

# A new generation of regional decadal hindcasts and predictions for Europe

COSMO User Seminar, 07.03. 2017

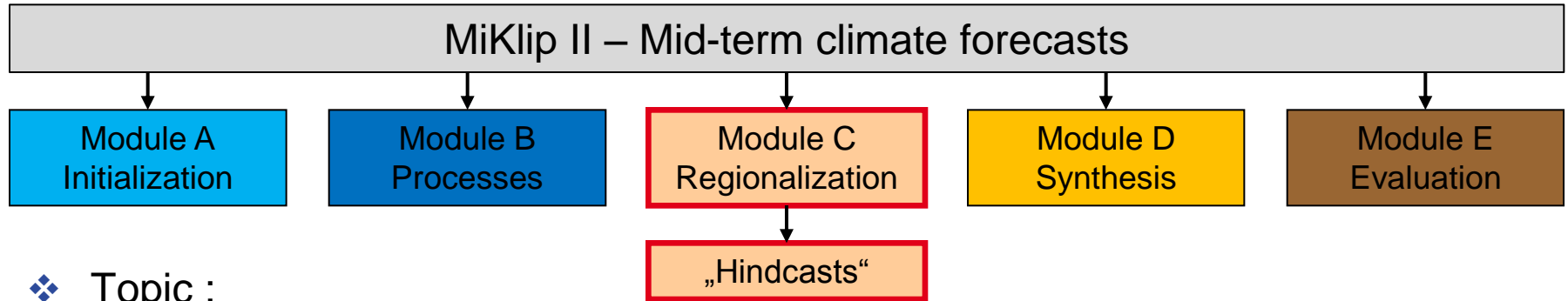
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<sup>1</sup> Department Climate and Environment Consulting, German Weather Service (DWD)

<sup>2</sup> Institute of Meteorology & Climate Research – Department Troposphere Research (IMK-TRO), Karlsruhe Institute of Technology (KIT)

# Technical aspects

## Project MiKlip II : Regionalization



❖ Topic :

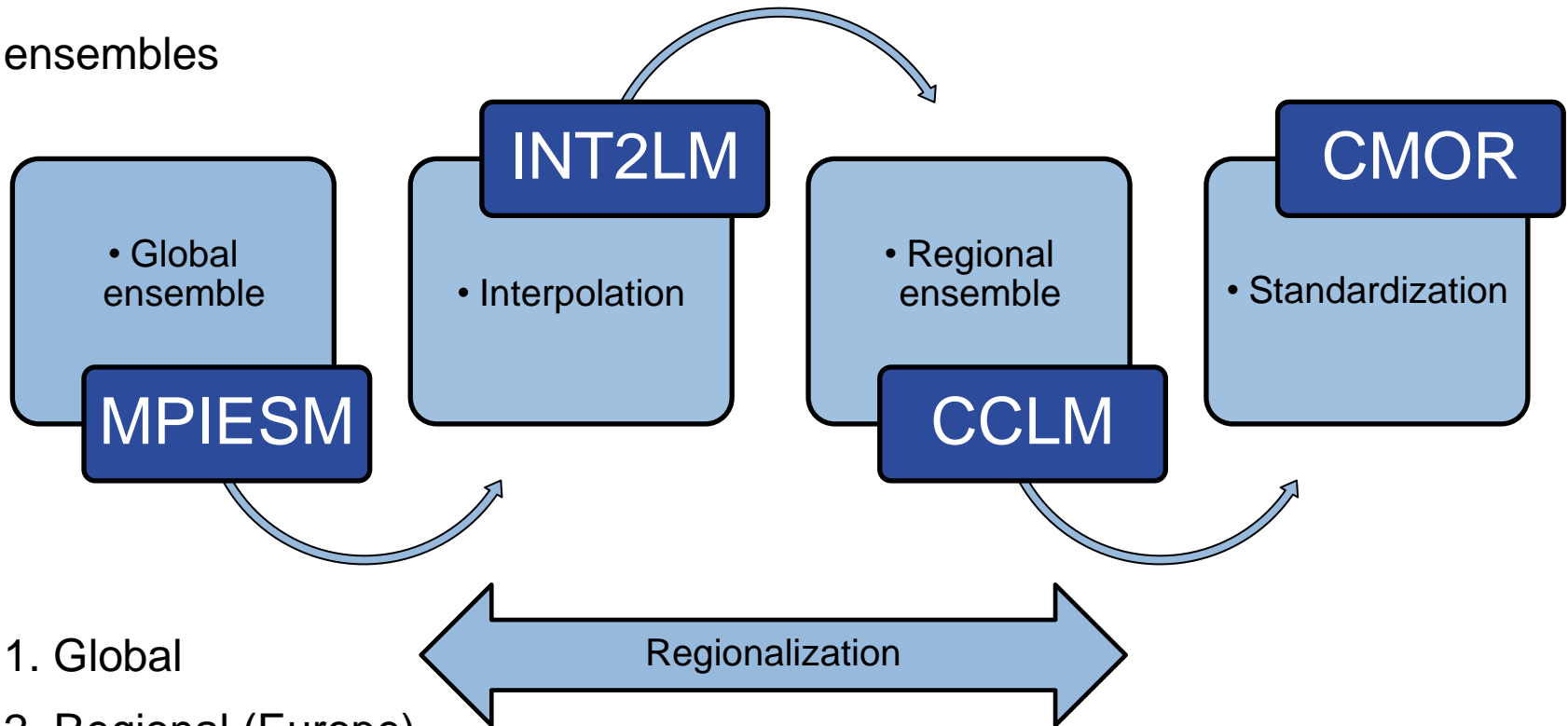
❖ C3-WP3

❖ Aims :

- ❖ Dynamical downscaling of the global decadal forecast ensemble for the European domain
- ❖ Creation of a regional decadal forecast ensemble with different starting conditions (in progress) and resolutions (in discussion)

