CONSORTIUM FOR SMALL SCALE MODELING

COSMO

PT AEVUS 2

Activities and Updates CIRA - CMCC

F. Repola*, E. Bucchignani and P. Mercogliano***

*** Centro euro-Mediterraneo sui Cambiamenti Climatici– Divisione REMHI**

****CIRA – Italian Aerospace Research Center**

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Model version and simulation set-up

- Model versions:

  - int2lm_190524_2.06up

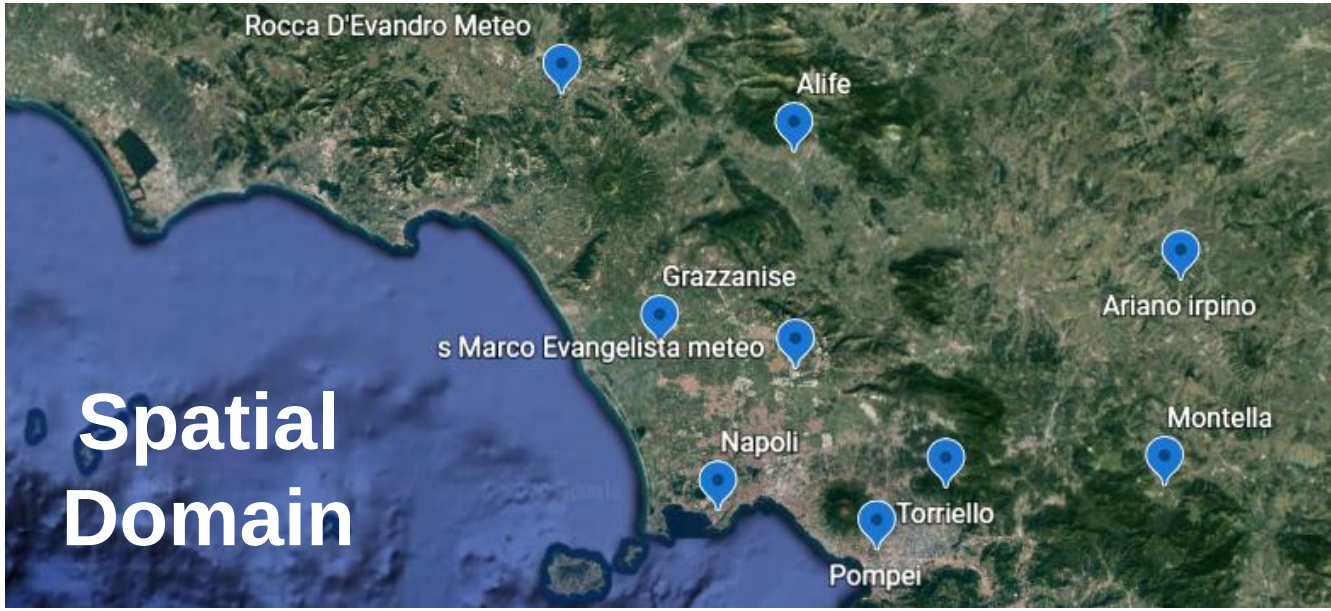
  - cosmo_181030_5.05_urb6up3

- COSMO-LM resolution: **0.009° (about 1 km)**
- Computational domain**: 260 x 138 points; 60 vertical levels; time step 10 s.**
- Domain**:12.22° – 14.55°E; 40.63° - 41.88° N (**Rotated North Pole**: -166°; 41°)**
- Forcing data: ECMWF IFS (resolution of 0.075°)
- Test cases considered: from August 8th to August 14th 2017
- Sensitivity analysis performed:

