Seasonal verification over Poland

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1 Introduction

The surface fields of the LM_ PL have been verified for Polish SYNOP stations and the precipitation field has been verified for rain gauges. For the verification before June 2007, the model data were retrieved from model version 3.5. For verification after that date, the model data are retrieved from model version 4.0. The model runs in an operational mode at 14-km grid spacing, twice a day 00 UTC and 12 UTC.

2 Surface verification

The LM_PL had been verified for all seasons from June 2007 to May 2008 JJA, SON, DJF, MAM. The mean error (ME) and the root square mean error (RMSE) were calculated for the following parameters: the temperature at 2m (T2m), the dew point at 2m (TD2m), the wind speed 10m (Wspeed) and the pressure reduced to mean sea level (MSLP). ME and RMSE were calculated using 8 forecast time points (every 6 hours) for 48 hours forecast starting at 00 UTC. ME and RMSE of the surface variables as a function of the forecast time are presented on figures 1 - 4.

3 Precipitation verification

Verification for the 24hour accumulated precipitation (a comparison with 60 SYNOP stations) had been made for all seasons from June 2007 to May 2008. Seven indices from the contingency table were calculated. In this paper only frequency bias index (FBI), probability of detection (POD) and false alarm ratio (FAR) are presented for thresholds: 0.2, 2, 10, 20 mm. These indices are shown on figures 5-9. Figures 10-21 contain distribution pattern of seasonal precipitation for model, rain gauges (301 stations) and their differences.

4 Results

4.1 The 2 m temperature

Mean error below zero occurred in winter (December, January, February). In spring (March, April, May) and summer (June, July, August) was above zero. In autumn (September, October, November) mean error was around zero. In summer and spring a diurnal cycle of RMSE was observed with maximum at noon (FCT 12, 36 h) and minimum at night (FCT 6, 30 h). No explicit diurnal cycle occurred in winter and autumn.

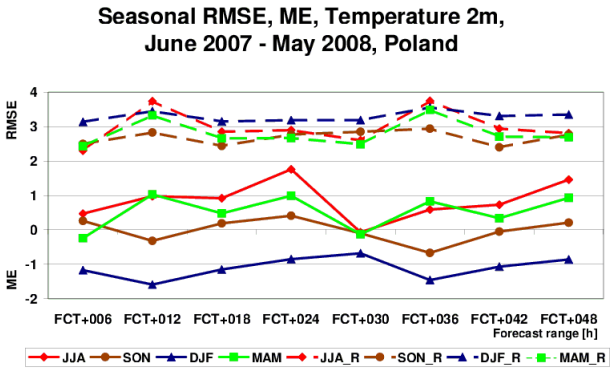

Figure 1: Sesonal RMSE, ME, Temperature 2m, June 2007 - May 2008, Poland

4.2 The dew point temperature at 2m a.g.l

ME around zero in winter and autumn was observed. In summer and spring ME was below zero. Diurnal cycle of RMSE was noticed in summer and spring. There was no explicit diurnal cycle of RMSE for winter and autumn.

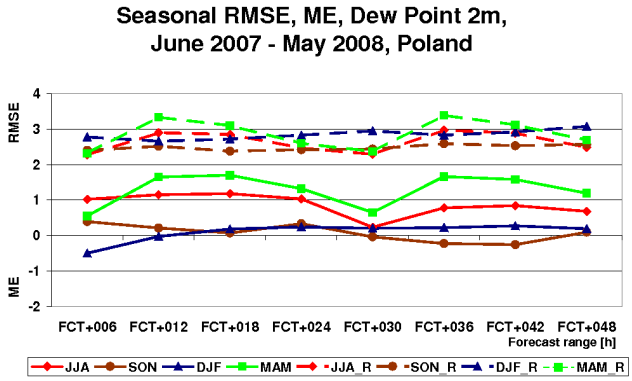

Figure 2: Sesonal RMSE, ME, Dew Point 2m, June 2007 - May 2008, Poland

4.3 The wind speed 10m a.g.l.

In DJF, ME was below zero at noon and above zero at night. ME above zero occurred for JJA SON. In MAM, ME was near zero. Fluctuations of ME for all seasons were really small. ME of wind speed was from [-0.27, 0.64] m/s. Also fluctuations of RMSE for all seasons were very small. No clear diurnal cycle was noticed.