## Regionalization (simplified)

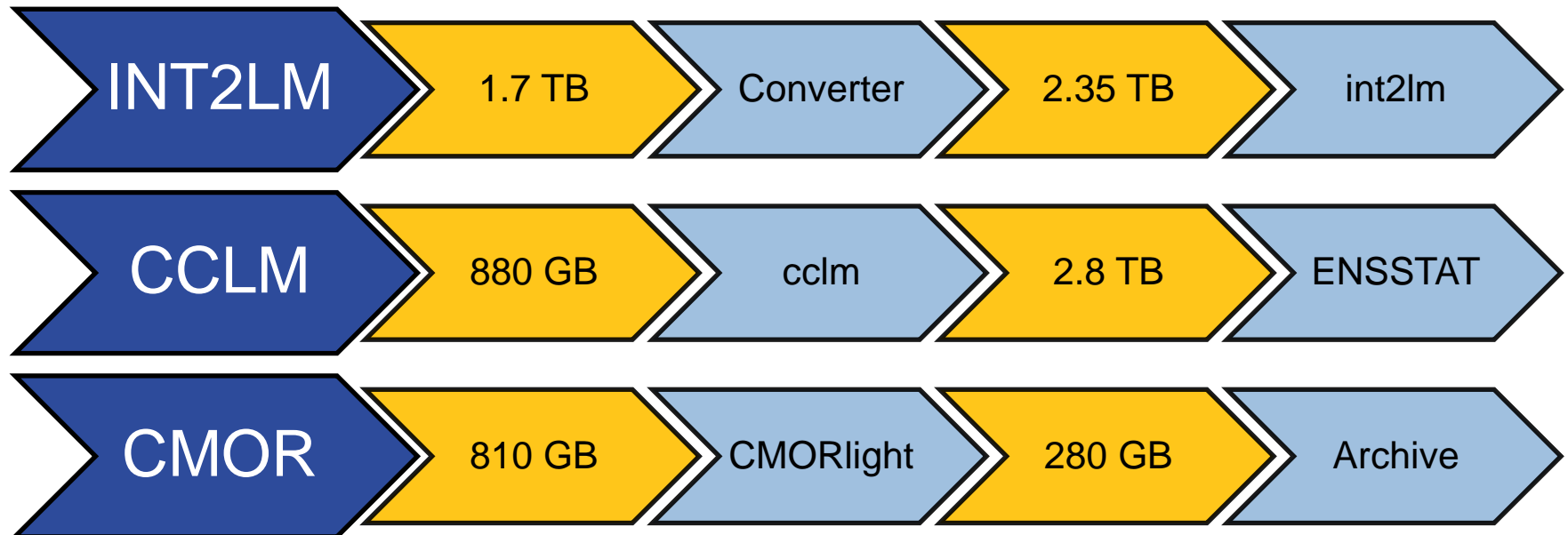
- ❖ series of model simulations
- ❖ ensembles



- ❖ 1. Global
- ❖ 2. Regional (Europe)

## Regionalization (complex)

❖ 6 steps



- ❖ Permanent search for mistakes and appropriate corrections !
- ❖ Permanent development of scripts !

## General information

- ❖ Grid width :
  - ❖ Global :  $1^\circ$  (approx. 100 km)
  - ❖ Regional :  $0.22^\circ$  (approx. 25 km)
- ❖ 95 levels (global) vs. 40 levels (regional)
- ❖ 10 „realizations“ (ensemble) :
  - ❖ 53 starting years (1960-2012) per realization
    - ❖ 10 years simulation (= 1 decade) for each starting year
- ❖ Computing time :
  - ❖ Approx. 2 days / decade, thereof
    - ❖ INT2LM approx. 6 h (36 CPUs = 1 „knot“ at the HPC)
    - ❖ CCLM approx. 30 h (612 CPUs = 17 „knots“ )

