Verification of Surface Weather Parameters at DWD

Ulrich Damrath

Deutscher Wetterdienst, P.O.Box 100465, 63004 Offenbach a.M., Germany

1 Time Series of Forecast Quality During the Last Year

Figs. 1 – 4 illustrate the behaviour of forecast errors for valid times 06 and 18 UTC from January to December 2003. The most important features of the seasonal variation of scores are similar to the results presented last year.

- Cloud cover: best results for winter months, overestimation of high cloud covers during summer at 6 UTC, general overestimation of high cloud covers at 12 UTC, but pronounced during summer.
- Cloud cover in different heights: frequency biases of low cloud covers near 1, non systematic behaviour of forecast quality concerning high cloud covers (frequency biases are sometimes higher than the maximum value drawn), possible reason: high cloud covers of high and medium clouds do not occur very often, small sample size compared to low clouds.
- Temperature: general underestimation of temperature at 18 UTC due to phase error in the diurnal variation (see section on diurnal cycle).
- Dew point depression: negative bias during most months (i.e. too moist especially for 18 UTC), better results for summer at 6 UTC.
- Extreme Temperatures: Minimum: underestimation during winter, small overestimation during summer, Maximum: best biases during Spring and Autumn, underestimation especially during the hot summer 2003.
- Wind direction: worst forecast during summer.
- Wind speed: in general slow underestimation, except for summer 6 UTC.
- Gusts: overestimation of gusts except for those greater than 25 m/s, worst forecasts during summer.
- Precipitation: worst forecasts during summer, small precipitation values are overestimated.

2 Diurnal Cycle of Forecasts and Observations for the Gridpoint Frankfurt/Main Airport

During summer conditions (Fig.5 for July 2003, Fig. 6 for August 2003) the diurnal cycle of temperature is predicted relatively well. The remaining old problem is that maximum values occur too early and the decrease during the afternoon is too rapid. During wintertime (Fig. 7 for January 2004) a strong negative bias occurs for all forecast times! It is worth mentioning that the extreme temperatures during July and August 2003 were predicted relatively well,

although predictions of dew point during August were bad with a maximum bias around 18 UTC of more than 3K. Wind speed is a little bit underestimated during daytime and decrease also too fast during afternoon (as could be expected due to the behaviour of temperature).

3 Results of QPF Verification Using Stations of High Density Network

During last year nearly the same patterns of errors in precipitation forecasts appeared as during the last years. A change of these error patterns can be expected, if the prognostic equation for drifting precipitation will be introduced into operational use. Until this time we will have:

- overestimation of precipitation in the windward side of obstacles and
- underestimation of precipitation in the leeward side,
- strong overestimation of precipitation during winter at the windward side of the obstacles.

Figs. 8 – 11 illustrate these typical errors.

