Multi-model Ensemble for Short-Range Predictability

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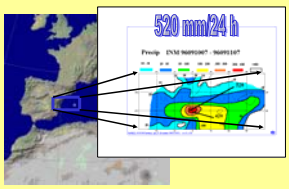
MINISTERIO DE MEDIO AMBIENTE

INTRODUCTION

Meteorological Framework

- Main Weather Forecast issues are related with Short-Range extreme events.
- Western Mediterranean is a close sea rounded by high mountains.
- Convective precipitation is the most dangerous weather event in Spain (several cases of more than 200 mm/few hours every year).
- Some fast cyclogenesis like "tropical cyclones" also appears from time to time.



Errors of the short-range forecast

- Due to model formulation.
- Due to simplifications in parameterisation schemes.
- Due to uncertainty in the initial state.
- Special for LAMs, due to errors in lateral boundary conditions.
- Due to uncertainties in soil fields (soil temperature and soil water content, ...).

SREPS Methods

- Multi-model approach (Hou & Kalnay 2001).
- Stochastic Physics (Buizza et al. 1999).
- Multi-boundaries:
  - From several deterministic global models.
  - From global model EPS (ECMWF).
  - SLAF technique (Hou & Kalnay 2001)

SREPS SYSTEM AT INM

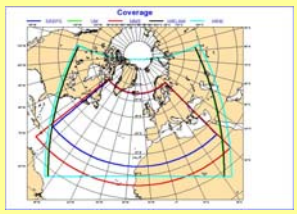
SREPS at INM

- Multi-model approach: Hirlam, HRM (DWD), MM5, UM (UKMO), Lokal Model
- Multi-boundaries: From few deterministic global models: ECMWF, GME, GFS, UKMO

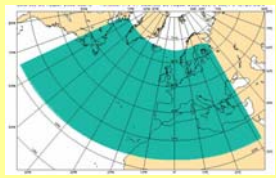
SREPS at INM

- Mummub: Multi-model Multi-boundaries
- 72 hours forecast twice a day (00 y 12 UTC).
- **Characteristics:** 5 models - 4 boundary conds.
  - 2 latest ensembles (HH, HH-12).
- 20 member ensemble every 12 hours
- Time-lagged Super-Ensemble of 40 members every 12 hours.

Integration Areas

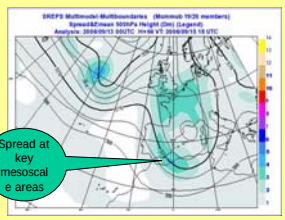


Common Post-process Area



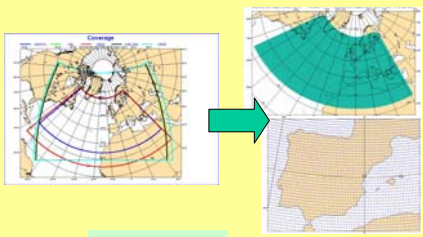
Monitoring in real time with a web server

Ensemble Mean – Spread Maps

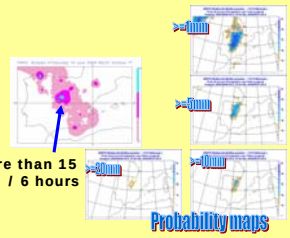


Stamp Maps

Interpolation to a common grid for verification



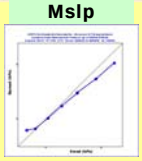
Case Study: 06 / 10 / 2006 at 00 UTC



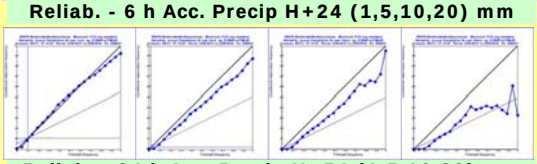
VERFICATION EXERCISE – April-June 2006

ECMWF Det. Model

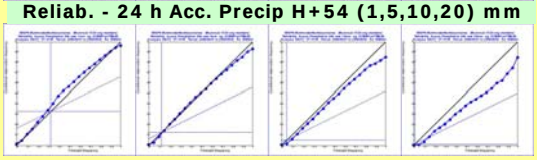
Mslp



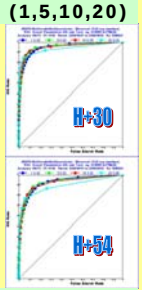
Reliab. - 6 h Acc. Precip H+24 (1,5,10,20) mm



