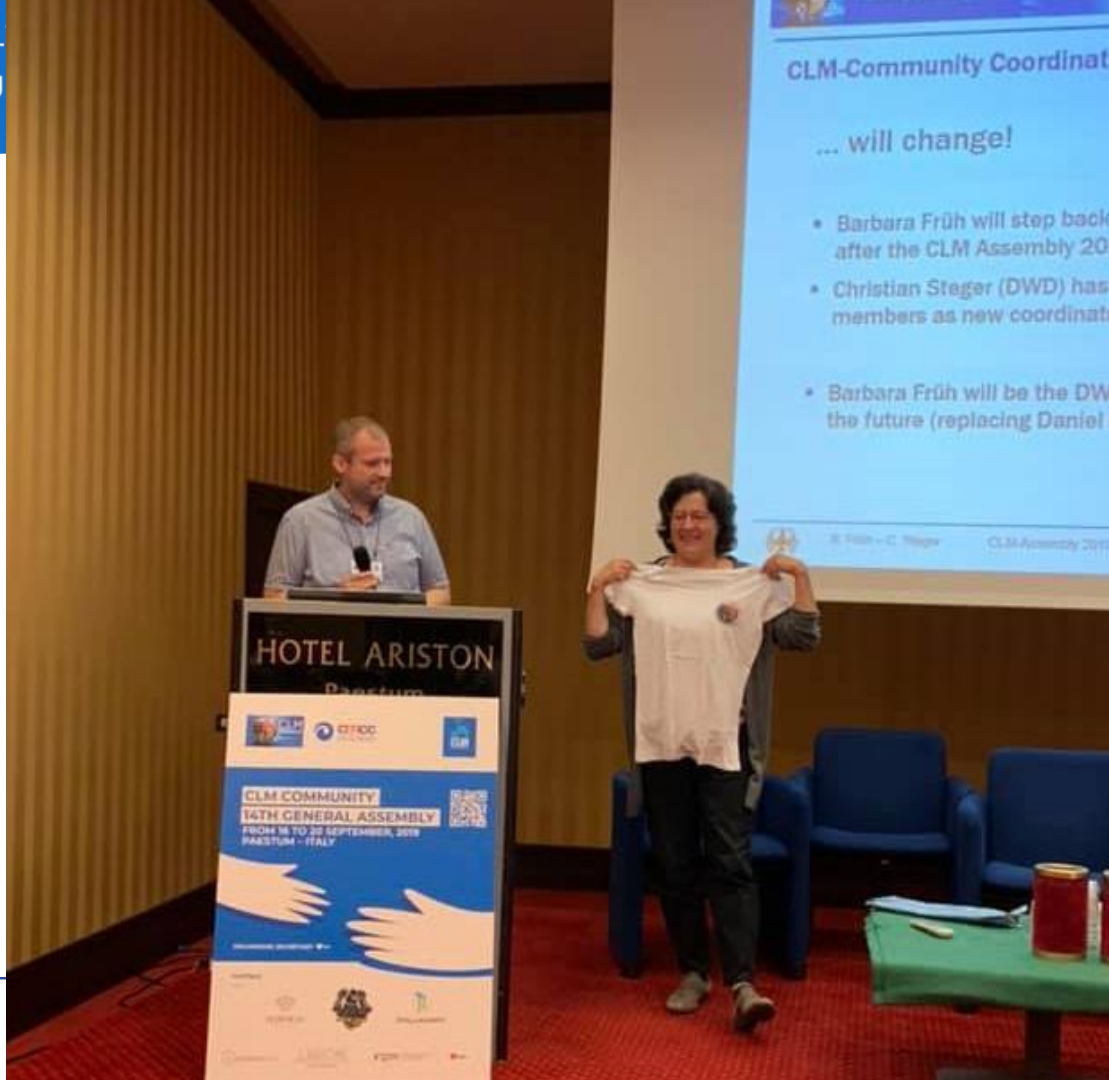


News CLM-Community

Christian Steger
COSMO General Meeting 2022
15 September 2022
Athens, Greece



CLM-Community Coordination

... will change!

- Barbara Früh will step back after the CLM Assembly 2019
- Christian Steger (DWD) has invited new members as new coordinators
- Barbara Früh will be the DWD representative for the future (replacing Daniel F...

