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WMO Guidelines on the Exchange of Ensemble Verification

**6th NAEFS Workshop
Monterey, CA**

DRAFT TEXT FOR THE NEW *MANUAL* ON GLOBAL ENSEMBLE PREDICTION, COORDINATION OF EPS VERIFICATION AND LIMITED AREA ENSEMBLE PREDICTION

- **II.2.1.3 – Global Ensemble Prediction SPECIFICATION**
- Centres participating, global Ensemble Prediction, shall:
- Prepare global ensemble forecast fields of basic and derived atmospheric parameters
- Make available on the WIS a range of these products. The minimum list to be made available, including parameters, forecast range, time steps and frequency, is given in Appendix A.II.2.1.3a
- Prepare verification statistics according to the standard defined in Appendix A.II.2.3.2, and make them available to the Lead Centre(s) for EPS Verification (JMA)
- Make available on a web site upto date information on the characteristics of its global Ensemble Prediction System. The minimum information to be provided is given in Appendix A.II.2.1.3b

Table of content

- Futur WIS data offering
- WMO EPS Verification
- Verification tables and graph examples
- Comments

MINIMUM LIST OF PRODUCTS TO BE MADE AVAILABLE ON THE WIS

- **Parameter** **Thresholds**
- Prob of Prec 1, 5, 10, 25, 50 mm and 100 mm/24 hours
- Prob of 10 m sustained surface wind and gusts exceeding
10, 15 and 25 m s⁻¹
- Probability of Temperature anomalies 850 mb
± 1, ± 1.5, ± 2 standard deviations with respect to a reanalysis
climatology specified by the producing Centre
- Ensemble mean + spread (standard deviation) of Geopotential
height 500mb
- Ensemble mean + spread (standard deviation) of MSL pressure
- Ensemble mean + spread (standard deviation) of wind speed at 850-
250mb
- **At Resolution (lat/lon grid) of 1.5° x 1.5° every 12h once per day**

Context: WMO Lead Centre for EPS verification

- The Japan Meteorological Agency (JMA) was named as the WMO lead centre for EPS verification
- The Expert Team for Ensemble Prediction Systems determined the scores to be reported by EPS producers
- EPS producers are expected to provide monthly verification score to JMA as per the guideline:
<http://epsv.kishou.go.jp/EPsV/guideline.pdf>
- JMA produces graphics from these scores on the *Lead Centre on Verification of Ensemble Prediction System* Web site: <http://epsv.kishou.go.jp/EPsV/>