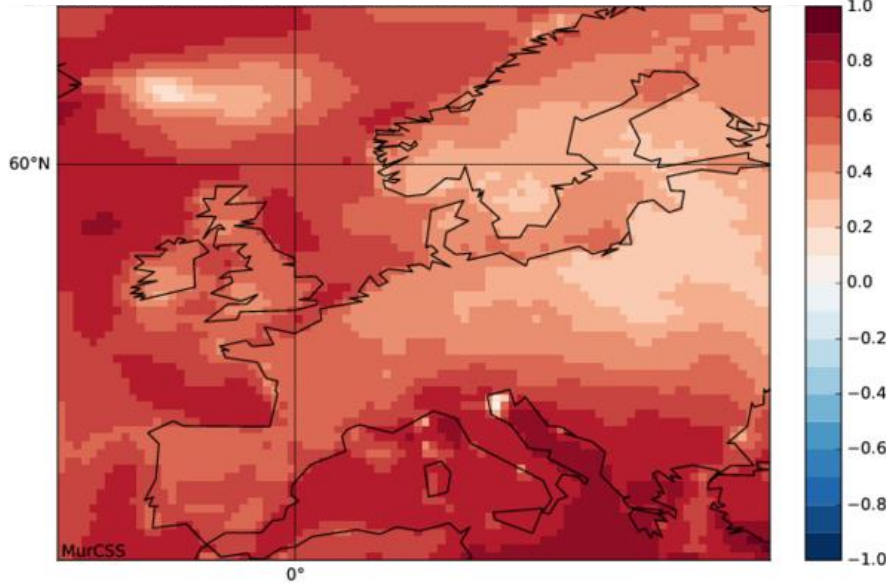


# First results

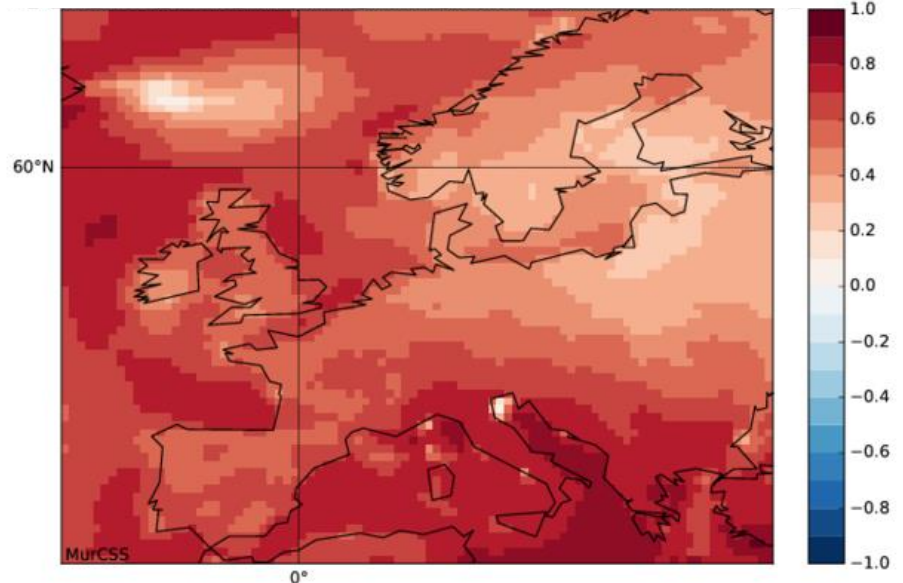


## Correlations : 2m – temperature / tas (LT 2-5 yrs)

*pre-op vs. CCLM5-ERA*



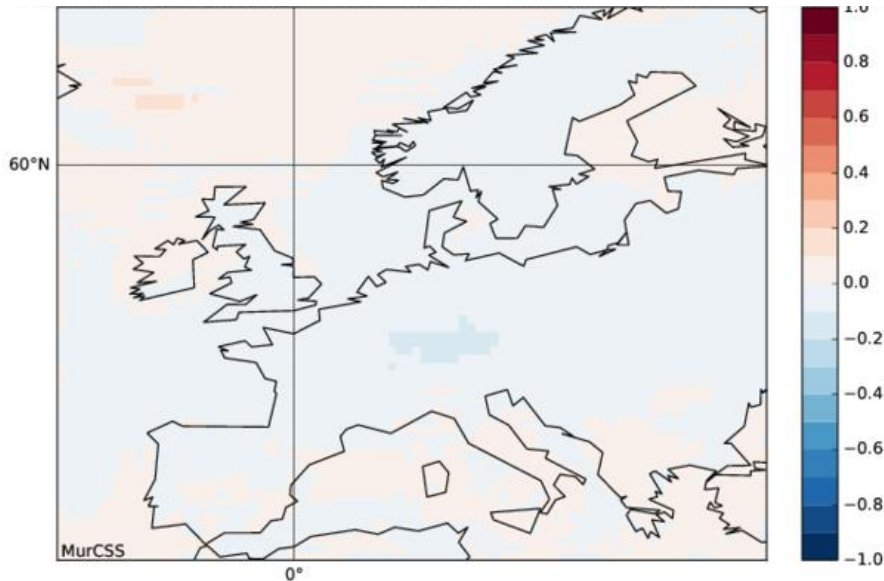
*MPI-ESM-HR vs. CCLM5-ERA*



❖ Global and regional results with similar forecast skills

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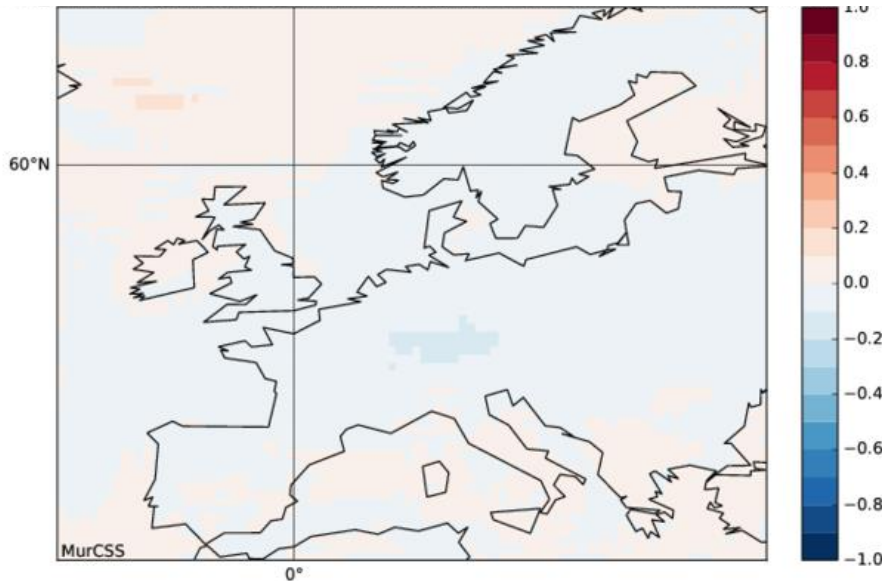


*Ref.: CCLM5-ERA*

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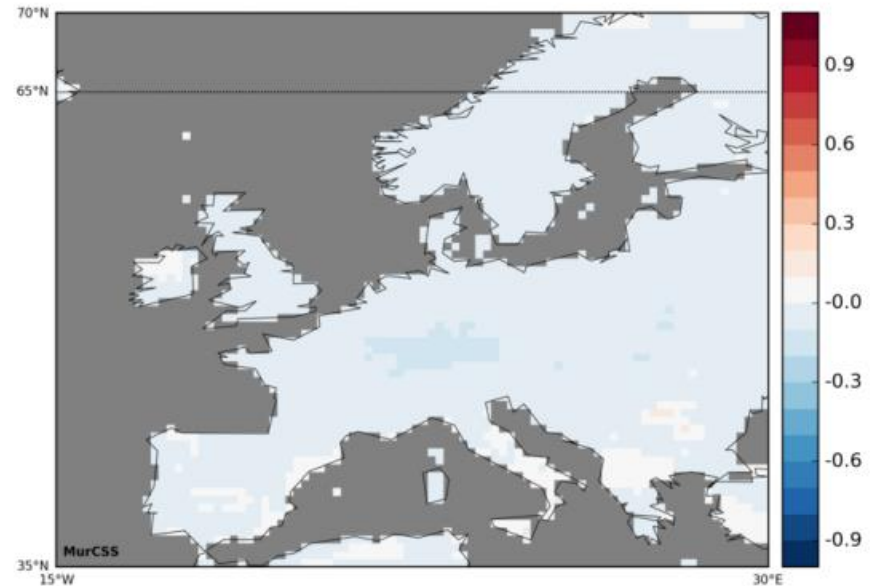
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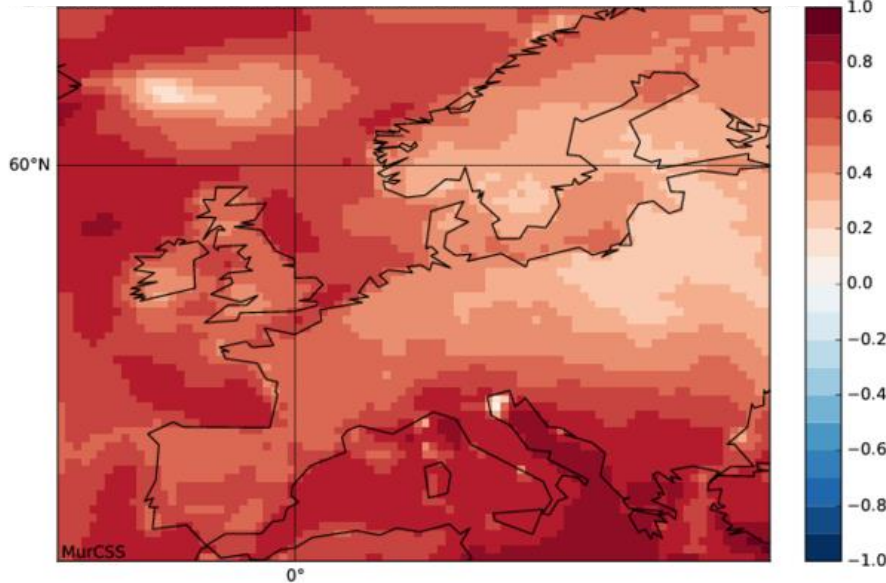