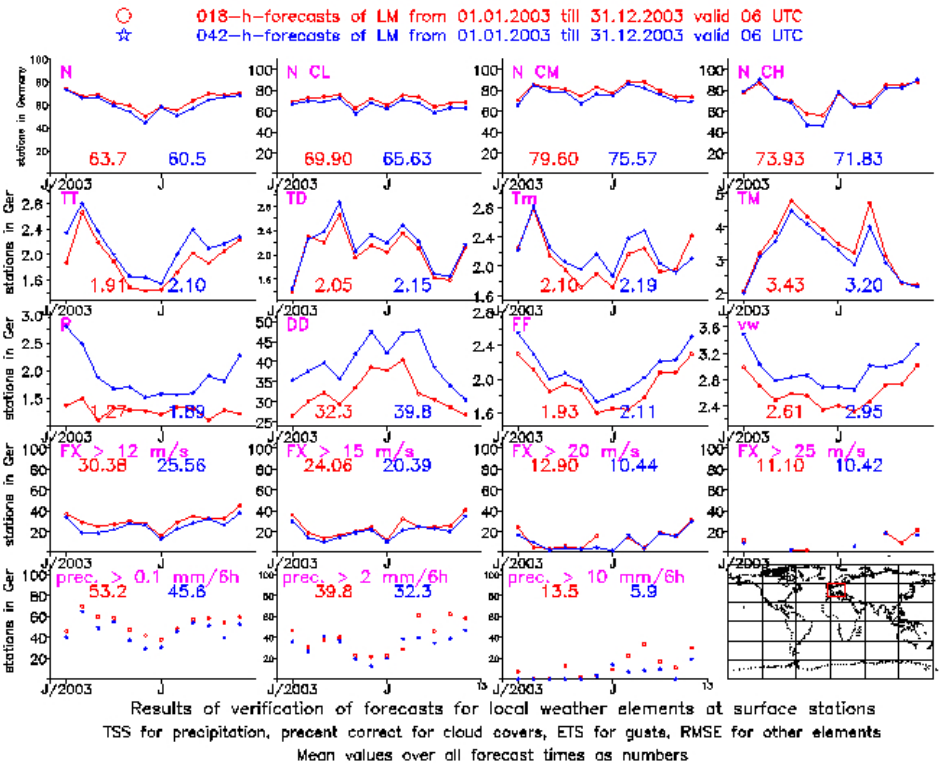

Figure 1: Results of verifcation for 18h and 42h forecasts at all Synop stations in Germany from January to December 2003. Percent correct for cloud covers, TSS for precipitation, ETS for gusts, Root mean square error for other elements (horizontal: time, vertical: score). Valid time: 06 UTC.

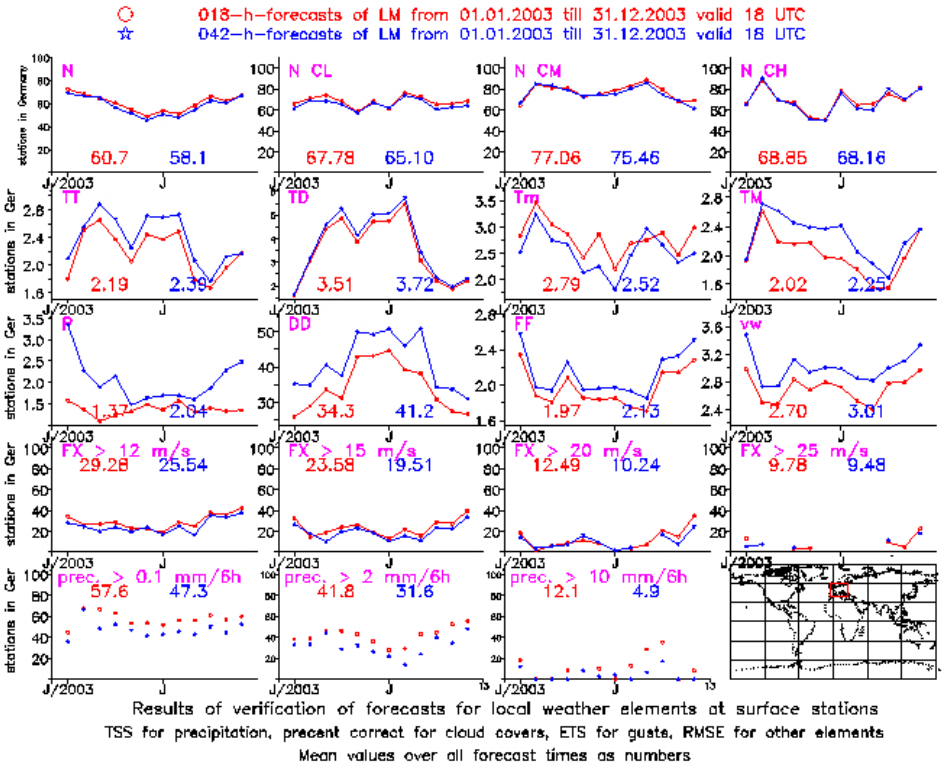

Figure 2: Results of verifcation for 18h and 42h forecasts at all Synop stations in Germany from January to December 2003. Percent correct for cloud covers, TSS for precipitation, ETS for gusts, Root mean square error for other elements (horizontal: time, vertical: score). Valid time: 18 UTC.