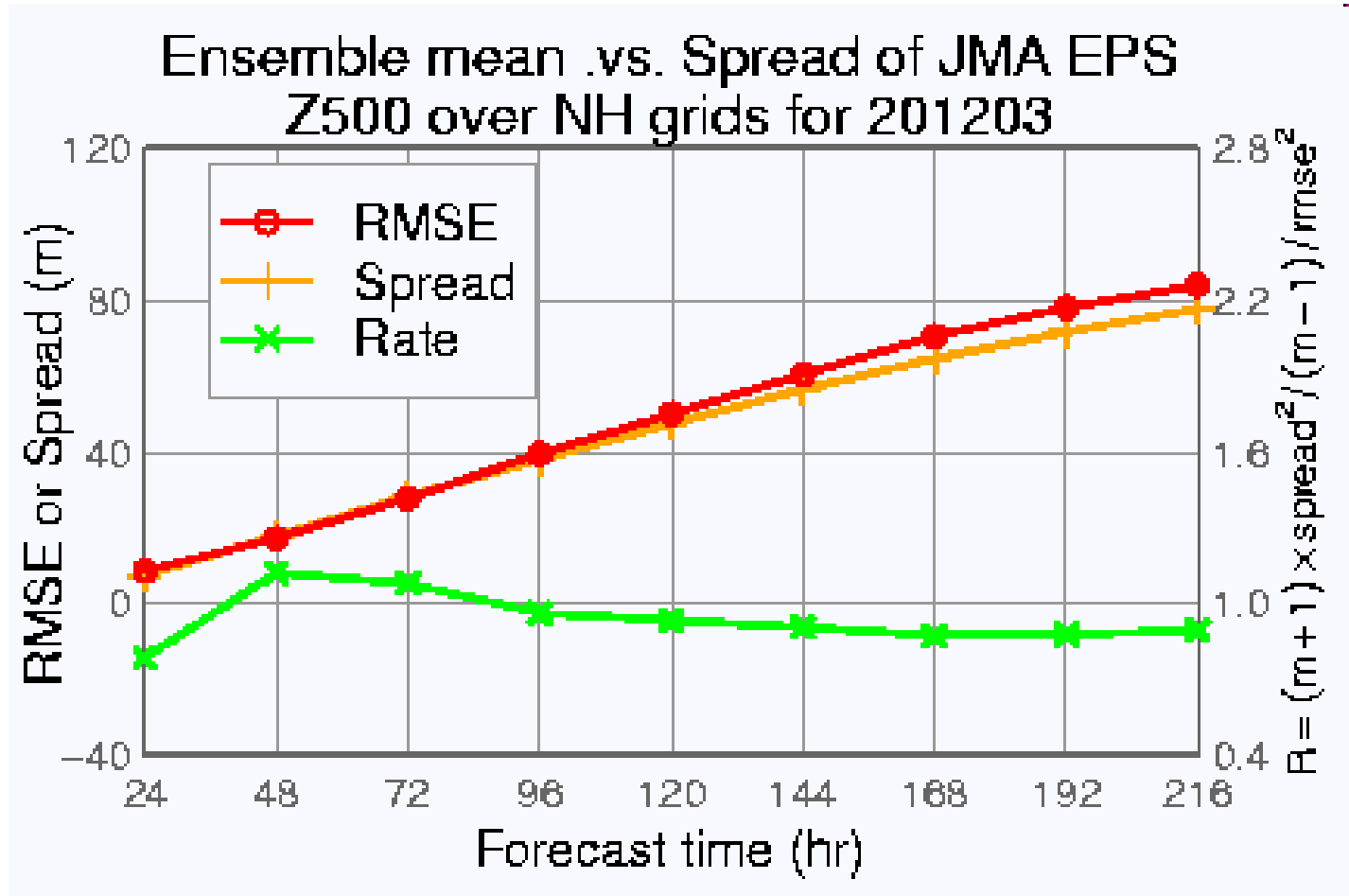
WMO Verification

- Three monthly verification tables are to be provided as ascii files:
 1. Deterministic table
 2. Reliability table
 3. CRPS (continuous rank probability score) table

