COSMO Priority Task ÆVUS2
Analysis and EValuation of TERRA_URB Scheme 2

Valeria Garbero, Massimo Milelli, Francesca Bassani

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Code developments

1. COSMO_5.05urb6up4sh and INT2LM_2.06up2 (July 2020) includes bug fixes and updates on the urban external parameters (Mikhail)
2. COSMO_5.05urb6up5sh (September 2020) bug found and fixed for the case when TERRA_URB = true and lemiss = true
3. COSMO_210309_5.10beta (March 2021)
4. COSMO_210426_5.10beta (April 2021) bug found and fixed for icldm_tran
5. COSMO_210624_5.10beta (June 2021) change in sfc_ahf.f90
6. COSMO_210712_5.10beta (July 2021) bug found and fixed for itype_eisa==1

Testing different model versions!

Setup

- ✓ Initial and boundary conditions from the IFS at 9 km resolution
- ✓ Domain size 350x350 km centered around Turin at 1km resolution
- ✓ Namelist from *Garbero et al., 2021* :

  .loldtur.=F*

  .lterra_urb.=T

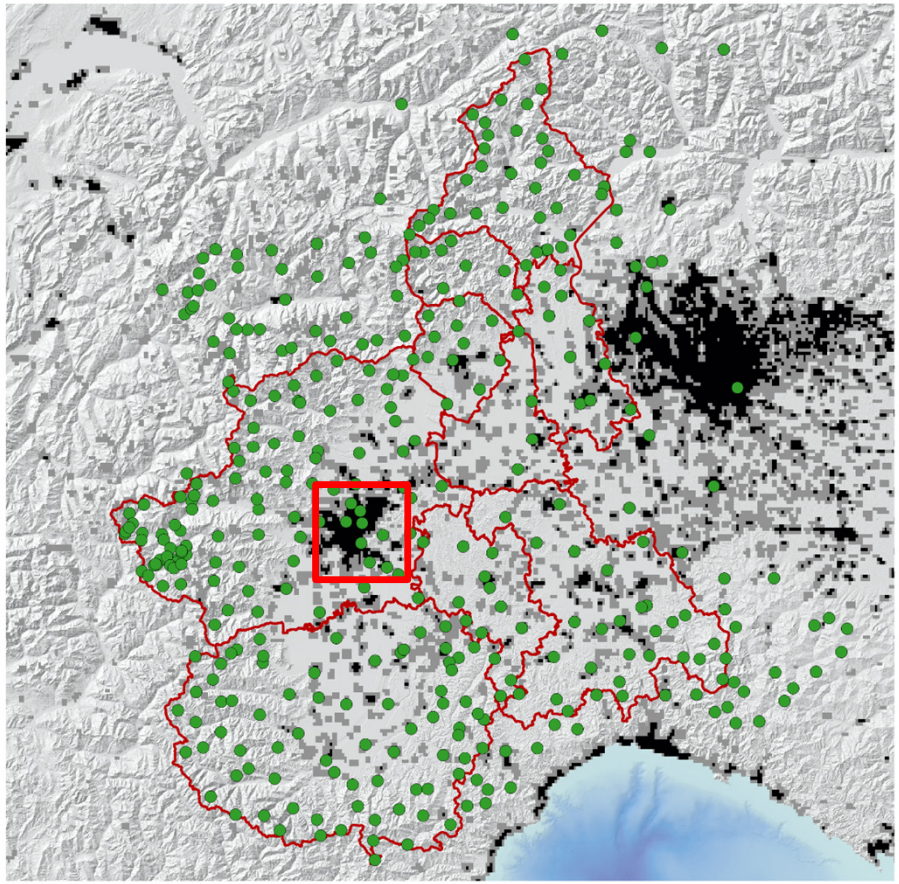
  itype_canopy=2**
- ✓ Test week: 16-23 March 2020

* **NEW** Namelist Settings for the Turbulence Scheme from the COSMO User's Guide (pp. 112-113)

** **NEW** Namelist Settings for TERRA from the COSMO User's Guide (pp. 114-115)

2021, 12, 237.

Verification



The different model versions have been evaluated by comparing the results with observations provided by:

