



CALMO-MAX MEETING WORKSHOP IN HNMS 7/1/2019-9/1/2019

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2018 Objectives

- 3 years soil spin-up with TSA.
- Add 5 new fields to the COSI score:
 - Sunshine duration
 - Dew point – mean
 - Dew point – max
 - Dew point – min
 - Precipitation FSS
- Verify simulation vs. observations
- Find the interaction point closest to the first guess.
- Translate the MM code to Octave to run on ECMWF computer.

Unplanned Challenges

- TSA problems to run in 1 km resolution. Thanks to JMB and Daniel Regenass from MeteoSwiss for helping with FieldExtra and bug fixing.
- MATLAB memory is not enough to handle huge arrays. Therefore, optimization process and splitting the dataset in time and space.
- Converting MATLAB to OCTAV many differences could not check on IMS machine.

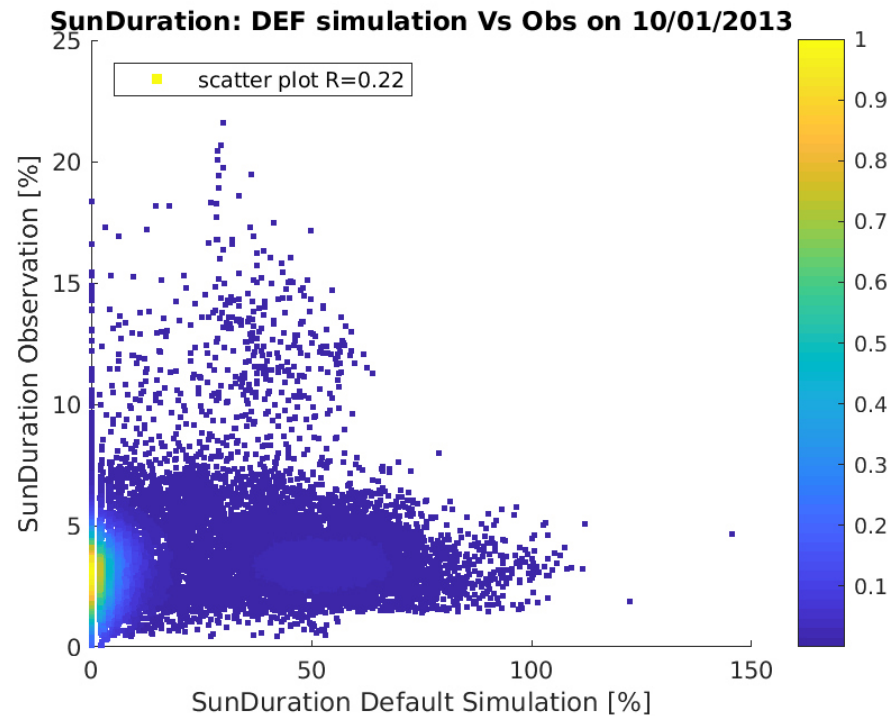
Observed vs. Simulated (default values)

Sunshine Duration

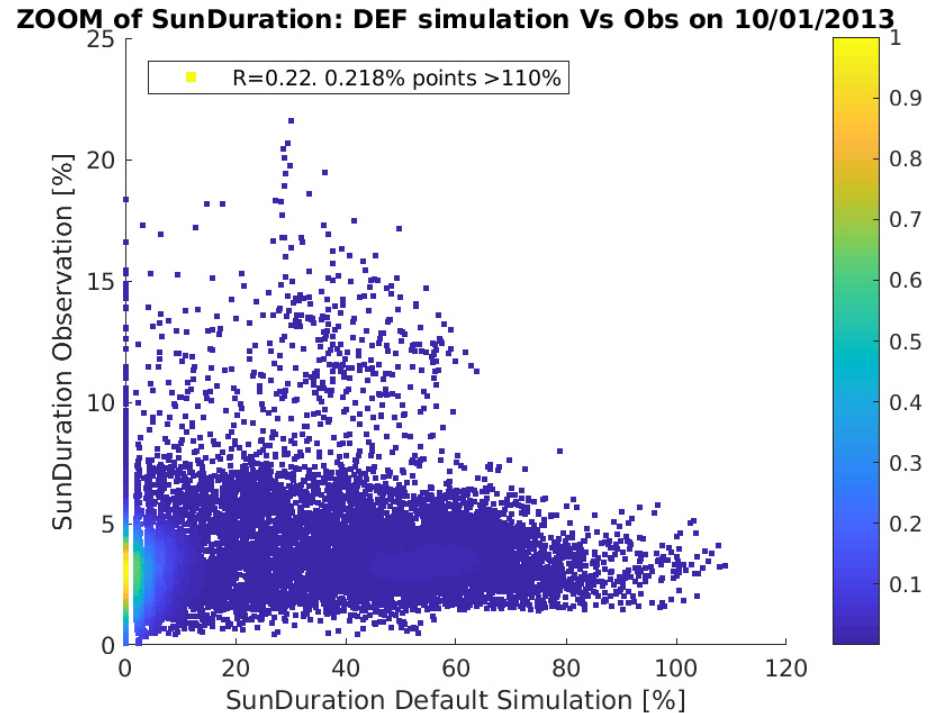
1/1/2013 - 10/10/2013

Sunshine Duration 10/1/2013

All Data



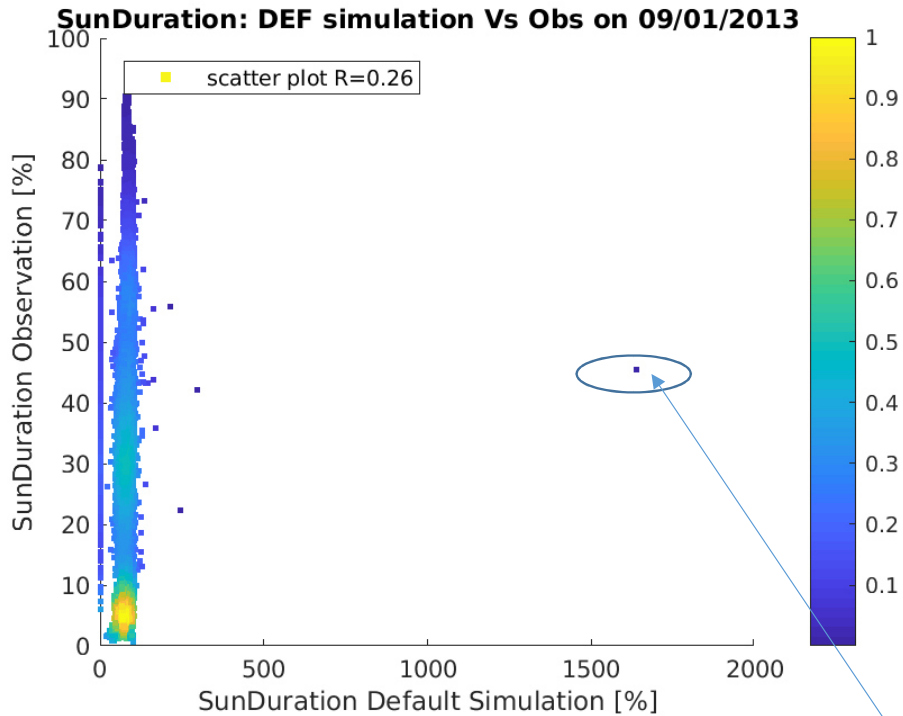
Only data of sun duration between 0-110%



Omitted bad data is the
Number of points which
their sun duration values are
out of the range 0%-100%