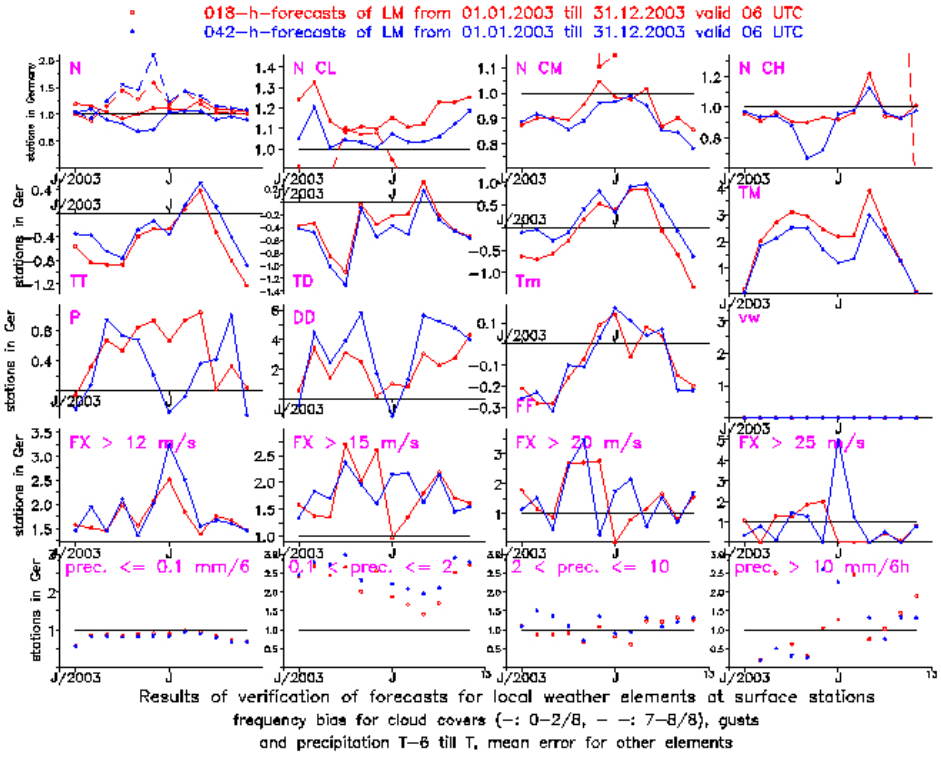

Figure 3: Results of verifcation for 18h and 42h forecasts at all Synop stations in Germany from January to December 2003. Frequency bias for cloud covers, precipitation and gusts. Bias for other elements (horizontal: time, vertical: score). Valid time: 06 UTC.

