



Priority Project

CALibration of the COSMO MOdel

CALMO

Status of work

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Milestones reached

- Preliminary work (Task 1)
- Adaptation of the existing method for NWP applications (Task 2, 2.1-2.5,2.8)
- Computed 48 experiments and analysed results with the MM (Task 2, 2.6-2.7)
- Documentation and dissemination of results- Part I (Task 5)



Parameters selection

| Surface layer | | |
|---------------|--------------|---|
| Name | range | comment |
| rlam_heat | [0.1,1*,2] | |
| c_soil | [0,1*,c_lnd] | c_lnd=2 |
| rat_sea | [1,20*,100] | <i>changes in rlam_heat must be compensated by an inverse change of rat_sea in order to maintain (at least approximately) rlam_heat*rat_sea. This in principle also applies to COSMO model unless we intend to change the evaporation over water.</i> |

| turbulence | | |
|---------------------|-----------------|---|
| Name | range | comment |
| tur_len | [100,150*,1000] | L_scal=MIN(0.5*_l_hori, tur_len) |
| tkhmin (and tkmmin) | [0.1, 0.4*,1] | <i>Should be equal! Increasing values does not keep low clouds, decreasing values better scores</i> |

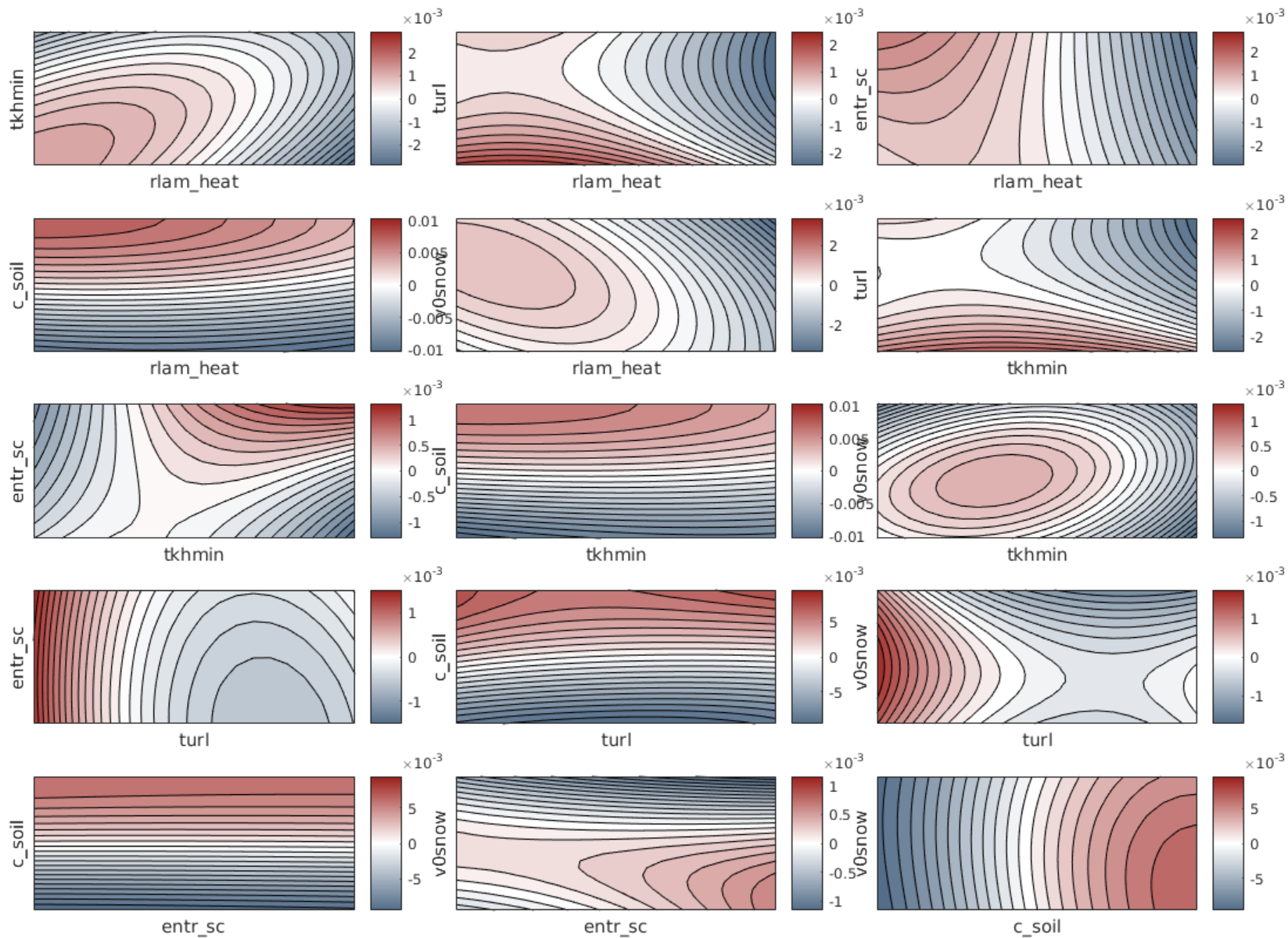
| Vegetation and soil | | |
|---------------------|---------------|--|
| Name | range | comment |
| crsmin | [50,150*,300] | Vegetation and soil affecting parameters are currently not considered <i>f=2 in Decharme et al, 2006, parameter for hydraulic conductivity induced in Tuning namelist by G.Morsier</i> |
| kexpdec | [0, 2*, 2] | |