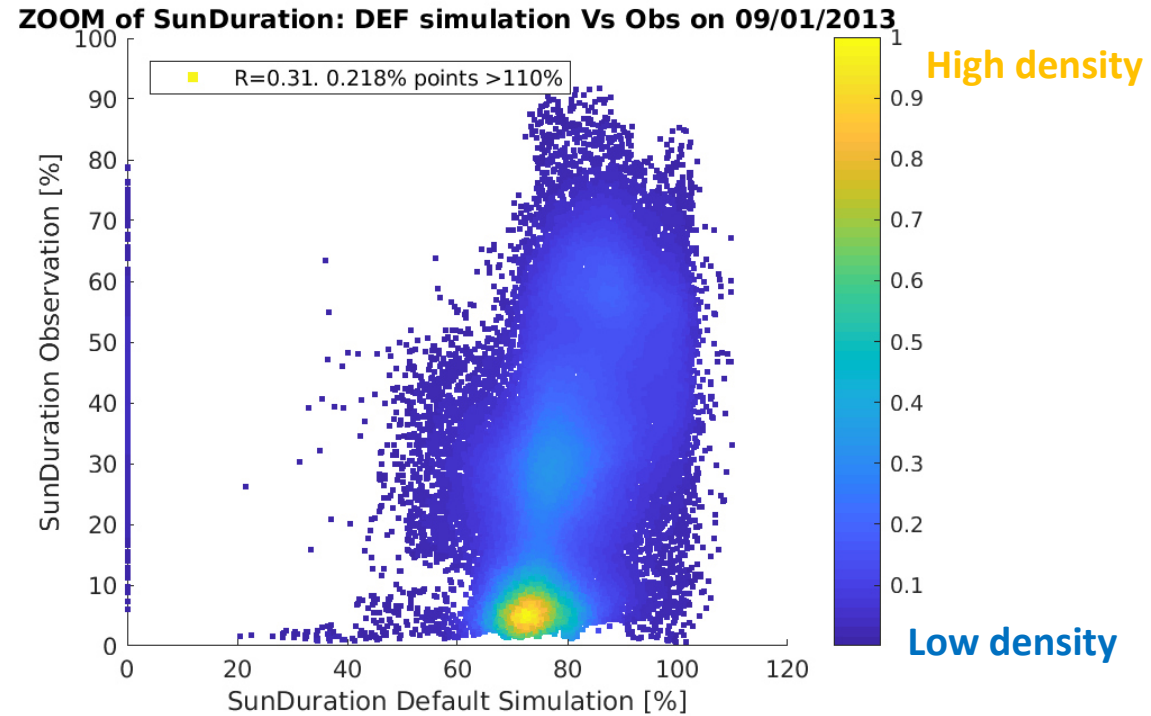
Sunshine Duration 9/1/2013

All DATA

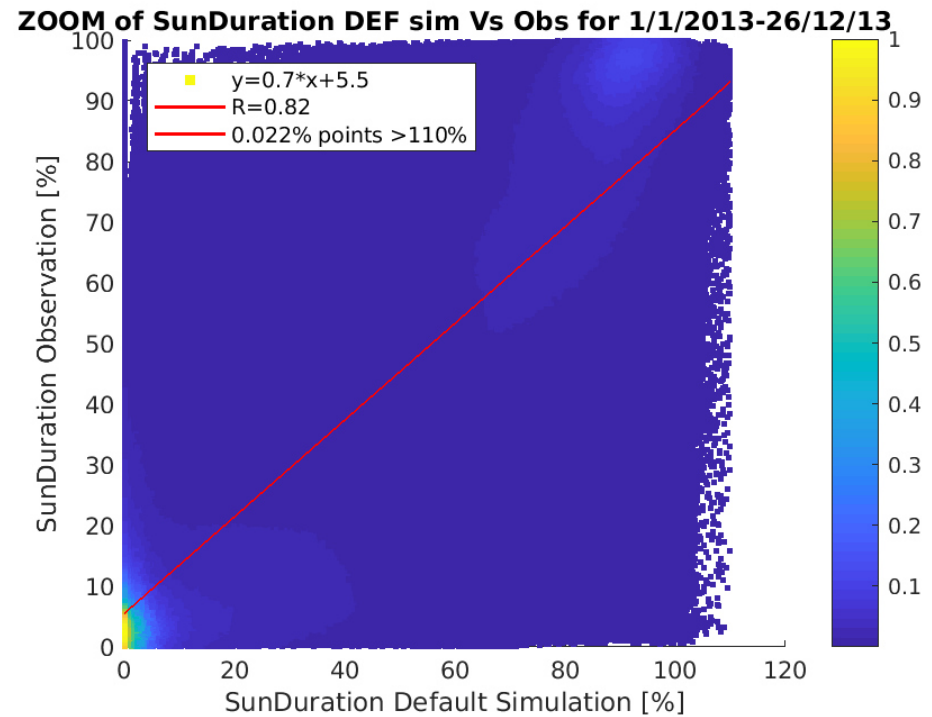
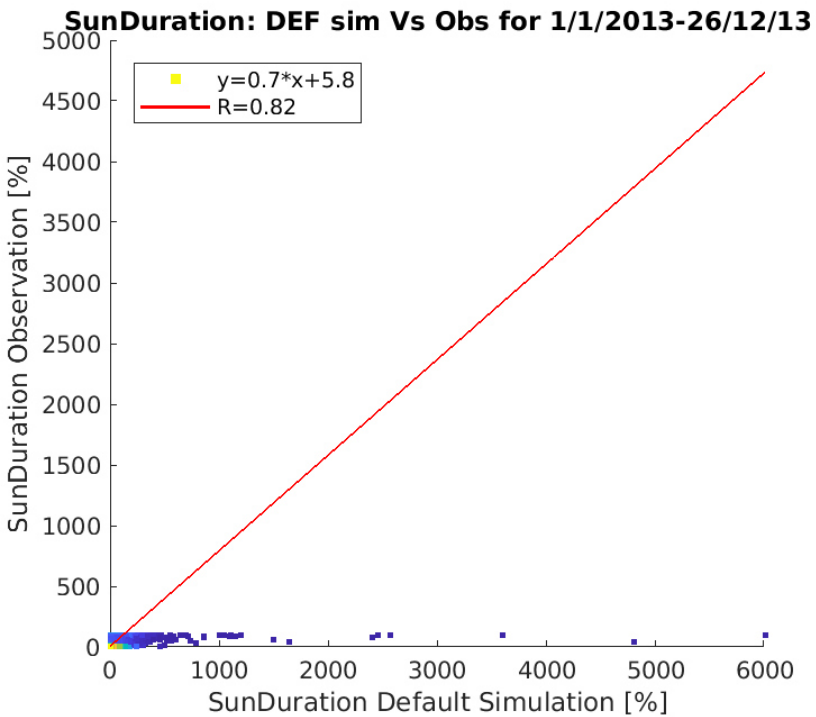


Very BAD DEFAULT
Simulation
Even if we omitted the bad
points the correlation
nevertheless is still worst. Only
0.29 !!!

Only data in range 0%-110%



SunDuration for period for almost all 2013
1JAN2013 to 26DEC2013
For 350 days out of 365days



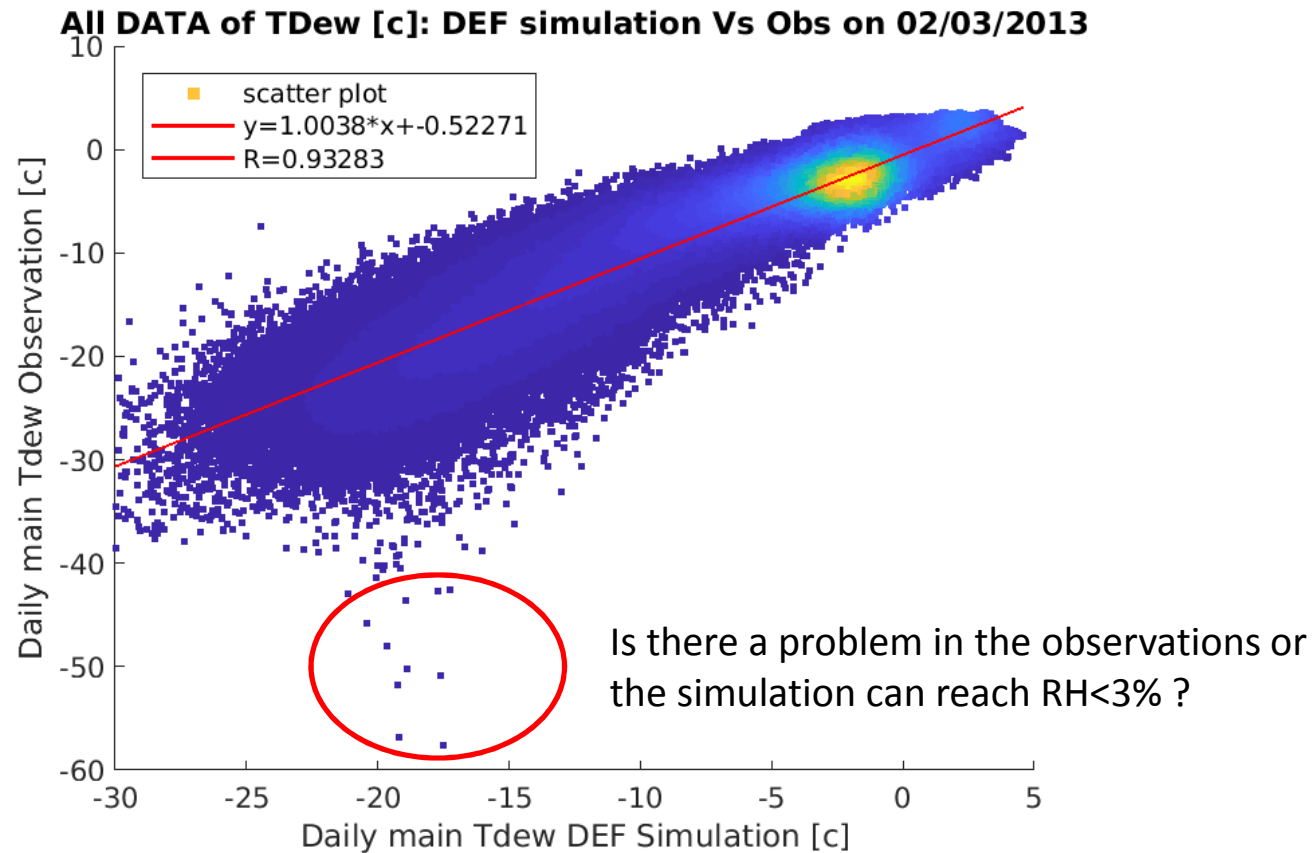
***the period 22MAR2013-31MAR2013 was omitted because of error in the file datamatrix.mat for that period**

Observed vs. Simulated (default values)

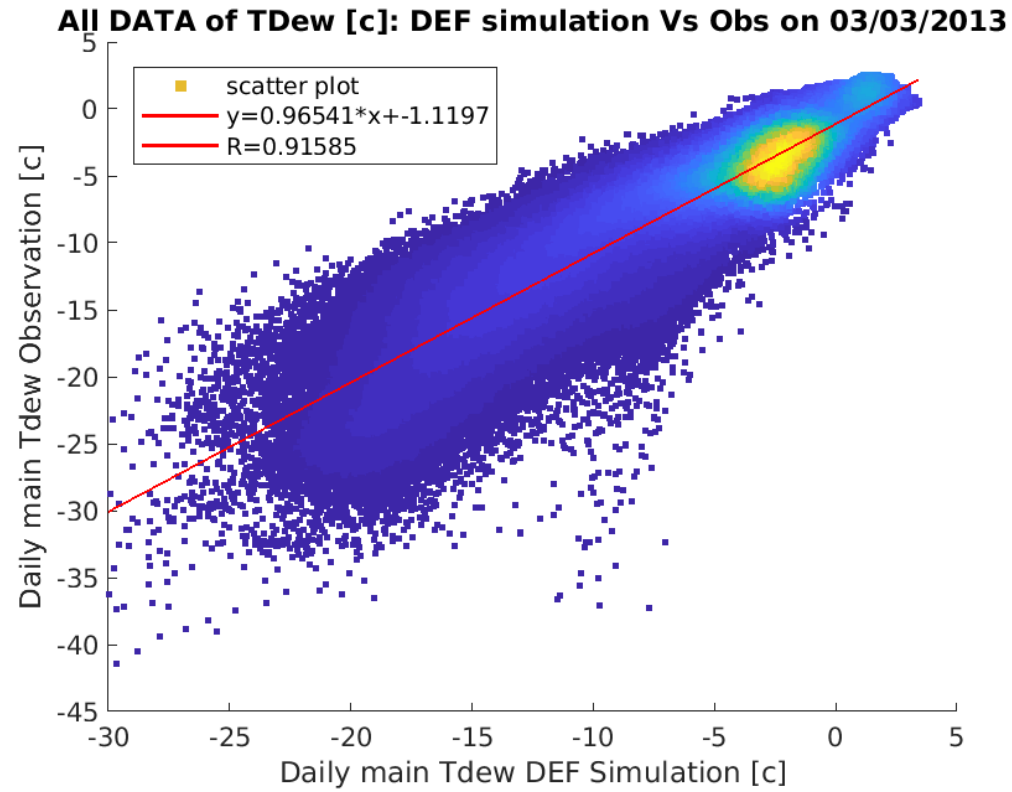
Daily mean Dew point

2/3/2013 - 11/3/2013

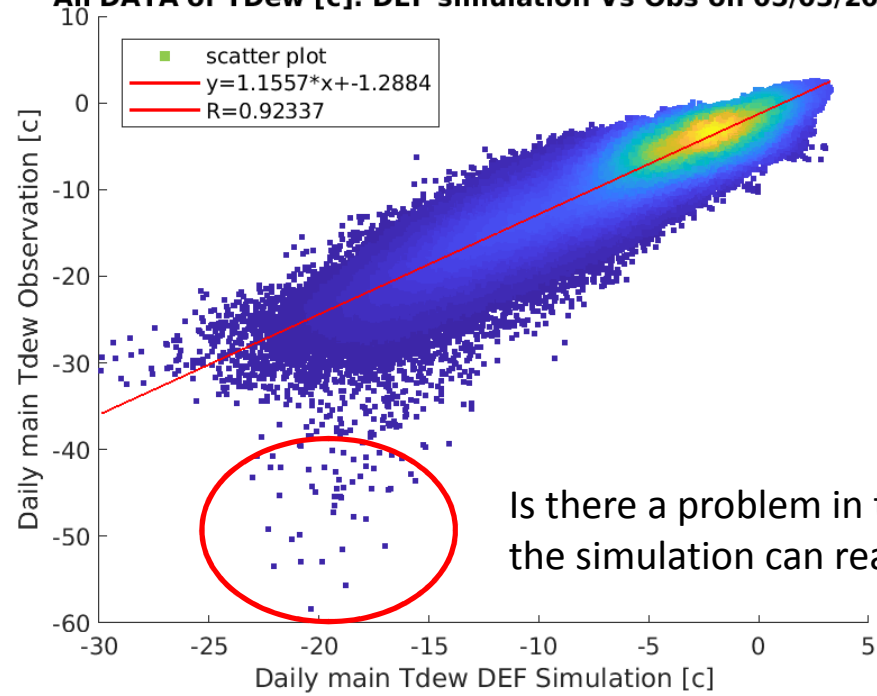
Tdew 2m Daily min on 2/3/2013 in the final matrix datamatrix.obsdata and datamatrix.refdata (before the stage of metamodel)