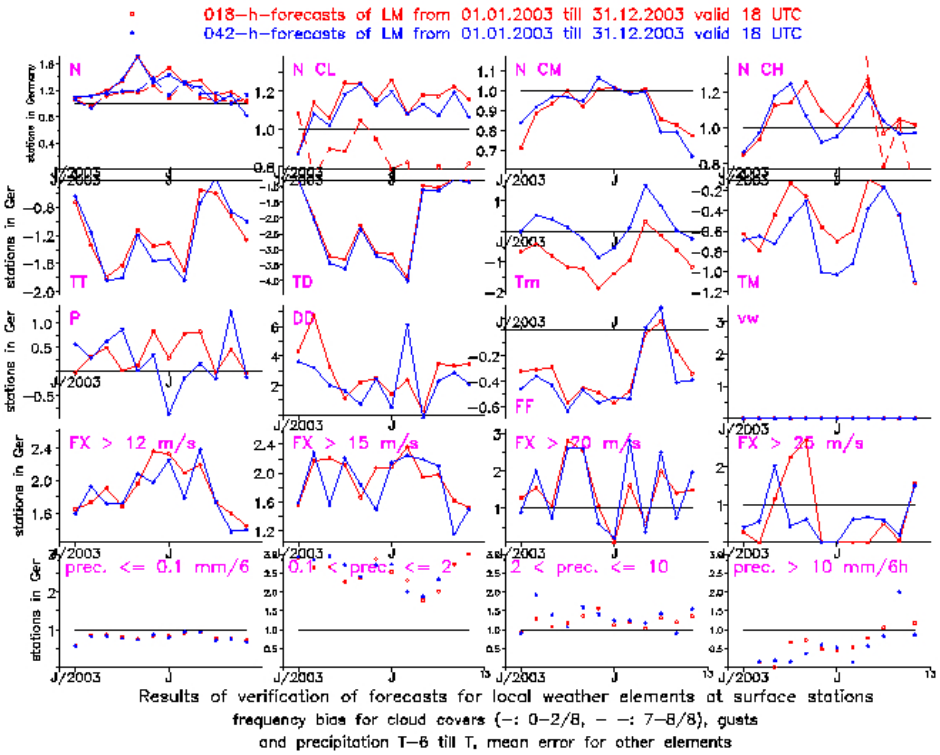

Figure 4: Results of verifcation for 18h and 42h forecasts at all Synop stations in Germany from January to December 2003. Frequency bias for cloud covers, precipitation and gusts. Bias for other elements (horizontal: time, vertical: score). Valid time: 18 UTC.

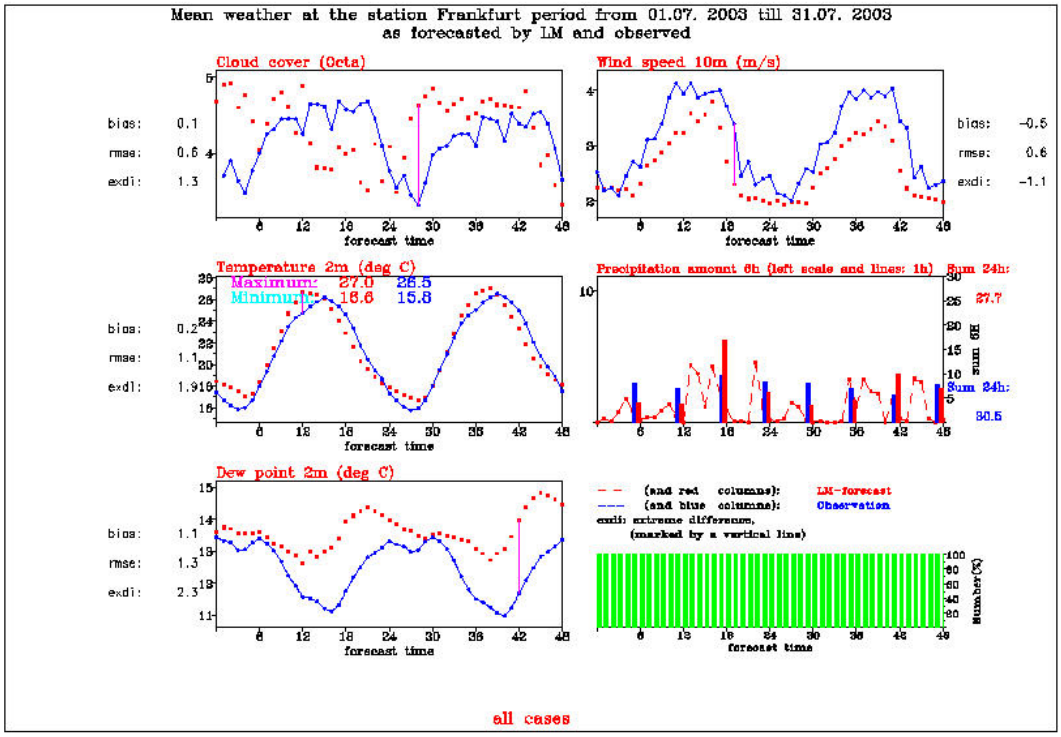

Figure 5: Diurnal cycle of different surface weather elements for the gridpoint Frankfurt/Main airport for July 2003 as forecasted and observed.