| Shallow convection | | |
|--------------------|-----------------|---------|
| Name | range | comment |
| entr_sc | [0.5,3*,20]E-04 | |

CALMO stage 2 calibration – preliminary results (March 2016)

- **Simulations:** **6 parameters**, currently no soil memory
- **Resolution:** 2.2km
- **Period:** 2013/01/01 – 2013/04/30 (out of entire 2013)
- **Fields:** **Tavg, Tmax, Tmin, 24h-Pr**, still without sounding fields (Cape, Cin, TCWC, 3 wind shears)
- **Regions:** 3 over Switzerland (will be enlarged when sounding stations and Italian data will be included)
- **Score:** RMSE-type (COSI still needs investigation)
- **Calibration type:** quadratic for all the parameters (logarithmic fits were not checked yet)

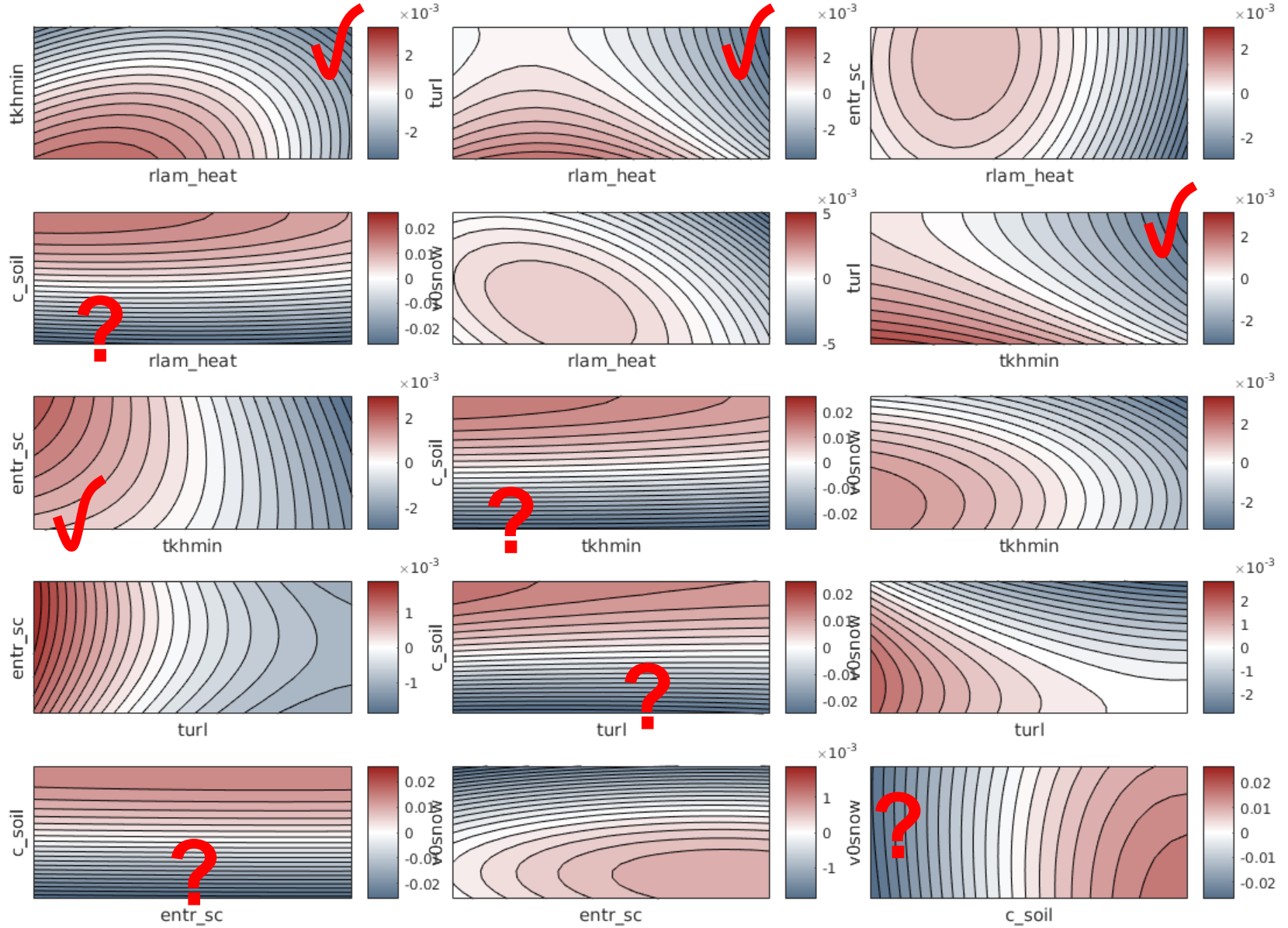
Averaged daily 2m-temperature (Tavg) score minus the default simulation score (gray is better than red)



