“TERRA-NOVA”: runs for North-Western Russia

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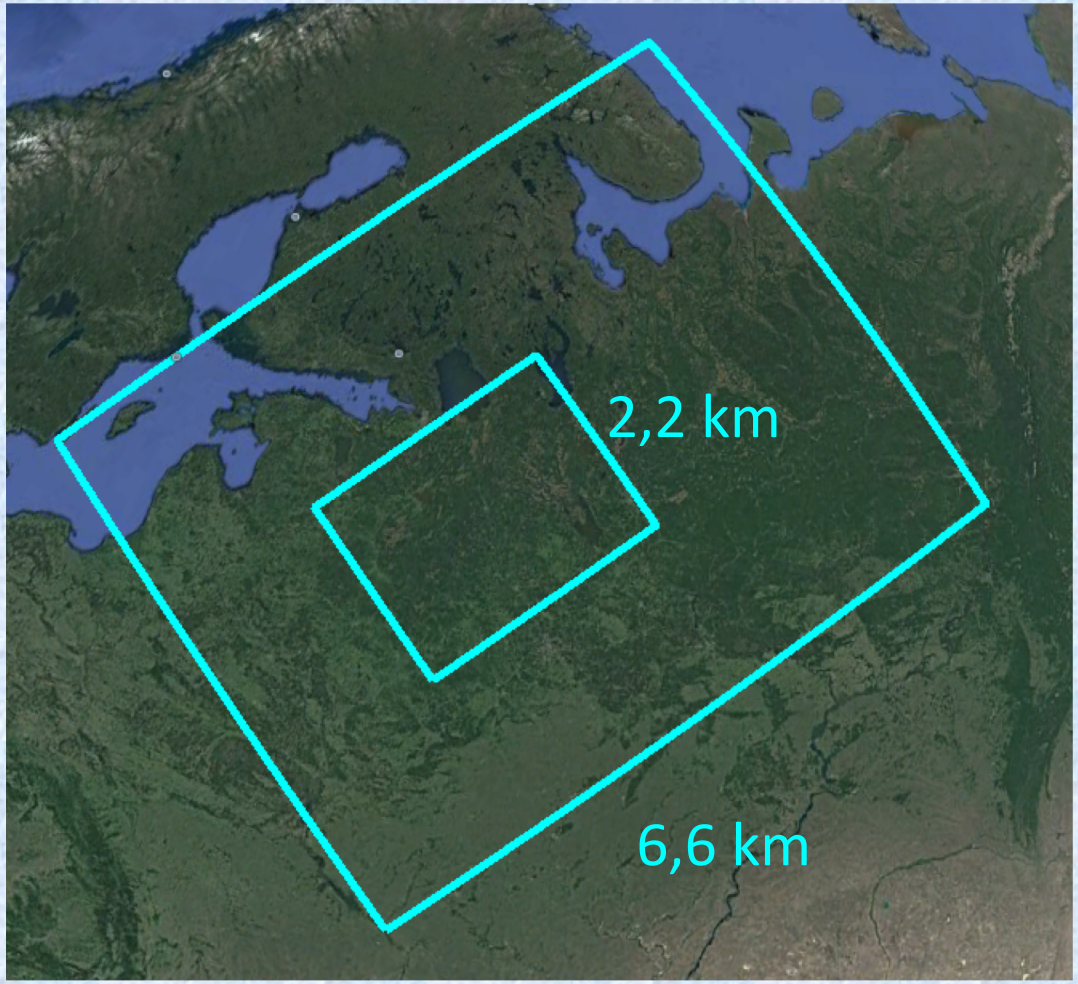
6,6 and 2,2 km domains for North-Western Russia

	6,6	2,2
ie_tot	280	300
je_tot	220	230
ke_tot	40	50
pollat	25	
pollon	-90	
startlat_tot	-1	3
startlon_tot	-33	-29



6,6 km – **NWR** domain (North-Western Russia)

2,2 km – **FOR** domain (Forest)

Output for analysis

Surface and near-surface variables (every hour):

'T_2M ', 'TD_2M ', 'RELHUM_2M', 'PMSL',
'U_10M ', 'V_10M ', 'VMAX_10M', 'TOT_PREC',
'ASHFL_S', 'SHFL_S', 'ALHFL_S', 'LHFL_S',
'ASOB_S', 'SOBS_RAD', 'ATHB_S', 'THBS_RAD',
'QVSFLX ', 'T_G ', 'T_S ', 'T_SO ', 'W_SO ', 'QV_S ',
'H_SNOW ', 'W_SNOW ', 'T_SNOW','T_ICE ','H_ICE '

Flake variables (every 3 hours):

'T_B1_LK', 'H_B1_LK', 'T_WML_LK', 'T_MNW_LK', 'T_BOT_LK', 'C_T_LK ', 'H_ML_LK'

Variables on P-levels (every 3 hours):