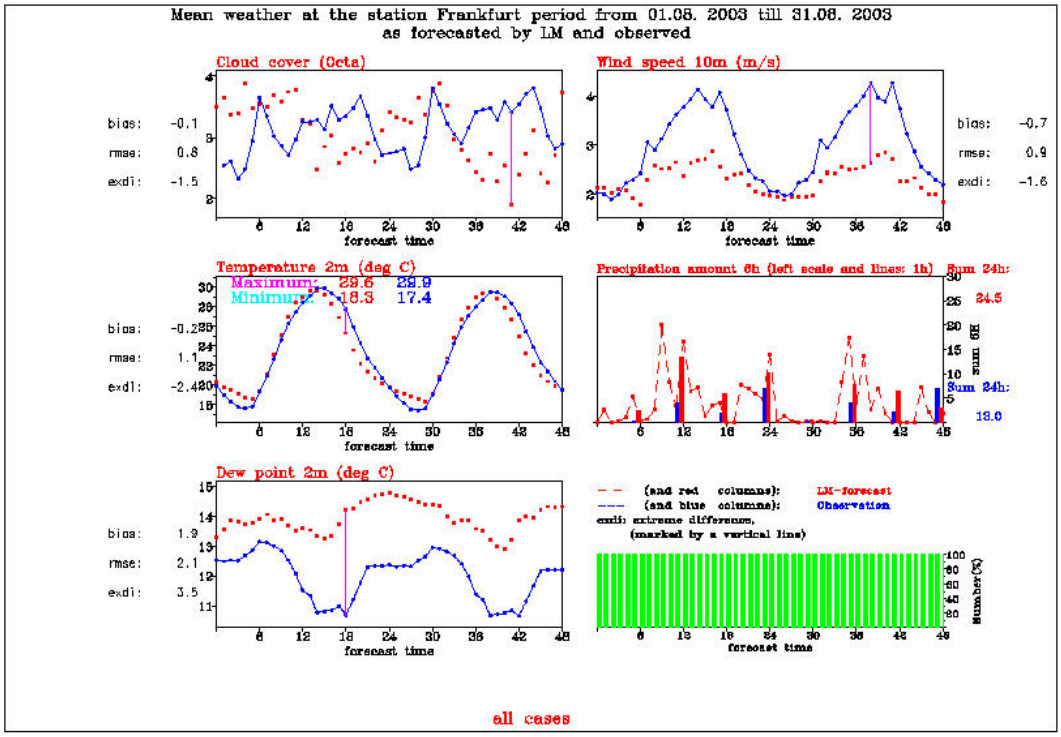

Figure 6: Diurnal cycle of different surface weather elements for the gridpoint Frankfurt/Main airport for August 2003 as forecasted and observed.