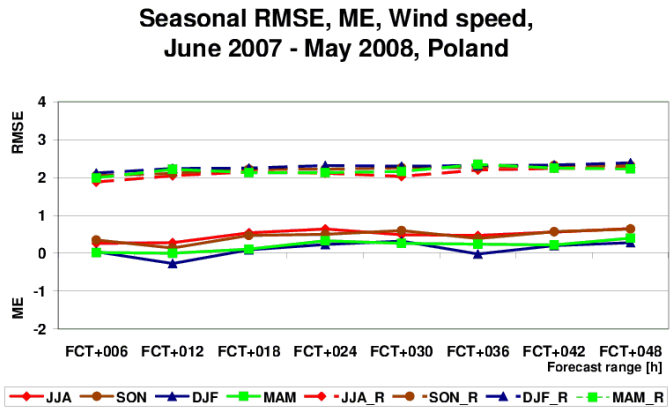

Figure 3: Sesonal RMSE, ME, Wind speed, June 2007 - May 2008, Poland

4.4 The sea level pressure

ME for all seasons increased with forecast time. ME was positive in winter for all the forecast ranges. In autumn and summer ME was near zero (FCT 6h - FCT 18h) and negative (FTC 24h FCT 48h). In spring, ME was negative for almost all forecast ranges. Similar to ME, also RSME increased with forecast time for all seasons. The highest values were observed in winter time (above 3h Pa) and the smallest in summer.

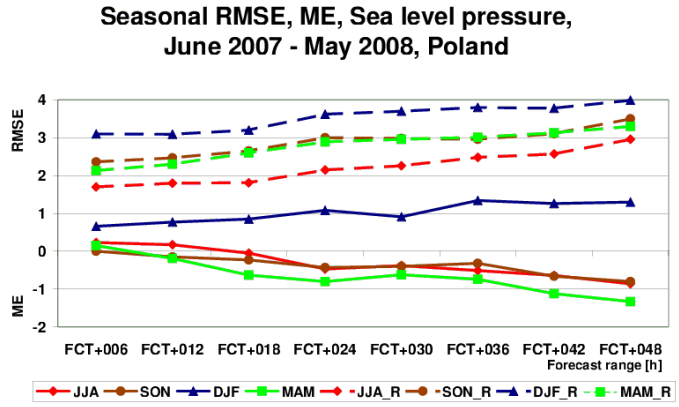

Figure 4: Sesonal RMSE, ME, Sea level pressure, June 2007 - May 2008, Poland

4.5 24h accumulated precipitation

Three indices: Frequency Bias Index, Probability of Detection and False Alarm Ratio computed for two forecast ranges (FCT 24h , FCT 48h) are presented below (fig5 - fig.6). FBI in DJF, for threshold 0.2 mm and 2 mm was above 1 for the both of forecast ranges. It implies over forecasting. FBI between 0.96-1.01 (almost no bias) was noticed for threshold 2 mm for the first forecast day in JJA, SON, MAM and for the second forecast day in JJA. Underestimation of precipitation occurred for higher thresholds (10mm, 20 mm) for the first forecast range in all of the seasons and in summer 2007 and autumn 2007 for the second day of forecast. In winter 2007/2008 and spring 2008 intensive, heavy precipitation was predicted more than in reality occured.

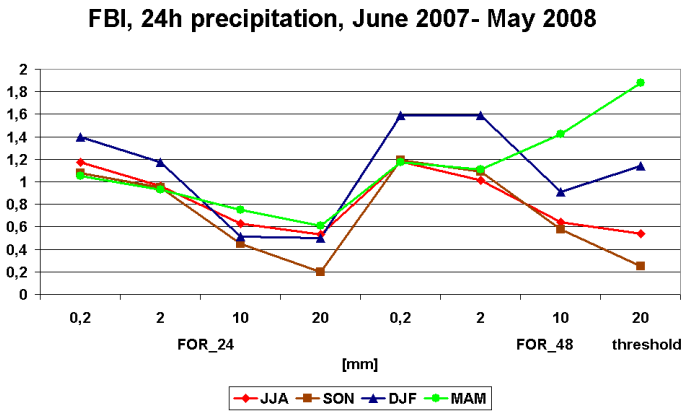

Figure 5: Frequency Bias Index, 24 h accumulated precipitation, the first (FCT_24) and the second (FCT_48) day of forecast, June 2007 - May 2008, Poland

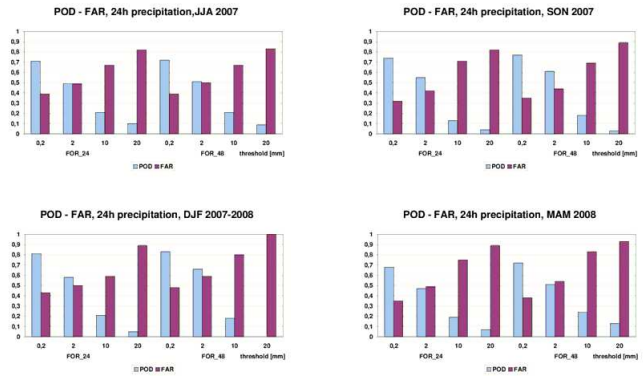

Figure 6: Probability od Detection, False Alarm Ratio, 24 h accumulated precipitation, the first (FCT_24) and the second (FCT_48) day of forecast, JJA 2007,SON 2007, DJF 2007/2008, MAM 2008, Poland

Distribution patterns of precipitation in the spring and the winter showed overprediction for almost whole country area. In summer underestimation occurred in central Poland and also partially near seaside and mountain areas.