'T', 'RELHUM', 'U', 'V', 'FI', 'OMEGA',

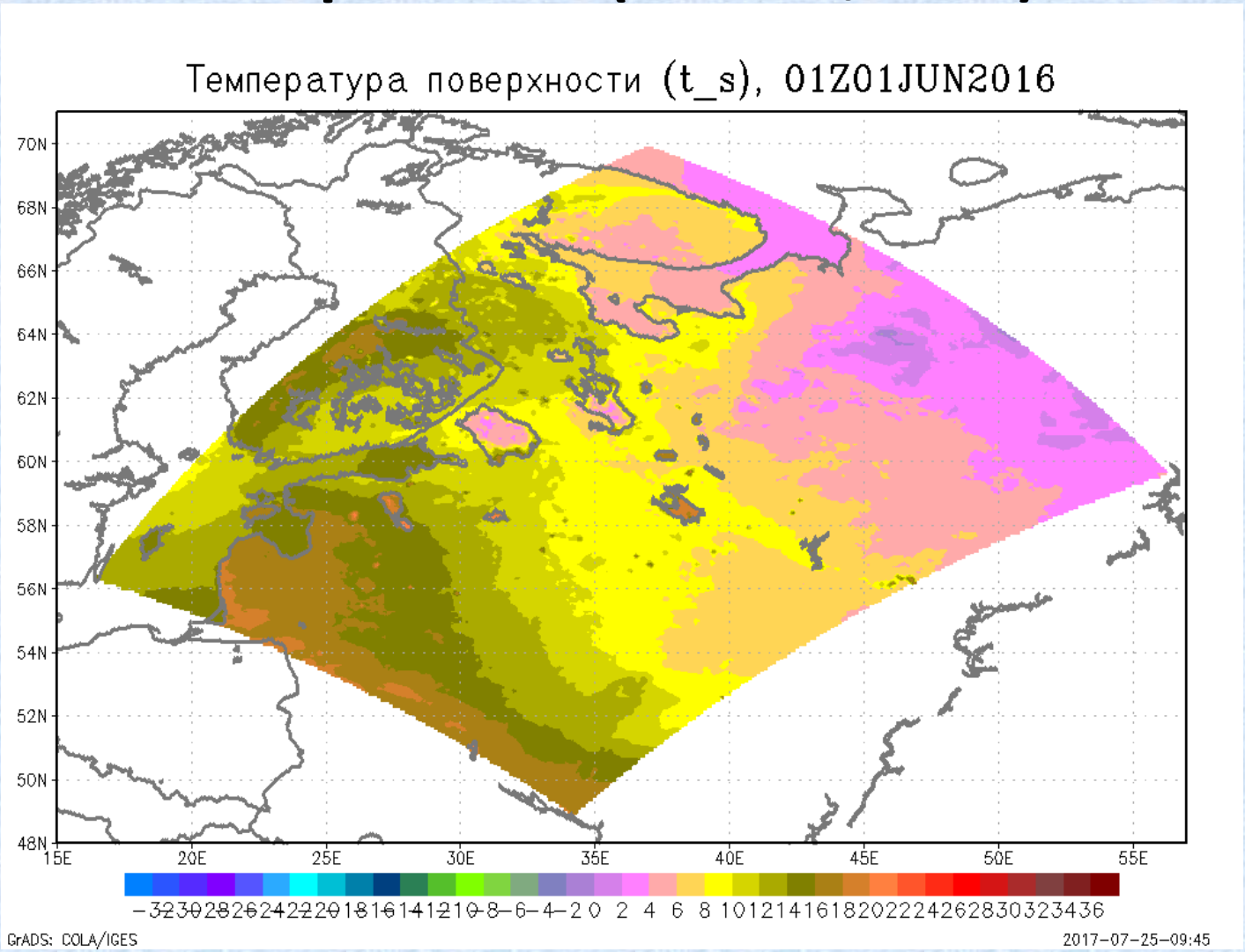
Runs for COSMO- NWR (6,6 km) and FOR (2,2 km) domains

- Two versions of COSMO-model (5.03 and 5.05)
- Initial and boundary conditions:

  ICON → NWR 6,6 km → FOR 2,2 km

  BC: updated every 3 hours
- Forecast time: 24 hours
- T_SO, W_SO, FLAKE variables were saved from day to day
- Parameterizations of sea ice and lakes were activated (lseaice=.TRUE., llake=.TRUE.)
- Calculations period: NWR: 01/11/2015 – 30/11/2016,
  FOR: 25/04/2016 - 31/10/2016

Temperature (NWR 6,6 km)



Temperature of the ground surface (1-5 June 2016, ver 5.03)

Temperature (NWR 6,6 km)

Averaged results (01/01/2016 - 30/11/2016)