Tdew 2m Daily mean on 3/3/2013 in the final matrix datamatrix.obsdata and datamatrix.refdata (before the stage of metamodel)

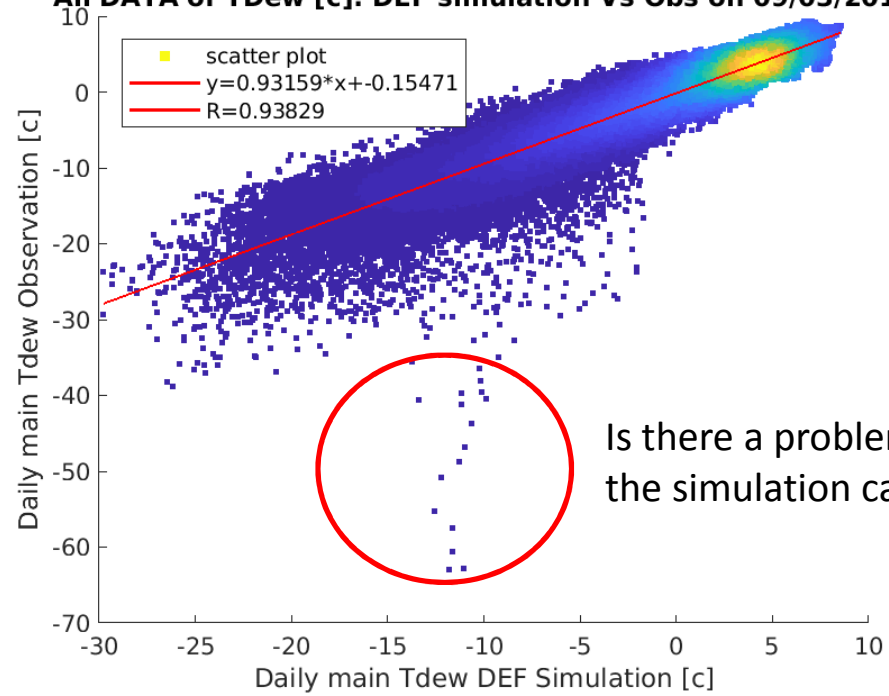


All DATA of TDew [c]: DEF simulation Vs Obs on 05/03/2013



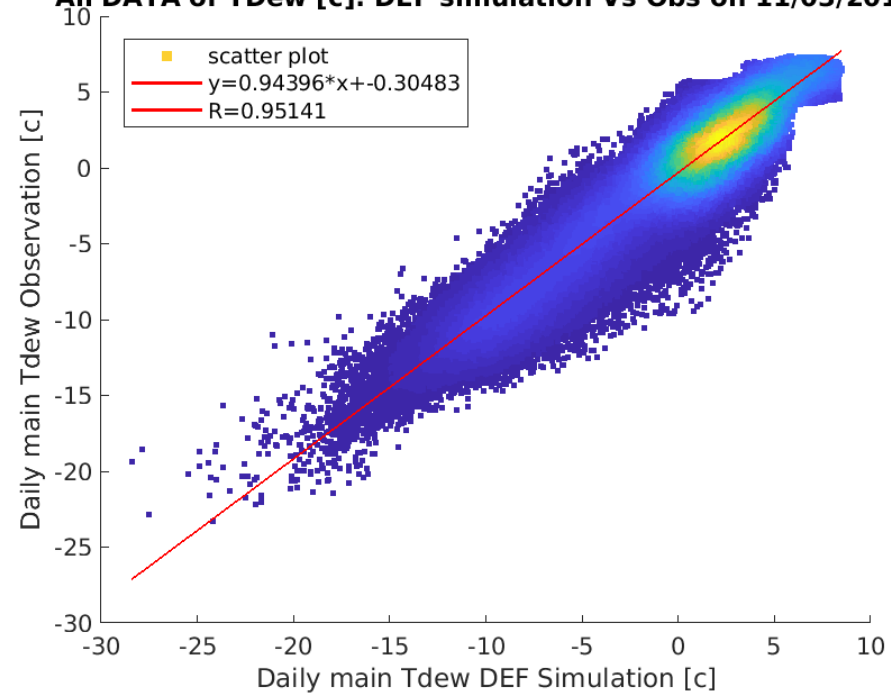
Is there a problem in the observations or the simulation can reach RH<3% ?

All DATA of TDew [c]: DEF simulation Vs Obs on 09/03/2013

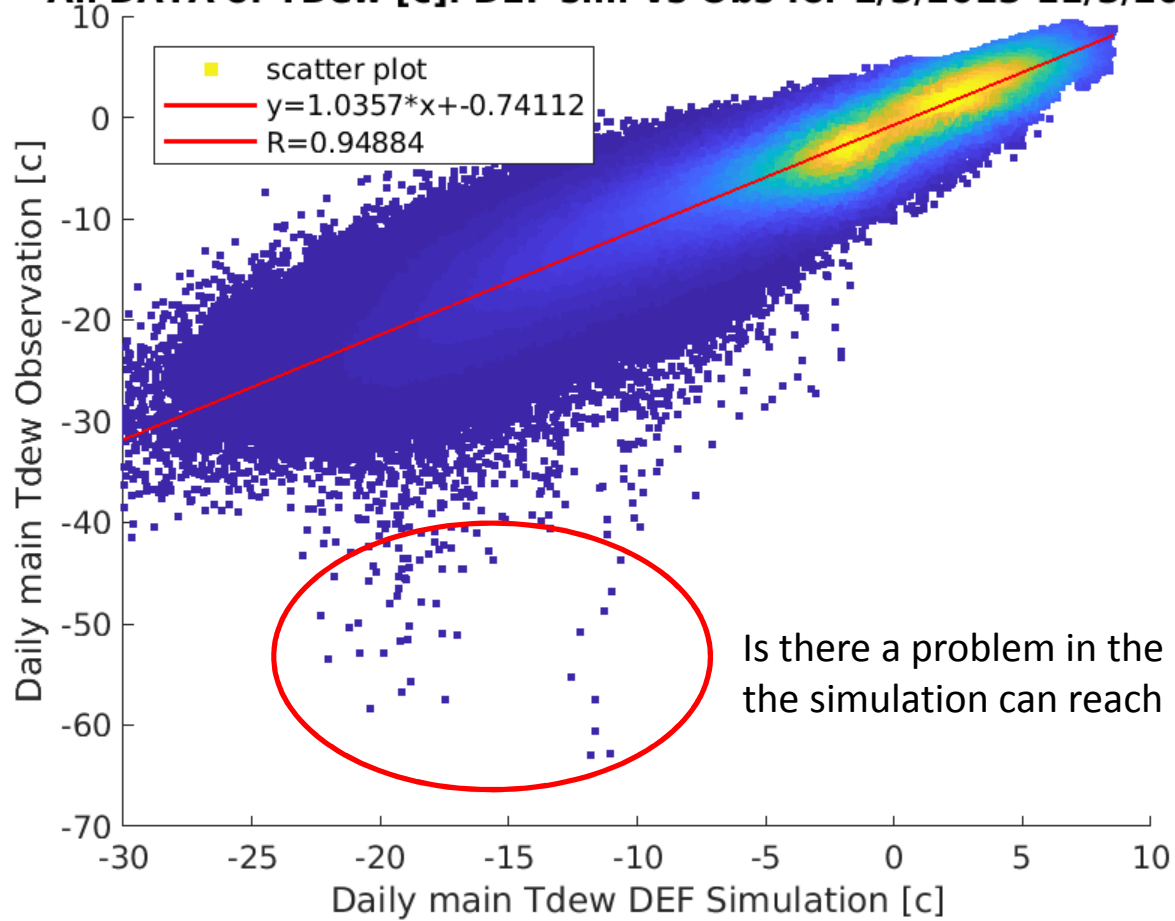


Is there a problem in the observations or the simulation can reach RH<10% ?

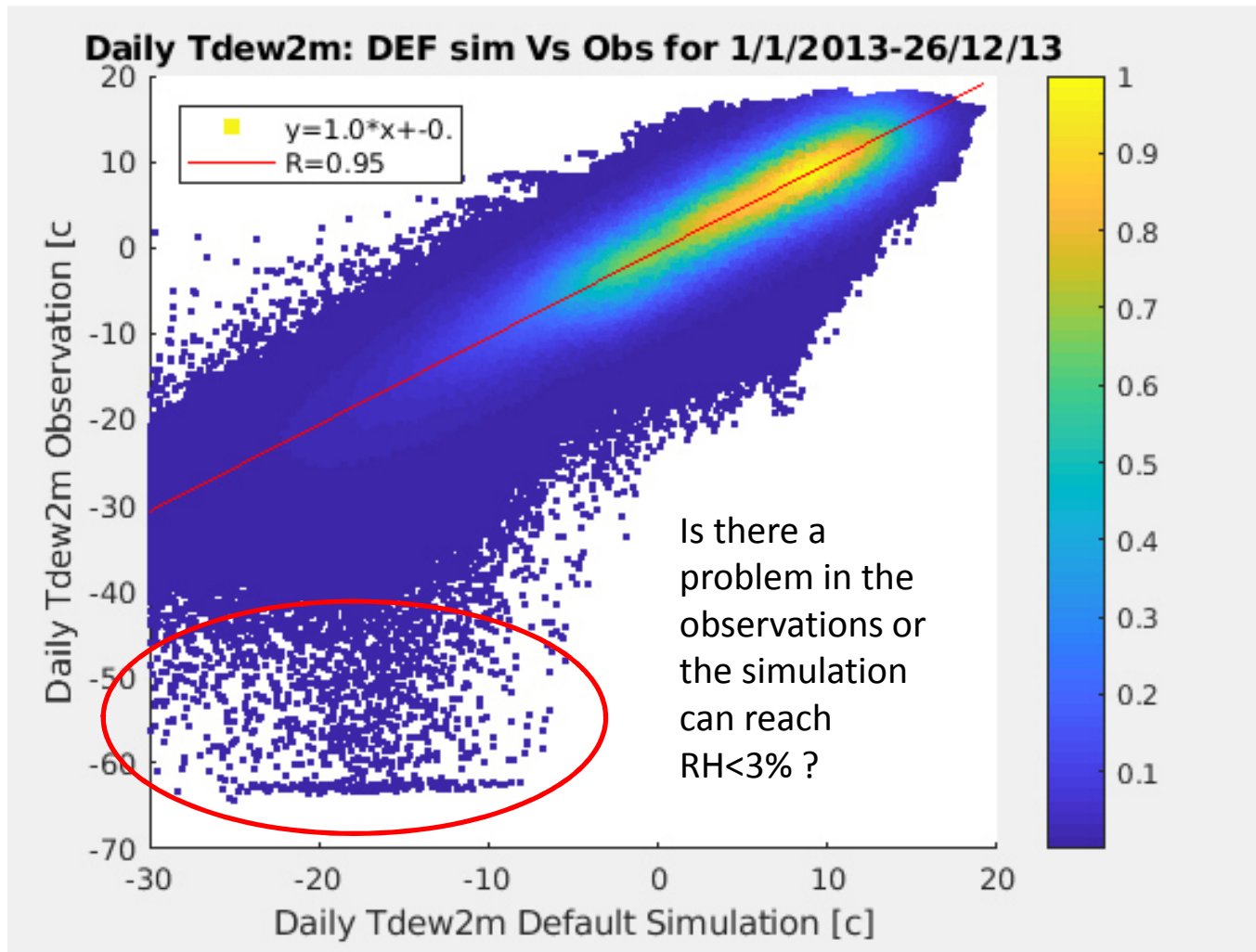
All DATA of TDew [c]: DEF simulation Vs Obs on 11/03/2013