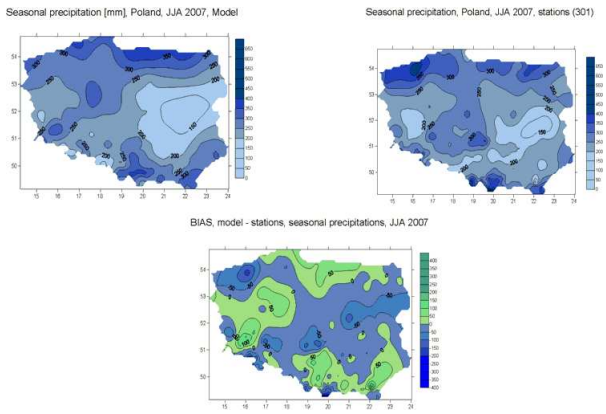

Figure 7: Distribution pattern of seasonal 24 h accumulated precipitation for model, rain gauges (301 stations) and BIAS, JJA 2007, Poland

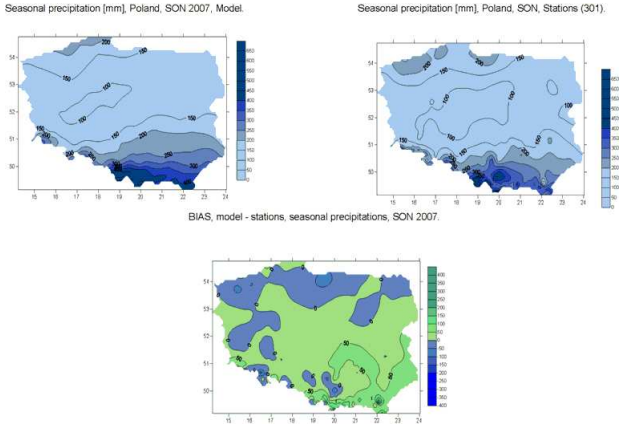

Figure 8: Distribution pattern of seasonal 24 h accumulated precipitation for model, rain gauges (301 stations) and BIAS, SON 2007, Poland

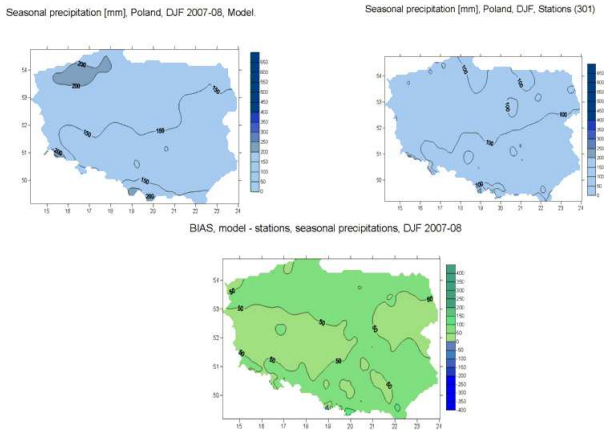

Figure 9: Distribution pattern of seasonal 24 h accumulated precipitation for model, rain gauges (301 stations) and BIAS, DJF 2007/2008, Poland

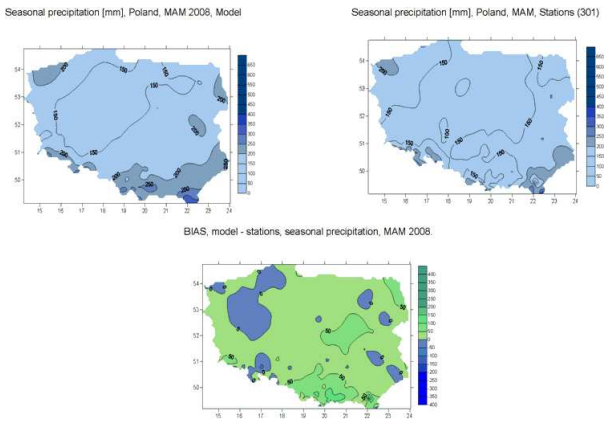

Figure 10: Distribution pattern of seasonal 24 h accumulated precipitation for model, rain gauges (301 stations) and BIAS, MAM, Poland