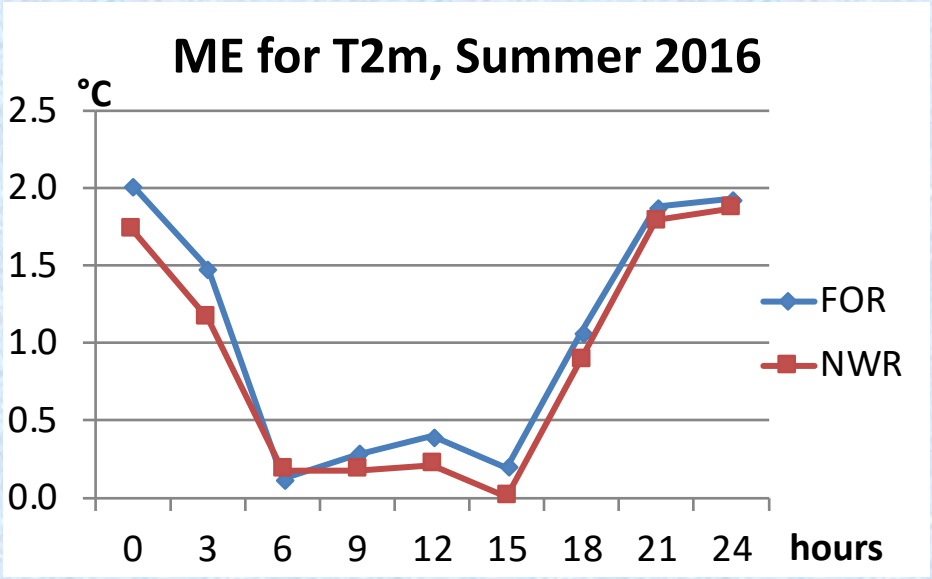
T_2m	
Ver 5.03	Ver 5.05
5,92	5,92

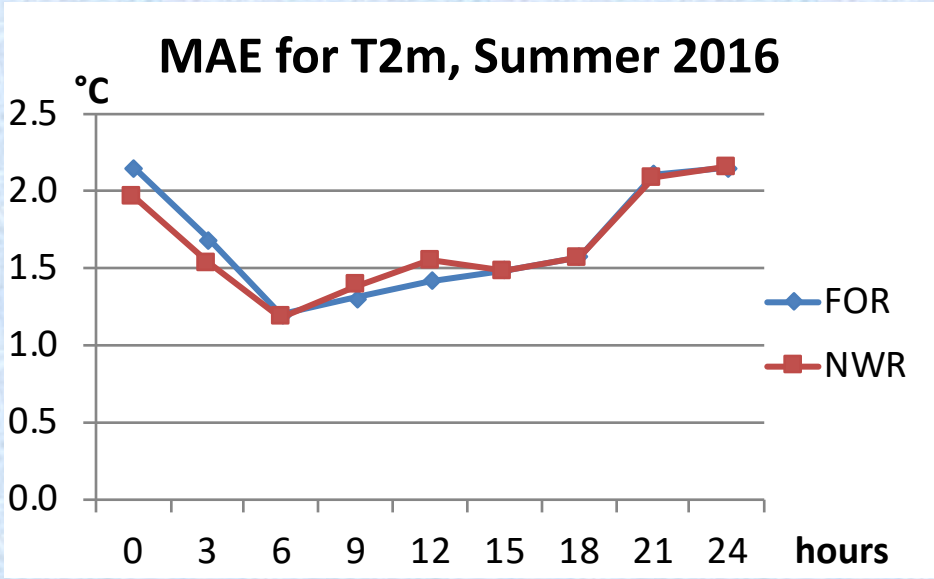
T_G	
Ver 5.03	Ver 5.05
6,10	6,03

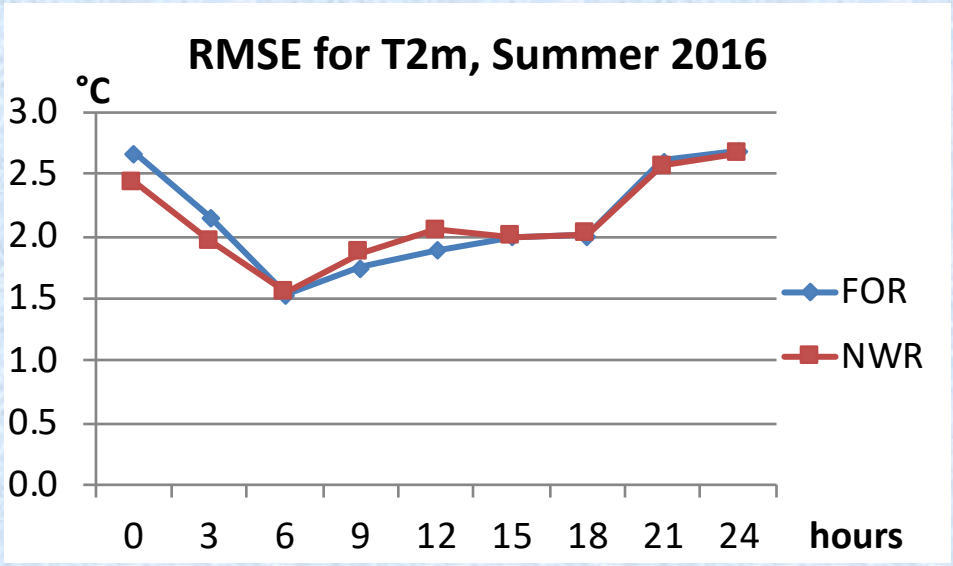
T_S	
Ver 5.03	Ver 5.05
7,20	7,26

Differences in surface and near-surface temperature between versions 5.03 and 5.05 are very small

Verification results of T2m (COSMO 5.03)