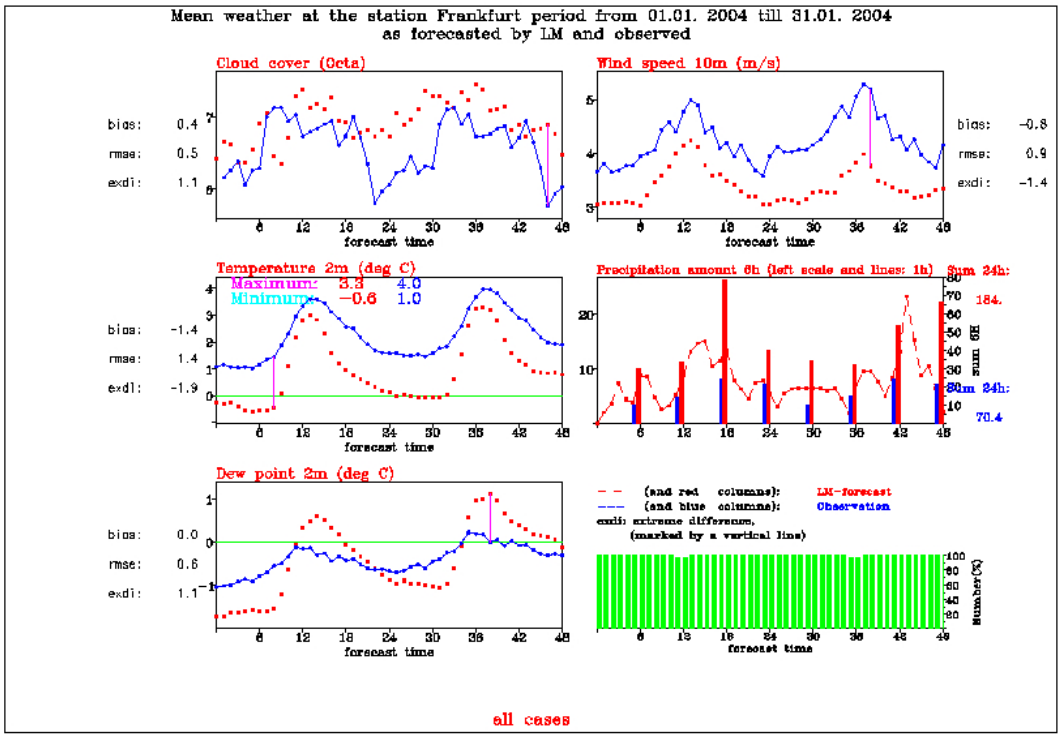

Figure 7: Diurnal cycle of different surface weather elements for the gridpoint Frankfurt/Main airport for January 2004 as forecasted and observed.

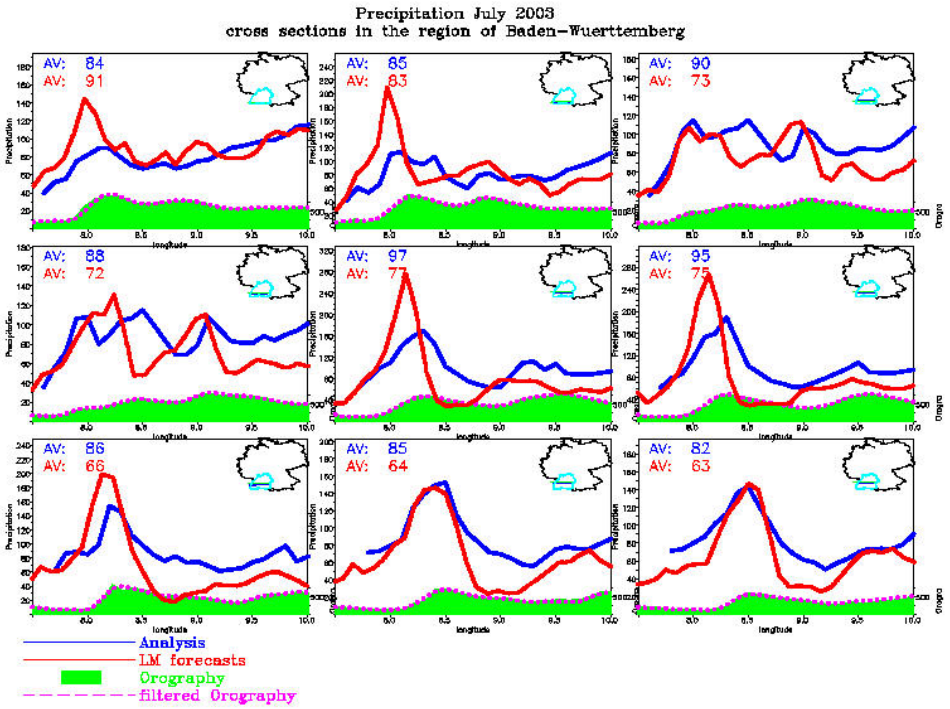

Figure 8: Various cross sections of observed and forecasted precipitation amounts for July 2003 over the southwestern part of Germany.