1. all the Arpa Piemonte network
2. few urban stations

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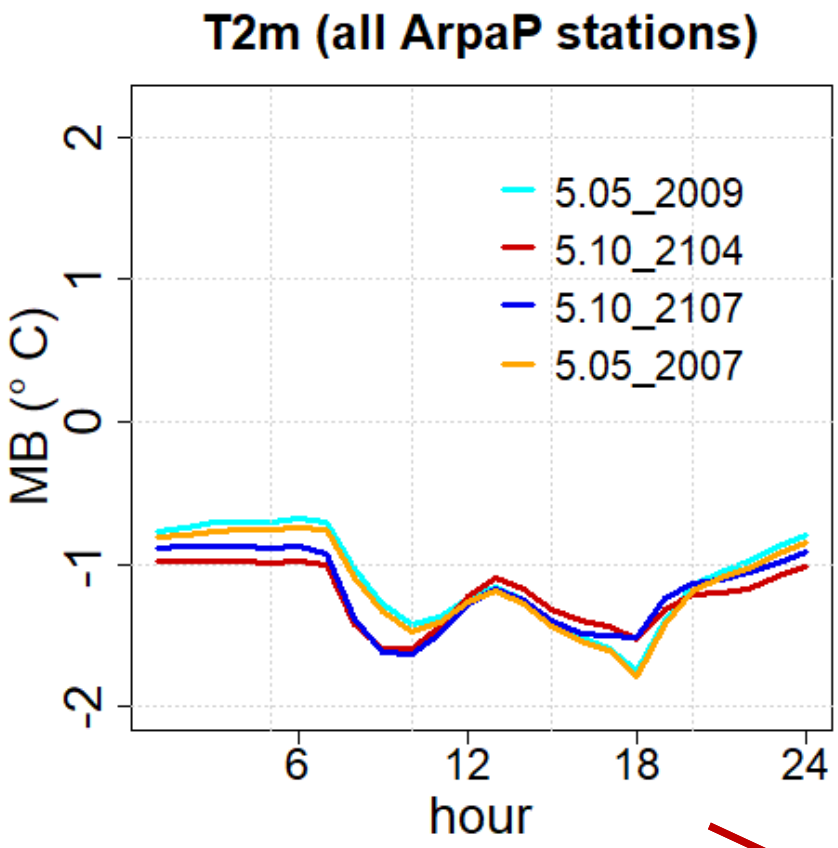
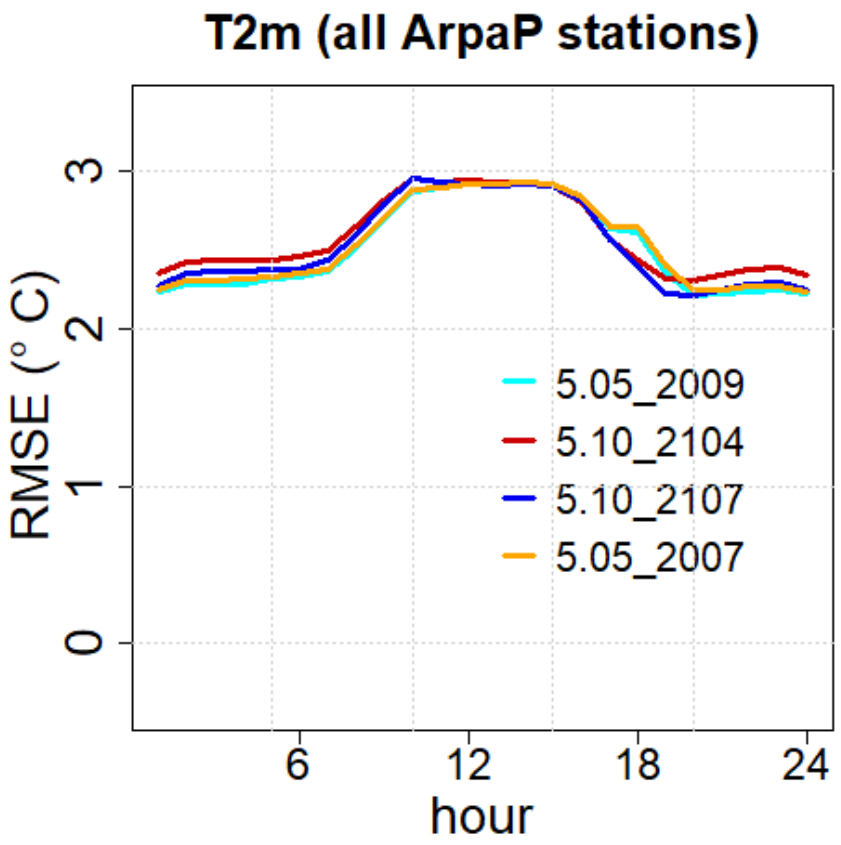
Different model versions





High underestimation!