All DATA of Tdew [c]: DEF sim Vs Obs for 2/3/2013-11/3/2013



Tdew min
120 days out of 365 days of 2013

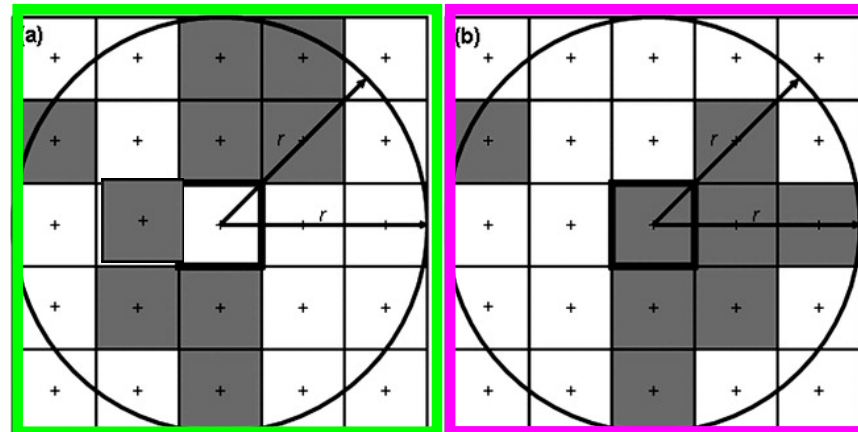


Td=-65C -> RH=0%

Fractions Skill Score (FSS) Validation Method

Obs. around point i,j

Forecast around point i,j



$$9/25=0.36$$

$$8/25=0.32$$

Black Point are grids where the amount of daily precipitation is equal or above some threshold

FSS coding has finished, MM runs are performed.

STAGE 1

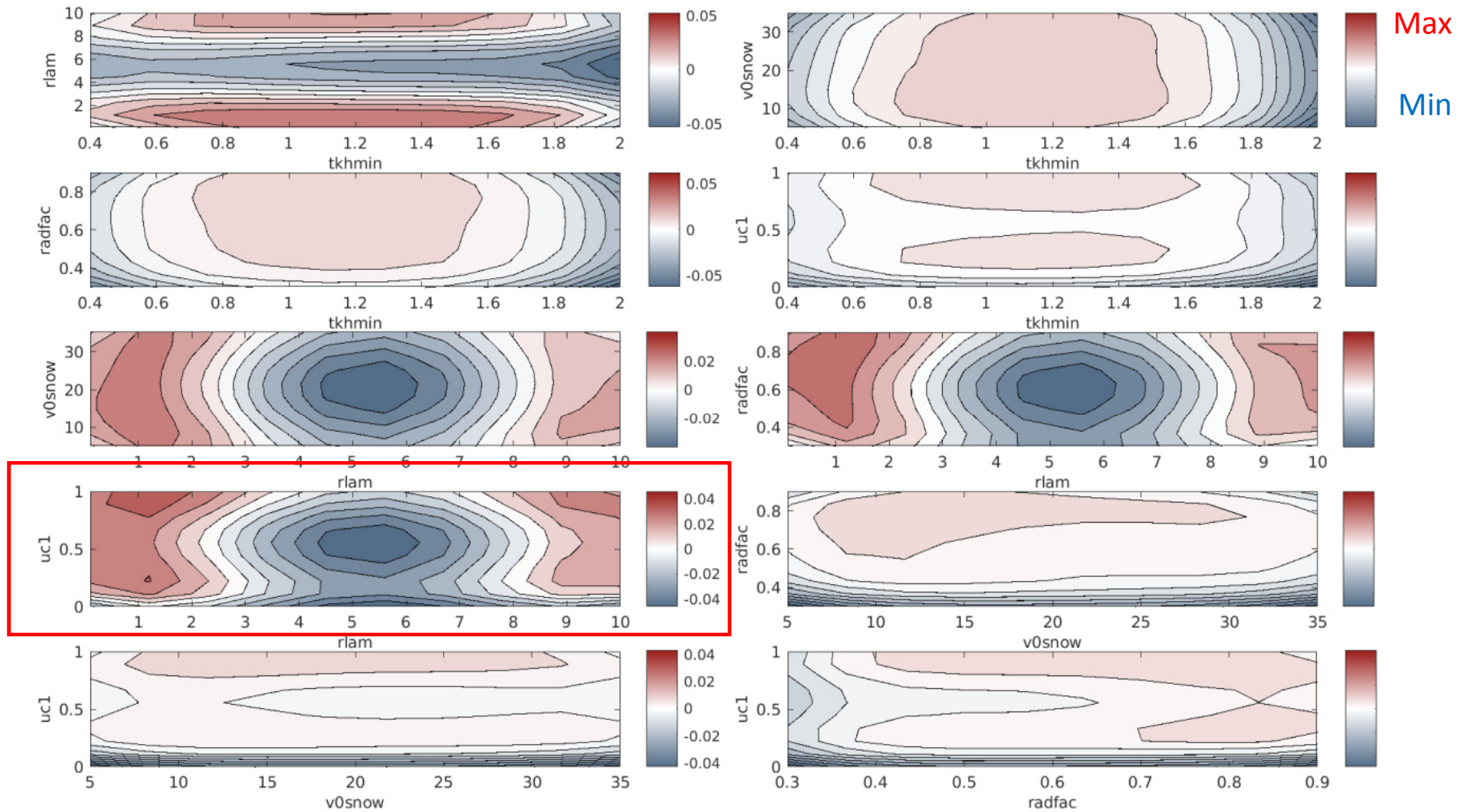
COSI SCORE

**DETERMINE THE “BEST” (~NOMINAL)
INTERACTIONS**

COSI scores for n=5 parameters -> $(n-1)*n/2=10$ pairs

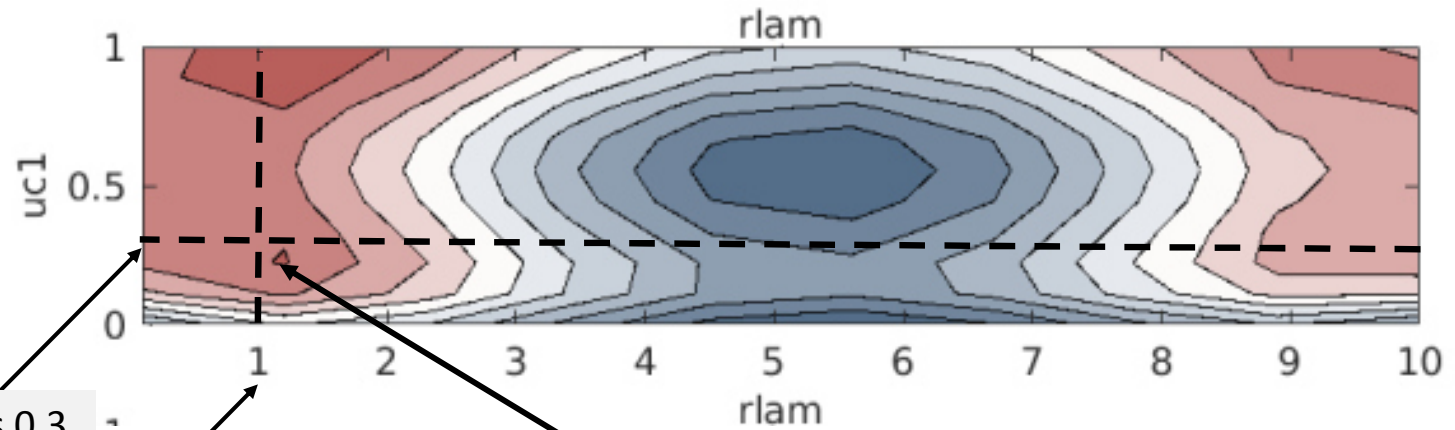
7 surface fields: T2max, T2min, T2mean, Td2max, Td2min, Tdmean and Precipitation + 16 radiosonde fields

1/1/2013-10/1/2013



Planes map Example

COSI SCORE for the first 10 days (decade) of January (1/1/2013-10/1/2013).
For using 7 surface fields: T2max,T2min, T2mean, Td2max, Td2min, Tdmean and Daily Precipitation.



Default value UC1 is 0.3.

Default value of rlam is 1.

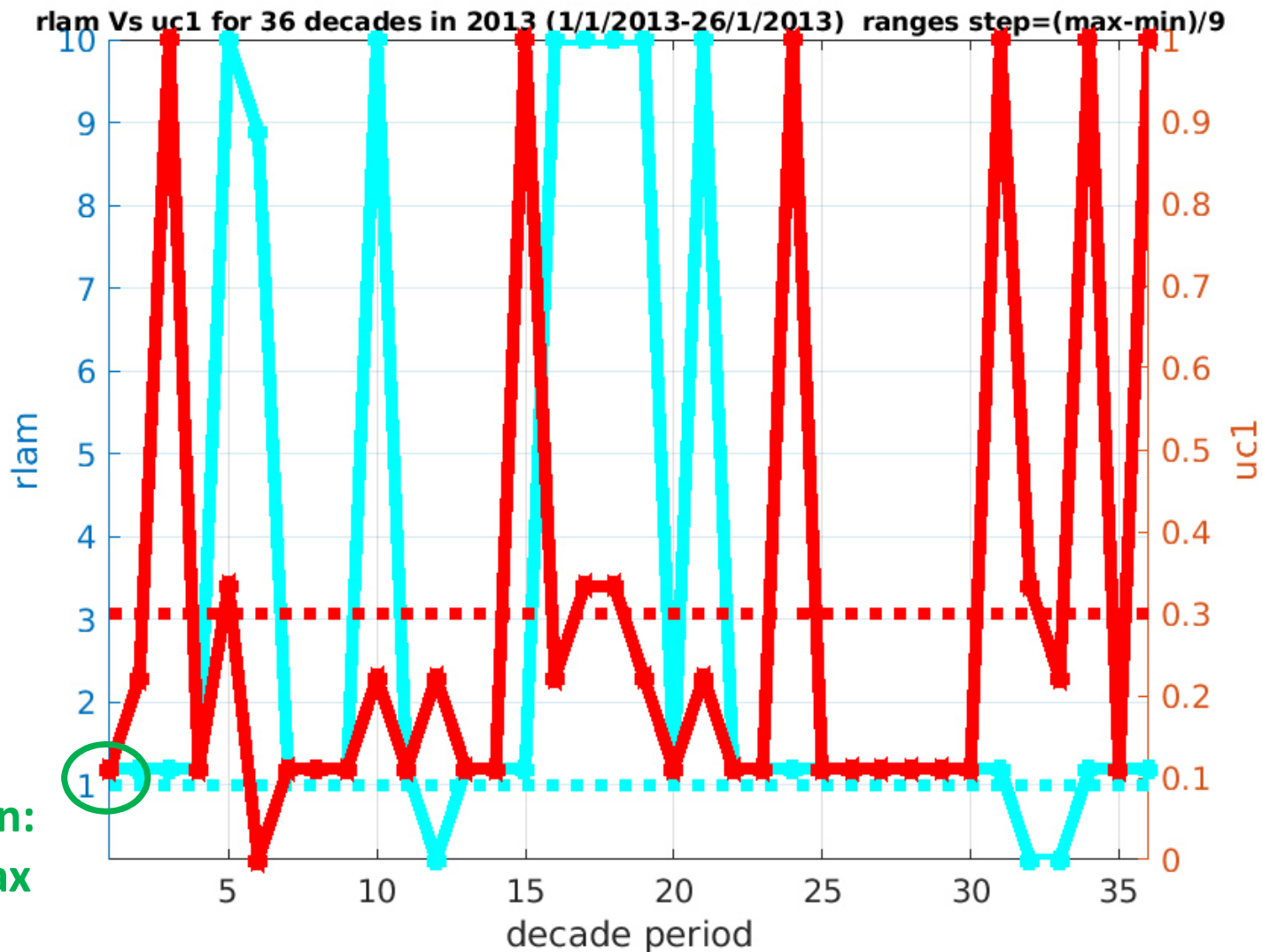
The maximum COSI score
rlam ~ 1.2, uc1~0.22 ->
Interaction: uc1_min and rlam_max

32 out of 36 periods of 10 days **rlam** is above the default

26 out of 36 periods **uc1** is below the default.