*Ref.: E-OBS / V14*

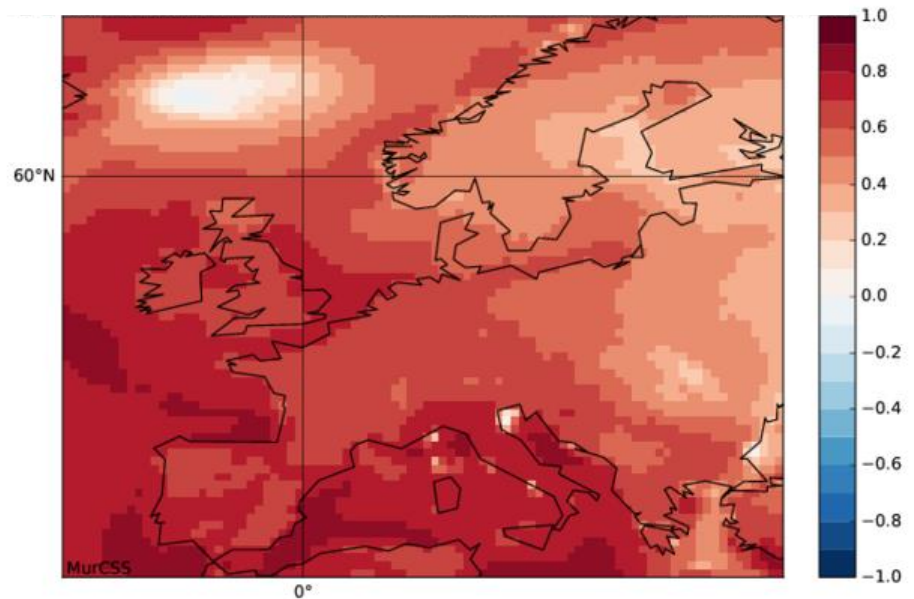
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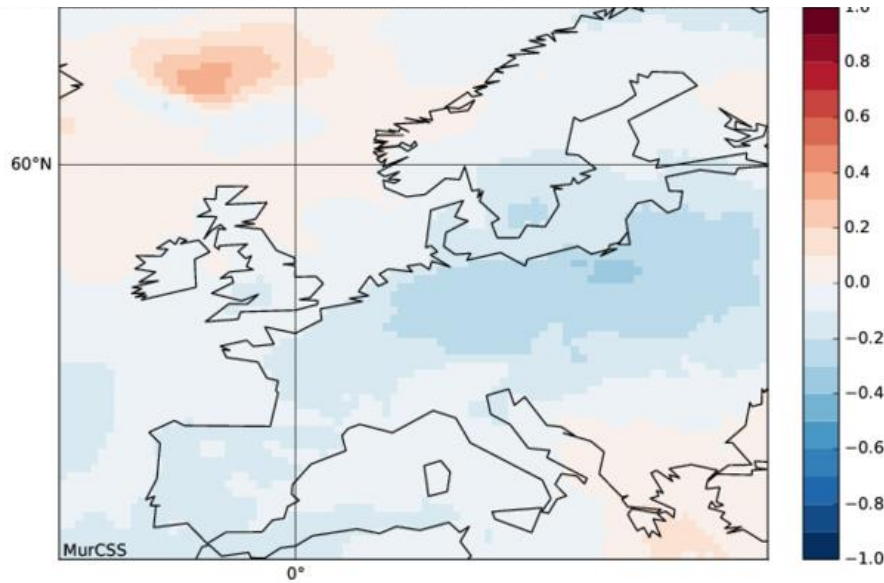
*baseline1 vs. CCLM5-ERA*



- ❖ New results with slightly worse forecast skills (at higher resolution)

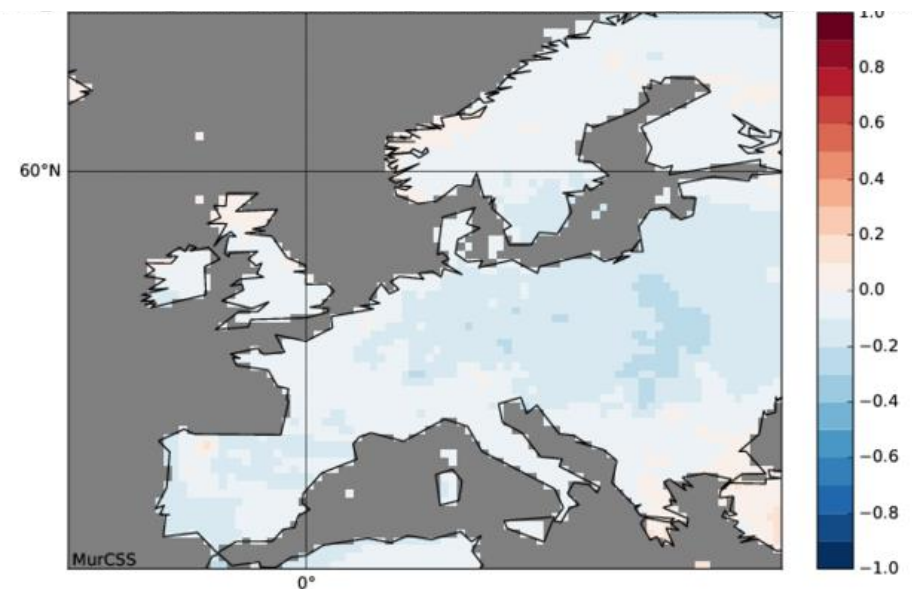
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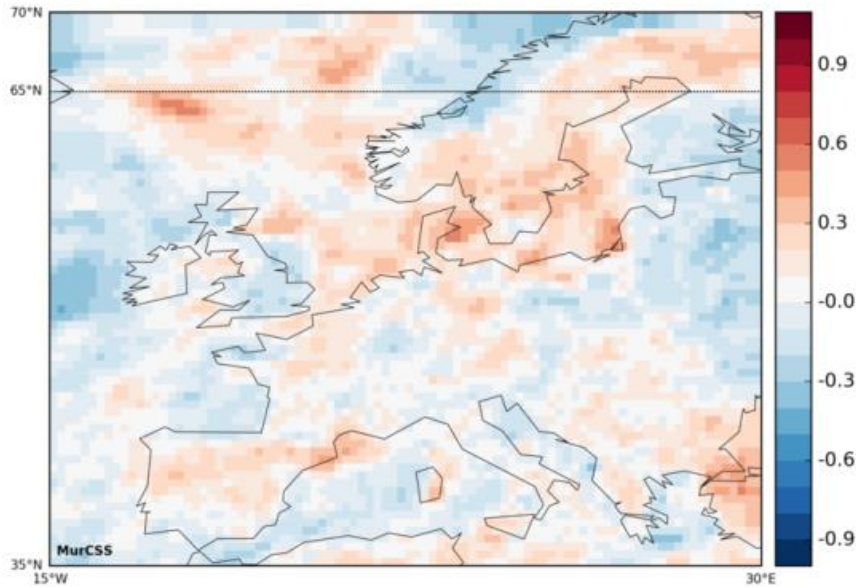