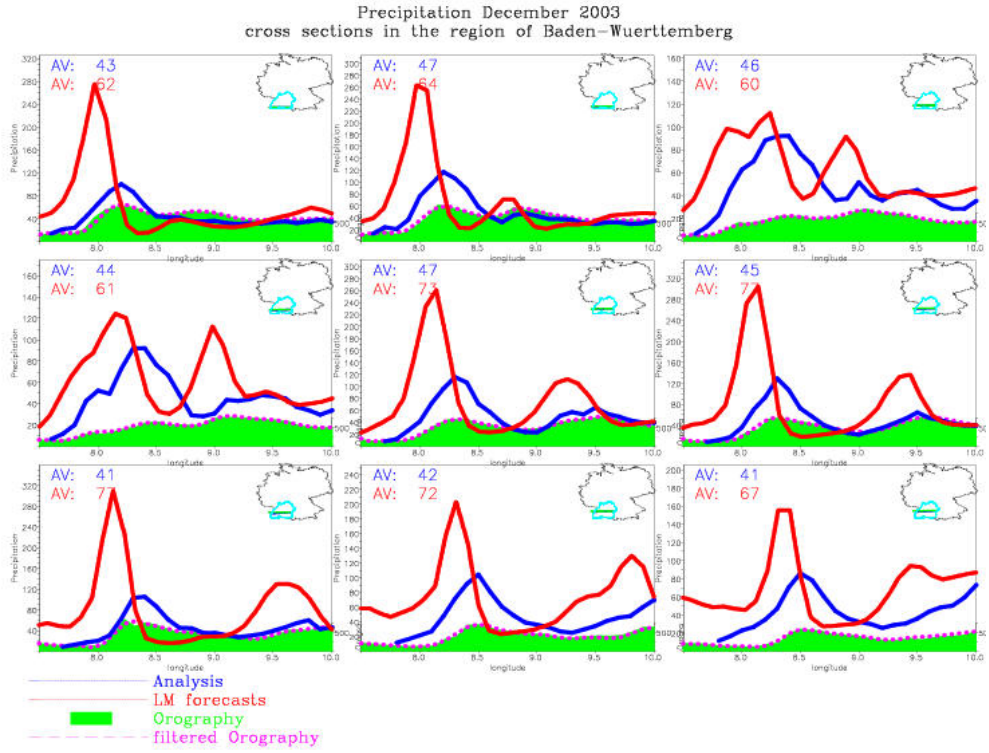

Figure 9: Various cross sections of observed and forecasted precipitation amounts for December 2003 over the southwestern part of Germany.