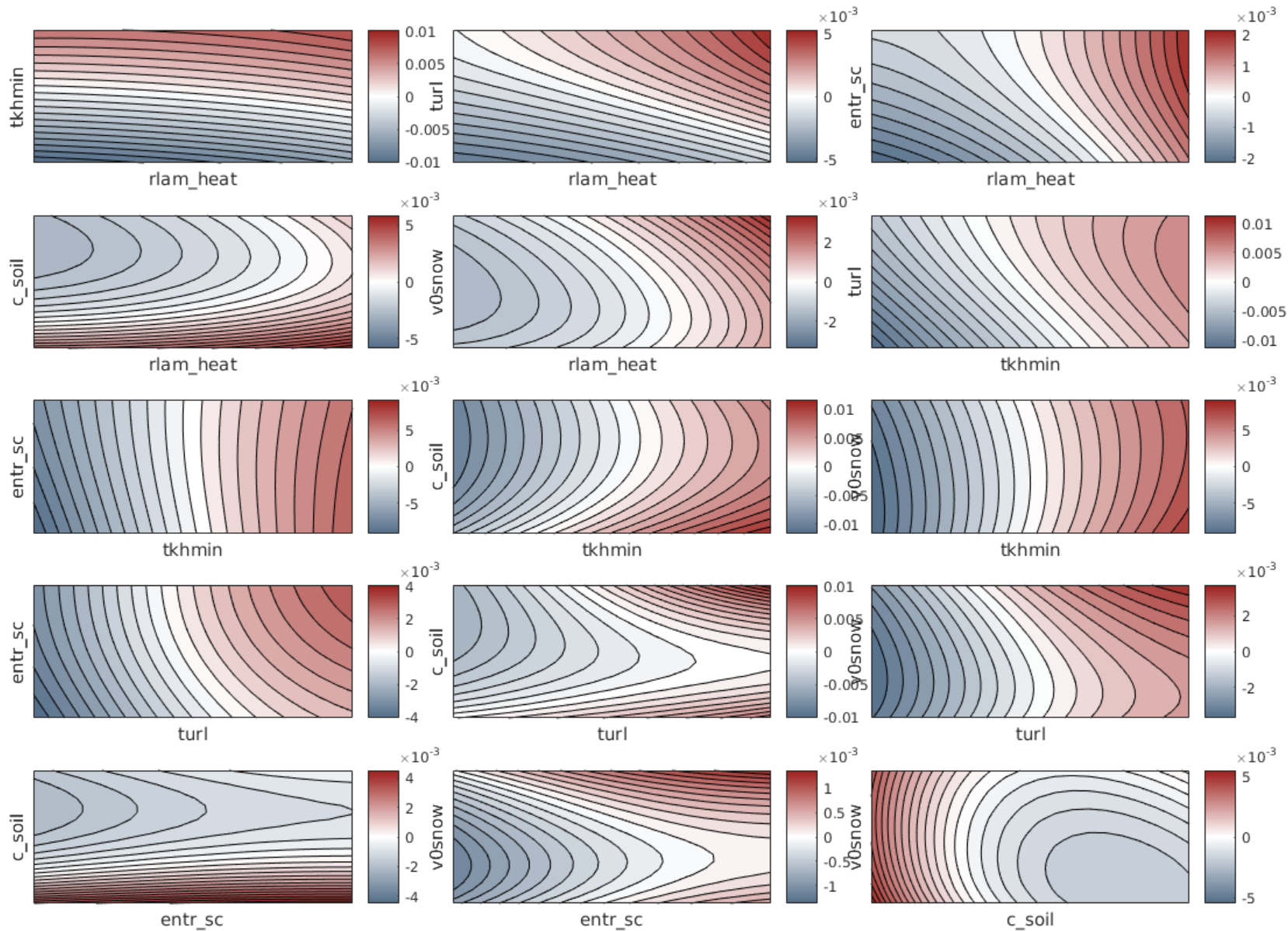


- Tmax often underestimated by the model
- Increasing tur_len, mixes more the atmosphere, increasing Tmax
- In winter (stable usually), increasing rlam_heat detaches the cold soil from the lower atmosphere, leading to increase in Tmax
- In winter, increasing tkhmin increases the mixing, leading to increase of Tmax
- c_soil - *Surface-area index of the evaporating fraction of grid points over land.* Increasing c_soil increases evaporation which leads (?!) to cooling, i.e reducing Tmax.
- entr_sc - *Mean entrainment rate for shallow convection.* Increasing entr_sc reduces the effectiveness of mixing, reducing Tmax. The effect is small !
- V0snow - *Factor in the terminal velocity for snow.* The effect is not very clear ?!