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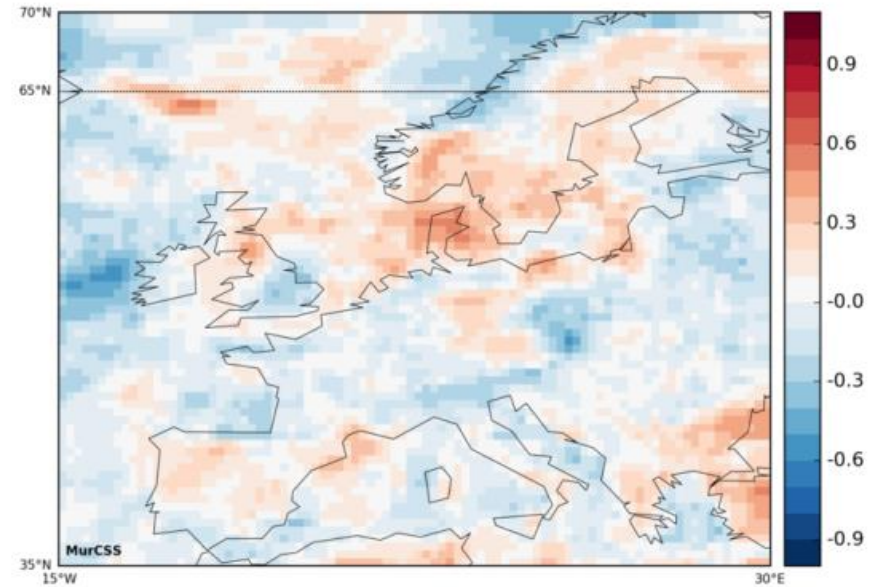
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## Correlations : Precipitation / pr (LT 2-5 yrs)

*pre-op vs. CCLM5-ERA*



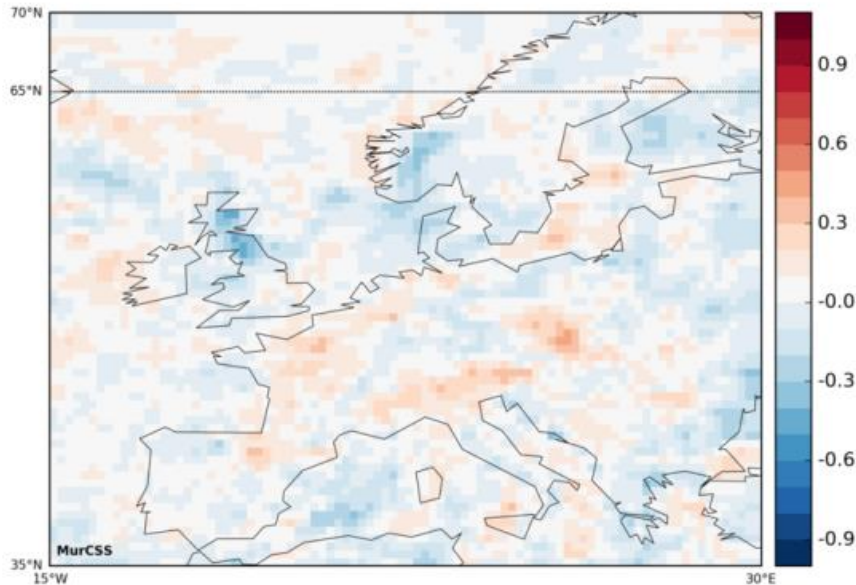
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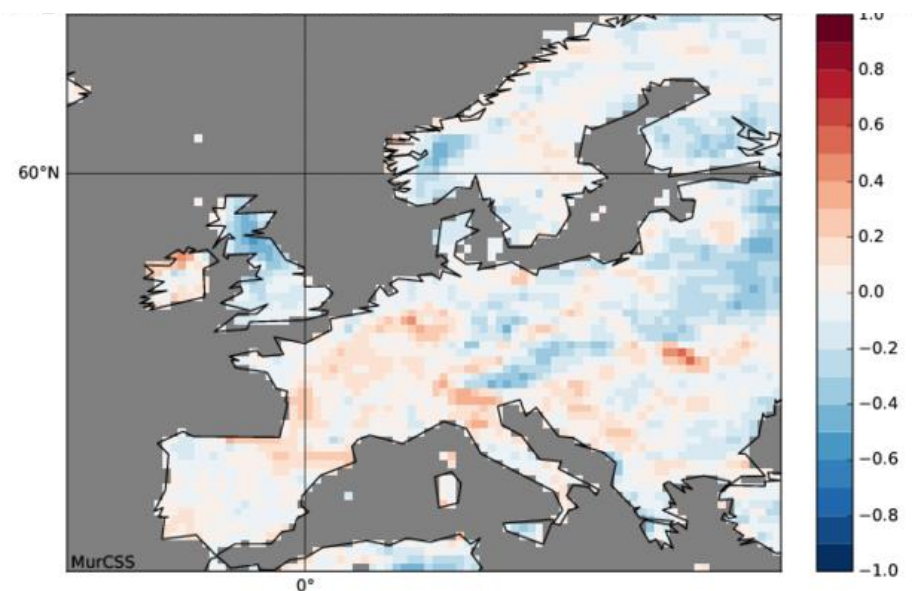
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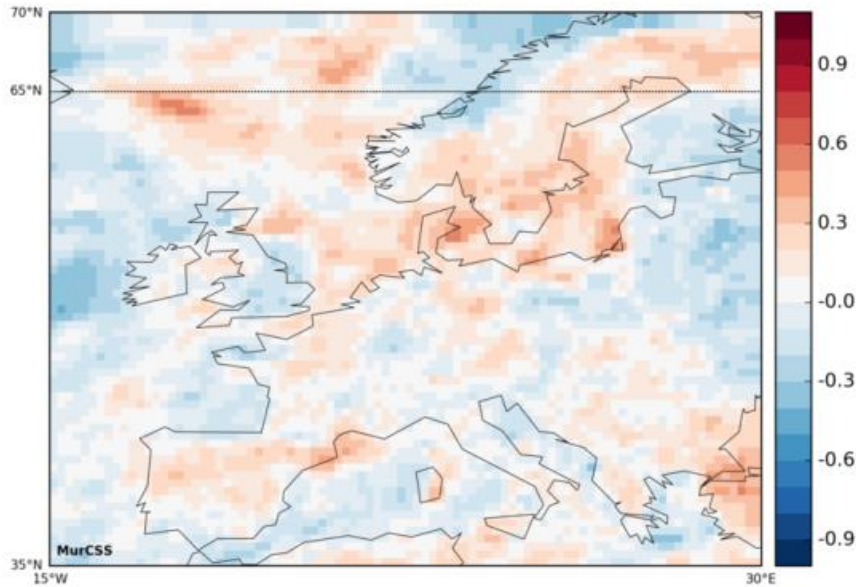