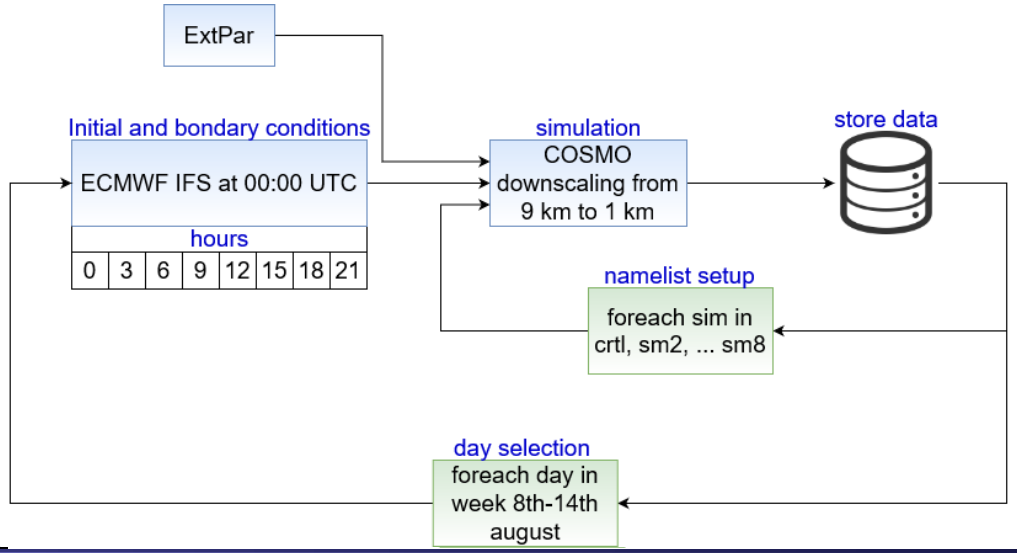
9 km -> 1 km								
	CTRL	sm2	sm3	sm4	sm5	sm6	sm7	sm8
terra_urb	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE
old_tur	TRUE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE
itype_canopy	1	2	1	2	1	2	1	2

Model version and simulation set-up

Observations: Hourly values by Civil protection of Campania (station locations are shown in blue)



Simulations workflow



Updates March 2021

- 2 runs performed again with the last version sent by Uli on March 10th 2021

  - cosmo_210309_5.10beta

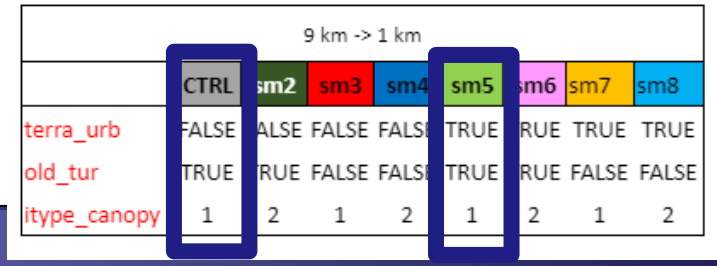
- In /PHYCTL/, cimpl, nrad_coarse, lradf_avg have been deleted

- A comparison with the last corresponding simulations (Garbero et al, 2021) is shown in this presentation.