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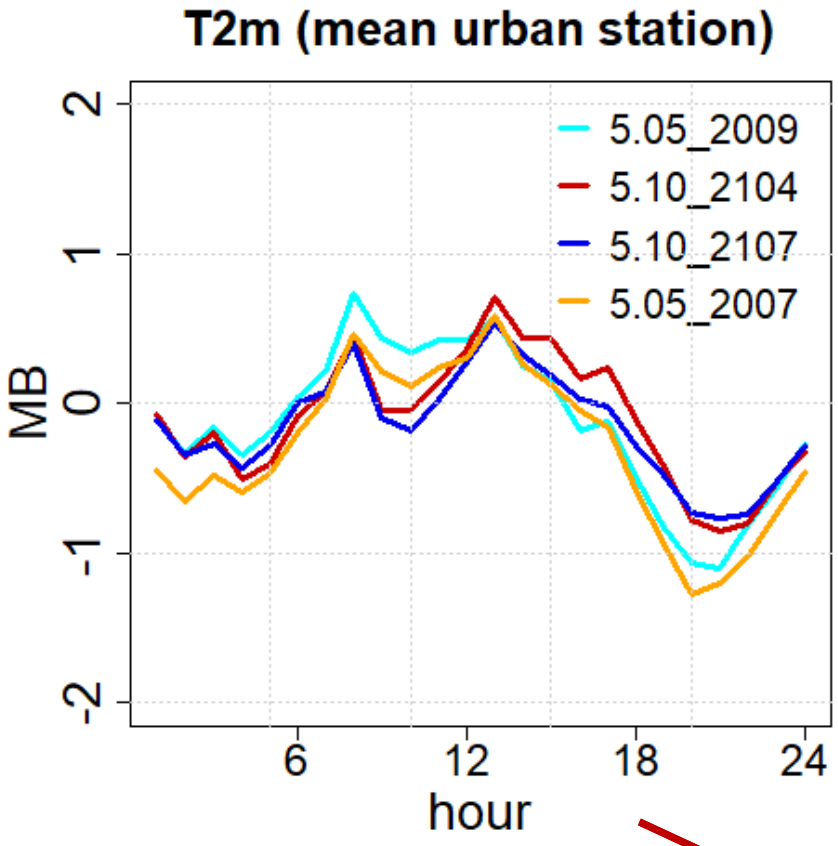
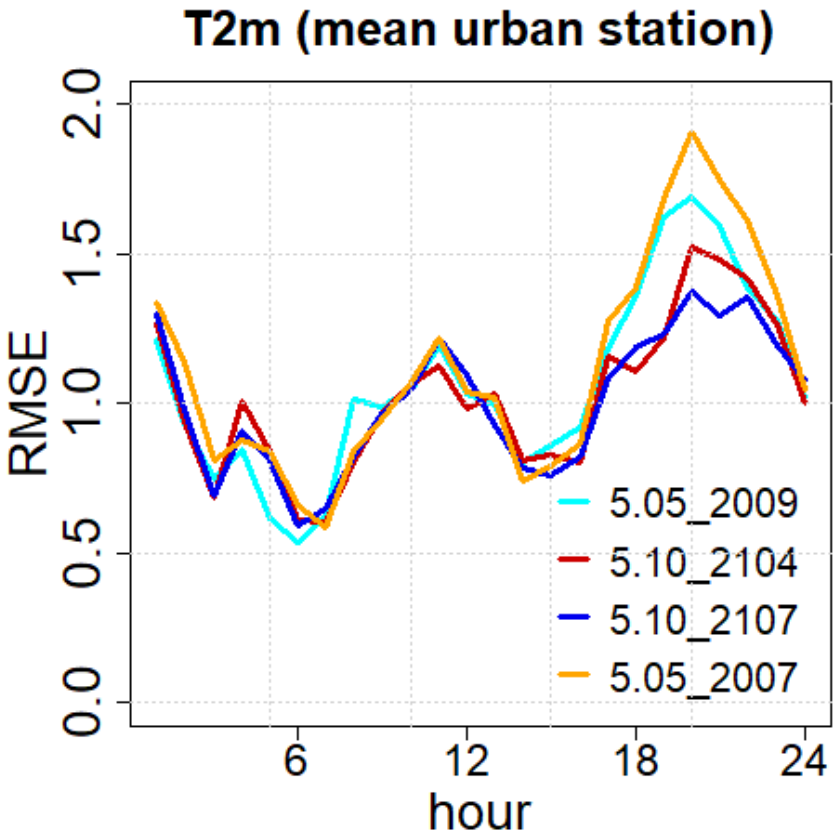
Different model versions