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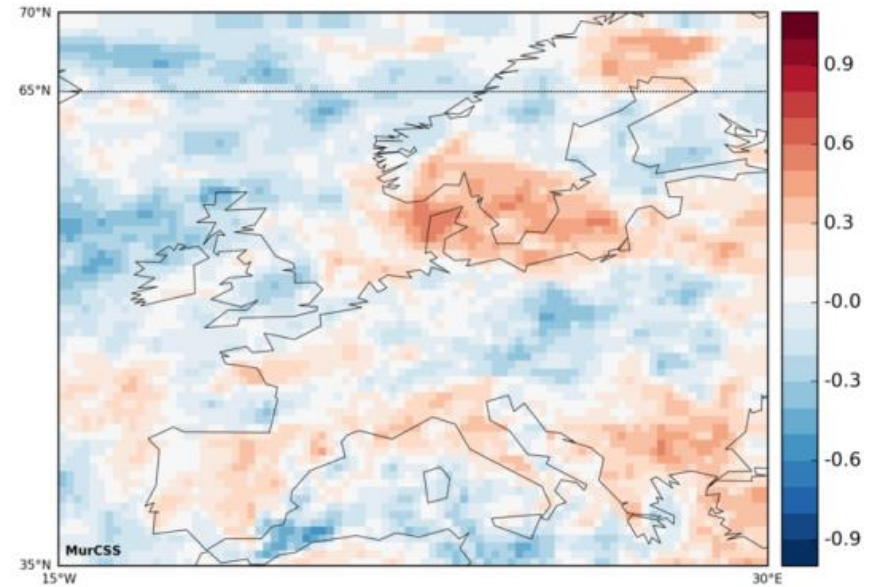
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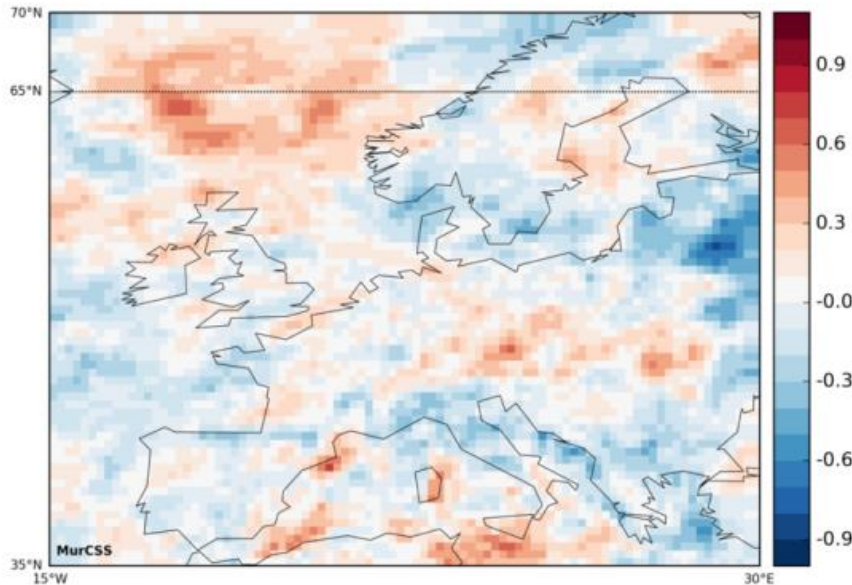


- ❖ New results with similar forecast skills (at higher resolution)



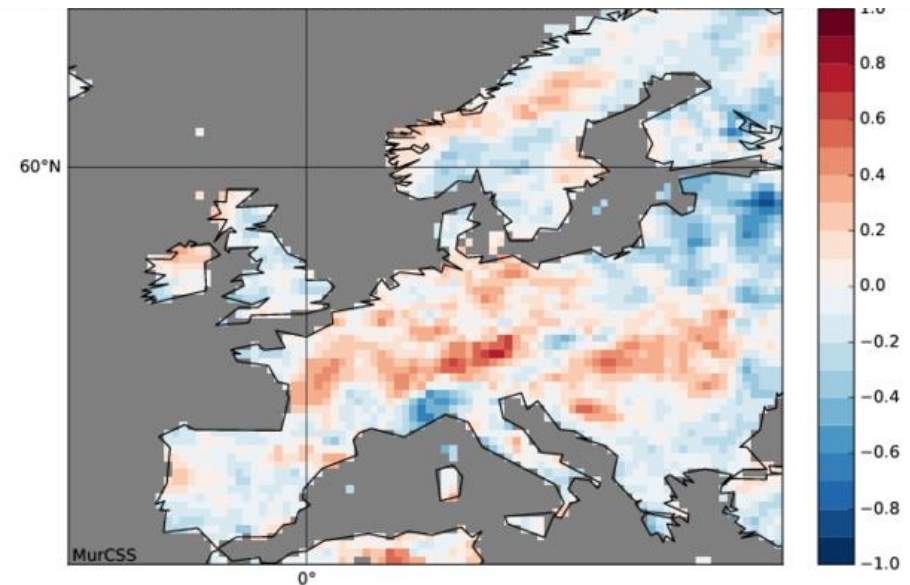
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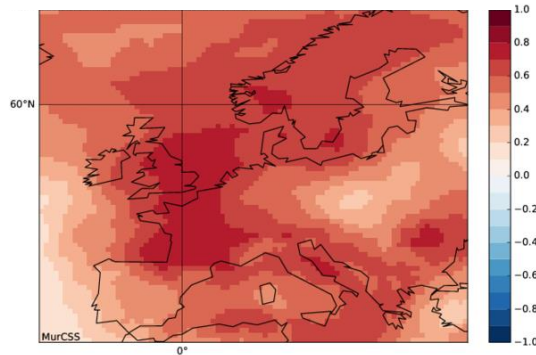