The interaction is:
maximum rlam
minimum uc1.

first 10 days Interaction:
uc1_min and rlam_max



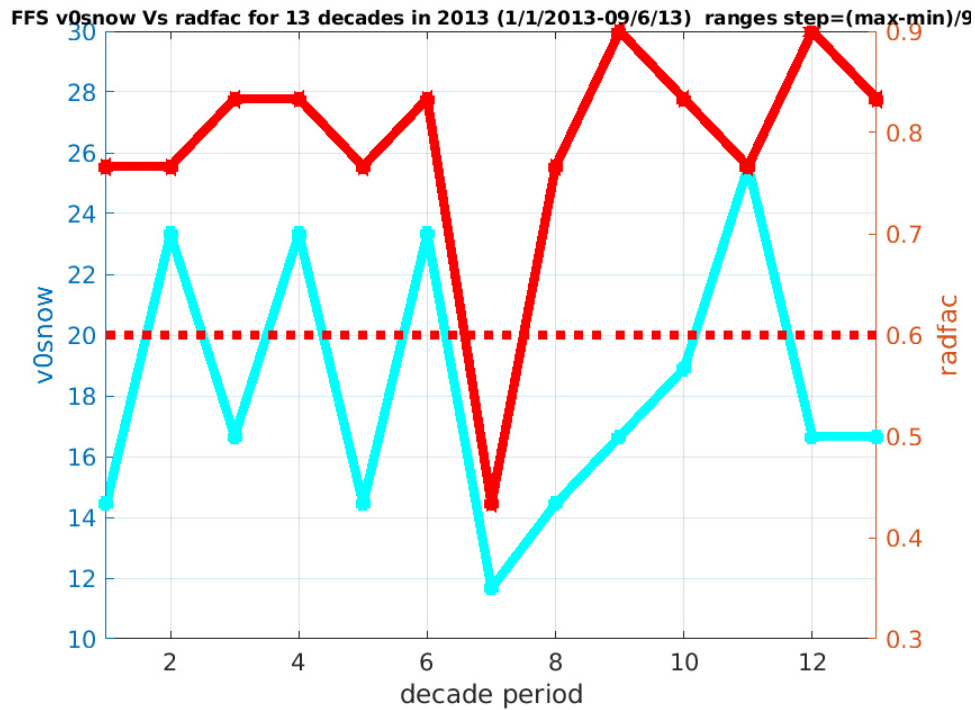
The Interaction suggestion by the optimal COSI score

1/1/2013-26/12/2013

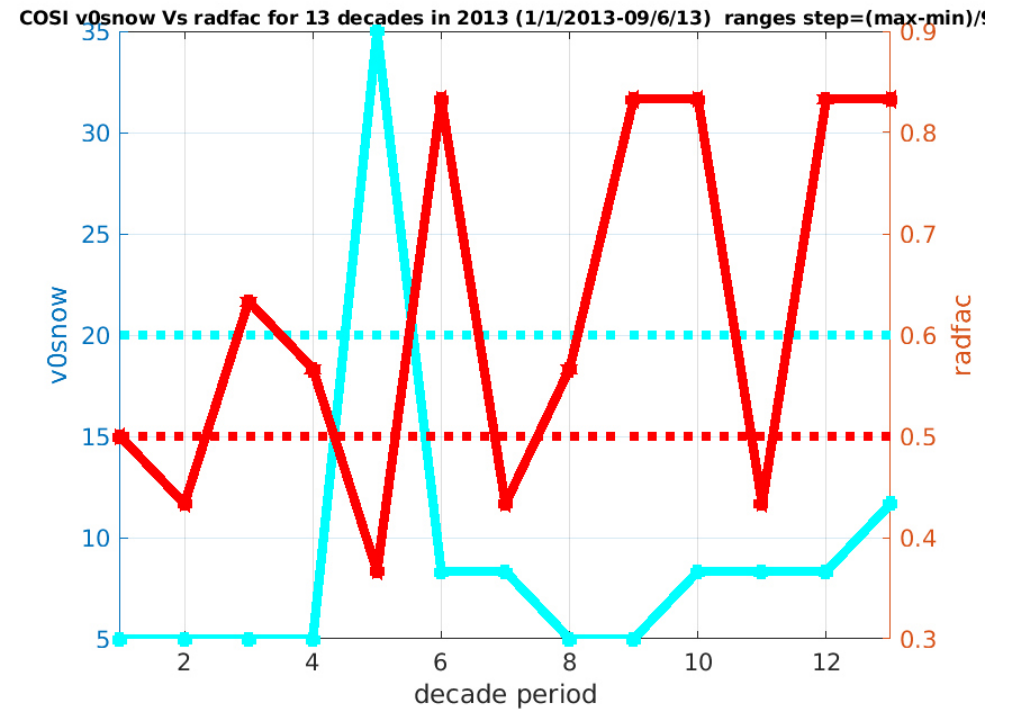
	interaction
1	Min Tkhmin and Max Rlam
2	Min Tkhmin and Min UC1
3	Min Tkhmin and Min V0snow
4	Max radfac and Min V0snow
5	Min UC1 and Min V0snow
6	Min UC1 and Max radfac
7	Max Rlam and Max radfac
8	Max Rlam and Min V0snow
9	Max Rlam and Min UC1
10	Min Tkhmin and Min radfacs

**The differences between FSS optimal interactions to COSI
ETA optima interactions for 13 periods of decades (10
days) From 1/1/2013-9/6/2013.**

**Suggested interaction
from FSS optimal score**



**Suggested interaction from
COSI ETA optimal score**



The New Default and Range for 5 parameters from Antigoni Table (in the Email). This was used for calculation COSI FSS and for COSI ETS we used different parameters default and Range

The 5 parameters differences

	5 parameters	COSI FSS 5 parameters values	COSI ETS 5 parameters values
1	tkhmin	Range 0.1-1 Default 0.4	Range 0.4-2 Default 1.0
2	rlam	Range 0.1-2 Default 1	Range 0.1-10 Default 1.0
3	v0snow	Range 10-30 Default 20	Range 5-35 Default 20
4	radfac	Range 0.3-0.9 Default 0.6	Range 0.3-0.9 Default 0.5
5	uc1	Range 0-1.0 Default 0.8	Range 0-1 Default 0.3

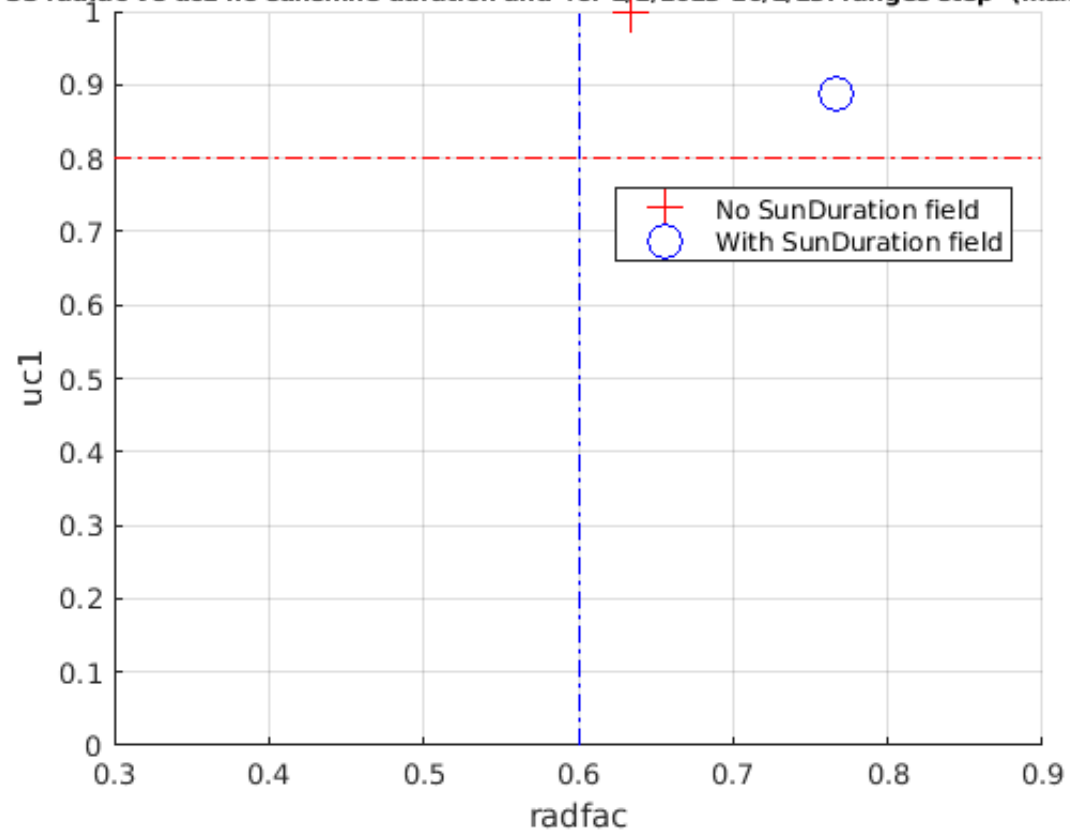
The Interaction suggestion by the optimal COSI score