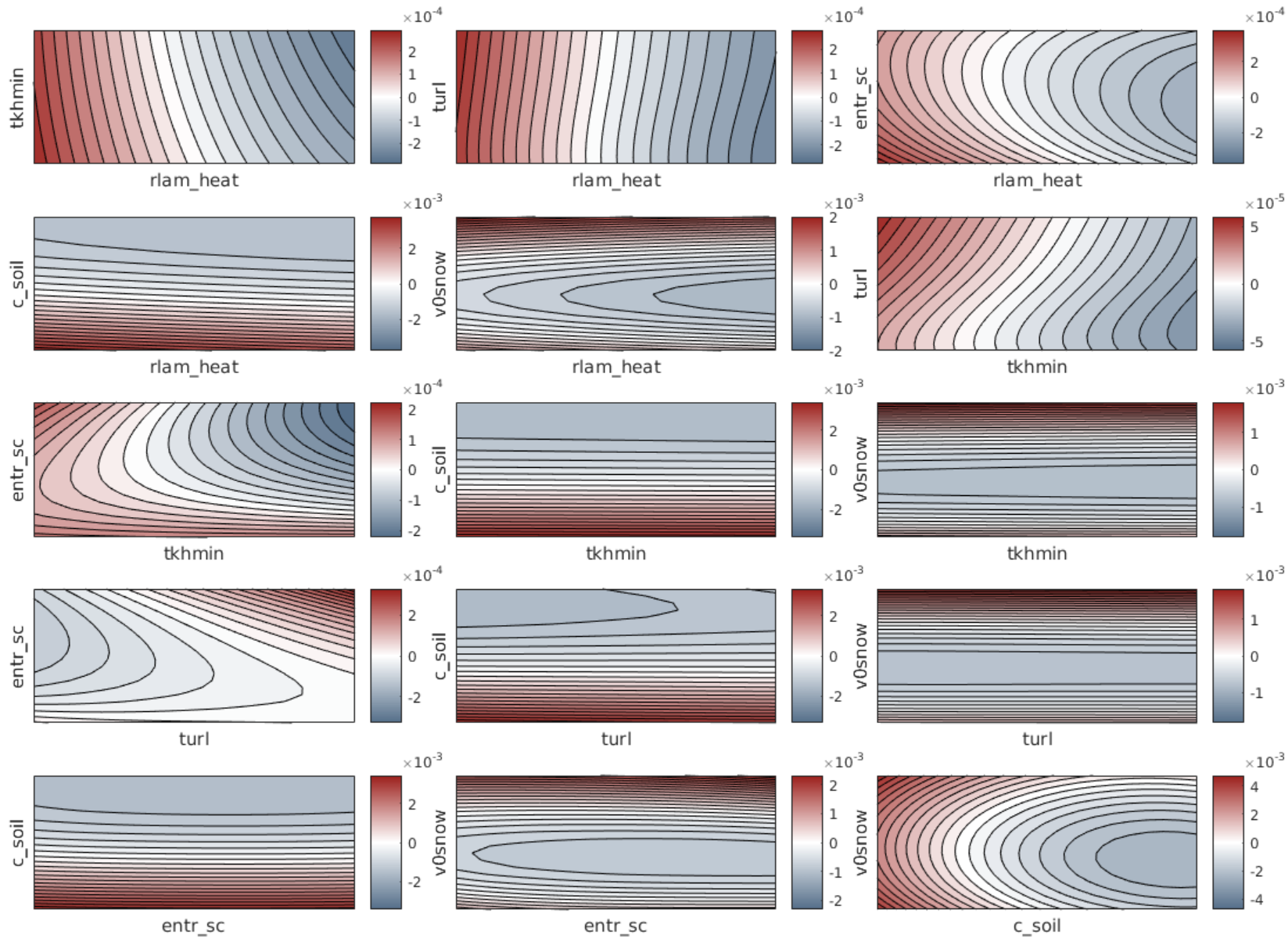
Averaged daily 2m-temperature (Tmax) score minus the default simulation score (gray is better than red)