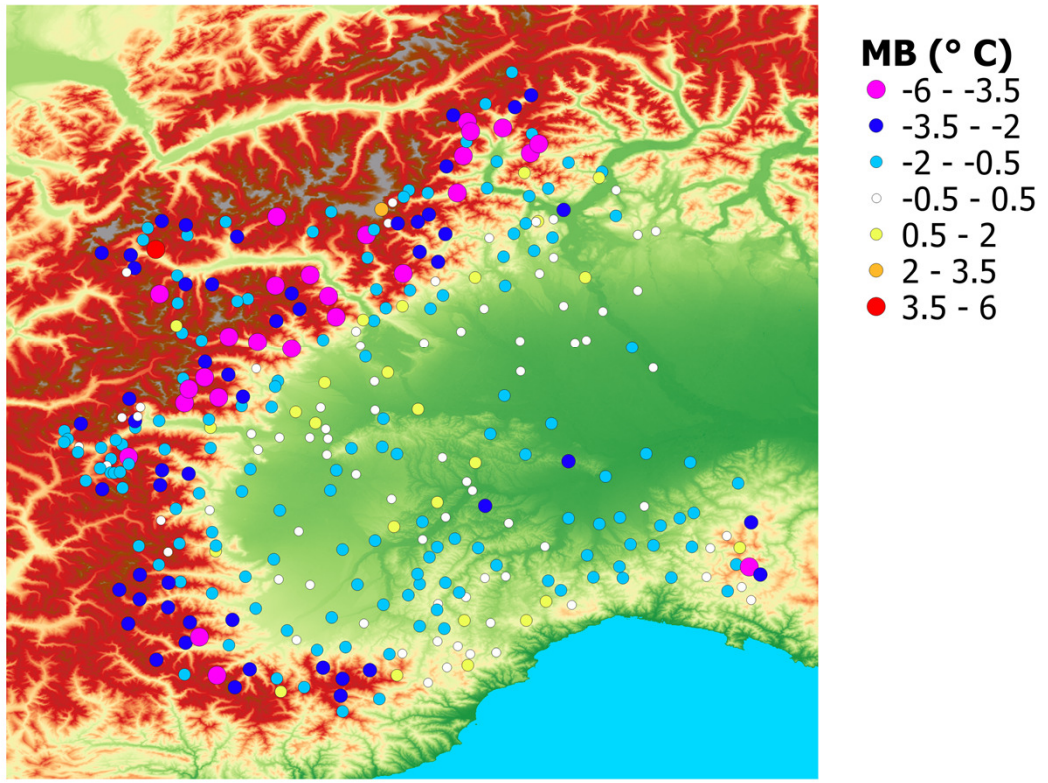




Quite good agreement

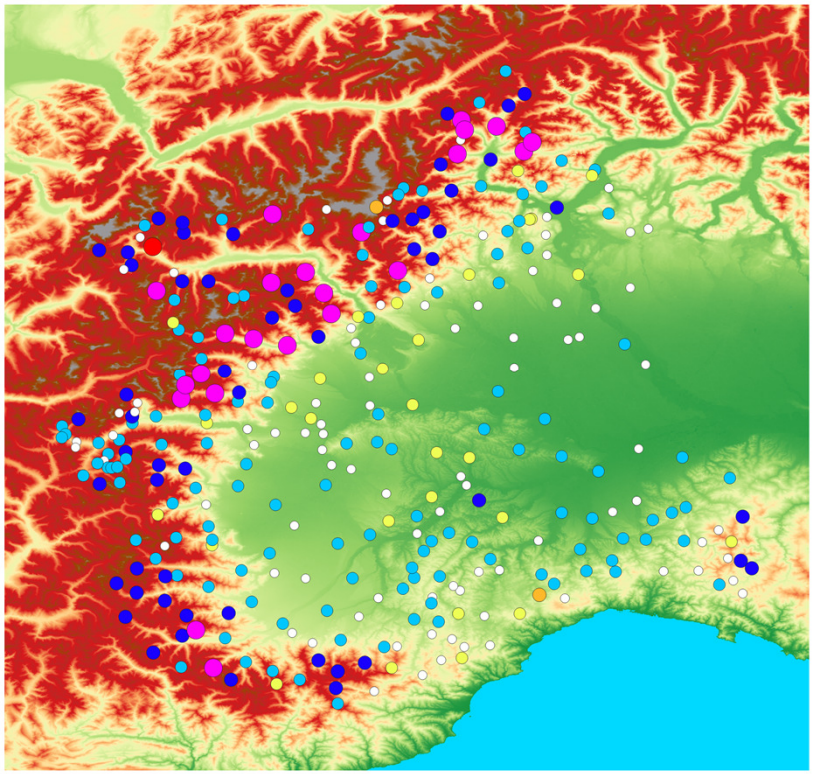
Different model versions

COSMO_210712_5.10beta



MB (° C)
- -6 - -3.5
- -3.5 - -2
- -2 - -0.5
- -0.5 - 0.5
- 0.5 - 2
- 2 - 3.5
- 3.5 - 6

COSMO_5.05urb6up5sh



High underestimation at slope: turbulence scheme..?