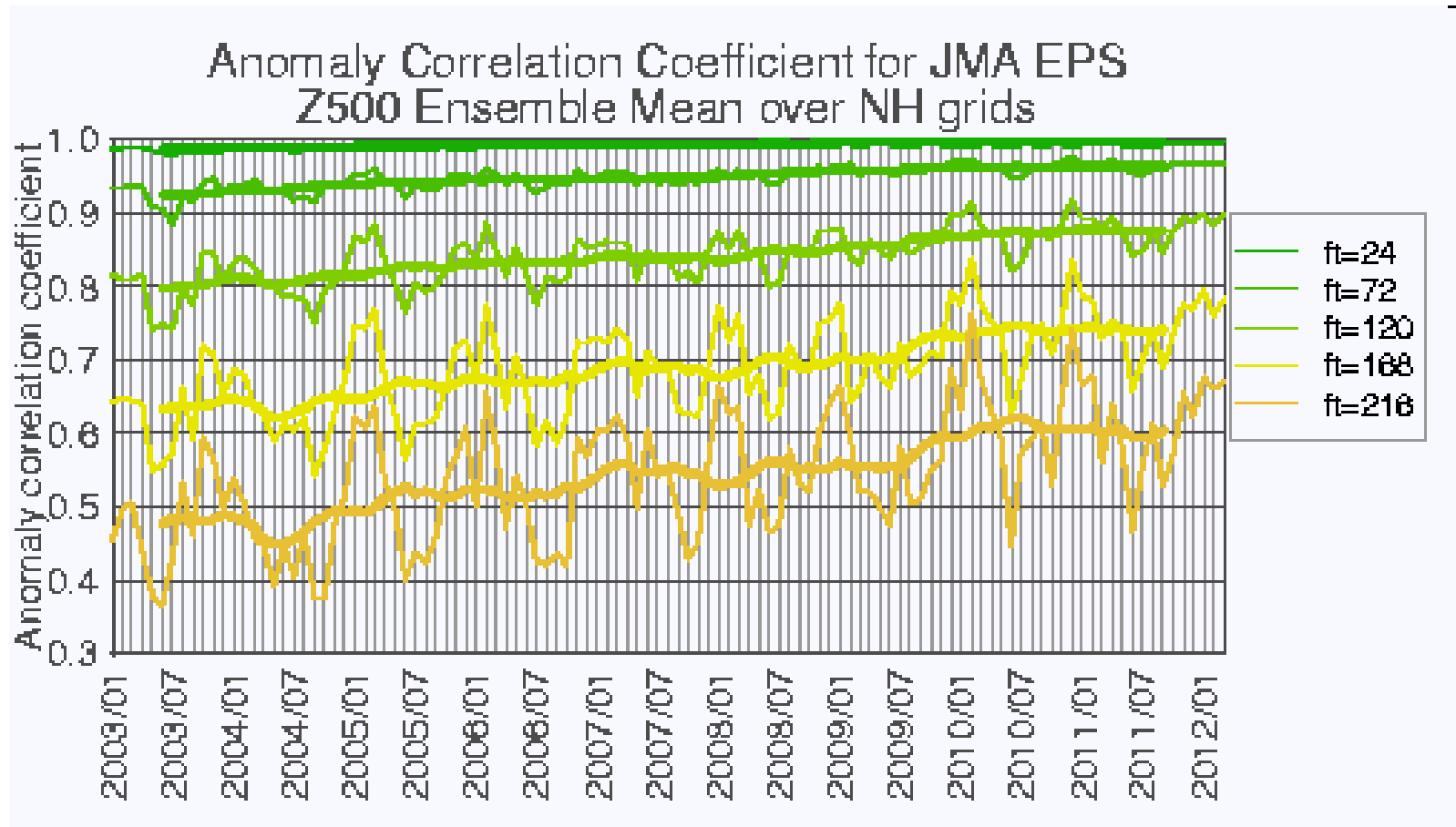
Deterministic table content

- Anomaly correlation coefficient of the ensemble mean
- Root mean square error of the ensemble mean
- Spread (standard deviation) of the ensemble