1/1/2013-9/6/2013

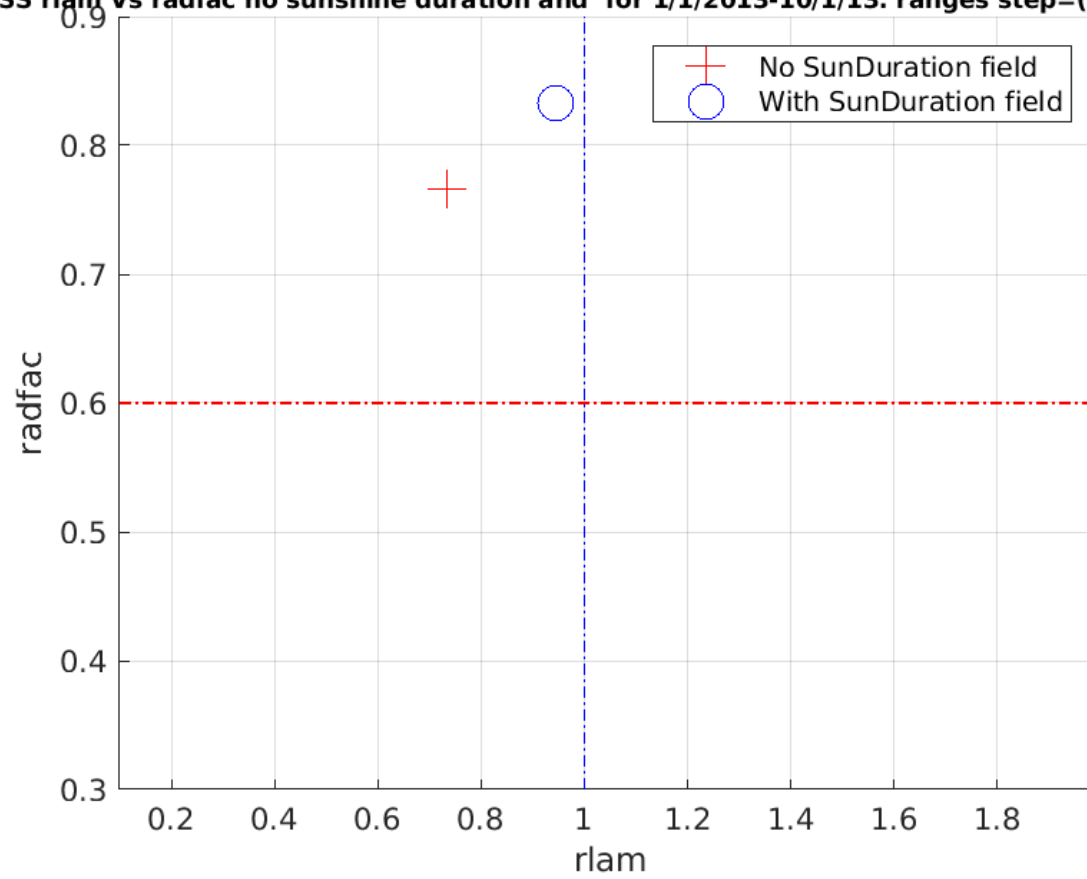
	Interaction by COSI FSS	Interaction by COSI ETS
1	Min Vosnow and Max Radfac	Min Vosnow and Max Radfac
2	Max Vosnow and Max UC1	Min Vosnow and Min uc1
3	Min rlam and Max V0snow	Max rlam and Min Vosnow
4	Min tkhmin and Max radfac	Min tkhmin and Max Radfac
5	Min tkhmin and Min rlam	Min tkhmin and Max rlam
6	Min tkhmin and Max UC1	Min tkhmin and Min UC1
7	Min tkhmin and Min Vosnow	Min tkhmin and Min Vosnow
8	Max radfac and Max UC1	Max radfac and Min UC1
9	Max rlam and Max Radfac	Max rlam and Max Radfac
10	Min ralm and Max uc1	Max ralm and Min uc1

The FSS SCORE WITHOUT Including Sun Duration Field

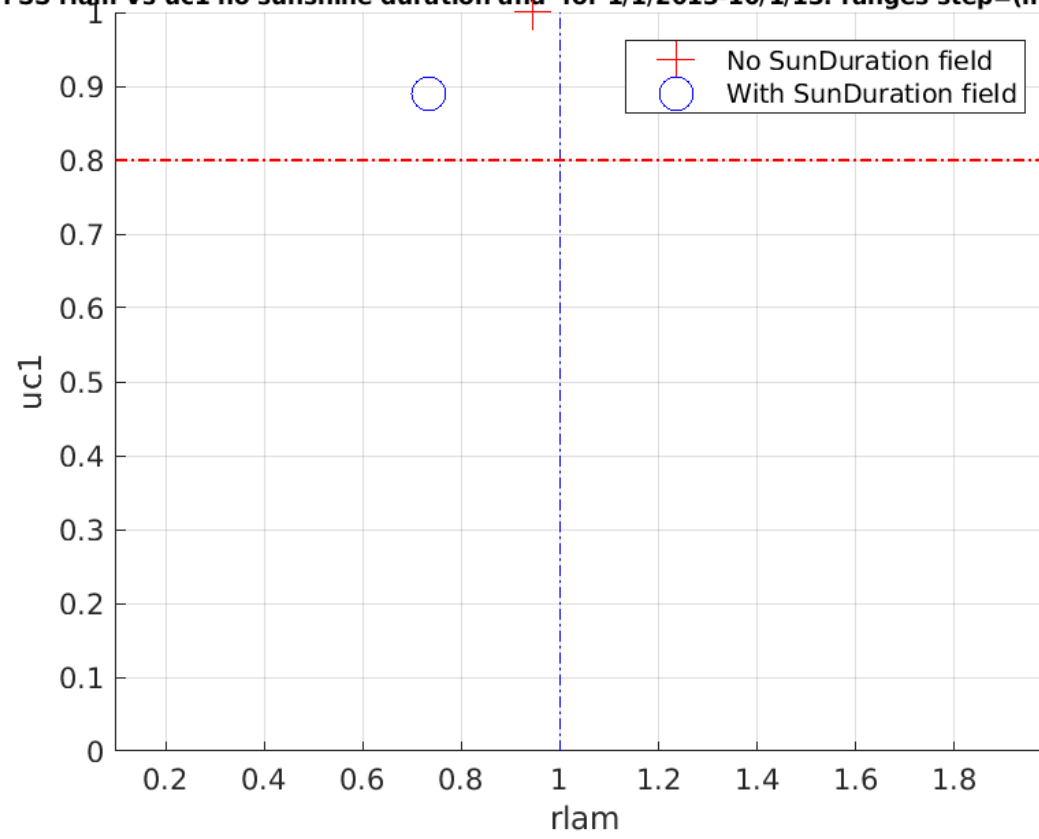
FSS radfac Vs uc1 no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)/4



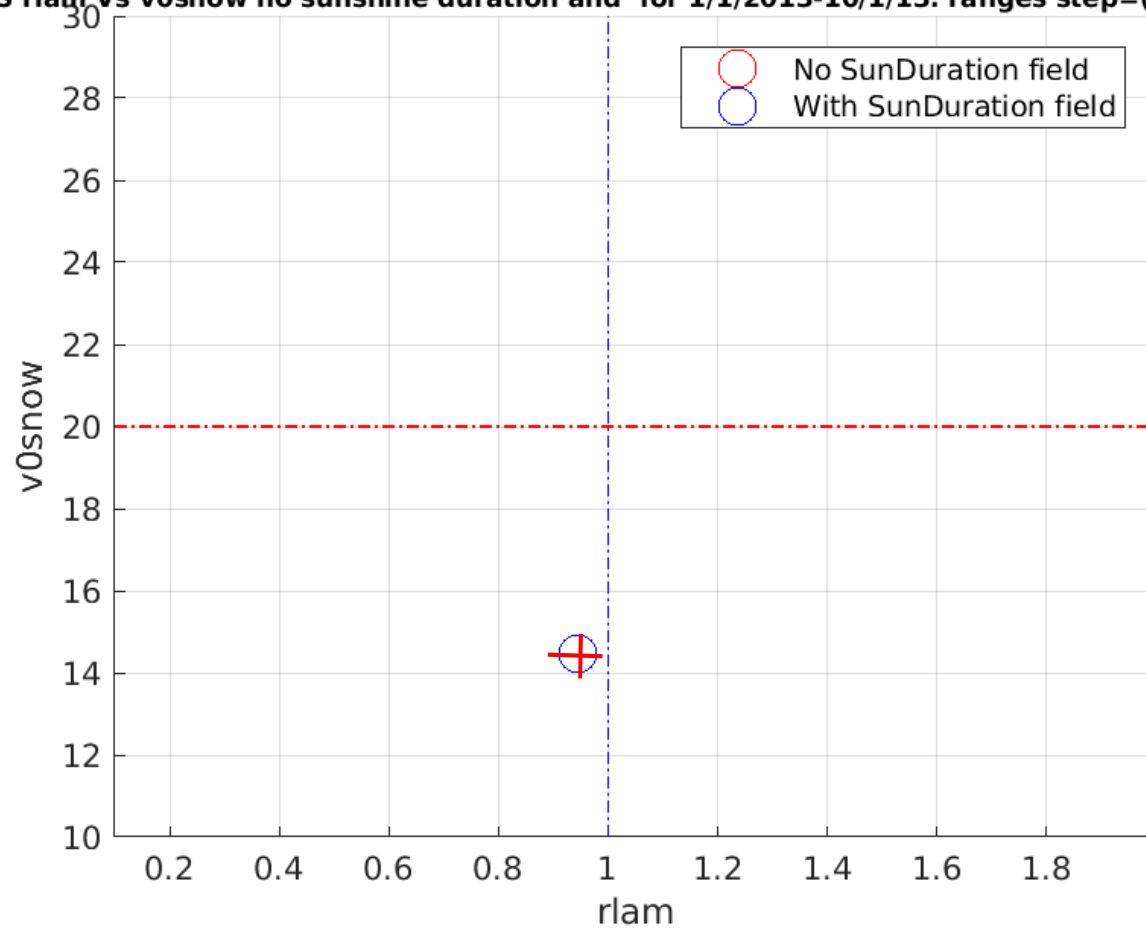
FSS rlam Vs radfac no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)/



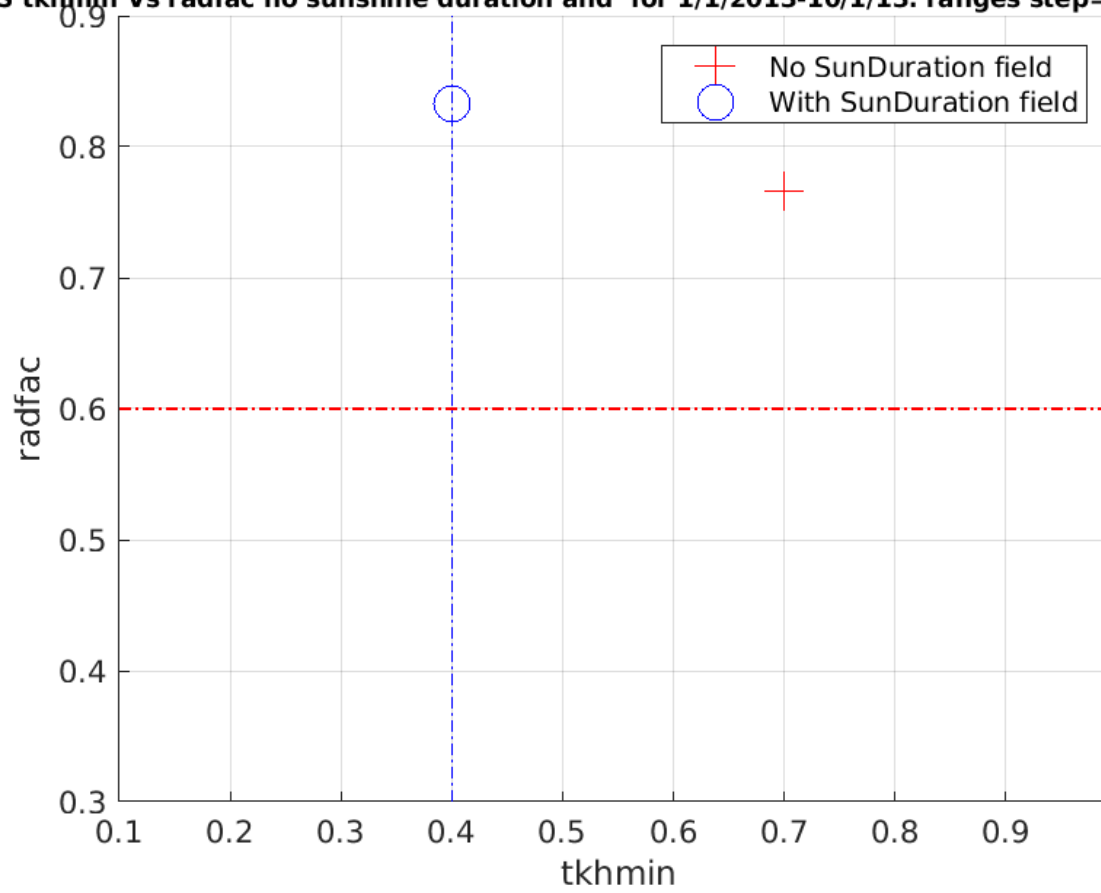
FSS rlam Vs uc1 no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)/9