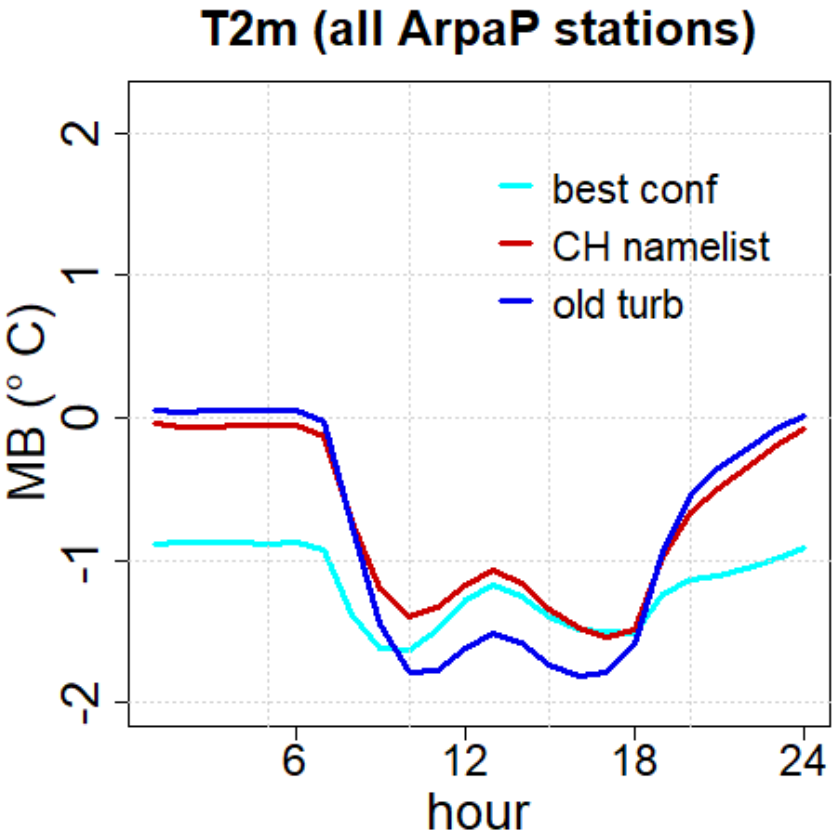
Setup

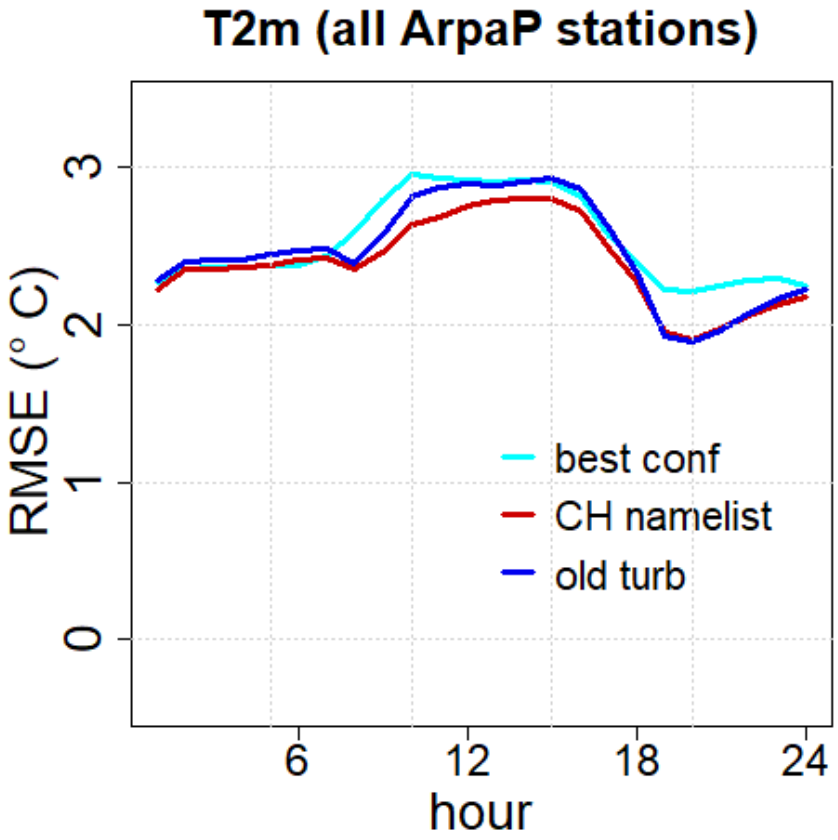
Testing different model configurations!

- ✓ Best configuration: **NEW** namelist Settings from the COSMO User's Guide (pp. 112-113)
- ✓ Old configuration: **OLD** namelist Settings from the COSMO User's Guide (pp. 112-113)
- ✓ CH configuration: namelist suggested by Switzerland (oldtur=true)

