

Verification of Surface Weather Parameters at MeteoSwiss

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The following nomenclature for LM is used in the text below: aLMo means "Alpine Model", the LM version operational at MeteoSwiss and LMD means the operational LM version at DWD.

1 High Resolution Verification of Daily Cycle over Switzerland

Results of aLMo and LMD have been computed monthly and seasonally for 2m-temperature, 2m-dewpoint and 2m-dewpoint depression, 10m-wind, precipitation (hourly sums for daily cycle and 6h sums for scores) and for cloud cover (3-hourly intervals). One of the main differences between aLMo and LMD is the prognostic TKE-scheme, operational at DWD, but not yet at MeteoSwiss. During 2002 several test versions of aLMo have been verified, such as the cloud ice scheme, the prognostic rain scheme and the multi-layer soil scheme. For latter: see report *Verification of the New LM Version LM 2.18 with Prognostic TKE and Multi-Layer Soil Model* in Section 9 of this Newsletter, which includes also Figures of operational verification of aLMo and LMD for Summer 2002.

The following points are of main interest:

- The 2m-temperature cooling in the night is too pronounced and the diurnal amplitude is too large (with the exception of Summer for gridpoints < 800m) and the daily maxima is reached ~ 1.5 hour too early. In LMD the diurnal amplitude was even ~ 0.5 K larger than in aLMo (except in Winter). The 2m-temperature negative bias is most pronounced in Winter during nighttime: it was of the order of 2.5K for gridpoints < 800m in the Winter 2001/2002 (but only 1.2 K in LMD with the TKE-scheme).
- The daily cycle of 2m dewpoint depression is much too little (aLMo always too dry during nighttime) and the daily cycle is not well reproduced. The TKE scheme, operational for LMD, corrects these errors.
- The results for precipitation are summarized in Table 1 with the scores of frequency bias of the four seasons for the thresholds 0.1, 2, 10 and 30 mm/6h for aLMo and LMD. It shows an overestimation for low amounts (0.1 mm/6h) of 50% (except Autumn). The high amounts (10 mm/6h) are underestimated, especially during the last Autumn (by 30%) when these cases were more frequent (4.2% of all cases). In Summer there is a strong diurnal cycle on the mountain gridpoints, that is not observed (due to a much too pronounced convection at daytime) and for gridpoints < 800m the daily maxima are forecasted too early and are too high. Differences between aLMo and LMD, observed during 2001, were much littler during 2002: aLMo gave $\sim 10\%$ less precipitation than LMD in winter, in spring aLMo gave $\sim 5\%$ more and in summer 15% more than LMD, in autumn the amounts of both models were very similar. This means that the introduction of the nudging assimilation in aLMo in November 2001 solved the problem of great differences between both models (see report "WP3.8.1" by Marco Arpagaus in Section 9 of this Newsletter).

Table 1: Frequency bias (%) of predicted precipitation over Switzerland. For all 6-h sums from + 6h till + 48h of all 00 UTC and 12 UTC forecasts, compared to 69 ANETZ stations. The LM precipitation is the mean over 5 gridpoints. For the high amounts (10 and 30 mm/6h) the percentage of occurrences (%) is given.

Threshold	Winter 01/02	Spring 02	Summer 02	Autumn 02
0.1 mm / 6 h				
aLMo	164	151	157	112
LMD	176	142	141	114
2.0 mm / 6 h				
aLMo	133	108	135	87
LMD	145	102	118	88
10 mm / 6 h				
aLMo	1.08	2.63	3.12	4.21
LMD	106	69	96	66
LMD	123	70	87	68
30 mm / 6 h				
aLMo	0.024	0.292	0.299	0.436
LMD	100	66	132	105
LMD	132	70	114	88

- Verification of 10m-wind (for stations below 800m) gave an overestimation of the wind-speed of ~ 0.5 -1.0 m/s both in aLMo and LMD. The diurnal cycle is qualitatively better in LMD (due to TKE-scheme) but the daytime values are even higher, i.e. positive bias greater (see also COSMO Newsletter 2, page 201).
- The diurnal cycle of total cloudiness not well reproduced in Spring and Summer (Fig 1): there is a positive bias during the night (up to 0.5-1.0 octa). Results in aLMo and LMD are very similar.