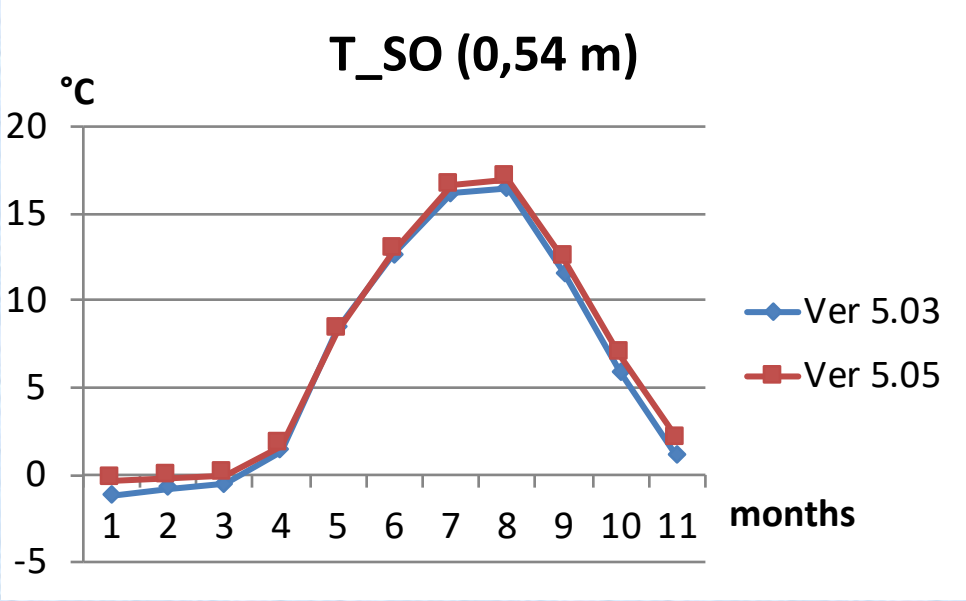




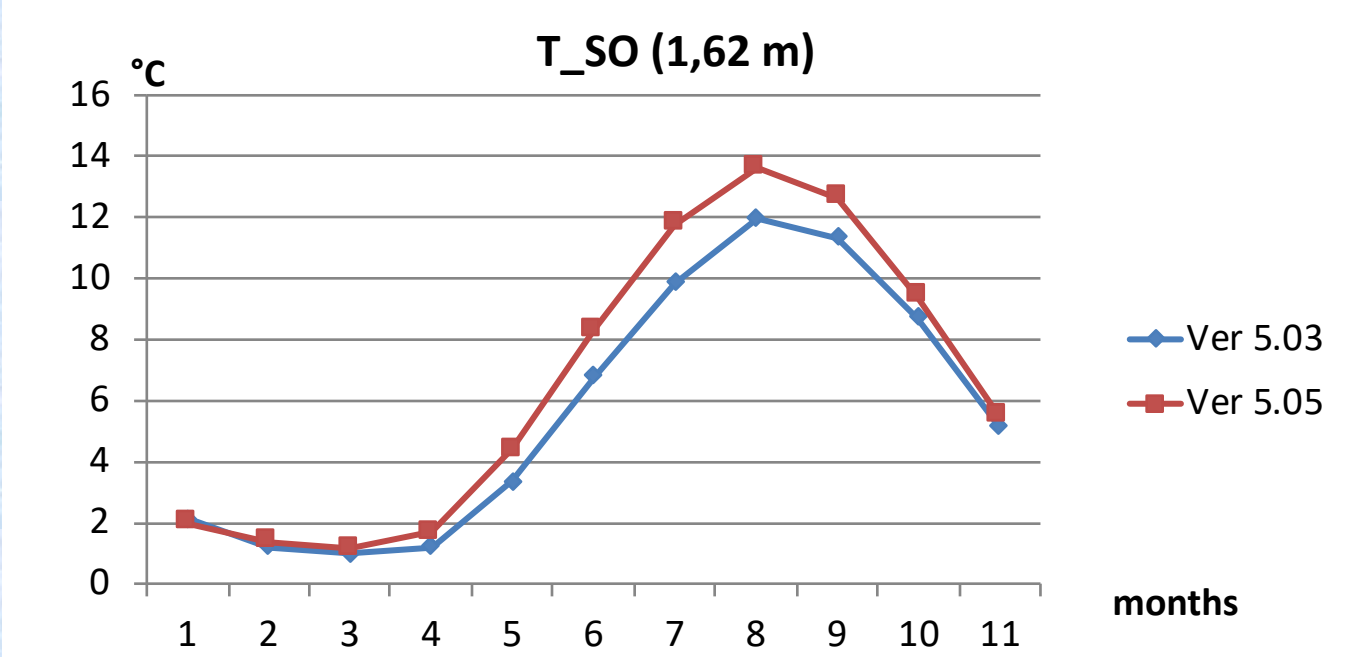
NWR – 6,6 km

FOR – 2,2km

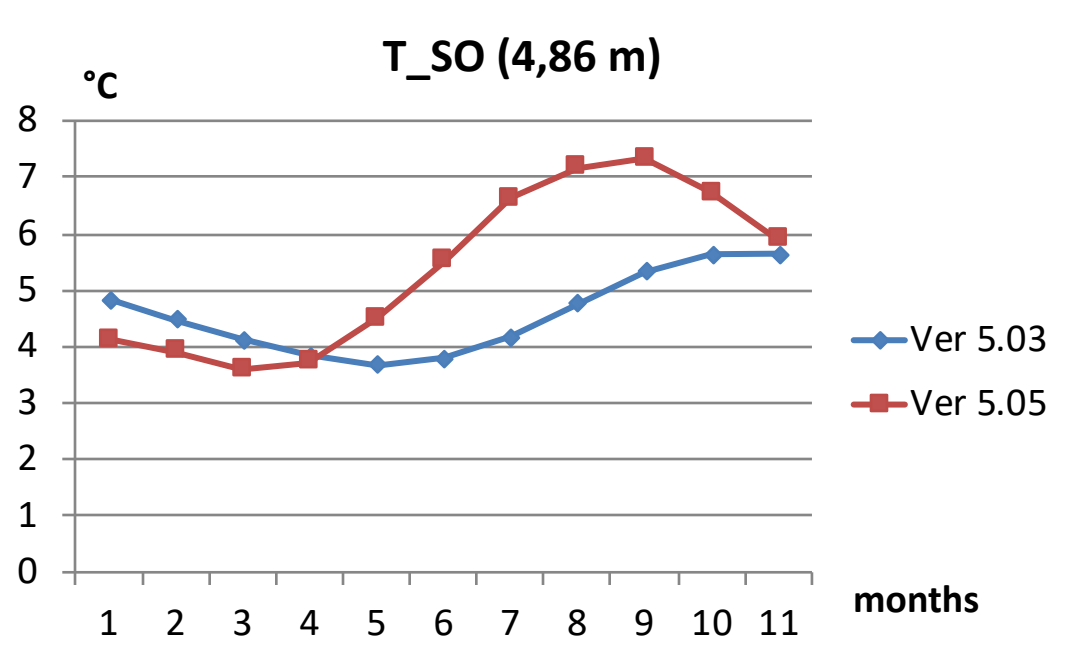
Soil temperature (NWR 6,6 km)



In more deeper layers differences begin to increase

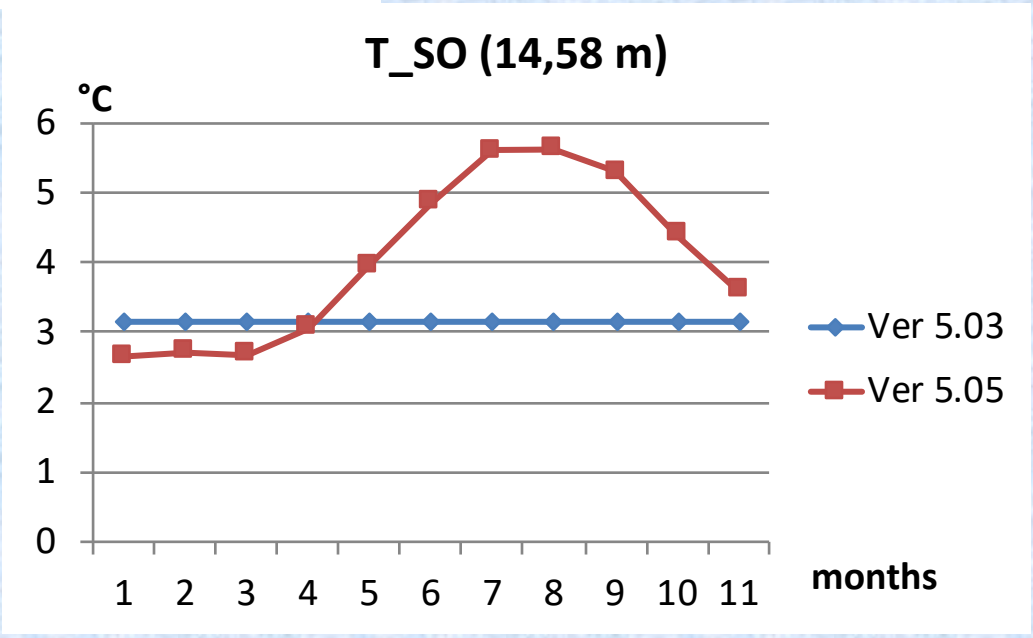


Soil temperature (NWR 6,6 km)

