VERIFICATION AND INTERCOMPARISON OF NWP GLOBAL MODELS AGAINST CEOP I REFERENCE SITE DATA

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MOTIVATION

Global models output provided by numerous institutions, as well as satellite products and in-situ observations collected under the auspices of CEOP I project are now widely available. This poster presents the very preliminary results of a study aimed at intercomparing and evaluating the models' ability in predicting different weather variables both on a daily and a sub-daily basis, over different domains, and under various weather regimes. In this work a special focus on the diurnal cycle is given.

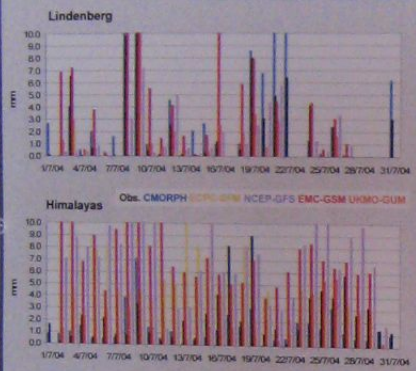
DATA AND METHODS

The period investigated is July 2004, and MOLTS from four global models are verified against five CEOP Reference Sites (RS) located from Mid-latitudes to the Equator. All the models are initialized at 12UTC for every run. Model characteristics and the RSs locations are briefly described in the tables exhibited in this section. Epson Meteo Centre will systematically provide its model output to CEOP Phase II. Only data from RSs flagged as "good" have been considered for the analysis, while data flagged as "bad" or "dubious" have been skipped. Satellite-derived precipitation estimates from NOAA CPC (CMORPH, Joyce et al., 2004), available at 0.5 degree resolution, are also considered for verification. For precipitation categorical statistics were performed but only the BIAS score is shown.

Name	Latitude	Longitude	Altitude
Lindenberg (Falkenberg) - BALTEX	52.17 N	14.13 E	73.0 meters
Cabauw - BALTEX	51.97 N	4.92 E	-0.7 meters
Bondville - GAPP	40.01 N	88.29 W	216.0 meters
Himalayas (Pyramid) - CAMP	27.90 N	86.81 E	5050.0 meters
Manaus - LBA	3.01 S	60.21 W	130.0 meters

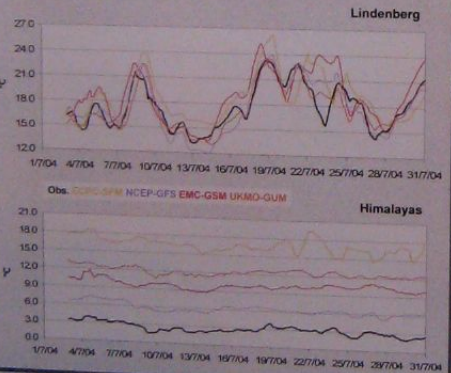
Institution	Model Name	Model Resolution	LSM	BC at the Surface
ECPC	SFM	T63L28	OSU2	16 soil types 12 vegetation classes
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NCEP	GFS	T254L64	SIB	9 soil types 13 vegetation classes
UKMO	Global Unified Model	0.83 x 0.56 degrees, 38 vertical levels	MOSES2	9 soil types 13 vegetation classes

MONTHLY BEHAVIOR

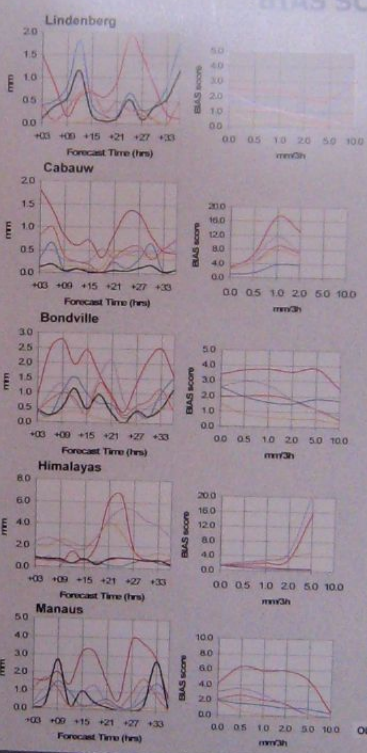


Three hours accumulated precipitations are exhibited for Lindenberg and Himalayas RSs. The observations are drawn against the forecasted values of the global models (validities +15h to +36h) and CMORPH satellite derived data. The occurrence of the precipitation events is usually well captured, what is evident though is that all the models, and for Lindenberg also CMORPH, tend to overestimate the quantity of rainfall.