Deterministic table graphs



Deterministic table graphs

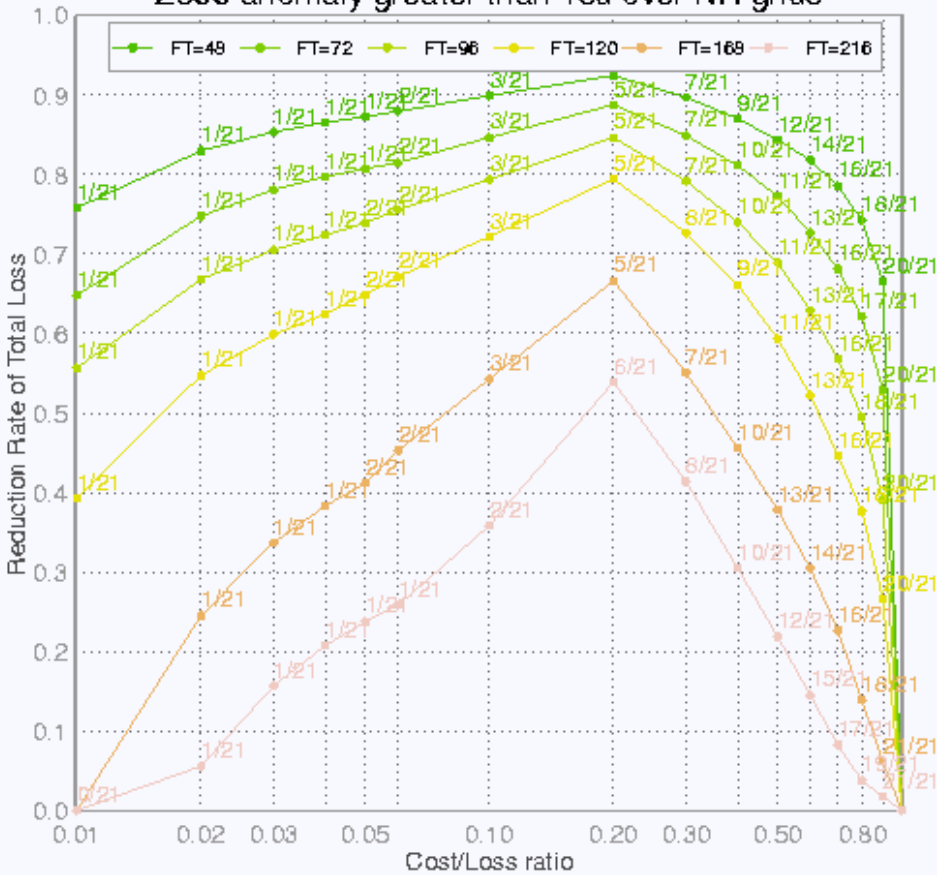


Reliability table content

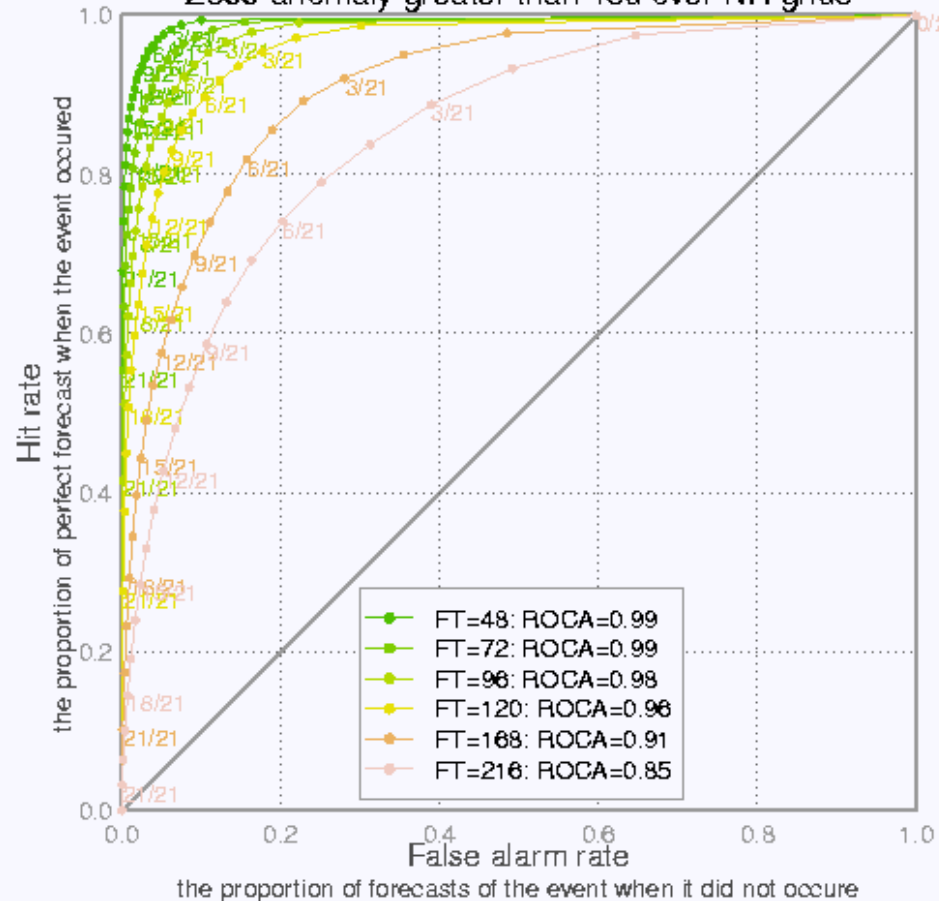
- An event is defined from the mean and standard deviation of the climatology
 - E.g.: Temperature more than 1 standard deviation above climatological mean
- The table content is:
 - The number of member forecasting the occurrence (non-occurrence) of the event
 - The count of observed occurrences (non-occurrence) of the events in each cases