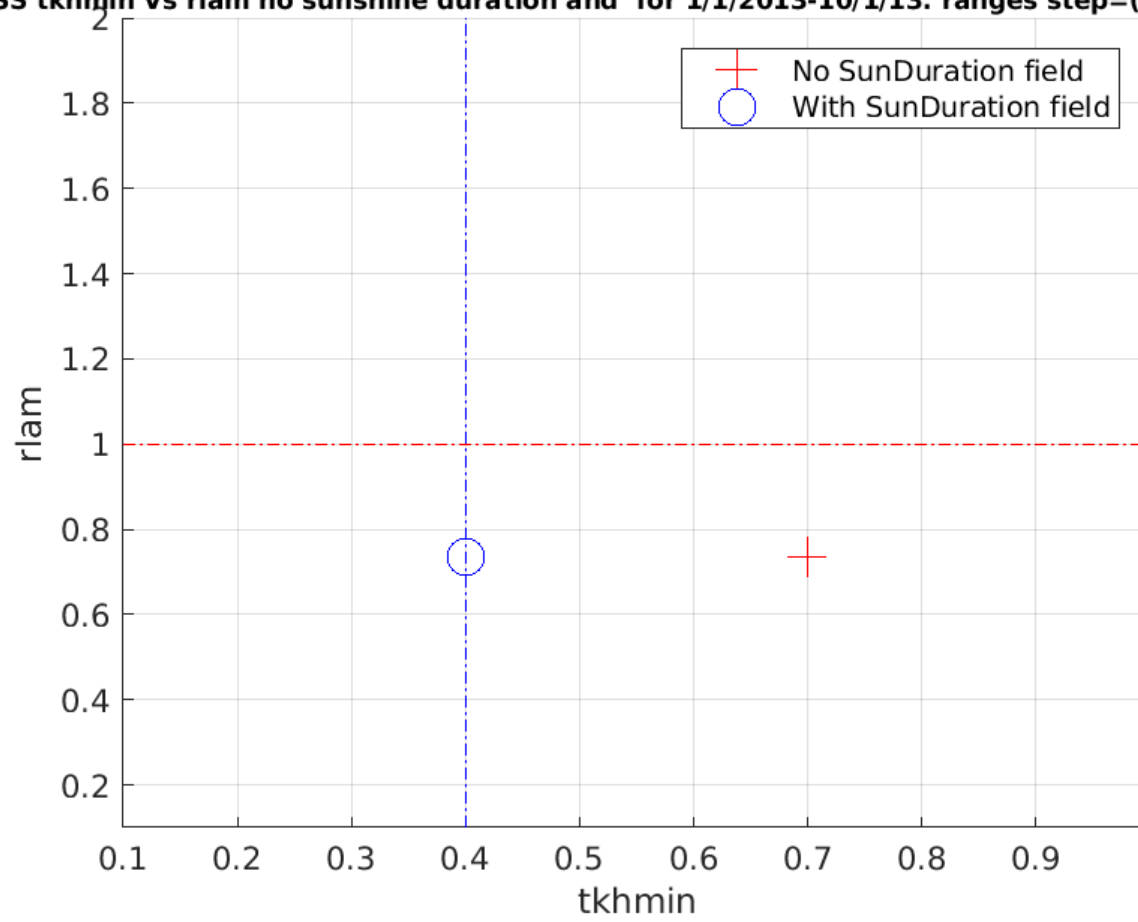
FSS rlam Vs v0snow no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)



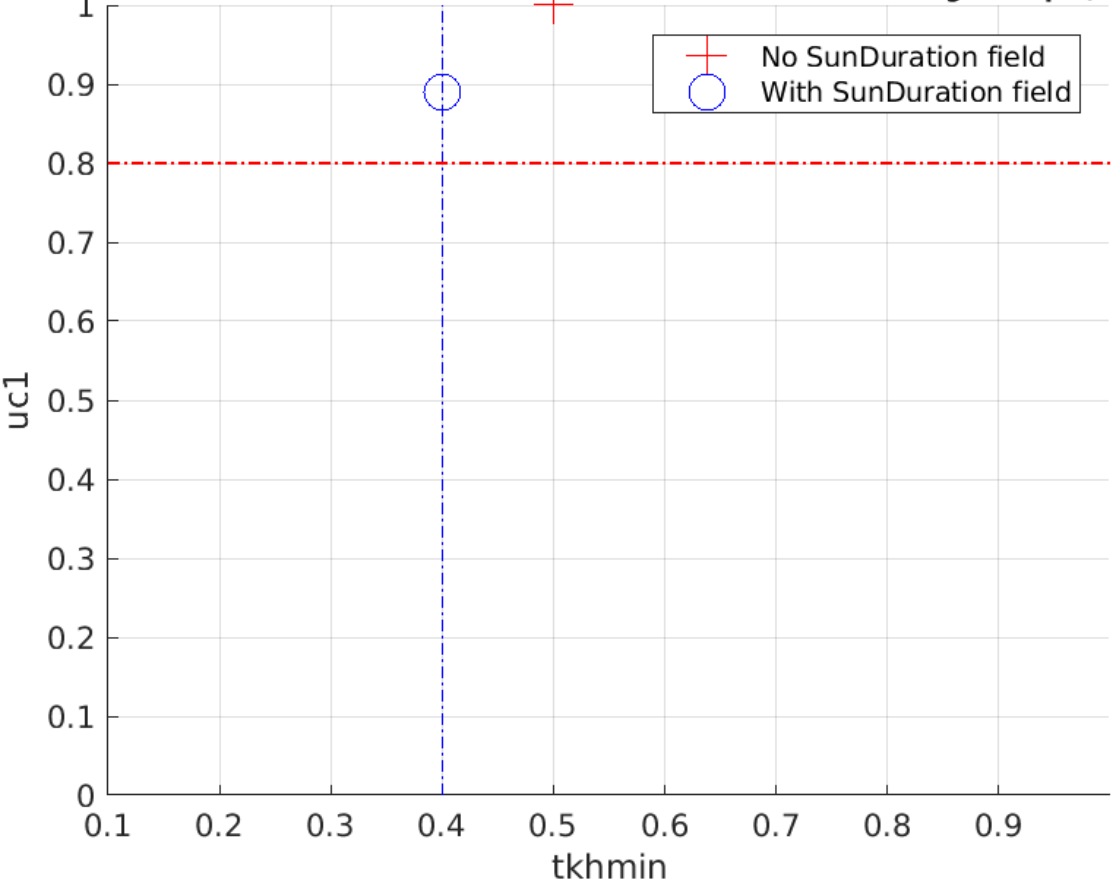
FSS tkhmin Vs radfac no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min



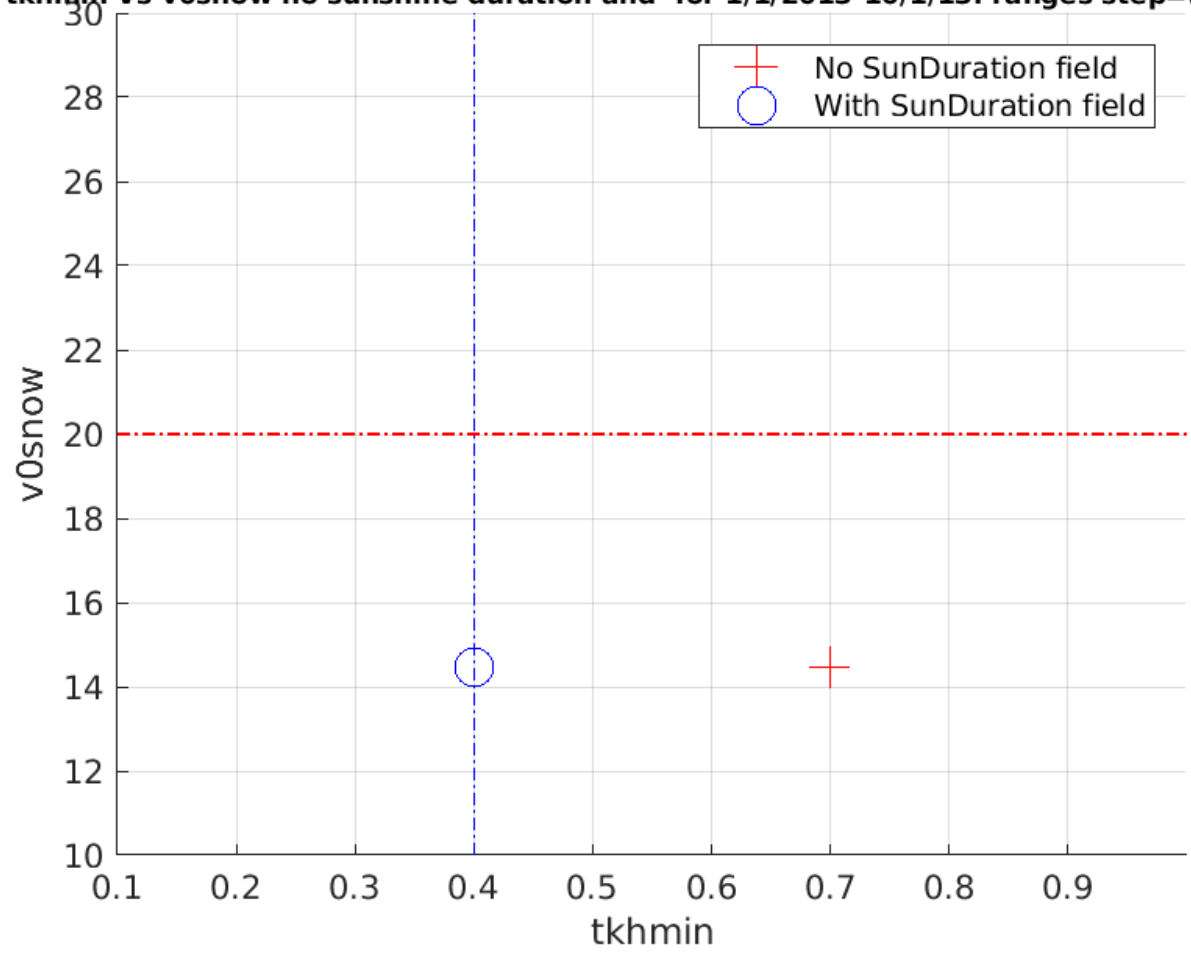
FSS tkhmin Vs rlam no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min),



