The revised Diagnostics of 2m Values

- Motivation, Method and Impact -

M. Raschendorfer, FE14
low- and mid level cloud cover in %

st_time=00Z28APR2007  vers=ana_lm2.
surface roughness [m] (over land) (ana_lm2_lm)

soil water fraction of field capacity [FCF] Lev 1 (ana_lm2_lm)

difference of 2m-temperature [K] (over land) (out_lm2_lm - ana_lm2_lm)

difference of 2m-dew-point-temp. [K] (over land) (out_lm2_lm - ana_lm2_lm)

pr_time=12Z27APR2007  pr_hour=12hr
Joined frequency distribution of roughness length and error of T2m:

pr_time=12Z27APR2007 pr_hour=12hr
Time-Height Cross-section for “errors” in the boundary layer:

Temperature “error”

Dew point “error”

Too cold

Too moist
The feed back with soil moisture analysis SMA:

- deviation of $T_{2m}$ compared to SYNOP-measure
- daily cycle of $T_{2m}$, $T_{P2m}$
- Diagnosis onto 2m level
- modified relation between sensible and latent heat flux
- parameters controlling evapotranspiration:
  - min. stomata resistance, PLCOV, LAI, root depth, sealing, soil type, …
- soil moisture

daily cycle of boundary layer profiles for temperature and humidity
Diagnosis of 2m-values with respect to a SYNOP lawn:

- Exponential roughness layer profile is valid for the whole grid box,
- but it is not present at a SYNOP station
Accumulated soil moisture increments of SMA for routine and Exp 6343:

The accumulated effect of SMA on soil moisture averaged along a domain that more or less covers Germany is plotted for the fist 6 weeks of Exp. 6343.

For about the first 14 days SMA of Exp. 6343 (green and blue lines) takes water out of the soil, whereas SMA of our routine always brings additional water into the soil. During this period soil moisture has adapted to the new formulation of T2m diagnostics. Integrated along the whole 6 week period SMA of the routine has significantly moistened the soil, indicating a systematic error. In contrast SMA of Exp. 6343 shows almost no systematic trend.
'city': (z > 0.3 m & 'plant cover' ≤ 70% & 'surface height' ≤ 800m)

pr_time=00Z27APR2007 pr_hour=0hr
Soil moisture profiles:

- Soil water fraction of field capacity [FCF] (Lon -5 5, Lat -5 5)
- Soil water fraction of field capacity [FCF] (roughness length <= 0.3 m) (Lon -5 5, Lat -5 5)
- Soil water fraction of field capacity [FCF] (city) (Lon -5 5, Lat -5 5)

pr_time=00Z27APR2007 pr_hour=0hr
pr_time=12Z27APR2007  pr_hour=12hr
2m-dew-point-temp. [C]

MIN = -15.2145  MAX = 15.8891  AVE = 6.94987  SIG = 3.62585

MIN = -10.9299  MAX = 4.6062  AVE = -1.4935  SIG = 1.69798

MIN = -7.44885  MAX = 13.2366  AVE = 1.2202  SIG = 2.81549

MIN = -8.996  MAX = 8.91739  AVE = -0.273289  SIG = 2.38145

pr_time=12Z27APR2007  pr_hour=12hr
2m-dew-point-temp. [C] (over land) Lon -5 5, Lat -5 5

2m-dew-point-temp. [C] (over land with roughness length <= 0.3 m) Lon -5 5, Lat -5 5

2m-dew-point-temp. [C] (roughness length > 0.3 m) Lon -5 5, Lat -5 5

2m-dew-point-temp. [C] (city) Lon -5 5, Lat -5 5
Results of verification of forecasts for local weather elements at surface weather stations

TSS for precipitation, ETS for gusts, percent correct for cloud cover, RMSE for other elements
all stations

Stations: 810
Results of verification of forecasts for local weather elements at surface weather stations

frequency bias for cloud covers (−: 0−2/8, −−: 3−4/8) and precipitation 1−10 mm/6h, mean error for other elements all stations

For "summer"
Results of verification of forecasts for local weather elements at surface weather stations.

TSS for precipitation, ETS for gusts, percent correct for cloud cover, RMSE for other elements.

All stations: 520
Results of verification of forecasts for local weather elements at surface weather stations

frequency bias for cloud covers (---: 0–2/8, —: 3–8/8) and precipitation 7–1 till T, mean error for other elements

all stations
Mean surface flux densities:

sensible surface heat flux [W/m²] (over land) Lon -5.5, Lat -5.5

latent surface heat flux [W/m²] (over land) Lon -5.5, Lat -5.5

ground temperature [°C] (over land) Lon -5.5, Lat -5.5

surface dew point temperature [°C] (over land) Lon -5.5, Lat -5.5

ref_time = t - 1 hr
Potential temperature [°C] (over land)

pr_hour=6hr

pr_hour=12hr

pr_hour=15hr

pr_hour=24hr

st_time=00Z27APR2007  Lon −5 5, Lat −5 5
Dew point temperature [°C] (over land)

*pr_hour=6hr*

*pr_hour=12hr*

*pr_hour=15hr*

*pr_hour=24hr*

st_time=00Z27APR2007  Lon -5 5, Lat -5 5
difference of temperature [K] (over land)

out_lm2_lm - ana_lm2_6343 (Lon -5 5, Lat -5 5)

MIN = -0.870782  MAX = 0.773982  AVE = -0.106662  SIG = 0.342229

out_lm2_6343 - ana_lm2_6343 (Lon -5 5, Lat -5 5)

MIN = -0.676353  MAX = 0.853742  AVE = 0.0954101  SIG = 0.336058
difference of Dew point temperature [K] (over land)
Thank You for attention!
difference of Dew point temperature [K] (over land)
Results of verification of forecasts for local weather elements at surface weather stations

SS: for precipitation, EIS for gusts, percent correct for cloud cover, RMSE for other elements
all stations
Results of verification of forecasts for local weather elements at surface weather stations

frequency bias for cloud covers (−0−2/8, −−−: 7−8/8) and precipitation (I−I till I, mean error for other elements
all stations