

Verification of test chains (LM v. 2.18 with prognostic TKE and multi-layer soil)

Francis Schubiger
4th COSMO meeting
Warsaw , 26.09.02

- Overview of the verified testchains in 2002
- The experimental set-up for testchain with LM version 2.18: the different model configurations
- Verification results of the daily cycle with hourly observations over Switzerland of:
 - 2m-temperature
 - 2m dewpoint depression
 - 10m windspeed
- Summary

The verified testchains in 2002

- Forecasts with / without nudging
April 2001 - February 2002: results on COSMO website
 - prognostic TKE scheme
14.08 - 06.11.01: results on COSMO website
 - New prognostic cloud ice scheme
17.01 - 09.02.02: results presented at the Workshop (Doms)
 - EUCOS: Impact with reduced SYNOP network
19.10.99 - 15.11.99: results presented at the Workshop (Bettems)
 - Two-time level scheme with 3D-transport of precipitation
09.08 - 18.08.02: results presented at the Workshop (Gassmann)
 - WP 3.8.1: identify cause for precipitation differences
results presented at the Workshop (Arpagaus)
 - New LM version 2.18 with prognostic TKE-scheme and multi-layer soil
 - Comparison of the operational model versions running at MCH and DWD
-

Experimental set-up "LM version 2.18"

- Three periods (each with 6 or 7 forecasts)
 - summer convective (high & low pressure): 17 - 23.08.01
 - winter advective (cold/mild, precipitation): 25 - 30.12.01
 - winter high pressure (stratus): 10 - 15.01.02
- The 3 model configurations: all with grid mesh 7 km on the operational domain of aLMo [385x325 gridpoints] with 45 levels
 - LM 2.17
 - LM 2.18
 - LM 2.18 with prognostic TKE and multi-layer soil

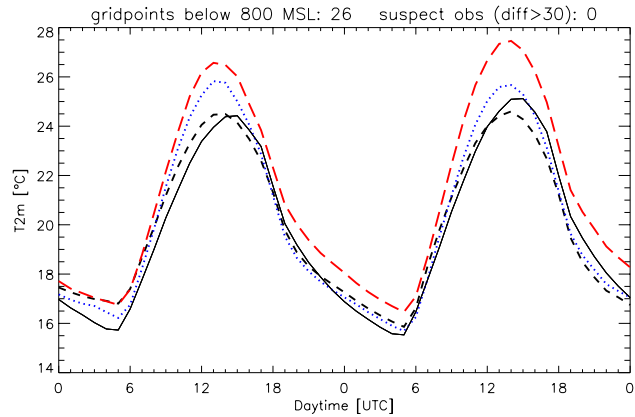
For each model configuration:

a **continuous assimilation** (starting one day earlier) and a **daily 48h forecast** (00UTC) have been computed and the forecasts verified with the surface verification package over Switzerland.

- These 3 configurations have also been compared to the operational forecasts running at MCH and DWD:
 - *aLMo operational at MCH*
(in 2001: version 2.4+ / summer 2002: version 2.17)
 - LM operational at DWD: 325 x 325 gridpoints 35 levels
 - prognostic TKE-scheme
 - initial state: nudging & soil-moisture analysis
 - since 08.11.01: new horizontal diffusion scheme
 - since 09.04.02: new calculation of 10m-wind (roughness length)
-

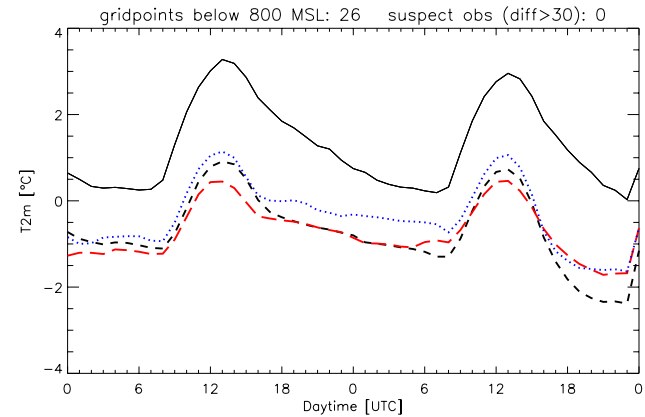
2m-temperature: daily cycle (gridpoints < 800m)

17 - 23.08.01 (conv)