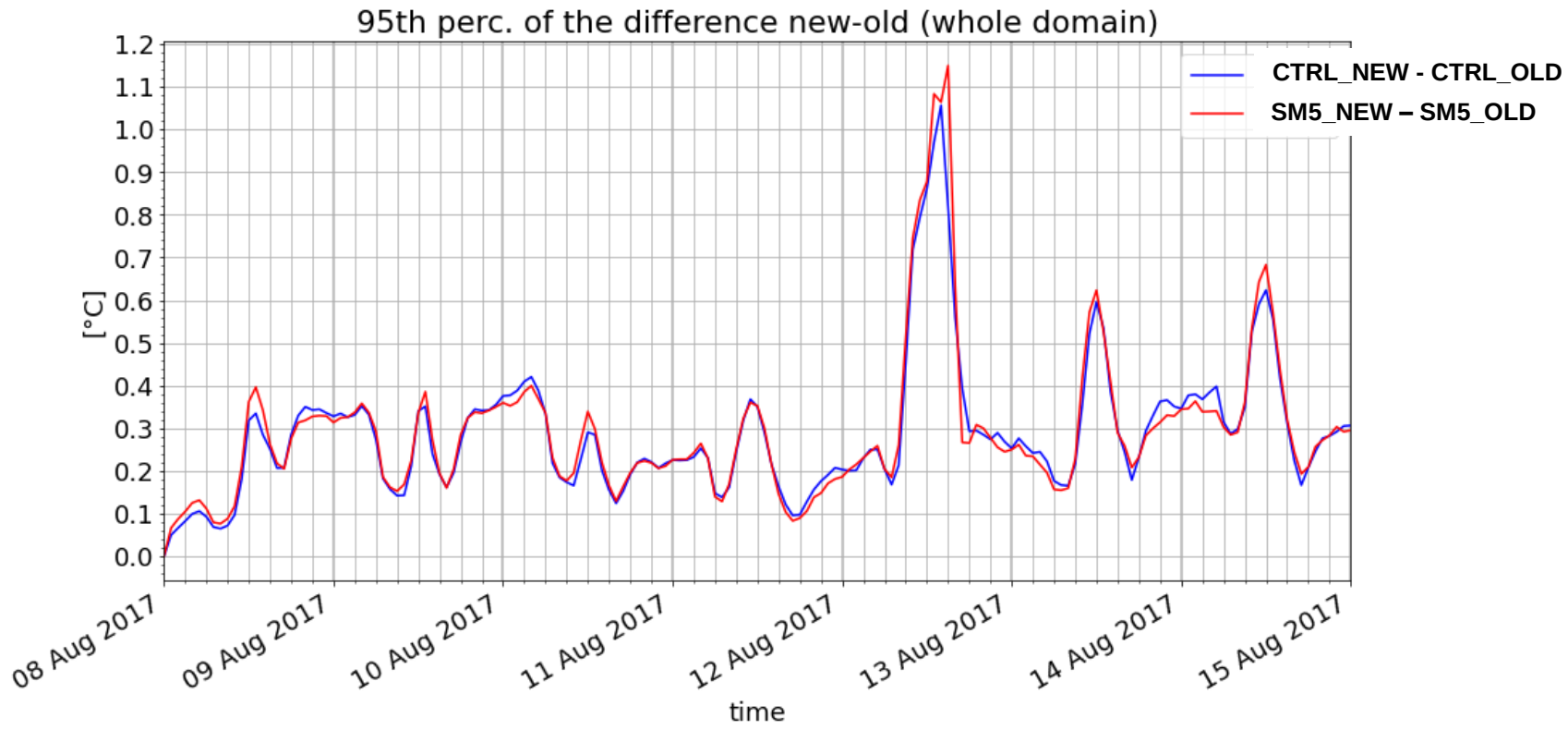
- Simulations: **CRTL** (**terraurb = false**, oldtur = true, itype_canopy=1)
  SM5 (**terraurb = true**, oldtur = true, itype_canopy=1)

- Preliminary evaluation performed for 2 meter temperature:
  - Urban, rural and Naples area
  - Different altitude areas (low, medium and high)

- Analysis for both configurations in terms of 95th percentile (to have the order of the magnitude of the maximum difference) of the difference between **CTRL_new** and **CTRL_old** and **SM5_new** and **SM5_old**



