CONSORTIUM FOR SMALL SCALE MODELING

COSMO

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Correct default values

- In our last meeting in ICCARUS MARCH 2021, we realized that there were errors (mistakes) in the assignments of TKHMIN and TURL_LEN default values in the Meta Model (MM). Hence, the final results had errors.

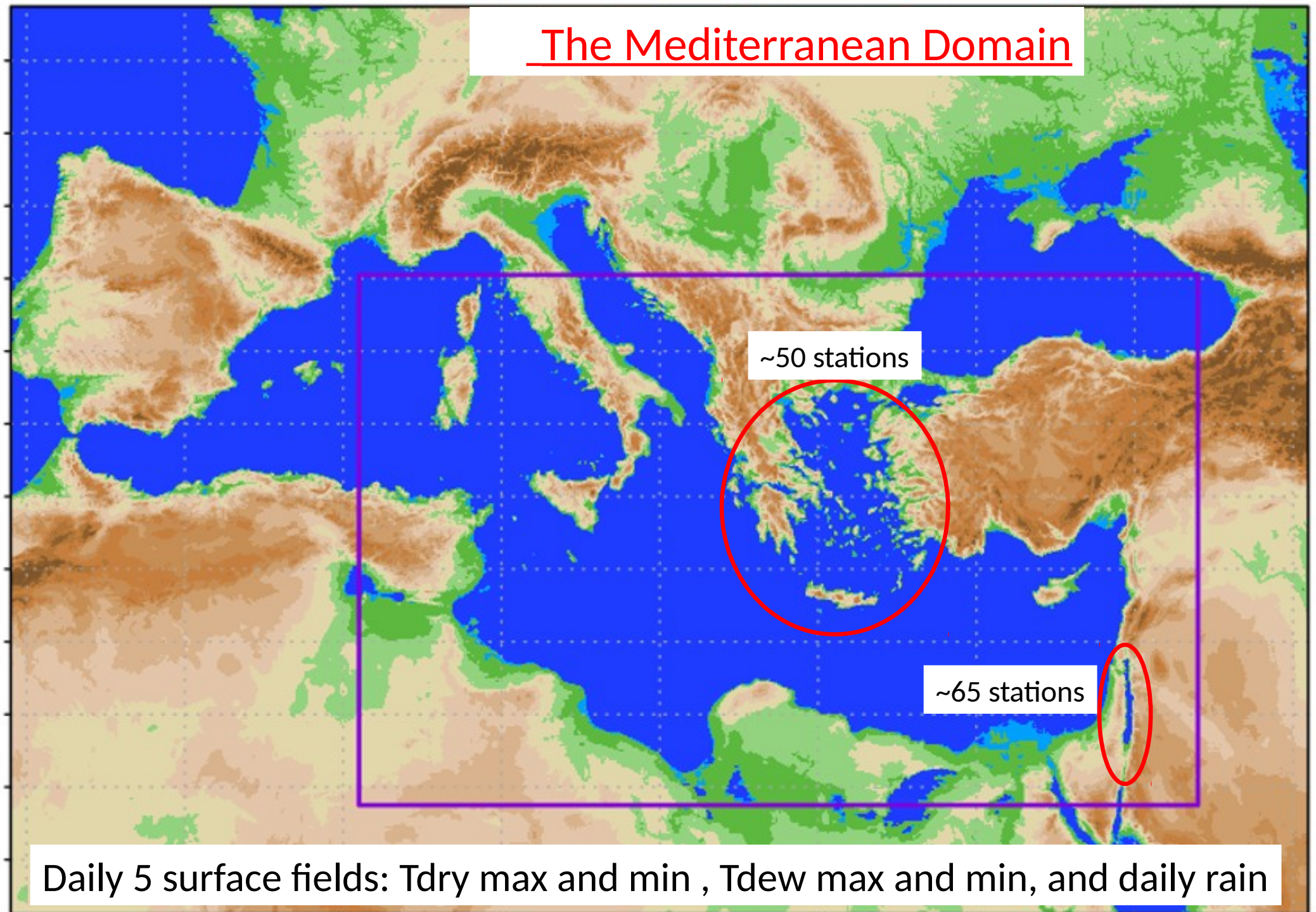
- The corrected default values of the two parameters are as follows:

  1) Tkhmin default value was changed from 1 to 0.4.

  2) Turl_Len default value was changed from 500 to 150.

- The above two parameters (Tkhmin and Turl_Len) were transformed to logarithmic scale in order to run in the MM, due to the fact that the new 2 defaults of thkmin and Turl_Len (0.4 & 150, respectively) are not in the middle of the ranges which are 0.1-2 & 100-1000, respectively.

The Mediterranean Domain



Daily 5 surface fields: Tdry max and min , Tdew max and min, and daily rain

Optimal parameter values (iteration number 100) Performance Score (PS) is for ALL 5 surface fields.

For 60 representative days in 2019

C_soil	Rat_sea	Tur_len*	rlam	Tkhmin*	parameter
0.8252	5.2889	524.66	1.0489	1.3564	Optimal values with height correction
0.8408	4.7125	568.35	1.0737	1.3903	Optimal values without height correction
1	10	150	1	0.4	Default
0-2.0	1-50	100-1000	0.1-2	0.1-2	range

* Please notice that the whole MM model stage (building the MM step) and the iterations step where used the values of “tkhmin” and “tur_len” in log scale. But eventually in the end the logarithmic values were transformed back to normal scale in order to see the optimal values in regular (relevant) scale.

Optimal parameter values (iteration number 100)
Performance Score for all 5 surface fields.