COSMO model version: **COSMO_210712_5.10beta**

Different model configurations





Old turbulence scheme improves performance during night

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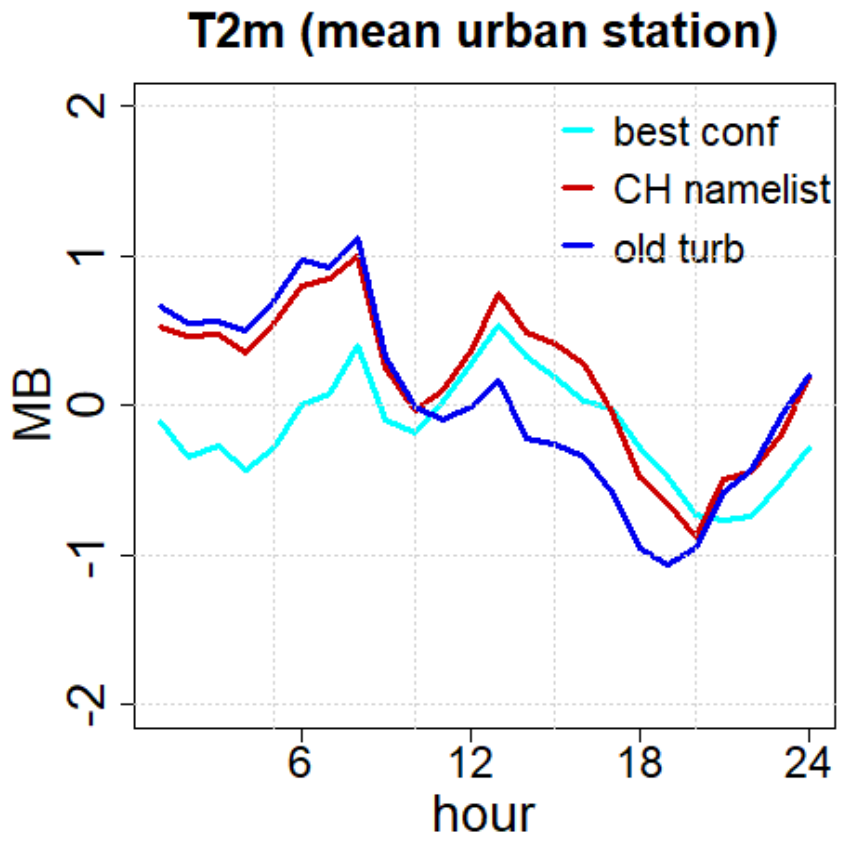
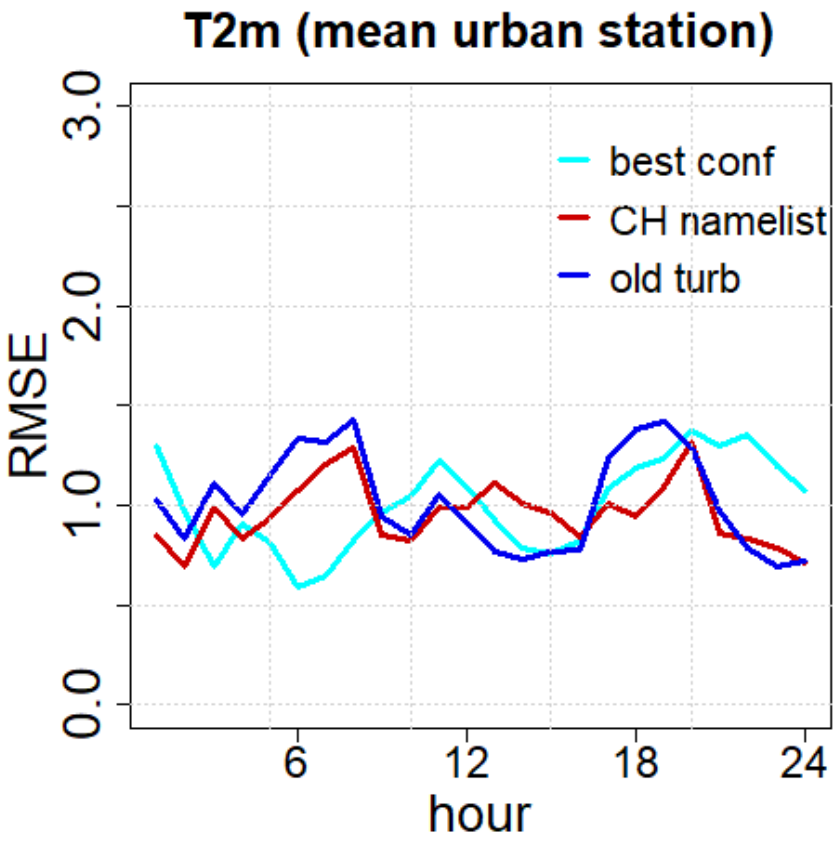
Different model configurations