T_2M differences over the whole domain

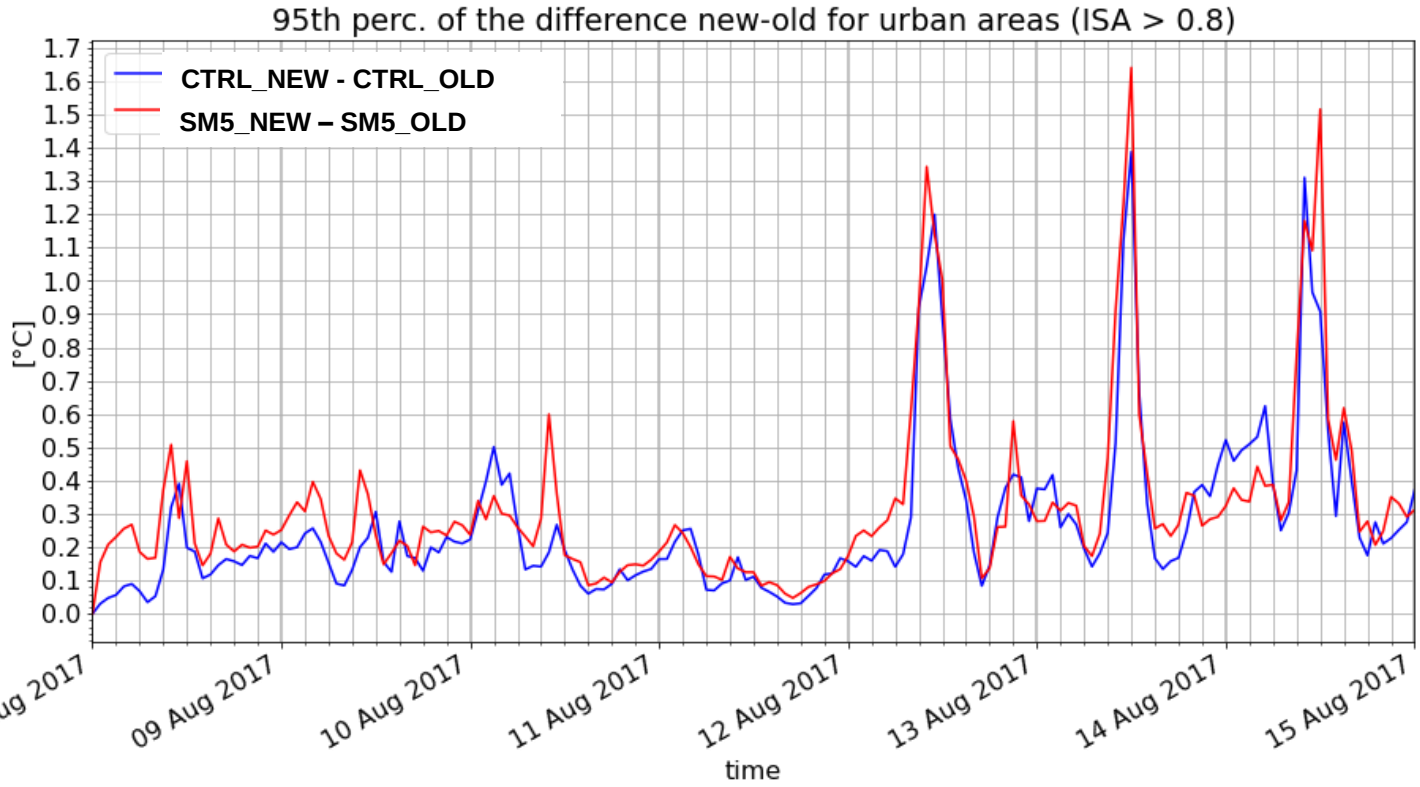


The 95th percentile is always larger than 0.1°C, for both simulations.

9 km -> 1 km

	CTRL	sm2	sm3	sm4	sm5	sm6	sm7	sm8
terra_urb	FALSE	ALSE	FALSE	FALS	TRUE	RUE	TRUE	TRUE
old_tur	TRUE	RUE	FALSE	FALS	TRUE	RUE	FALSE	FALSE
itype_canopy	1	2	1	2	1	2	1	2

T_2M Differences over urban areas (ISA>0.8)