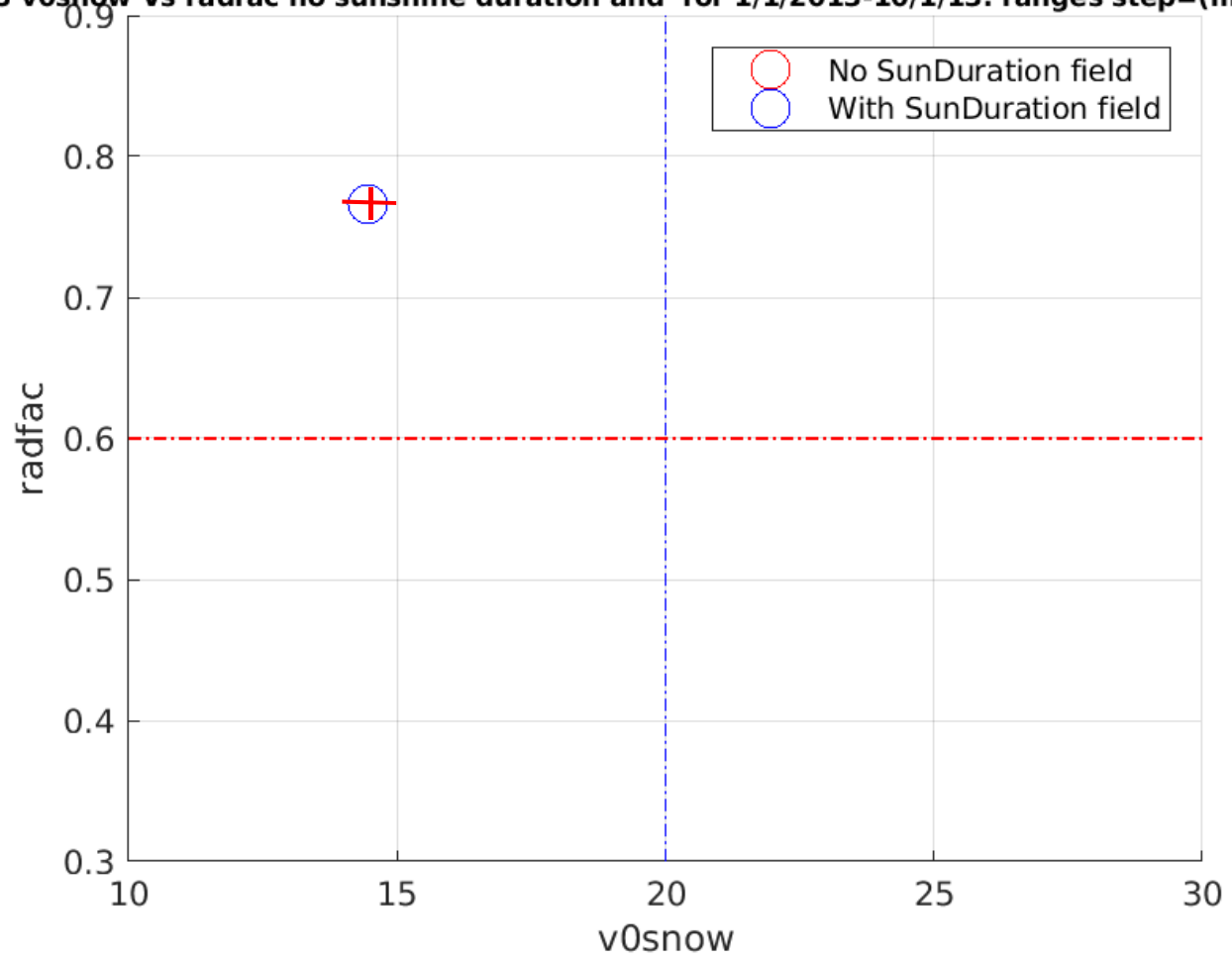
FSS tkhmin Vs uc1 no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)/



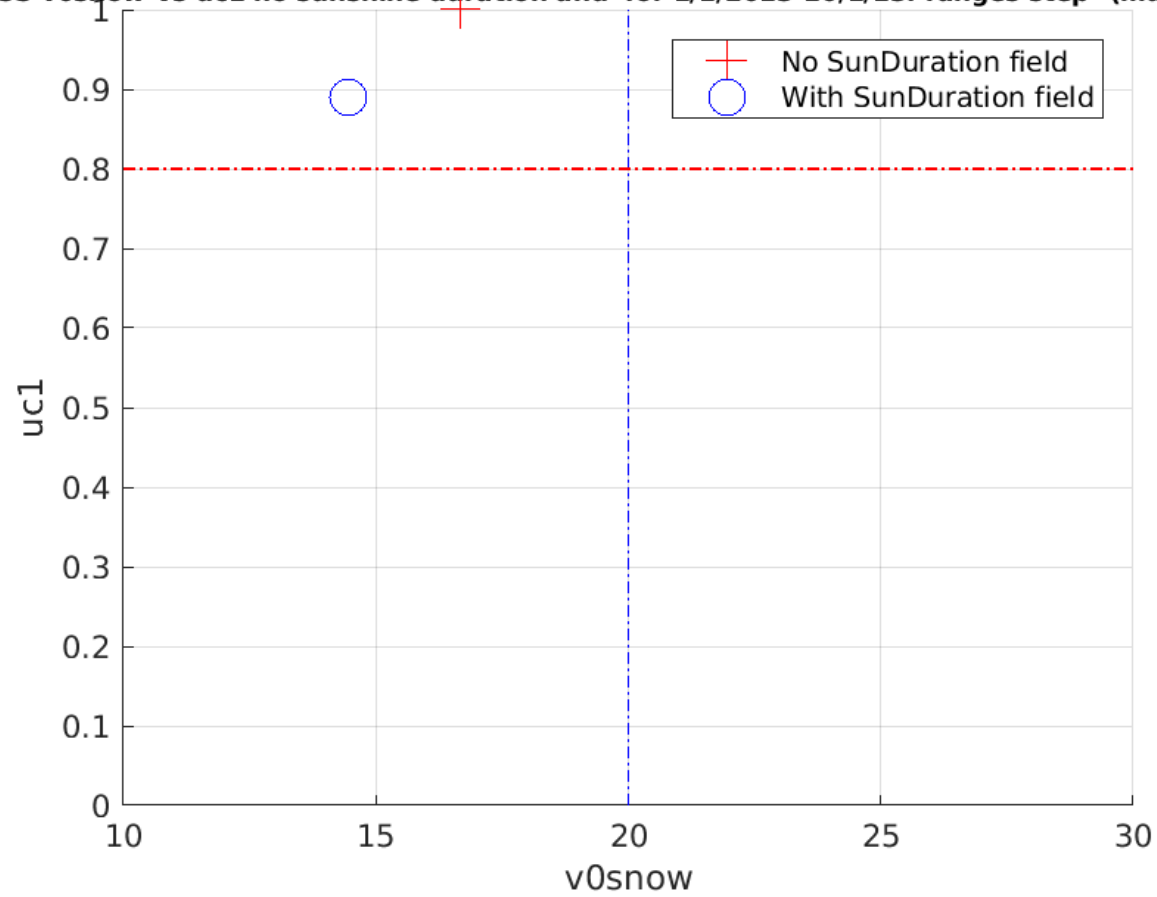
FSS tkhmin Vs v0snow no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-mir



FSS v0snow Vs radfac no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min



FSS v0snow Vs uc1 no sunshine duration and for 1/1/2013-10/1/13. ranges step=(max-min)/



The Interaction suggestion by the optimal FSS score for one period with Sunshine duration filed and without sunshine duration field.

1/1/2013-10/1/2013

	With sunshine duration field	No sunshine duration filed
1	Min Vosnow and Max Radfac	Min Vosnow and Max Radfac
2	Min Vosnow and Max UC1	Min Vosnow and Max uc1
3	Min rlam and Min V0snow	Min rlam and Min Vosnow
4	default tkhmin (0.4) and Max radfac	Max tkhmin and Max Radfac
5	default tkhmin (0.4) and Min rlam	Max tkhmin and Min rlam
6	default tkhmin (0.4) and Max UC1	Max tkhmin and Max UC1
7	default tkhmin (0.4) and Min Vosnow	Max tkhmin and Min Vosnow
8	Max radfac and Max UC1	Min radfac and Max UC1
9	Min rlam and Max Radfac	Min rlam and Max Radfac
10	Min ralm and Max uc1	Min ralm and Max uc1

Points for discussion

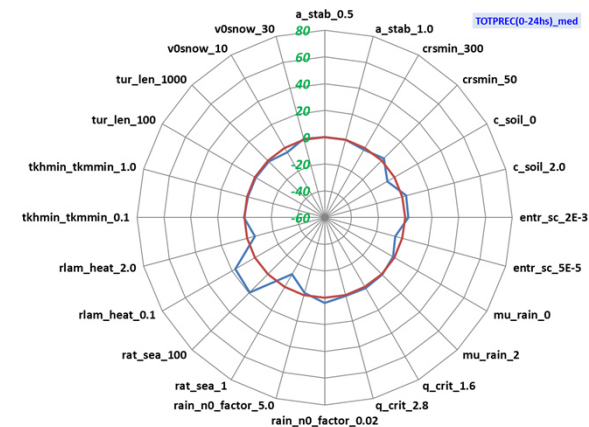
- Erroneous values of sunshine duration in the simulations and maybe Tdew observations.
- The COSI score is not stable in time (parameters optimum is a function of weather and season).
- There are erroneous simulated sunshine duration values and low correlation with observation was found. Should we included it in the COSI, or give it low weight?
- What weight should be given to the new fields? There are 3 dew points perhaps the mean should be omitted as Tmin and Tmax?

meteorological fields weights in COSI

$\omega = 1$	Surface Tmax , Tmin and Precipitation;
$\omega = 1$	Total column water vapor (TCWV);
$\omega = 0.33$	Vector wind shear between the levels of 500mb and 700mb (WS1);
$\omega = 0.33$	Vector wind shear between the levels of 700mb and 850mb (WS2);
$\omega = 0.33$	Vector wind shear between the levels of 850mb and 1000mb (WS3);
$\omega = 0.33$	Temperatures at 500mb (T500), 700mb (T700) and 850mb (T850);
$\omega = 0.33$	Relative humidity at 500mb (RH500), 700mb (RH700) and 850mb (RH850);
$\omega = 0.22$	East-west wind component at 500mb (U500), 700mb (U700) and 850mb (U850);
$\omega = 0.22$	South-north wind component at 500mb (V500), 700mb (V700) and 850mb (V850);
$\omega = ?$	Tdmax, Tdmin;
$\omega = ?$	Tdmean;
$\omega = ?$	Sunshine duration;
$\omega = ?$	FSS;

Suggested work for PP CALMO-ICON

- Sensitivity – Euripides
- Reduce computer power - Instead of running a full year:
 - Create an algorithm to select “typical” case studies. Find cases with relatively small Euclidean distances in 500 hPa, 850 temp, winds.....
 - Running only ~10 case studies (cold starts for 30 hour, including 6 hour for spin up)
 - Automatic tuning (CALMO) for all COSMO members, users (Brazil.....), ICON-CLM.
- If there are tuning parameters which are not interacting with each other, like VOSNOW and TKHMIN, in order to save runs is it possible to build 2 separate MM’s



END

Thanks' for your attention