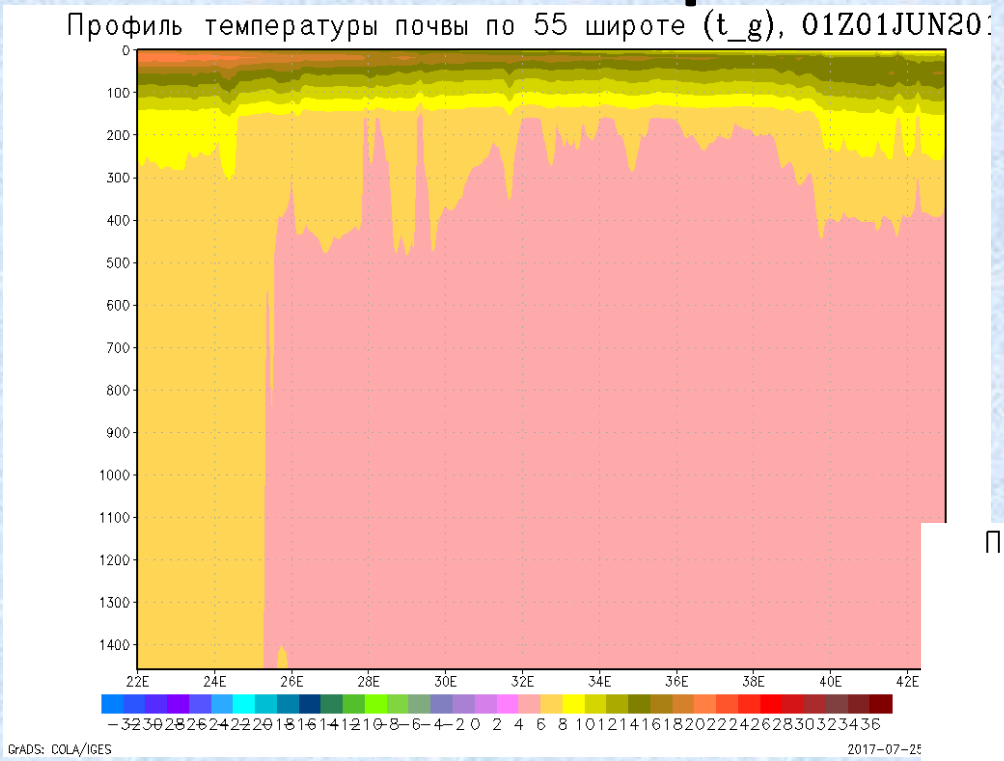


At the level 4,86 m soil temperature in a version 5.05 has larger yearly amplitude

At the level 14,58 m in version 5.03 temperature was a constant. It changes in new version of parametrization



Soil temperature (NWR 6,6 km)

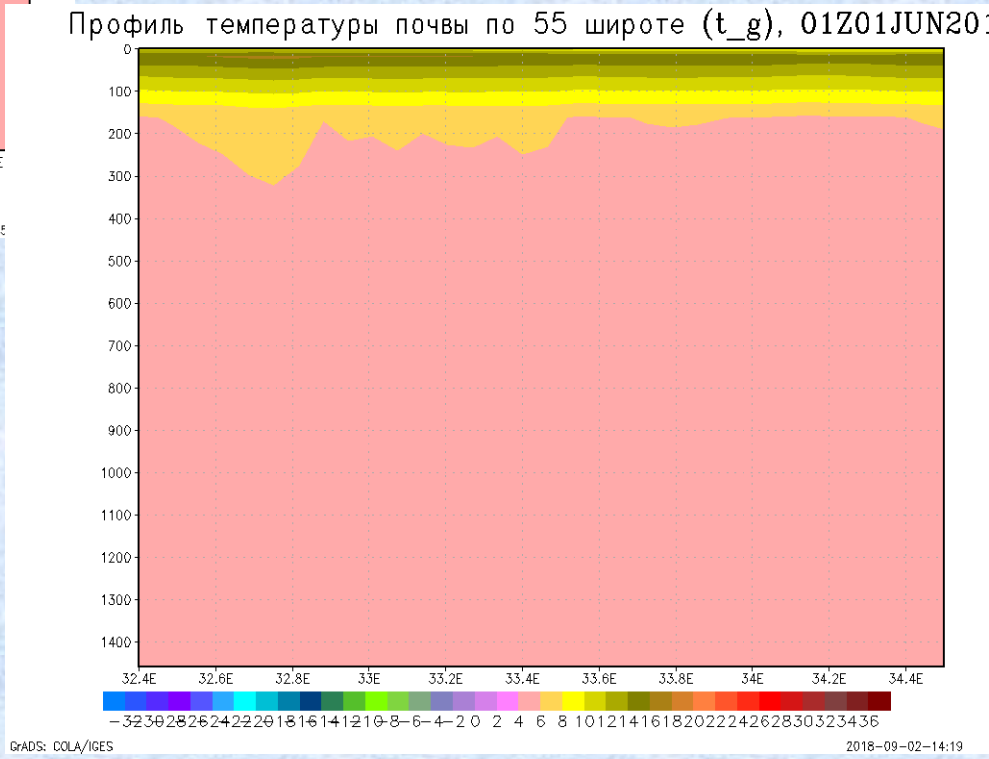


Version 5.03

Soil temperature profile (0-14m) along 55°Lat:

