Kakar, W.S. Olson, and F.J. Turk, 2001: Real-time multianalysis-multimodel superensemble forecasts of precipitation using TRMM and SSM/I products. *Mon. Wea. Rev.*, **129**,2861-2883.
3. Krishnamurti, T.N., K. Rajendran, T.S.V. Vijaya Kumar, S. Lord, Z. Toth, X. Zou, S. Cocke, J.E. Ahlquist, I.M. Navon, 2003: Improved skill for the anomaly correlation of geopotential heights at 500 hPa. *Mon. Wea. Rev.*, **131**, 1082-1102

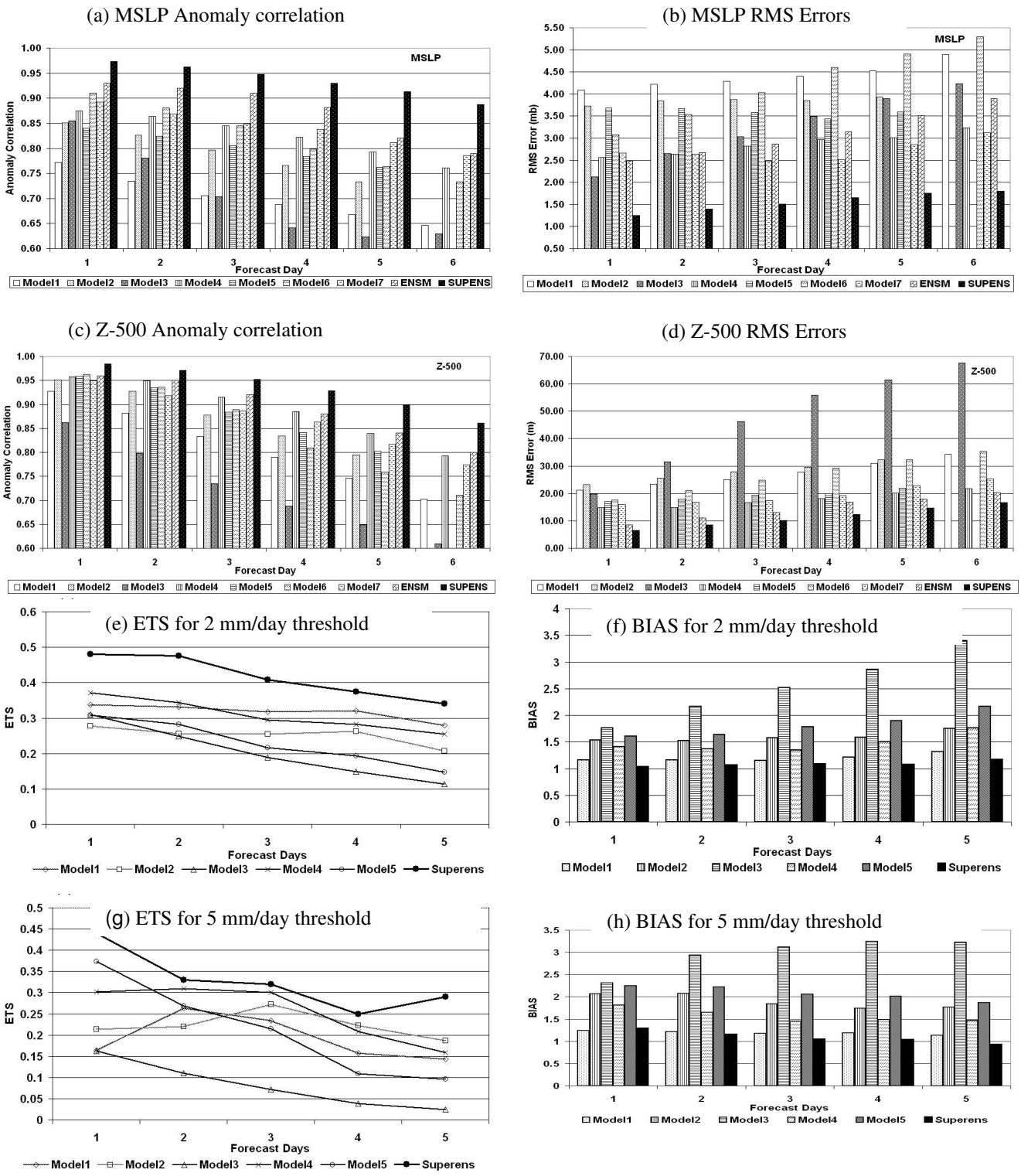

Figure 1. Skill scores of Operational FSU Multimodel Superensemble for June 2005 (a) MSLP Anomaly correlation, (b) MSLP RMS Errors, (c) z-500 Anomaly Correlation, (d) z-500 RMS Errors, (e) Equitable threat score (ETS) for 2mm/day threshold, (f) BIAS for 2mm/day threshold, (g) ETS for 5mm/day threshold and (h) BIAS for 5mm/day threshold.