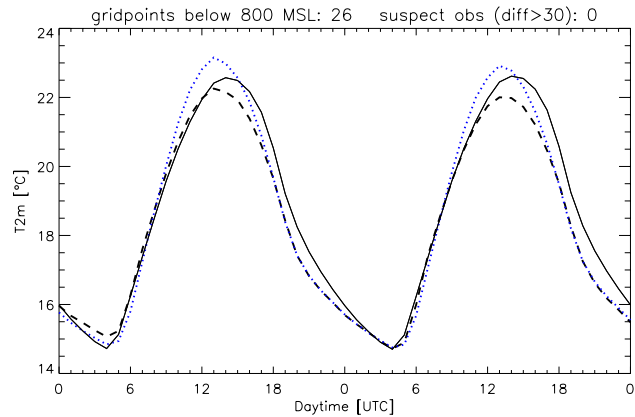
— ANETZ - - - RF2 - - - TS2 DWD
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25 - 30.12.01 (adv)



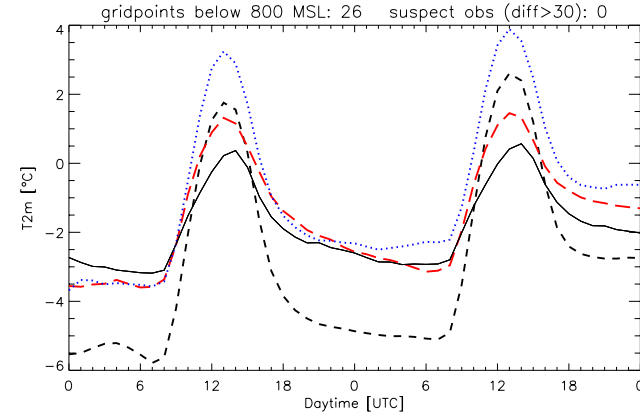
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Summer 2002



— ANETZ - - - aLMo LMD
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10 - 15.01.02 (high)

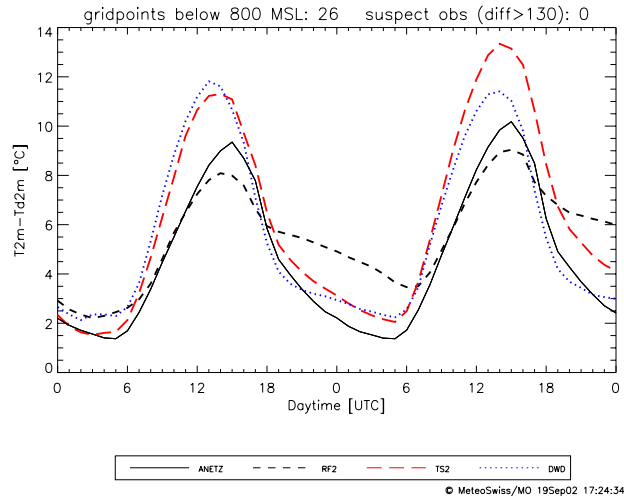


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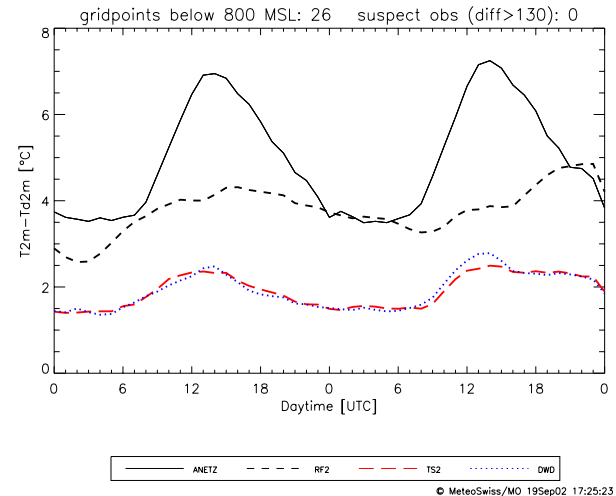
model: aLMo opr (Summer 2002) aLMo 2.17 aLMo 2.18 LM-DWD

2m-dewpoint depression: daily cycle (gridpoints < 800m)