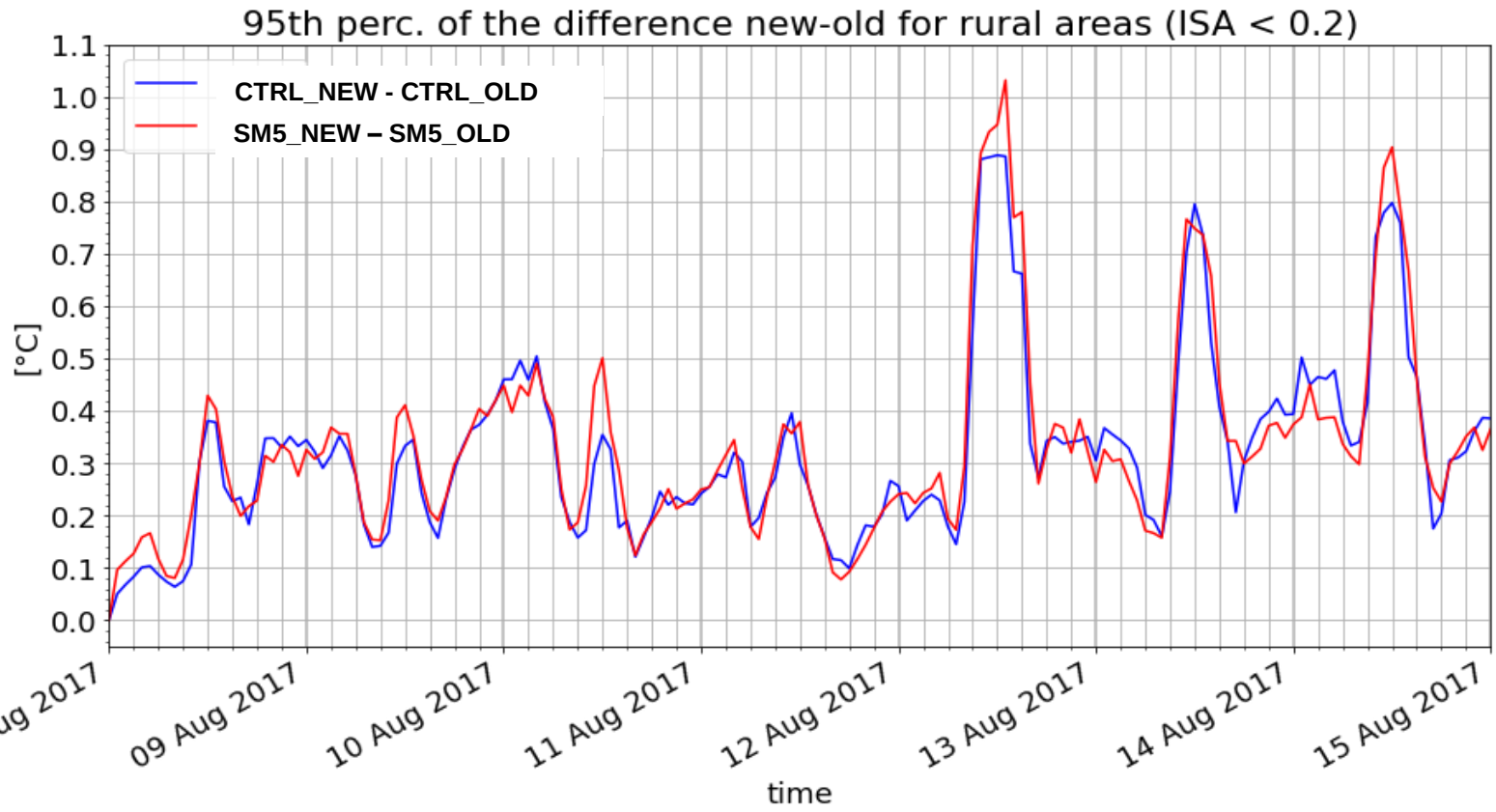
In the first four days, differences range between 0.1°C and 0.4°C. Three peaks of differences in the hottest hours of the last three days.

Remarkable differences are observed when Terra_urb is activated.

9 km -> 1 km

	CTRL	sm2	sm3	sm4	sm5	sm6	sm7	sm8
terra_urb	FALSE	LSE	FALSE	FALS	TRUE	TRUE	TRUE	TRUE
old_tur	TRUE	RUE	FALSE	FALS	TRUE	TRUE	FALSE	FALSE
itype_canopy	1	2	1	2	1	2	1	2

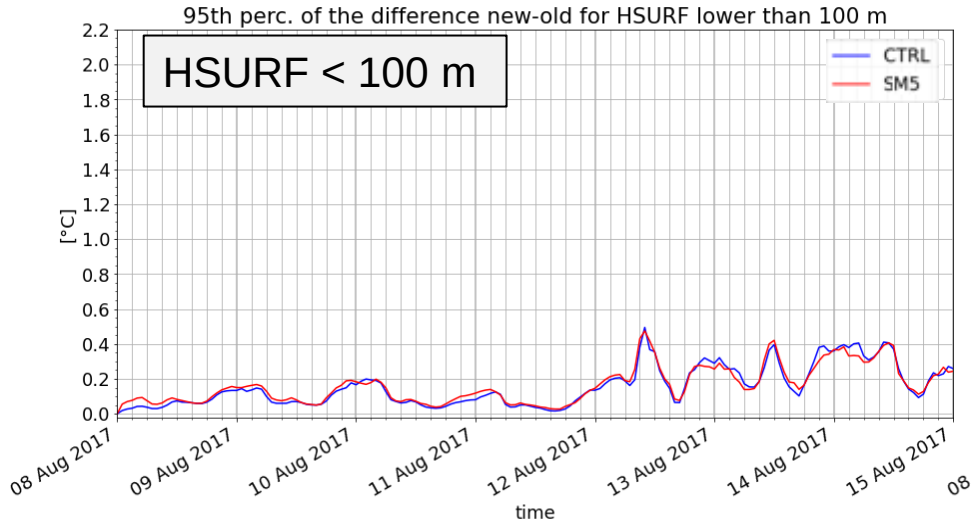
T_2M Differences over rural areas (ISA<0.2)