The running mean over eight 3-hourly temperature records is computed for Lindenberg and Himalayas RSs. For Lindenberg the trend is reproduced by all models. ECPC-SFM and EMC-GSM temperatures are generally higher than observations, with a greater error during the warmest periods. UKMO and GFS have a lower error's magnitude. For Himalayas the dependence of the forecast accuracy from model resolution is evident, stressing the importance of interpolation methods for complex terrains.



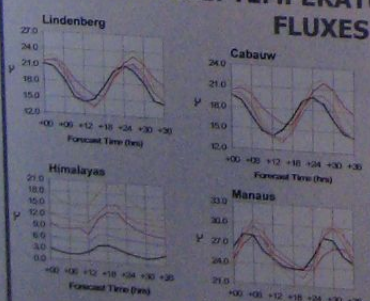
DIURNAL CYCLE: PRECIPITATION MEAN AND BIAS SCORE



Precipitation is one of the most difficult weather elements to predict, as it depends on many dynamical and physical processes. An accurate prediction of rainfall depends on the correct representation of all these processes in the model, including convective rainfall parameterization.
As highlighted in this section, models' behavior varies sensibly one from another, depending on the resolution and on the physical schemes adopted.
The mean of every output step from 31 daily runs is computed for the depiction of the diurnal cycle. The BIAS score is represented as a function of increasing precipitation thresholds to highlight the accuracy in reproducing rainfall frequency.
On average, for every station and for every model, with the exception of SFM, the mean quantity of diurnal rainfall is overpredicted. This is mainly due, in the central hours of the day, to the enhancement of convective events. Also CMORPH tends to overestimate the quantity of precipitation, especially for the heaviest episodes, with the exception of mountain regions and the southern emisphere, where rainfall is slightly underestimated.
On average, also the frequency of rain events is overpredicted (BIAS score > 1), with again the exception of the SFM model. This is true both for light or heavy rain episodes.

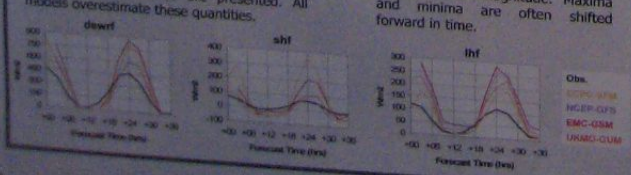
Obs. CMORPH ECPC-SFM NCEP-GFS EMC-GSM UKMO-GUM

DIURNAL CYCLE: TEMPERATURE AND RADIATIVE FLUXES



To study a complete diurnal cycle the mean of every single output step from 31 daily runs is computed. For all the RSs, with the exception of Himalayas, a single model behaves in a similar way to itself. EMC-GSM is generally warmer than observations in every time step. Other models tend to overestimate maxima and underestimate minima with a different error magnitude. Maxima and minima are often shifted forward in time.

For the Lindenberg RS downward shortwave radiation (dswrf), sensible heat (shf) and latent heat (lhf) fluxes are presented. All models overestimate these quantities.



SUMMARY AND CONCLUSIONS

- *Both daily and monthly temperature trends are well reproduced by all models.*
- *On average models tend to overestimate temperatures maxima and underestimate minima in the diurnal cycle.*
- *Heat and radiative fluxes are overestimated.*
- *All models, with the exception of SFM, tend to overpredict the quantity and the frequency of rainfall, especially for convective events.*
- *Model resolution is crucial for a more accurate forecast of both temperature and precipitation. Possibly some form of interpolation instead of the nearest grid point method could decrease the magnitude of errors.*
- *Significant model trends for several variables could be observed if the forecasts were extended in time. Runs up to 72 or 84 hours could be sufficient to get insight on model behavior without creating an excessive amount of data.*

FUTURE AIMS

This first intercomparison and verification effort will be further developed and completed considering both gridded and MOLTS data collected during at least a one-year period, and it will benefit from the inclusion of other global models, Reference Sites, and satellite-derived precipitation products.

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