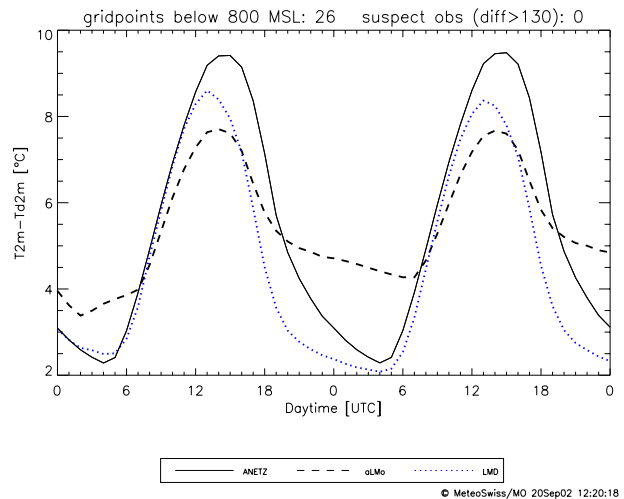
17 - 23.08.01 (conv)



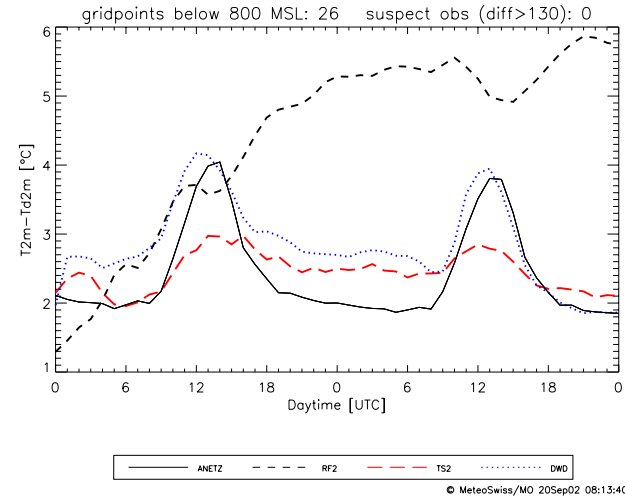
25 - 30.12.01 (adv)



Summer 2002



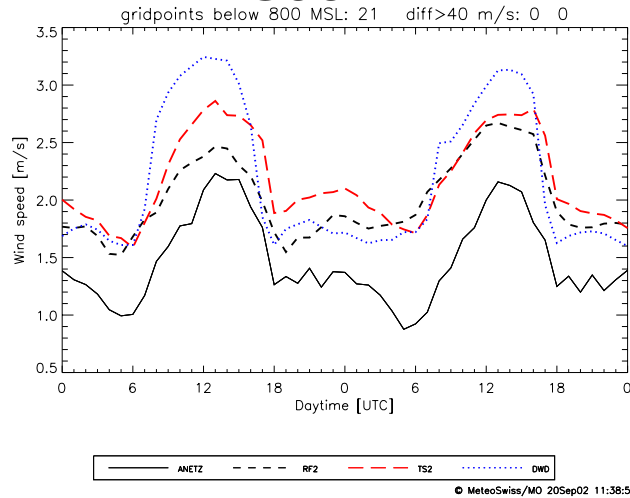
10 - 15.01.02 (high)



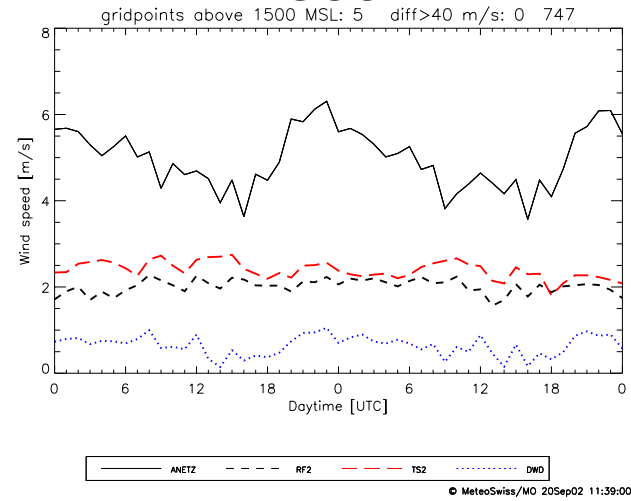
model: aLMo opr (Summer 2002) aLMo 2.17 aLMo 2.18 LM-DWD