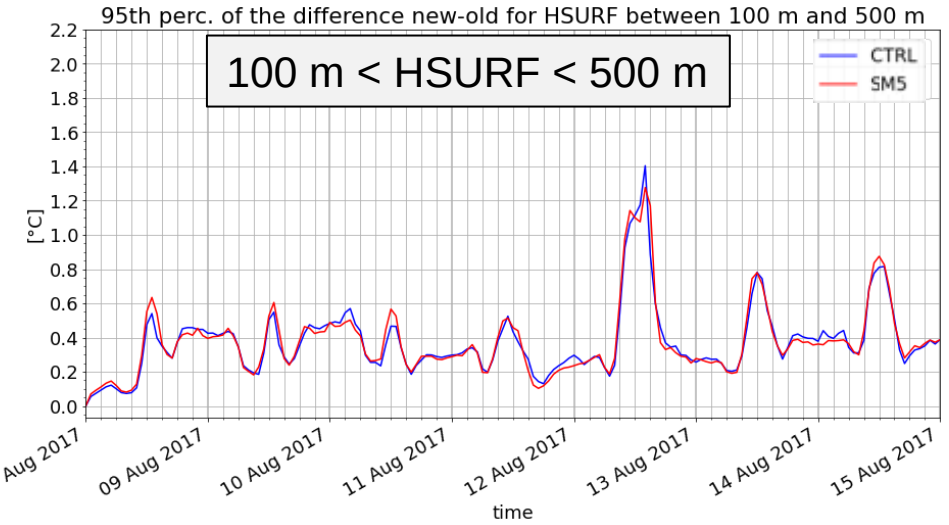


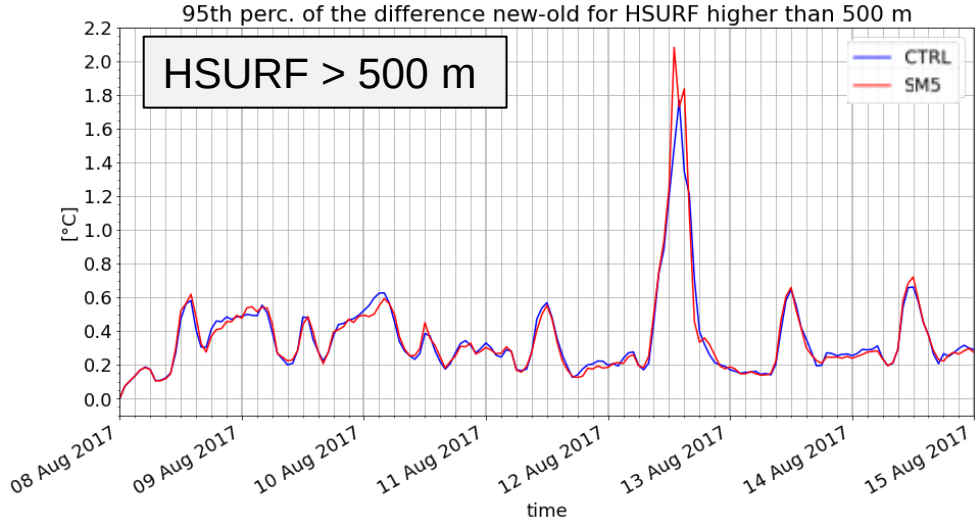
Similar peaks of difference in the hottest hours of the last three days, but with lower values with respect to urban areas.

It is evident that differences are due not only to the Terra_urb implementation, but also to the other changes implemented in the new configuration.