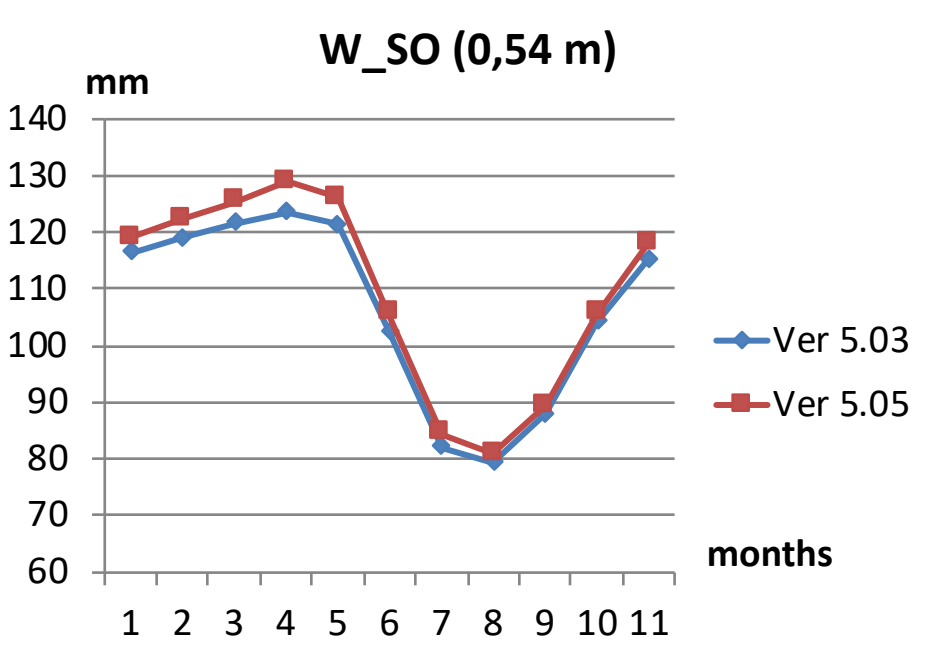
01.06.2016 – 31.07.2016,
time step: 24h

Version 5.05



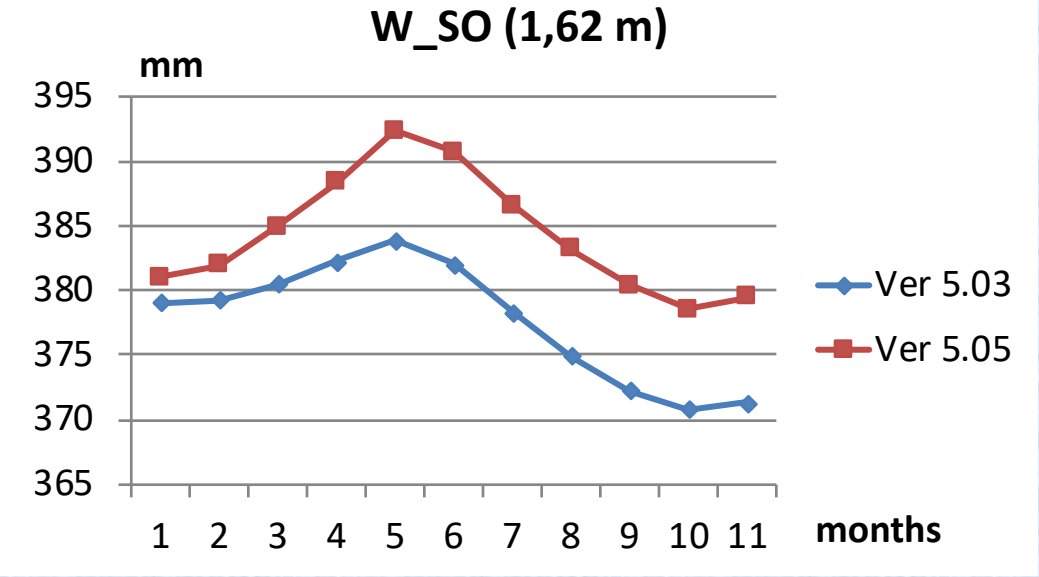
In new version soil temperature changes smoother in deep layers

Soil moisture (NWR 6,6 km)

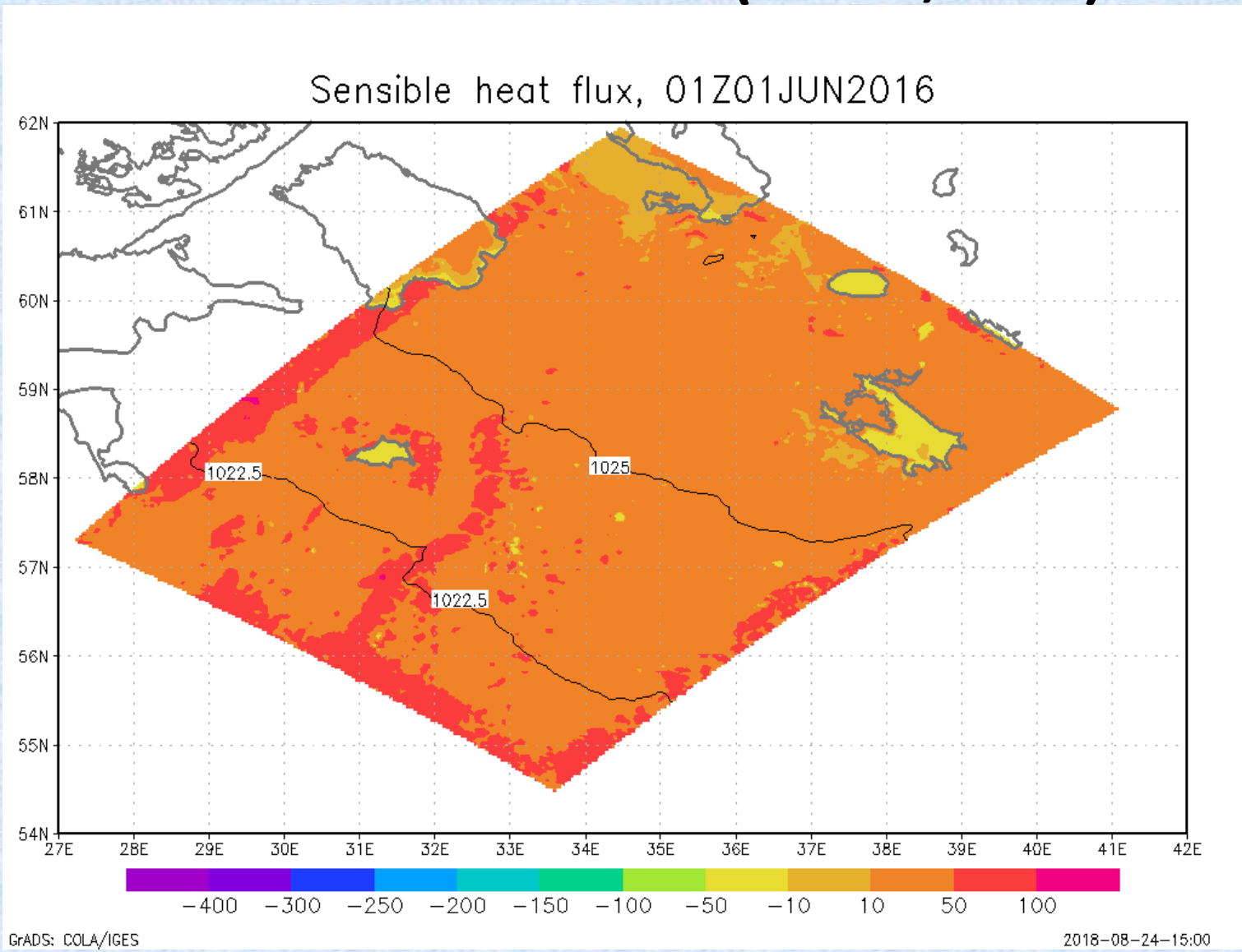


At the level 0,54 m difference in soil moisture are not very significant

At the levels 1,62, 4,86 and 14,58 m differences in soil moisture have a same pattern