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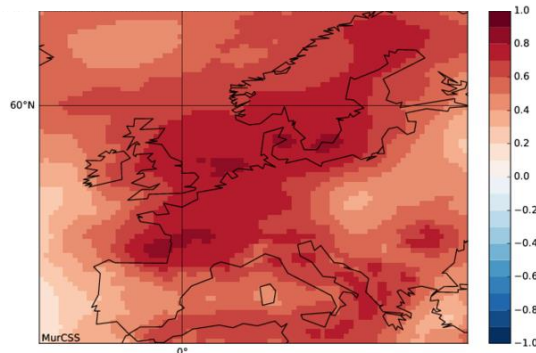
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## Correlations : Water vapor path / prw (LT 2-5 yrs)

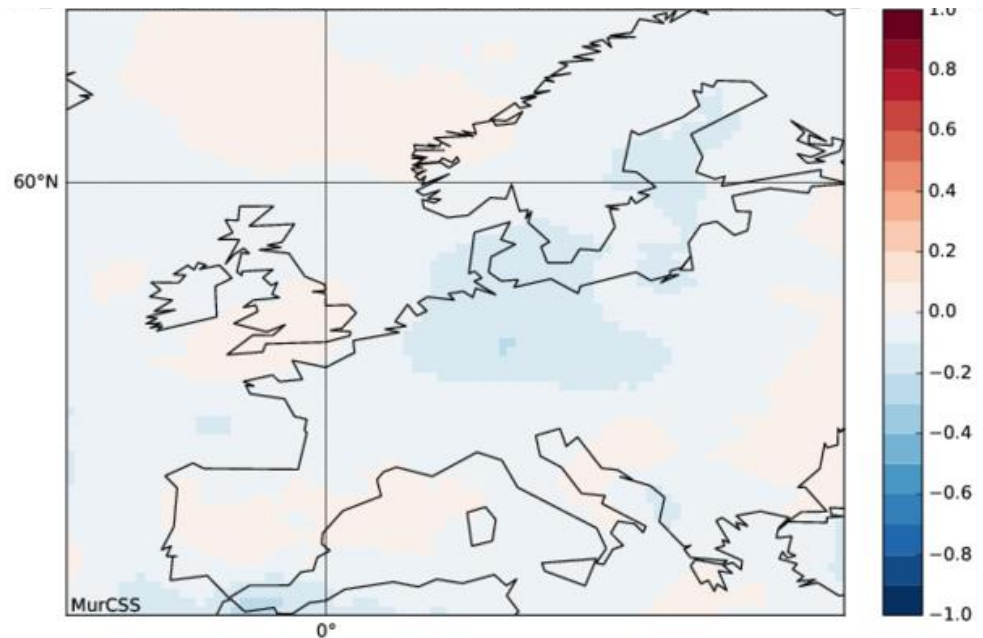
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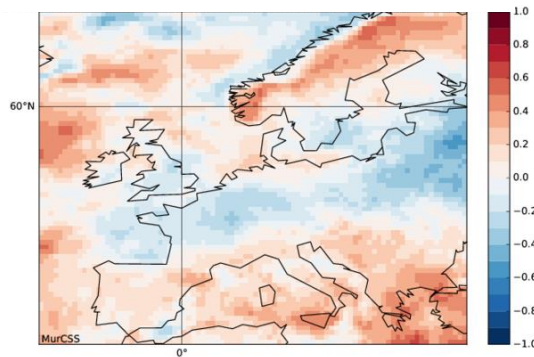
*pre-op – baseline1*



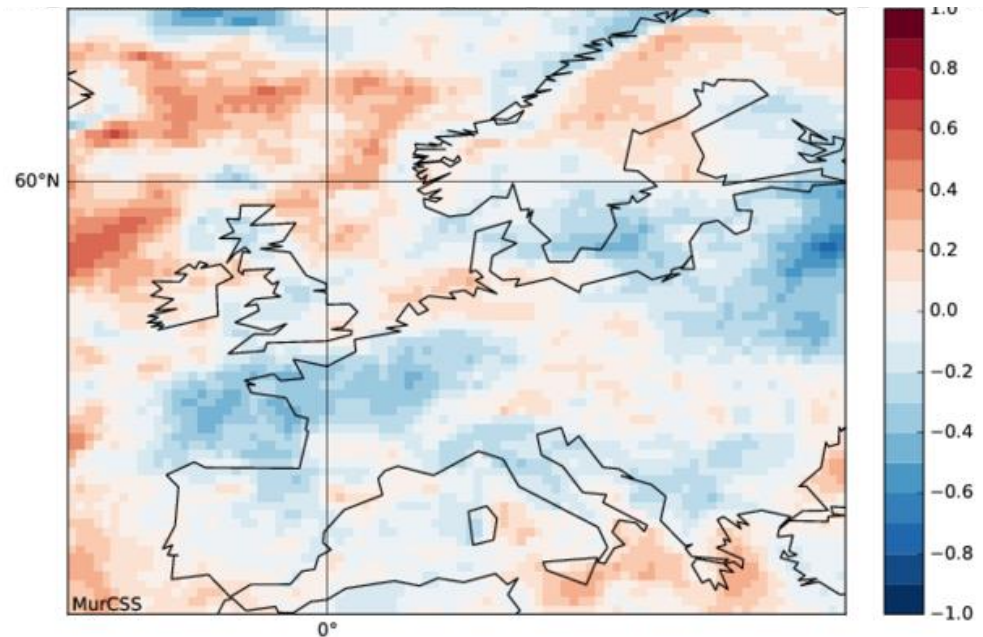
❖ Good correlation (!)

# Correlations : Duration of sunshine / sund (LT 2-5 yrs)

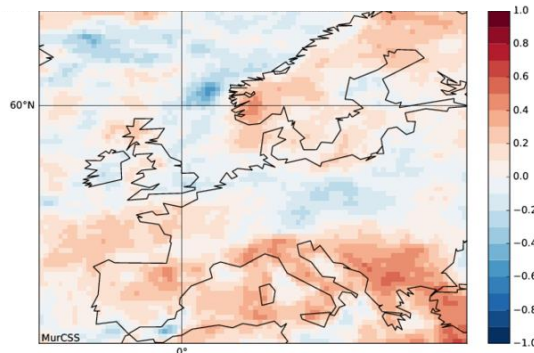
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*pre-op – baseline1*