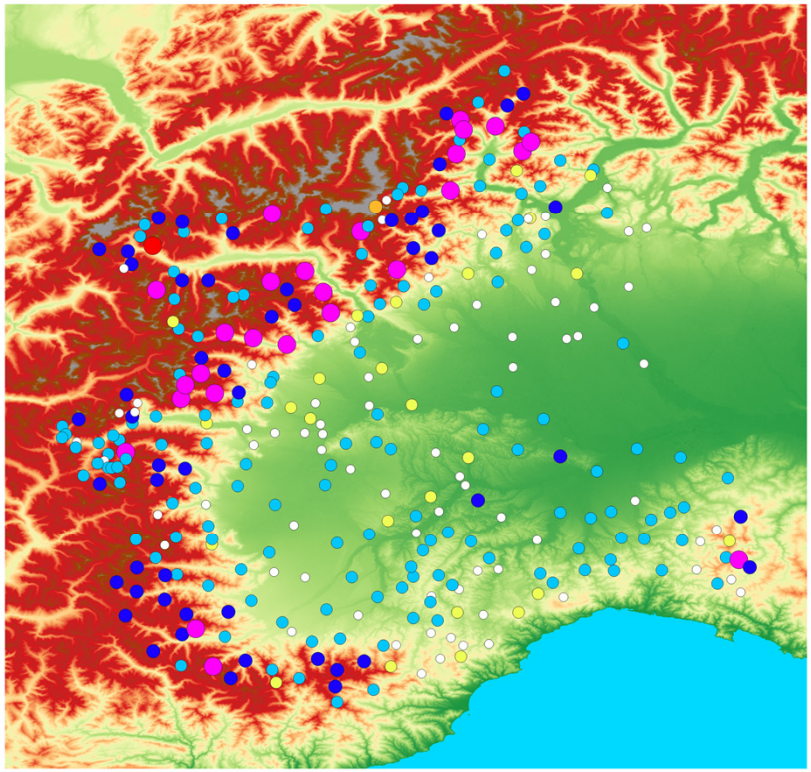




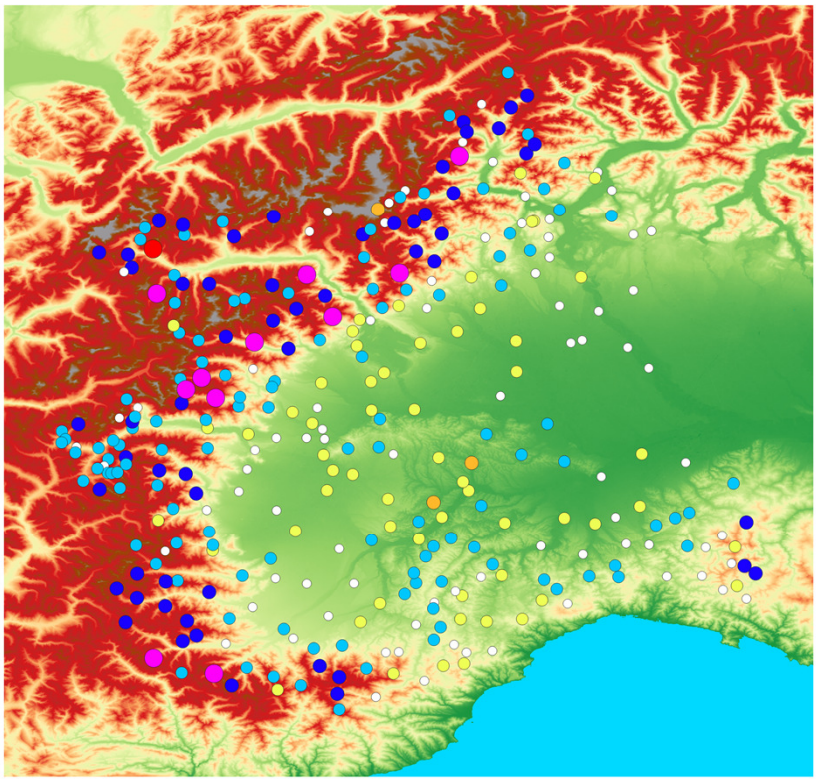
Best conf remains the best configuration for urban stations