Reliab. - 24 h Acc. Precip H+54 (1,5,10,20) mm

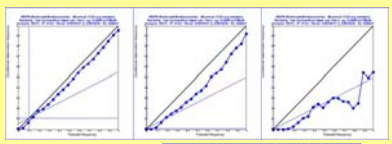


ROC - 24 h Acc. Precip. (1,5,10,20)

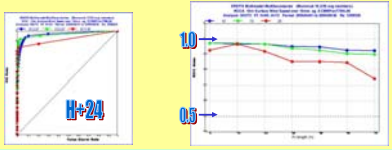


10 m wind H+24 (10,15,20) m/s

Reliability

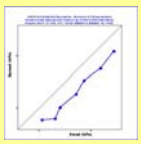


ROC

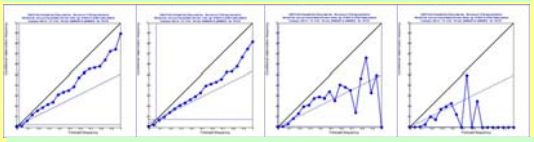


Synoptic Obs

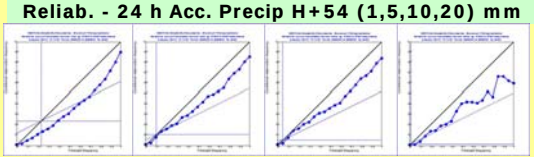
Mslp



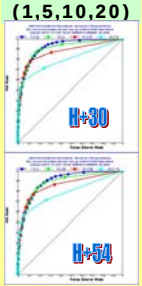
Reliab. - 6 h Acc. Precip H+24 (1,5,10,20) mm



Reliab. - 24 h Acc. Precip H+54 (1,5,10,20) mm

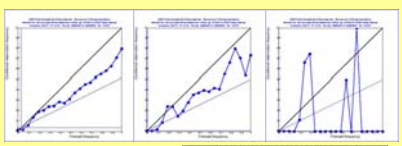


ROC - 24 h Acc. Precip. (1,5,10,20)

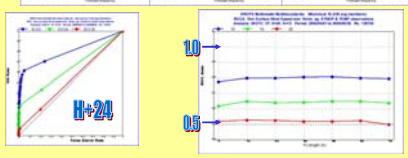


10 m wind H+24 (10,15,20) m/s

Reliability



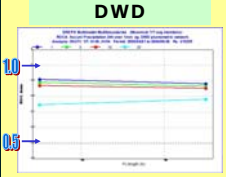
ROC



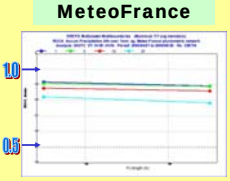
Climate Net. Obs

24 h Acc. Precip. (1,5,10,20) mm

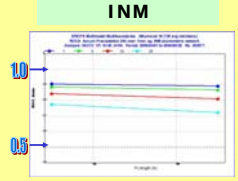
DWD



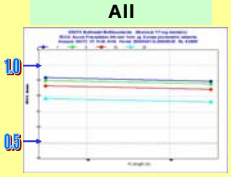
MeteoFrance

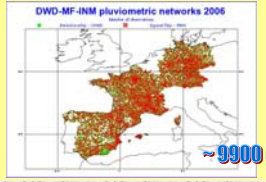


INM



All





CONCLUSIONS

- A Multi-model-Multi-boundaries Short Range Ensemble Prediction System (MMSREPS), has been develop at the INM-Spain
- We show here 3months verification results (April-June 21006), against both synoptic and climate observations and ECMWF analysis and model:
  - Response to binary events: reliability and resolution of surface variables 10m surface wind, 6h and 24h accumulated precipitation
- These first results look promising:
  - Verification against ECMWF analysis and model shows very good results
  - Verification against observations shows quite good results
    - Ensemble is under-dispersive
    - Good response to binary events (synoptic and climate observations)
- The ensemble performance improves with some post-processing (see presentation in this workshop), like bias correction and calibration using Bayesian Model Averaging (BMA)

Future

- Dissemination of probabilistic forecasts in real time (February 2007).
- BMA for 10 meter wind speed and precipitation.
- BMA in real time in the system.
- Four runs a day.
- Clustering software.

References

- (2001) Hou D., Kalnay E., & Droegemeier, K.K.: Objective Verification of the SAMEX'98 Ensemble Forecasts. M.W.R., 129, 73-91.
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