Reliability table graphs

Economic values of CMC EPS 201203
Z500 anomaly greater than 1sd over NH grids

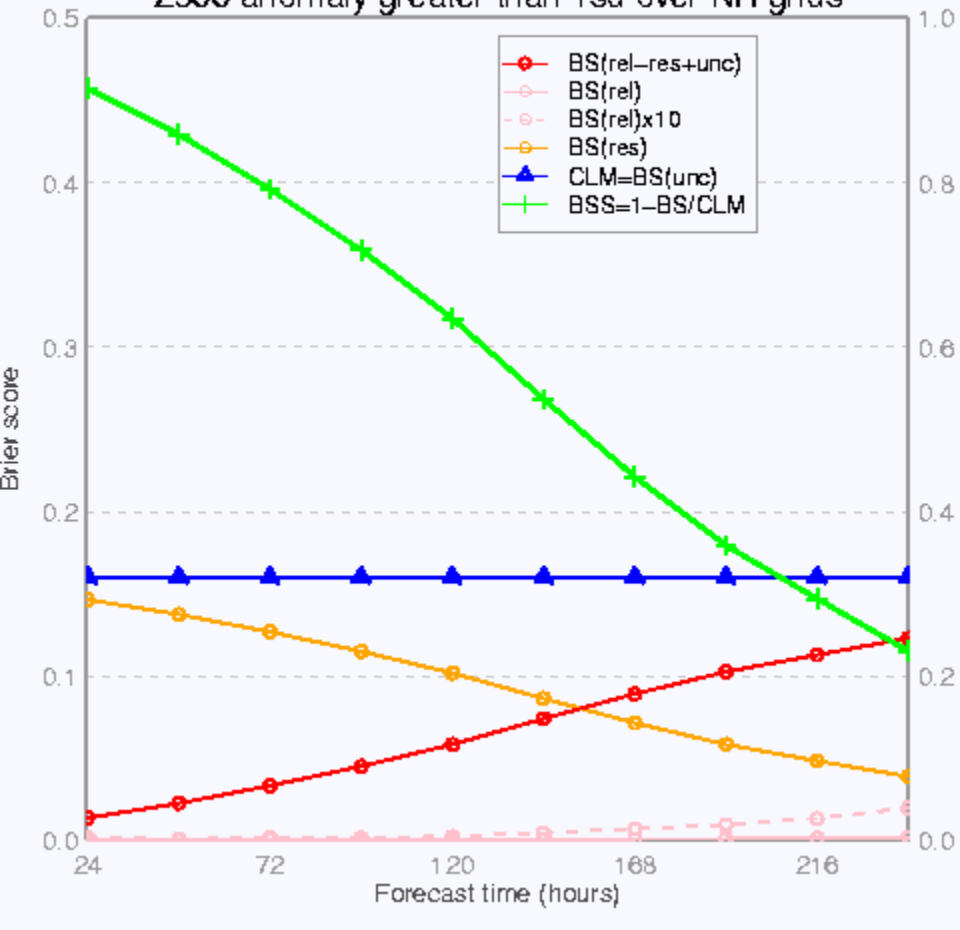


ROC curves of CMC EPS 201203