2 Daily Verification of aLMo cloudiness with the Meteosat VIS-Channel

This verification is operational for the full aLMo domain.

3 Verification of the Vertical Profiles at TEMP Stations

See Section 8.2.1 for the operational verification of vertical profiles.

4 Subjective Verification of aLMo by Bench Forecasters

The bench forecasters of MeteoSwiss re-started in December 2002 a subjective verification of aLMo (see also COSMO Newsletter No.1, p. 51 and No.2, p. 60) with the testchain "prognostic rain scheme" which run in parallel to the operational aLMo-forecast since 13.11.2002. Emphasis was given to the general performance of precipitation forecasts with the new scheme (maxima, distribution, timing) and to the relative performance as compared to the operational runs. Results (till 12 February 2003) show: Precipitation forecasts with the prognostic rain scheme were judged better in 38% of the cases, similar in 50% and worse in 12%.

Total Cloud Cover 00UTC Summer 2002 missing forecasts: 1 Total Cloud Cover 12UTC Summer 2002 missing forecasts: 1

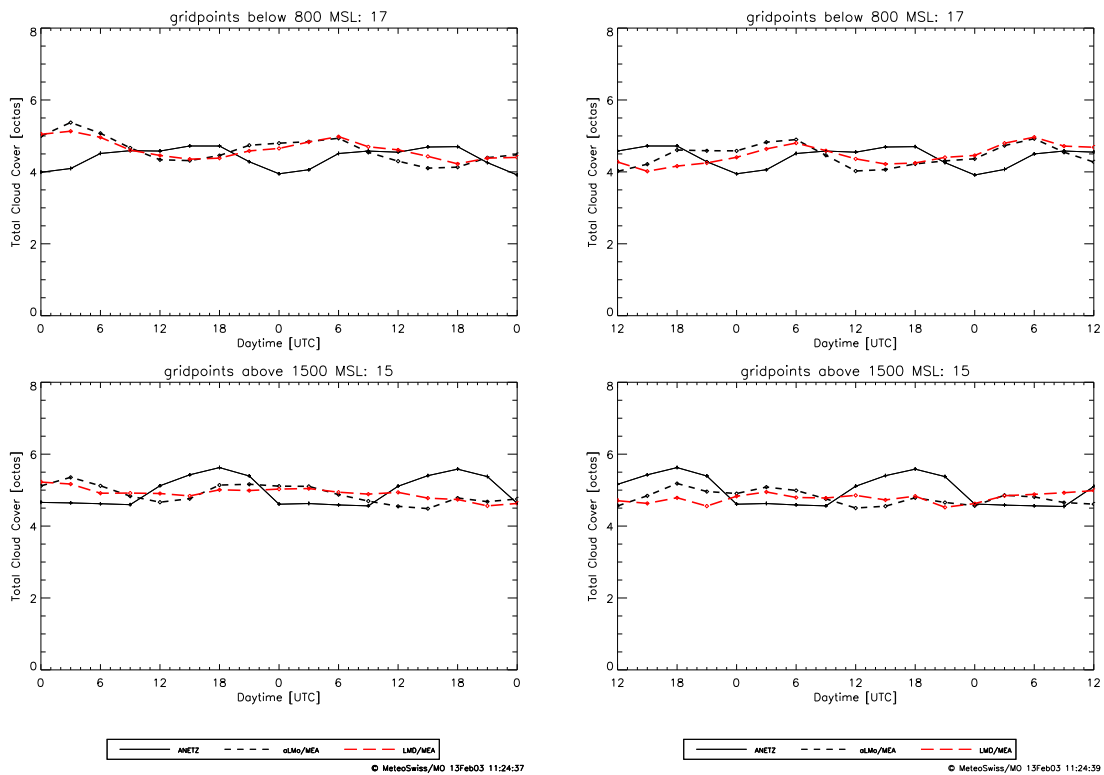


Figure 1: Verification of the daily cycle of total cloud cover over Switzerland in Summer 2002 for gridpoints < 800m (upper part, 17 locations) and for gridpoints > 1500m (lower part, 15 locations), for 00 UTC runs (left) and 12 UTC runs (right). Observations (ANETZ: full line black), aLMO (dashed black), LMD (dashed red). The LM total cloud cover is the mean of 41 gridpoints around the observation station and for three hours, to take in account that an observer sees in the mean of sky radius of ~ 30 km.