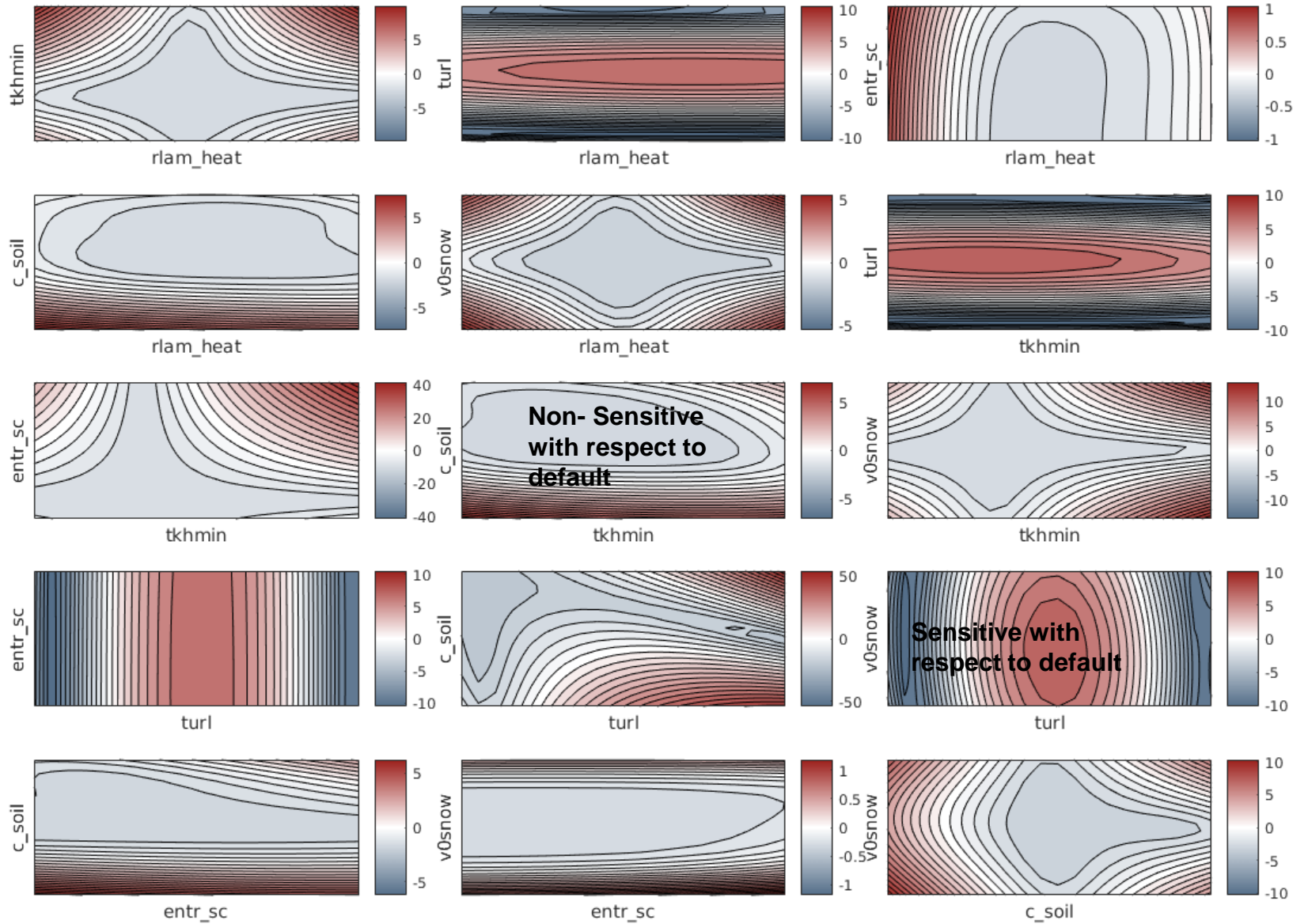
Averaged daily 2m-temperature (Tmin) score minus the default simulation score (gray is better than red)



24h-Precipitation (Pr) score minus the default simulation score (gray is better than red)



Total score minus the default simulation score (gray is better than red)





Optimal parameters of preliminary MM results:

| | |
|-------------------------|------------------|
| rlam_heat=0.266 | default = 1 |
| tkhmin=0.385 | default = 0.4 |
| turl=169.107 | default = 150 |
| entrsc=0.942*e-3 | default =0.3*e-3 |
| csoil=1.576 | default =1 |
| v0snow=19.833 | default =20 |

Optimum values extracted only for 4 consecutive months (JFMA) are close to default for :

tkhmin
turlen
v0snow

Regarding these parameters it looks that the model is well tuned.

csoil, and rlam_heat can be considered as the most sensitive parameters.

The planes once completed (using entire year) should be thoroughly examined.

Metamodel is now applied over the entire year in order to extract the final set of optimum parameters



Milestones remaining

- A preliminary BEST simulation with the optimum set is running.
- Repeat experiment with 'soil history'
- Extend calibration to COSMO-1
- Organize a workshop beginning of April
- Define optimal methodology in terms of computing time and quality gain
- Documentation and dissemination of results –Part II



Submissions Being Processed for Author Antigoni Voudouri, Ph. D

Page: 1 of 1 (1 total submissions) Display 10 results per page.

| Action | Manuscript Number | Title | Initial Date Submitted | Status Date | Current Status |
|------------------------------|---------------------|--|------------------------|--------------|----------------|
| Action Links | ATMOSRES-D-15-00752 | Objective calibration of numerical weather prediction models | Oct 21, 2015 | Feb 08, 2016 | Under Review |

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