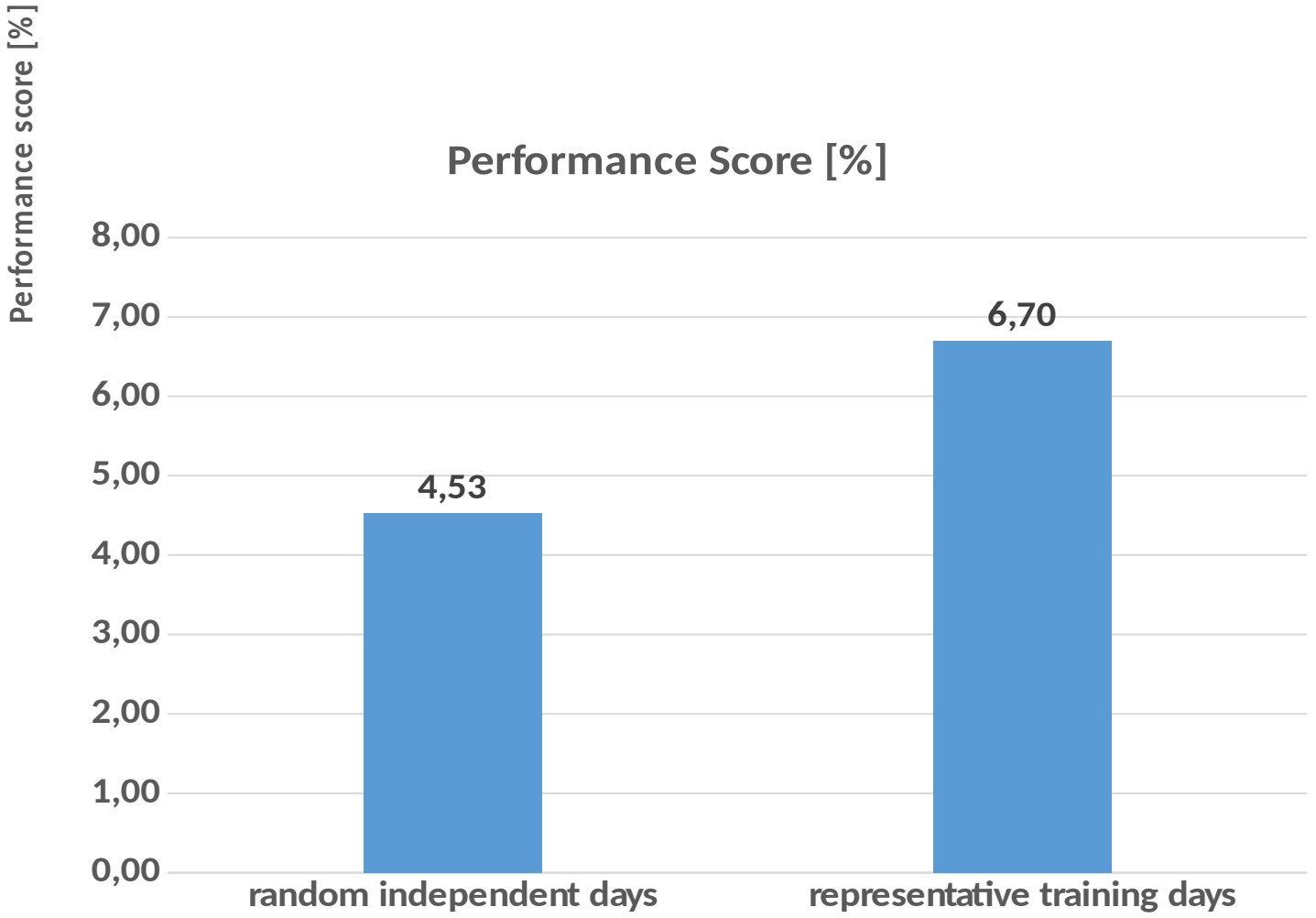
seasons, 15 representative days for every season in 2019 4

C_soil	Rat_sea	Tur_len	rlam	tkhmin	parameter
0.7346	1.3873	274.658	1.1796	1.0551	winter (DJF, 15 days)
1.0004	5.3174	688.76	1.0677	1.8574	spring (MAM, 15 days)
0.9184	8.9973	711.41	0.9510	1.8626	summer (JJA, 15 days)
1.3921	10.7768	508.81	0.7681	0.8552	autumn (SON, 15 days)
0.8252	5.2889	524.66	1.0489	1.3564	**all 60 representative days**
1	*10*	*150*	*1*	*0.4*	*Default*
0-2.0	*1-50*	*100-1000*	*0.1-2*	*0.1-2*	*range*

Verification with independent days

- 60 randomly days which were not included in training days
- Year 2019
- 5 days for each month

- The random days' skill is only slightly lower compared to the skill of the days the MM was built on.



CALibration of MOdel (CALMO) lesson learned

- The CALMO methodology improves very slightly the overall model skill.
- The improvement comes with the cost of big computer resources.
- The tuning parameters are strongly dependent on season, or perhaps the weather pattern, atmospheric stability….
- For optimal skill, the parameters should be set according to the atmospheric conditions with a hard-coded algorithm.

CALibration of MOdel (CALMO) lesson learned

- In ICON there are much more parameters compared to COSMO. Therefore, CALMO methodology is questionable.

- CALMO can be a tool for expert tuning of physical schemes:
  - Perform sensitivity test to reduce the number of parameter.
  - Tune each scheme separately by using a score with the relevant fields.
  - Verify the whole model. If the score deteriorates then other schemes may have compensated for errors and they should be tuned again.

Not a dead end

model tuning is our bread and butter