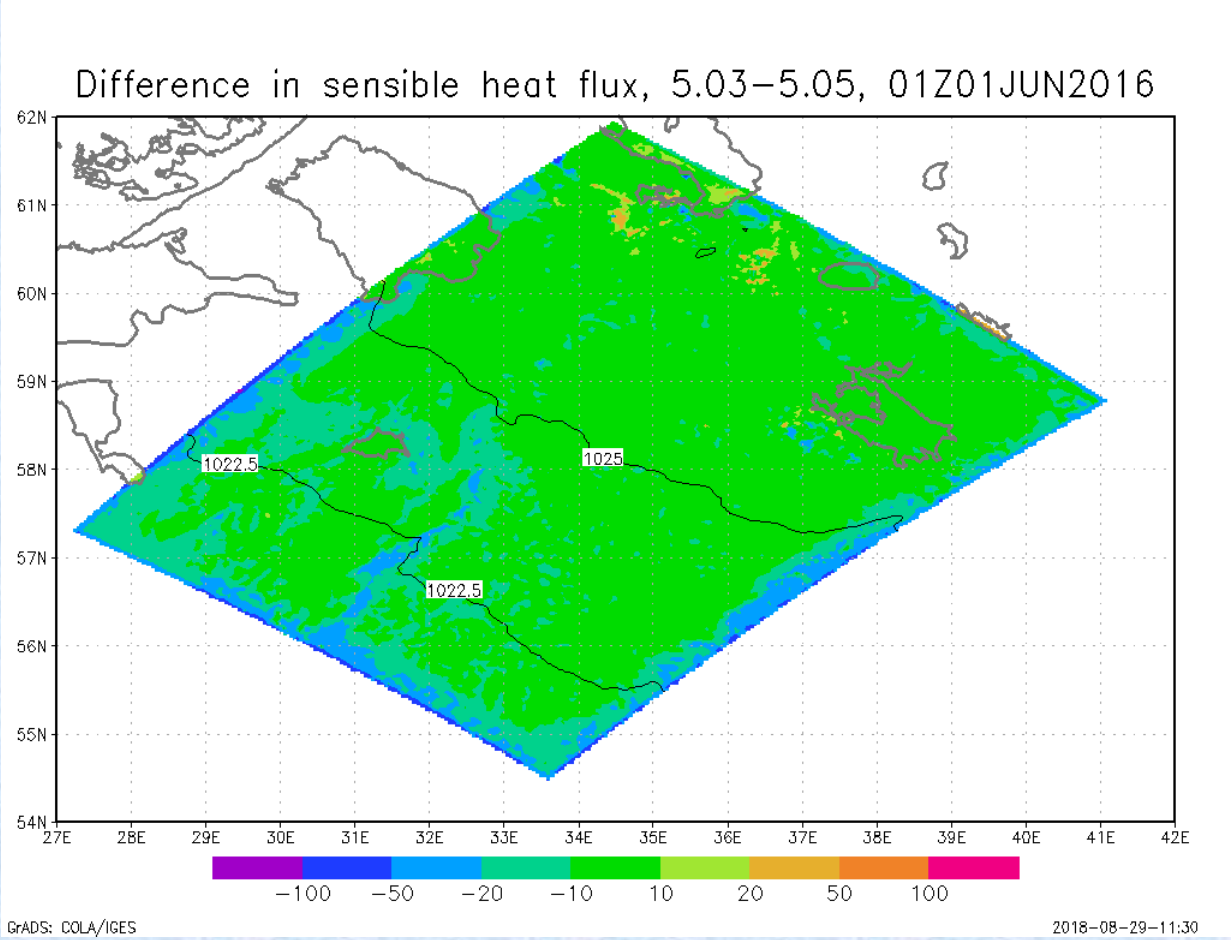
Sensible heat flux (FOR 2,2 km)



Downward surface sensible heat flux [W/m2], 1-9 June 2016, version 5.05

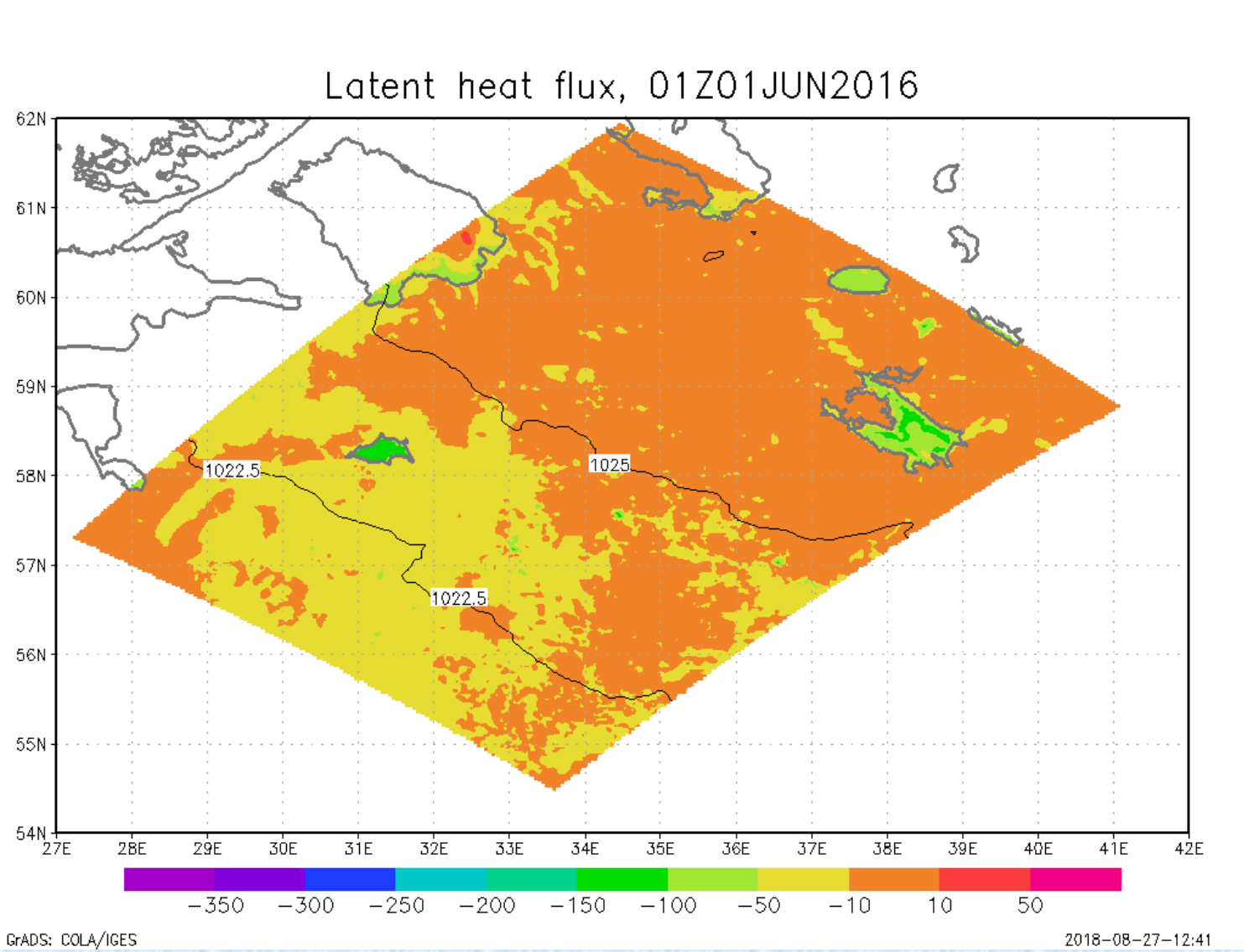
Difference in sensible surface heat flux (FOR 2,2 km)