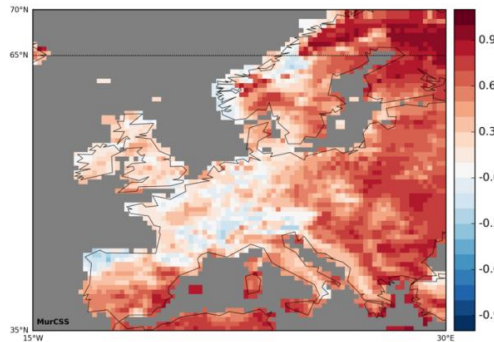
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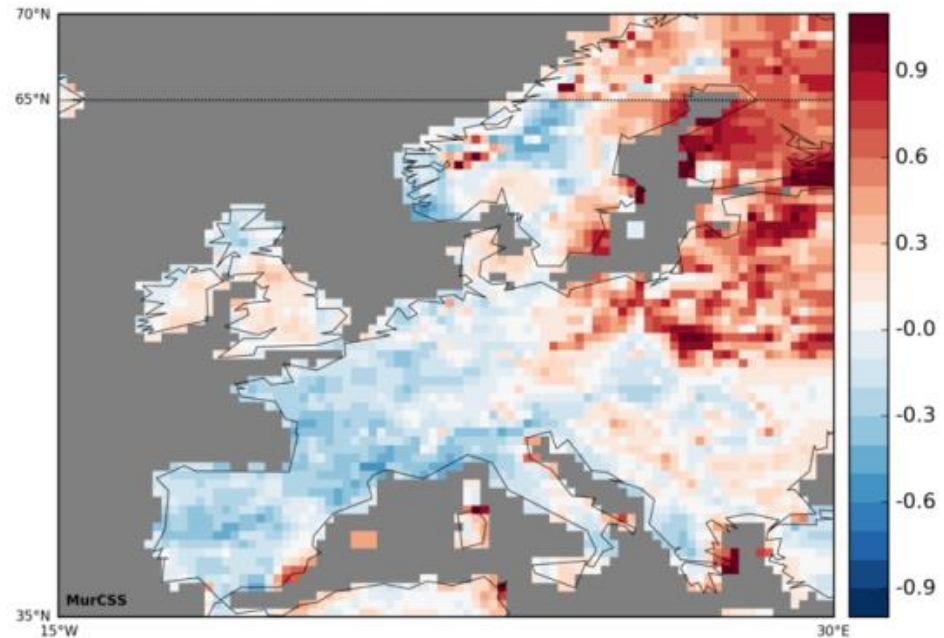
❖ Linked to topography & climatology

## Correlations : Total soil moisture / mrso (LT 1 yr)

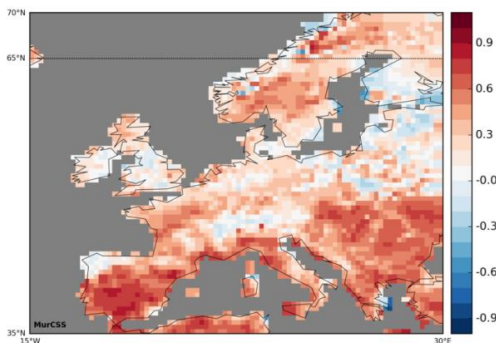
*pre-op vs. CCLM5-ERA*



*pre-op – baseline1*



*baseline1 vs. CCLM5-ERA*



❖ Due to enhanced soil scheme

## Correlations : PRUDENCE – regions (LT 1 yr)

Table 2 : Correlations pre-op vs. CCLM5-ERA (LT 1)

Variable	EU	BI	IP	FR	ME	SC	AL	MD	EA
tas	0.31	0.39	0.39	0.36	0.33	0.17	0.35	0.49	0.14
tasmax	0.29	0.36	0.31	0.26	0.29	0.16	0.31	0.48	0.14
tasmin	0.31	0.42	0.40	0.42	0.33	0.17	0.35	0.45	0.11
ta850	0.24	0.31	0.30	0.28	0.24	0.04	0.34	0.47	0.07
hus850	0.15	0.25	0.05	0.28	0.29	0.16	0.23	0.07	0.05
prw	0.22	0.29	0.16	0.37	0.32	0.18	0.29	0.24	0.10
mrso	0.45	0.22	0.39	0.16	0.26	0.53	0.15	0.54	0.64
mrso1	0.20	0.03	0.13	-0.18	-0.01	0.30	-0.05	0.27	0.35
mrro	0.16	0.23	0.13	0.29	0.37	0.08	-0.01	0.12	0.18
pr	-0.02	0.06	-0.07	-0.16	0.10	0.01	-0.15	-0.02	-0.08
clt	-0.02	-0.01	-0.14	-0.07	0.00	0.02	-0.10	-0.05	-0.04
sund	-0.01	-0.06	-0.03	-0.13	-0.03	0.02	-0.16	0.05	-0.03
psl	-0.05	-0.11	-0.15	-0.17	0.01	-0.03	-0.03	-0.03	0.09
sfcwindmax	-0.03	-0.14	-0.11	-0.27	-0.20	0.09	-0.16	0.02	-0.01

- ❖ Black:  $\geq 30\%$
- ❖ Green:  $\geq 60\%$
- ❖ BI : British Isles
- ❖ IP : Iberian Peninsula
- ❖ FR : France
- ❖ ME : Middle Europe
- ❖ SC : Scandinavia
- ❖ AL : Alps
- ❖ MD : Mediterranean Sea
- ❖ EA : East Europe

## Correlations : PRUDENCE – regions (LT 2-5 yrs)

Table 1 : Correlations pre-op vs. CCLM5-ERA (LT 2-5)

Variable	EU	BI	IP	FR	ME	SC	AL	MD	EA
tas	0.52	0.66	0.62	0.60	0.45	0.39	0.55	0.68	0.30
tasmax	0.48	0.61	0.55	0.51	0.38	0.35	0.52	0.67	0.23
tasmin	0.54	0.70	0.64	0.66	0.49	0.43	0.55	0.67	0.32
ta850	0.49	0.57	0.49	0.49	0.43	0.41	0.56	0.65	0.27
hus850	0.52	0.63	0.50	0.68	0.55	0.54	0.59	0.47	0.41
prw	0.58	0.65	0.48	0.72	0.60	0.60	0.64	0.60	0.49
mrso	0.14	-0.14	0.22	0.06	-0.03	0.22	0.01	0.26	0.09
mrso1	0.04	-0.18	0.19	0.02	-0.10	-0.02	0.03	0.23	-0.03
mrro	0.07	-0.04	0.12	0.11	0.11	0.06	0.05	0.08	0.03
pr	0.06	-0.03	0.09	0.07	0.11	0.05	0.04	0.05	0.00
clt	0.05	0.02	-0.07	-0.16	-0.04	0.03	-0.02	0.12	0.02
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  - ❖ Assume / prepare coming operational phase, but decide later



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**Thanks for Your attention !**