Z500 anomaly greater than 1sd over NH grids

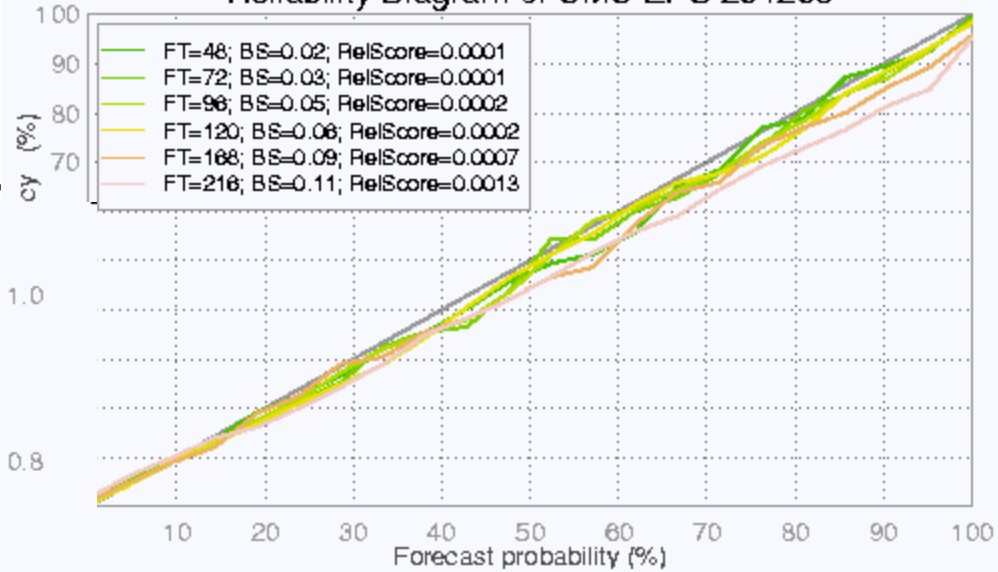


Graphs

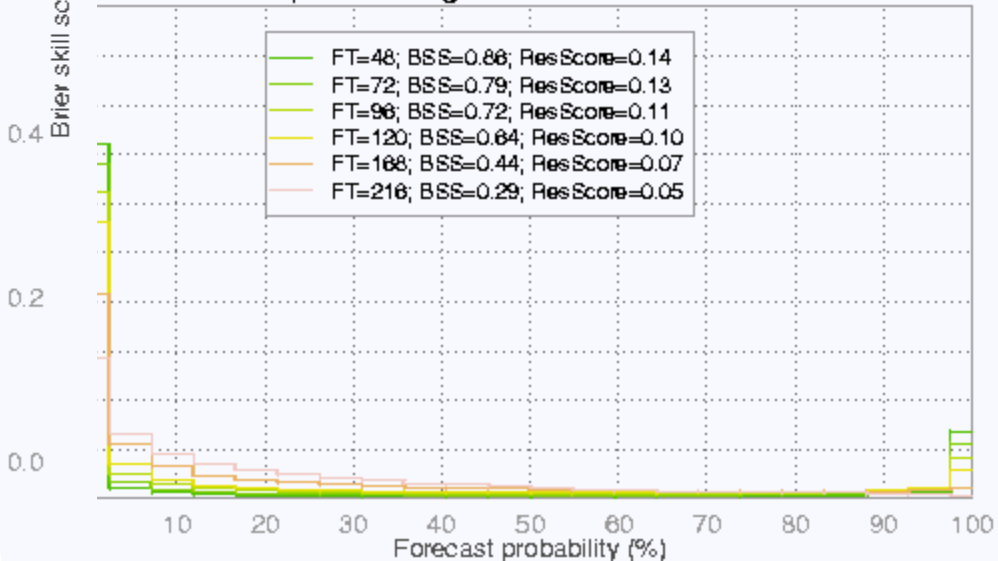
Brier Score of CMC EPS 201203
Z500 anomaly greater than 1sd over NH grids