Different model configurations

COSMO_210712_5.10beta

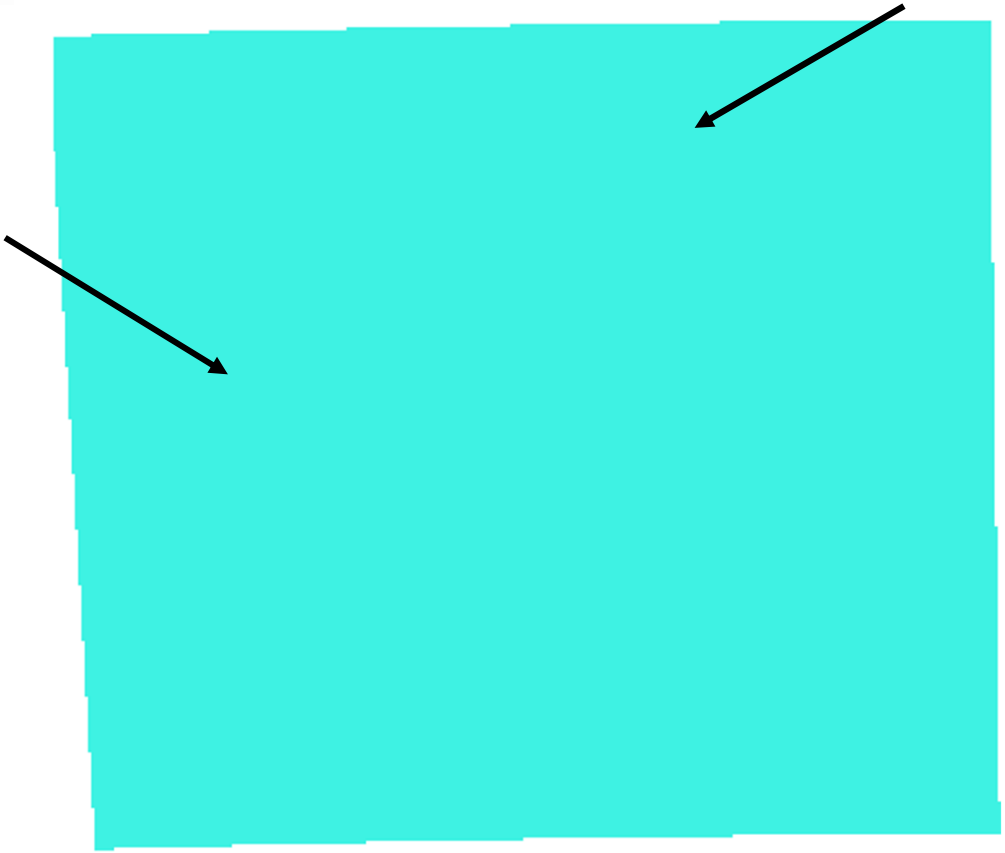


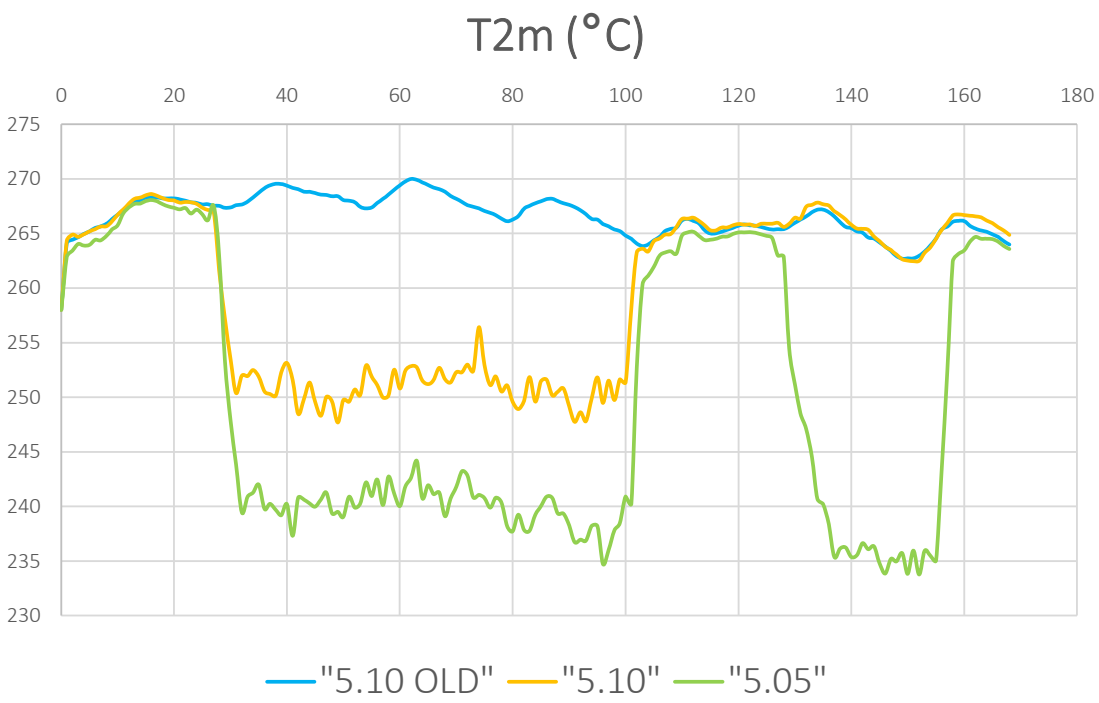
COSMO_210712_5.10beta - old turbulence



High underestimation at slope less pronounced for old tur

T2m_5.10old – T2m_5.10





Stochastical fluctuation??

Conclusions

- ✓ Best configuration (NEW namelist setting for turbulence scheme and TERRA) performs well in urban context but poorly elsewhere: singularities at slopes!
- ✓ Old turbulence scheme gets worse in urban areas but improves elsewhere: no singularities at slope!
- ✓ CH configuration has better scores than old configuration