T_2m Differences at various altitude areas





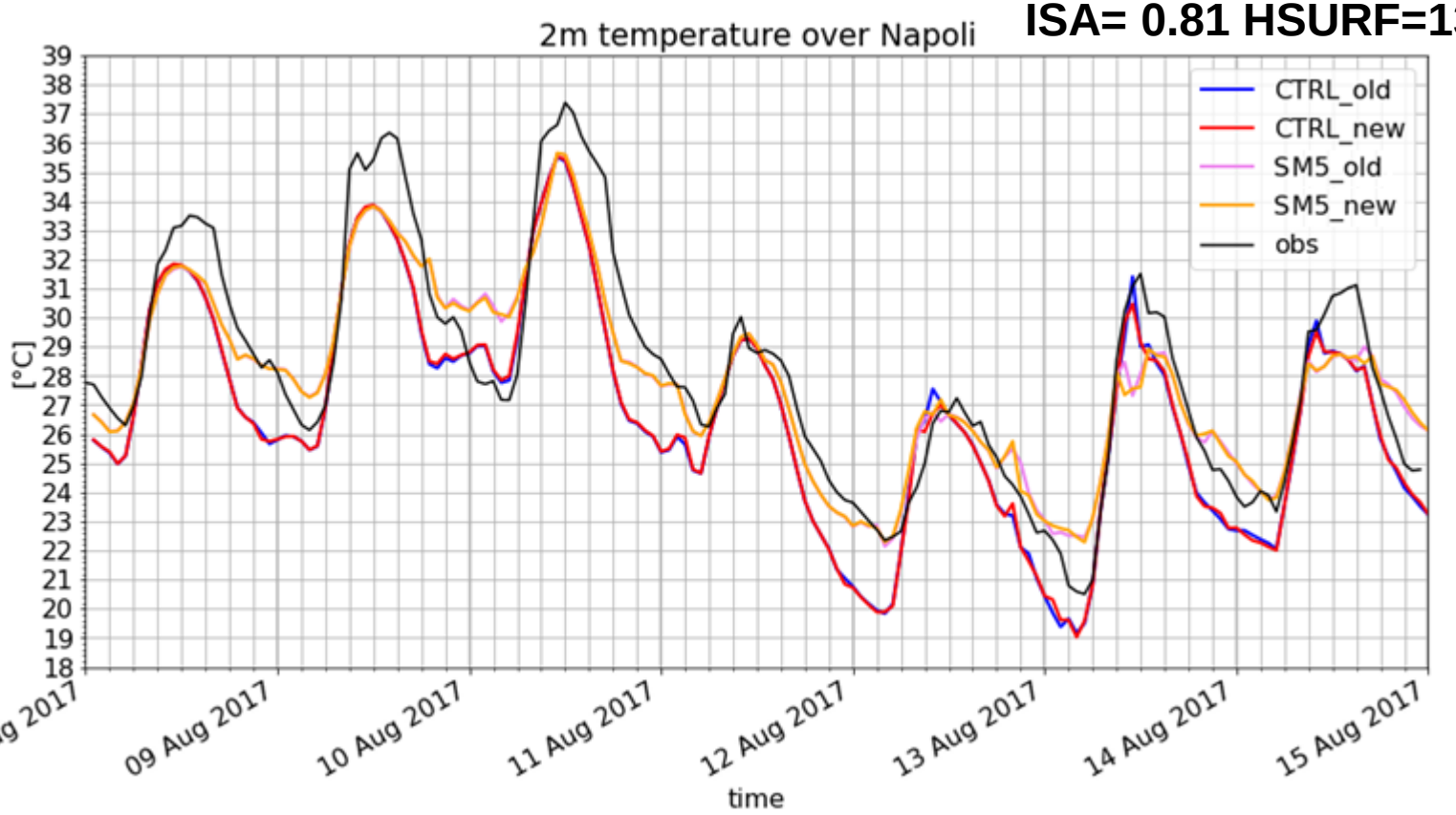


At low altitudes, differences between old and new simulations are minimal.

At high altitudes, differences are more relevant, up to 2°C.
It is worth noting that at high altitudes the environment is almost rural.