Z500 anomaly greater than 1sd over NH grids
Reliability Diagram of CMC EPS 201203



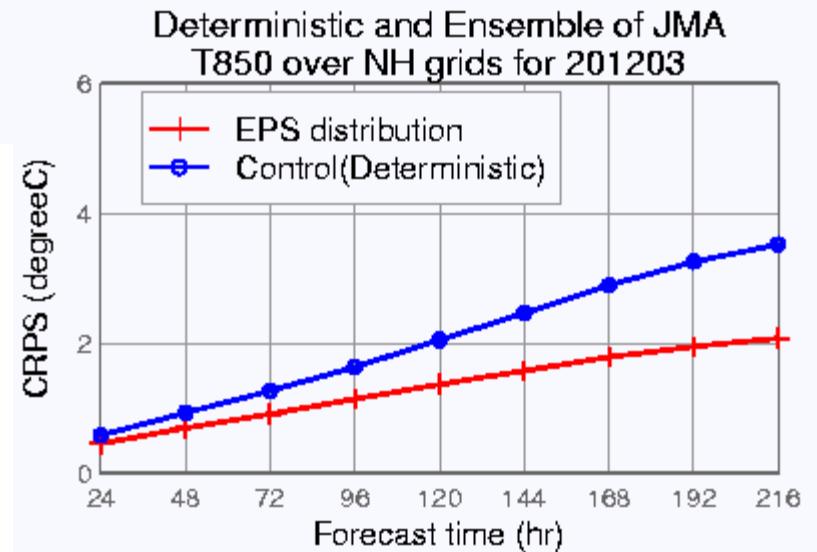
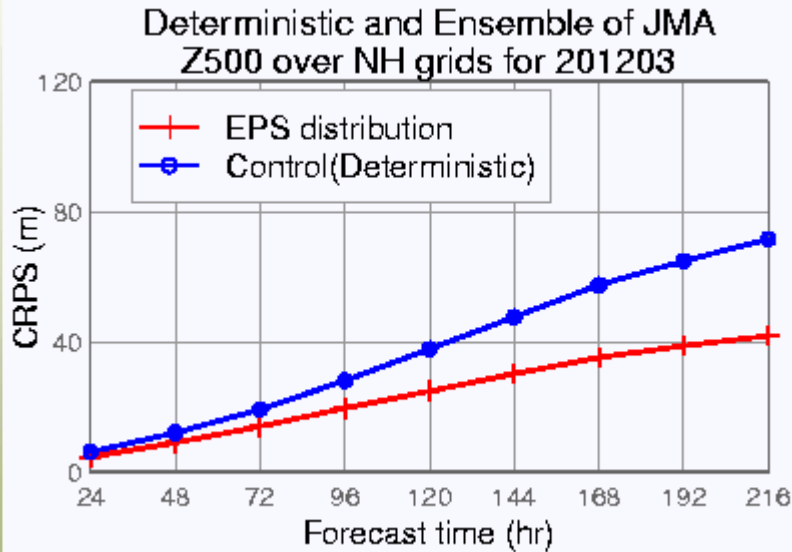
Sharpness Diagram of CMC EPS 201203



CRPS table content

- The CRPS of the EPS forecast distribution
- The CRPS of the control forecast
 - Equal to mean absolute error of the control forecast
 - Set to « -1 » if not reported

CRPS table graphs



Comments

- Presently, CMC only produces the reliability table for the CMC EPS and send it to JMA
- The other scores are in the plans for 2012
- Currently, the NCEP reanalysis climatology is used by CMC to define events for the reliability table
- The expert team is recommending to use a common climatology for all EPS producers in the futur (ECMWF)

Conclusion

- CMC will make some progress in the next year in order to catch up in meeting all the EPS Global Producer's duty
- NAEFS partnership might facilitate this...