	SHFL_S	
Months	Ver 5.03	Ver 5.05
6	-40,7	-45,2
7	-35,8	-40,4
8	-20,7	-22,2



1) Strong differences during the day
2) Mosaic pattern.
3) In version 5.05 surface heats air more significantly

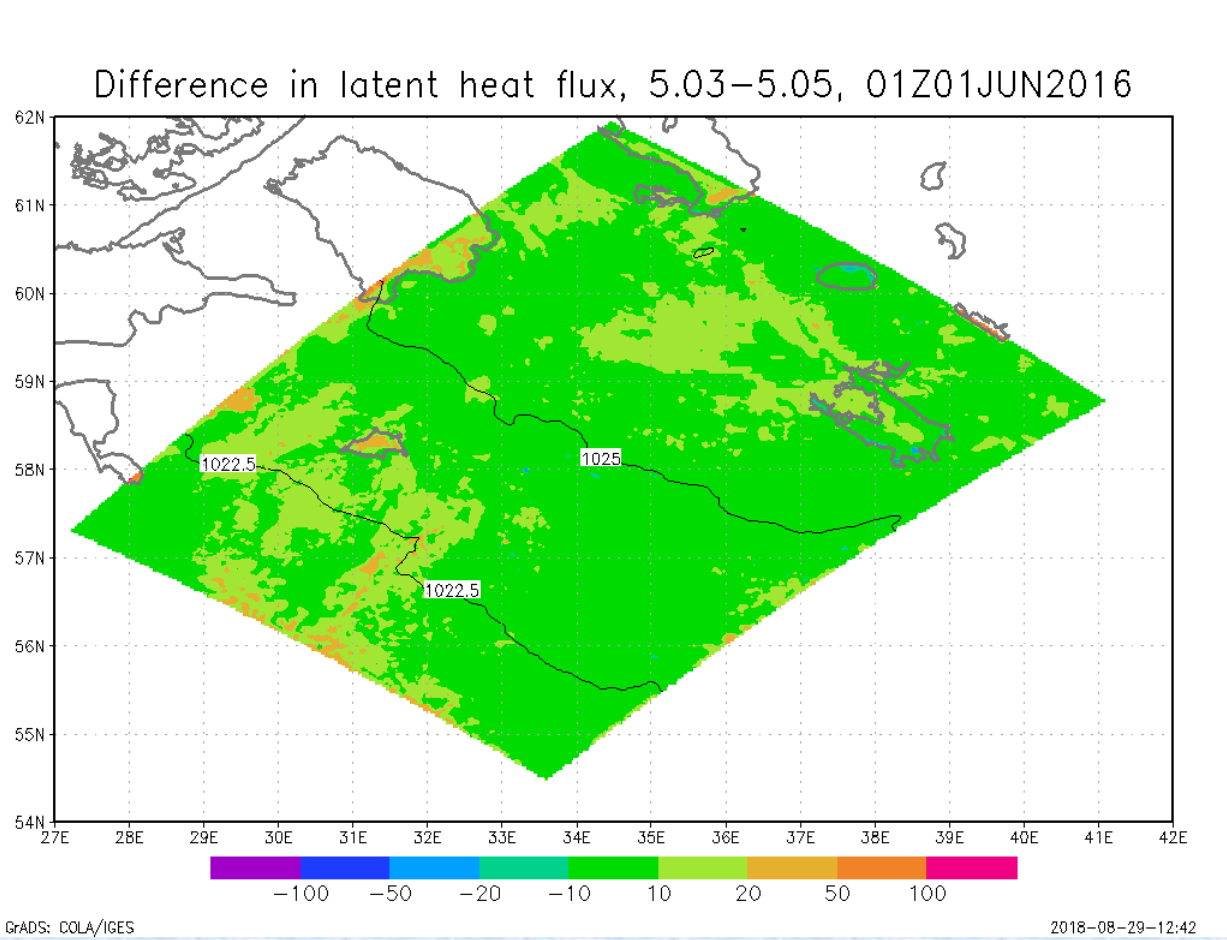
Latent heat flux (FOR 2,2 km)



Downward surface latent heat flux [W/m2], 1-9 June 2016, version 5.05

Difference in latent surface heat flux (FOR 2,2 km)

	LHFL_S	
Months	Ver 5.03	Ver 5.05
6	-66,2	-74,3
7	-63,1	-70,7
8	-48,6	-55,3



1) Also strong differences during the day
2) More evaporation from lake Ilmen, lake Beloe and Rybinsk Reservoir
3) More evaporation from surface.

Conclusions

1) Differences in surface and near-surface temperature between versions 5.03 and 5.05 are very small
2) In deeper layers in version 5.05 soil temperature has larger yearly amplitude, but smoother spatial patterns
3) In version 5.05 water moisture in deeper layer increases
4) During the summer in version 5.05 fluxes of sensible and latent heat are more significant