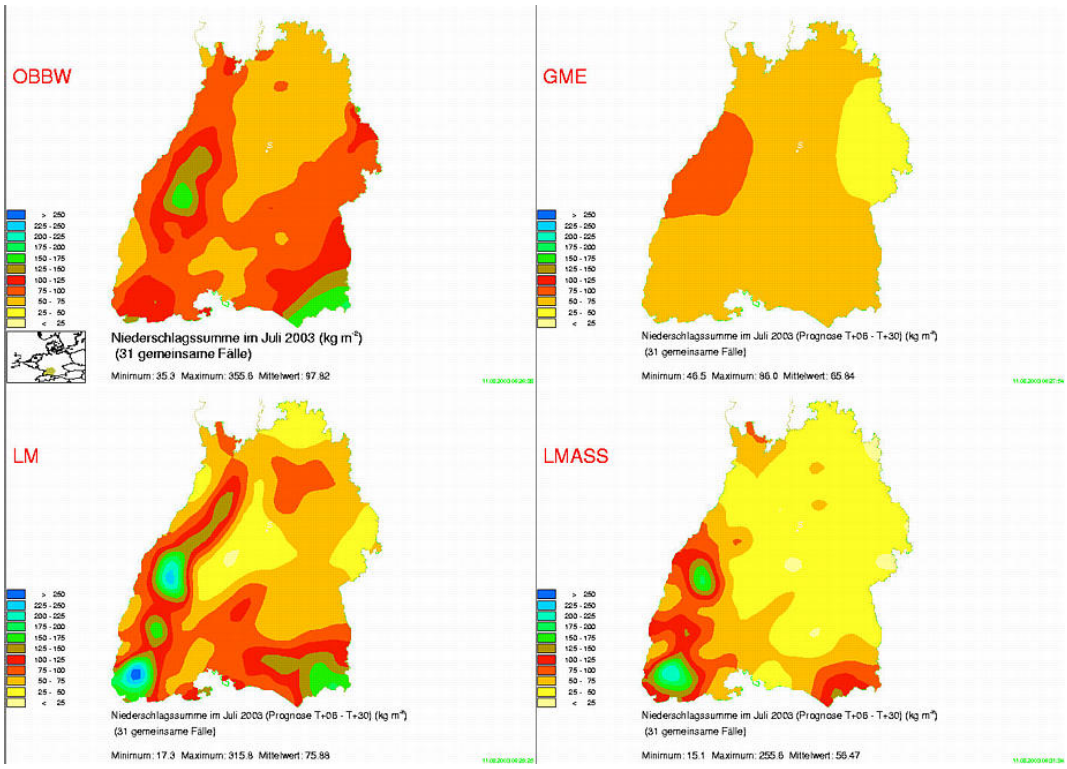

Figure 10: Horizontal distribution of observed and forecasted precipitation amounts for July 2003 over the southwestern part of Germany (OBBW: observation, GME: global model, LM: Lokal-Modell, LMASS: assimilation run of LM).

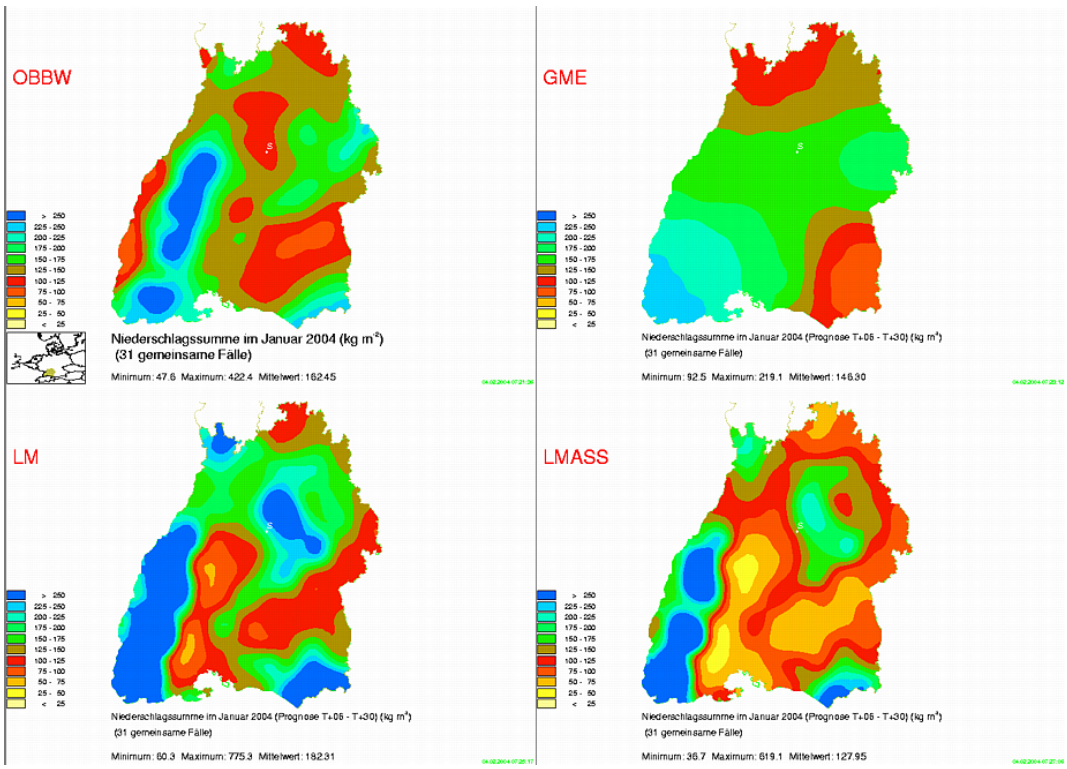

Figure 11: Horizontal distribution of observed and forecasted precipitation amounts for January 2004 over the southwestern part of Germany (OBBW: observation, GME: global model, LM: Lokal-Modell, LMASS: assimilation run of LM).