T2m time series over Napoli

ISA= 0.81 HSURF=13 m

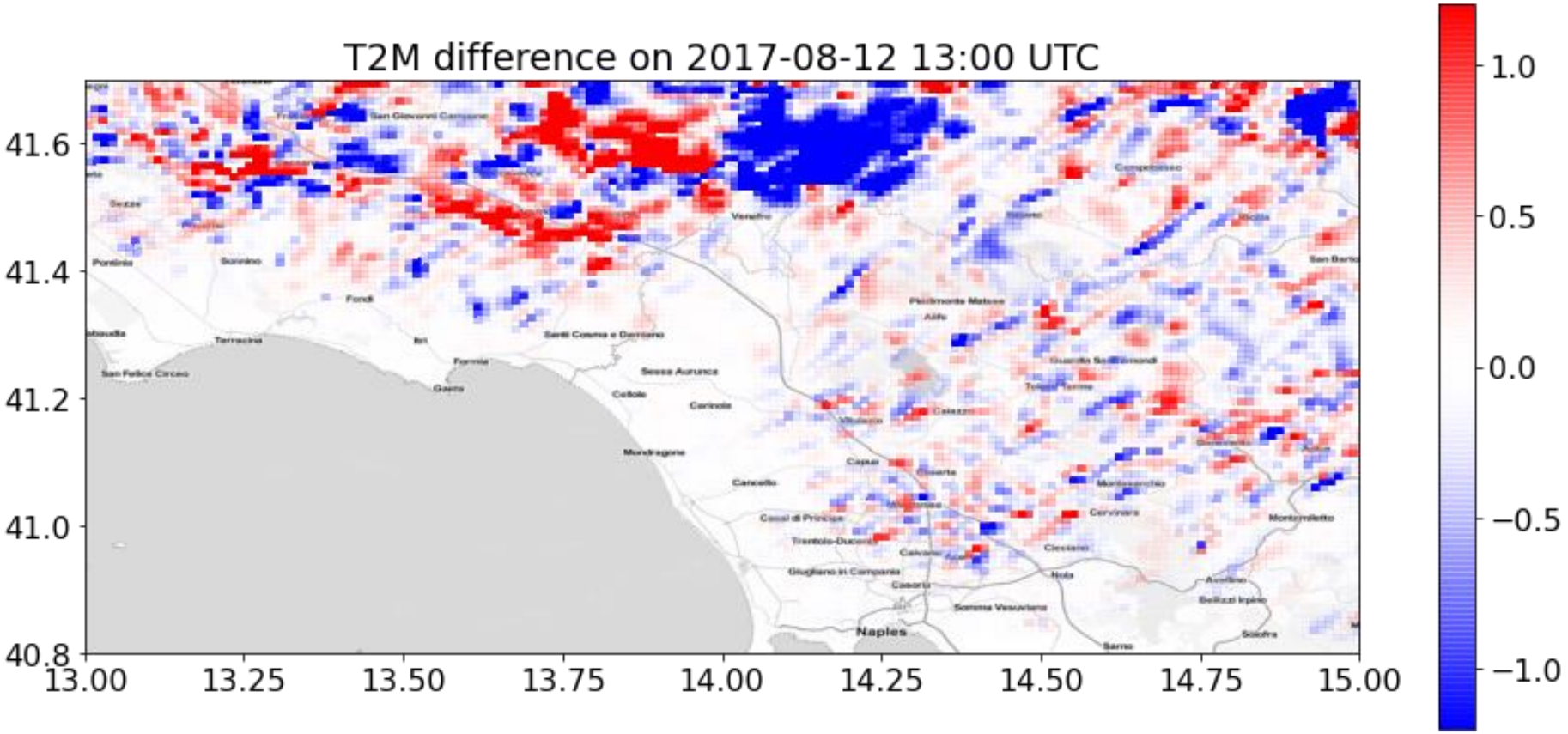


Differences in terms of maximum values are observed between old and new version. In particular,

- in the case of simulation with Terra_urb on, a peak of difference of 0.8°C is recorded;
- in the case of simulation with Terra_urb off, several negative differences are recorded.

Map of T2m differences

T2m difference between CTRL_new and CTRL_old.



T2m differences are not negligible, up to +4°C and -5°C.

Conclusions

- Preliminary analysis have been performed in terms of 95th percentile of difference of the 2 meter temperature between new and old version of COSMO model, with Terra_urb on (SM5) and off (CTRL).
- Standard deviations of differences have been also analysed, showing similar results to 95th percentile one.
- In urban areas (ISA>0.8) remarkable differences are observed when Terra_urb is activated.
- Differences are recorded also in rural areas (ISA<0.2), but of lower intensity.
- Differences are increasing with altitude even if environment is almost rural
- Further analysis will concerns precipitations and other variables.

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Thank you for your attention.
Any questions ?