10m-wind speed: daily cycle

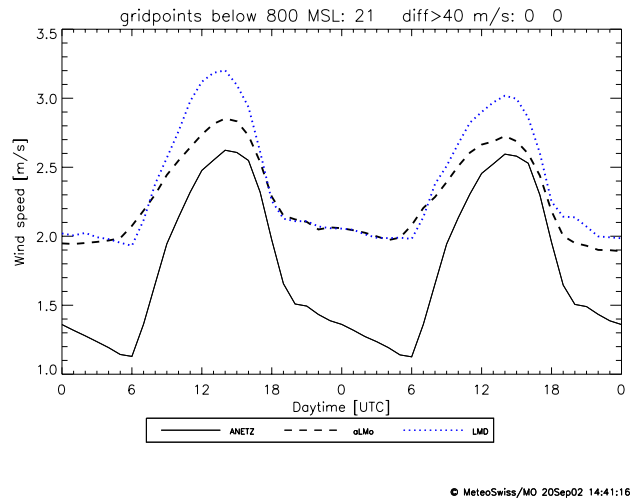
17 - 23.08.01 (conv)
< 800m



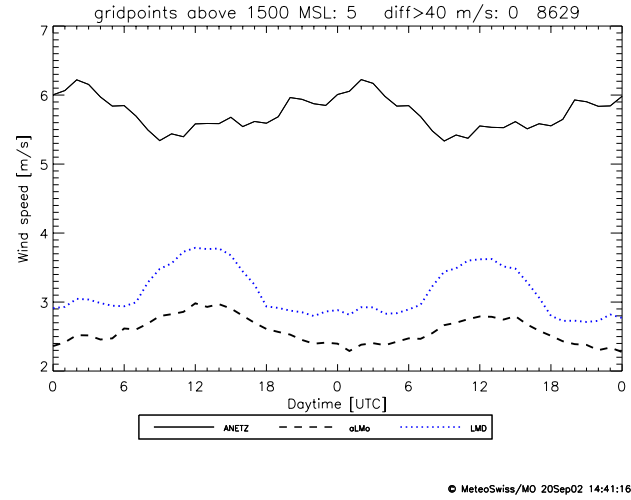
17 - 23.08.01 (conv)
> 1500m



Summer 2002
< 800m

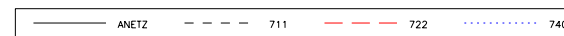
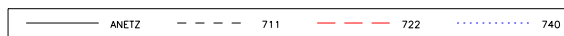
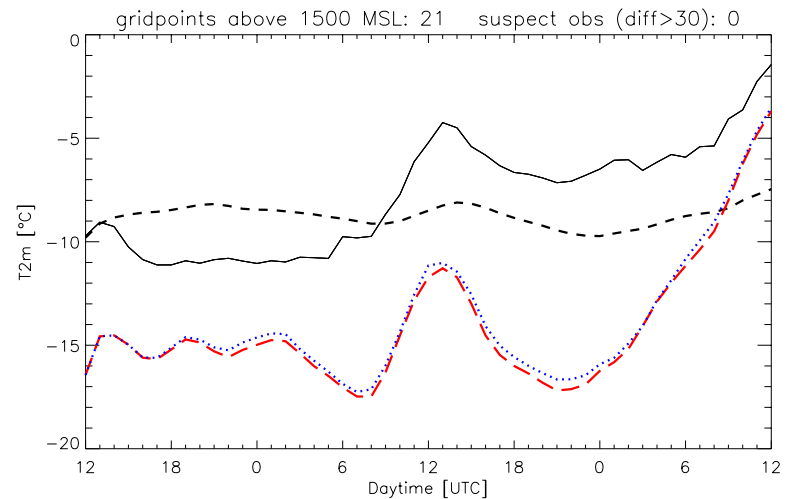
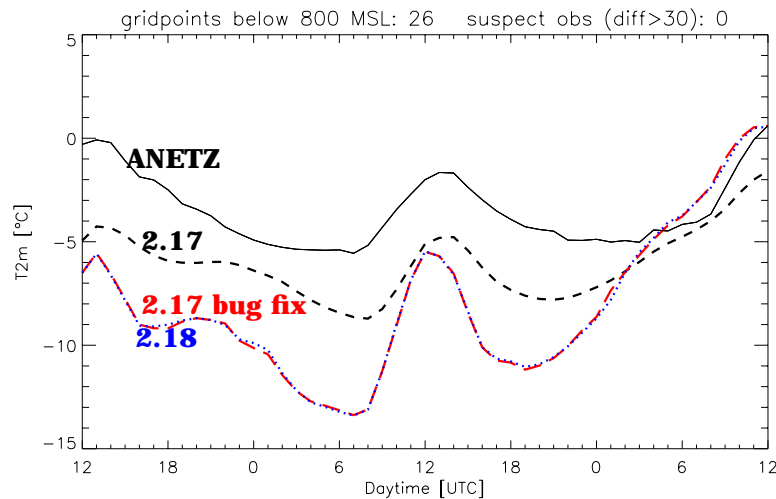
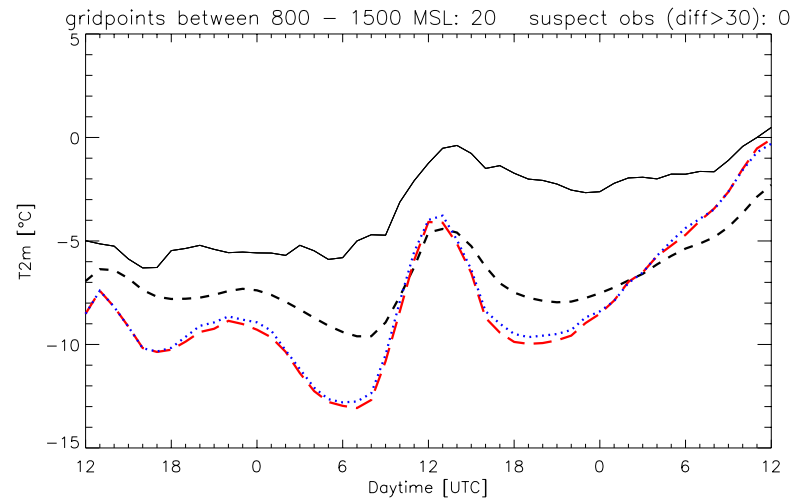
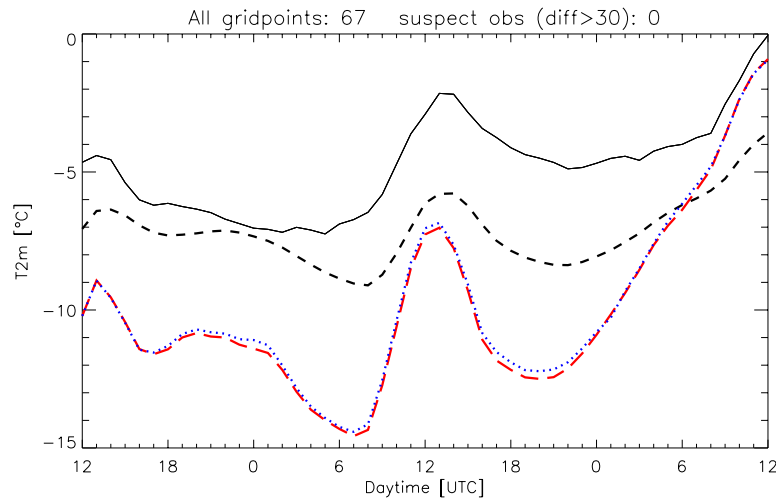


Summer 2002
> 1500m



model: aLMo opr (Summer 2002) aLMo 2.17 aLMo 2.18 LM-DWD

2m-temperature: aLMo forecasts of 21.12.1999 12 UTC initial fields from GME



2.17 bug fix: correction of error in calculation of ground temperature when ground covered by snow

Summary

- **2m-temperature**

TKE: (slightly) increased diurnal amplitude in summer
+ multi soil layer: increased diurnal amplitude in summer
reduced diurnal amplitude in winter

- **2m dewpoint depression**

TKE: more realistic diurnal amplitude
in winter: above 800m much wetter (lower values)
+ multi soil layer: amplitude slightly increased in summer
for g.p < 800m, otherwise reduced
[some stations in valleys and south of the Alps:
wetter in daytime
some stations in Jura, NW-CH: drier in daytime]

- **10m windspeed**

TKE: more realistic diurnal amplitude, but higher
values in daytime (i.e. greater positive bias)
above 1500m: values reduced by a factor ~ 3-5
reduced influence of roughness length (in conjunction with TKE):
above 1500m: values increased by a factor ~ 3-5

- ***Bug in calculation of ground temperature***

(error if ground covered by snow: corrected in version 2.18)
after correction: 2m-temperature reduced by > 5 K (!) in presence
of snow at the begin of forecast from GME-fields
in forecasts from own assimilation cycle: similar 2m-temperature