B. Früh - C. Steger CLM-Assembly 2019

HOTEL ARISTON
Paristum

CLM COMMUNITY
14TH GENERAL ASSEMBLY
FROM 16 TO 20 SEPTEMBER, 2019
PARISTUM - ITALY



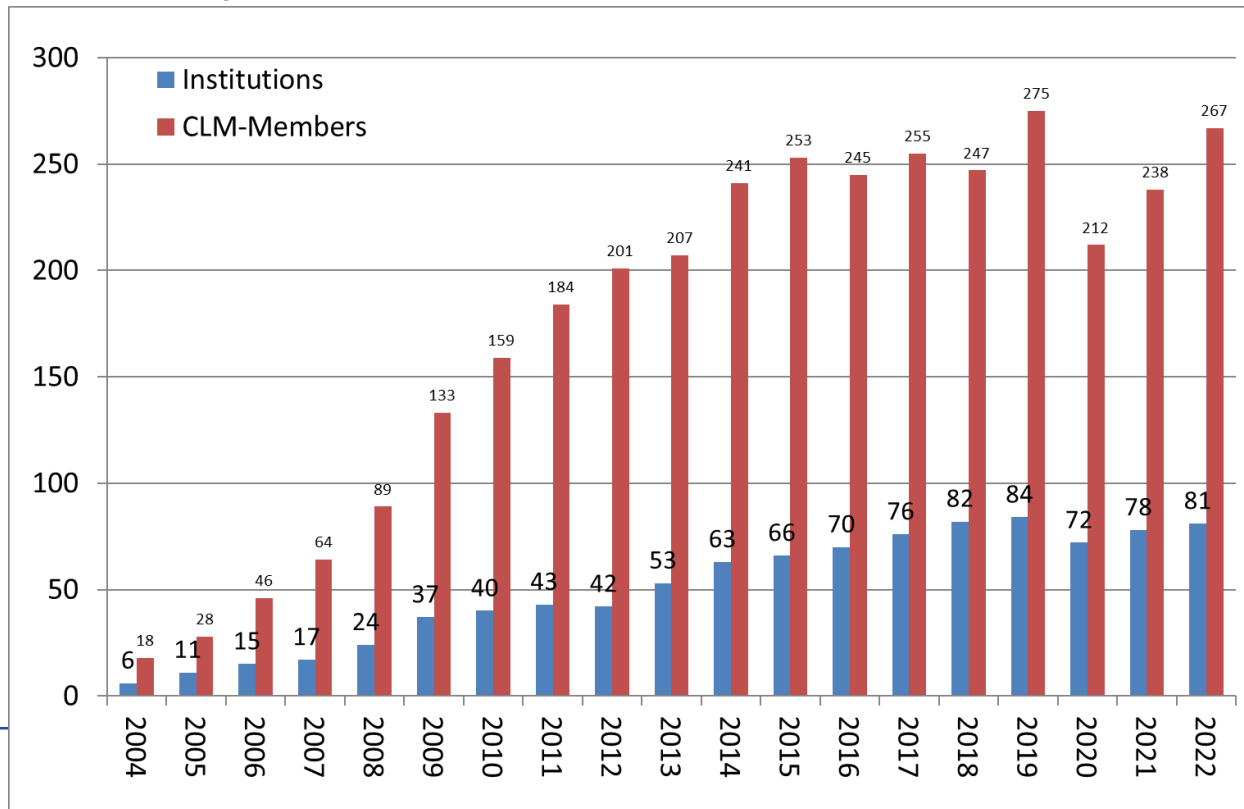
Logos of partner organizations: DLR, DWD, ERM, etc.

Overview

- 1. Community issues**
2. ICON-CLM development
3. COPAT2 (COordinated PArameter Tuning 2)
4. Contribution CORDEX – CMIP6



CLM-Community members and institutions



CLM-Community institutions by country

CLM-Community WORLD

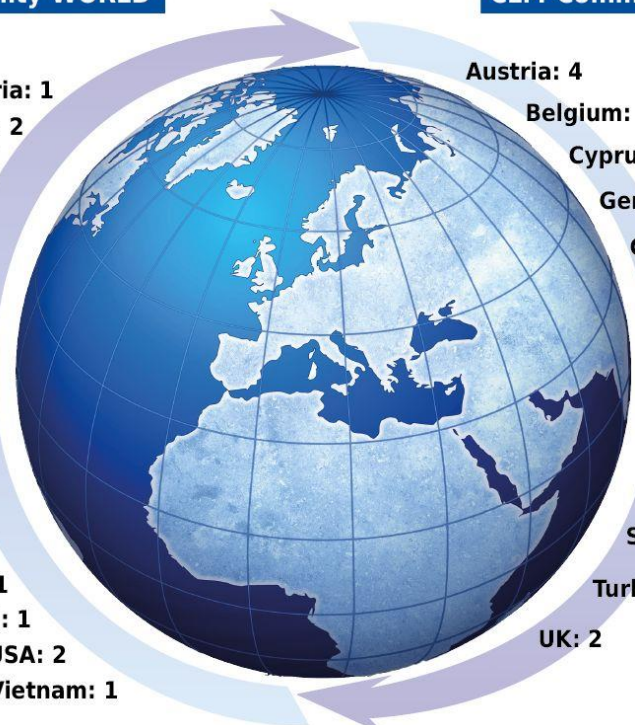
Algeria: 1
Brazil: 2
Burkina-Faso: 1
China: 3
Egypt: 1
India: 2
Iran: 1
Israel: 2
Mexico: 1
Nigeria: 4
Pakistan: 1
Russia: 2
Saudi Arabia: 1
Simbabwe: 1
South Korea: 1
Swasiland: 1
USA: 2
Vietnam: 1

CLM-Community EUROPE

Austria: 4
Belgium: 3
Cyprus: 1
Germany: 26
Greece: 2
Ireland: 1
Italy: 2
Luxembourg: 1
Norway: 4
Poland: 1
Switzerland: 4
Turkey: 2
UK: 2

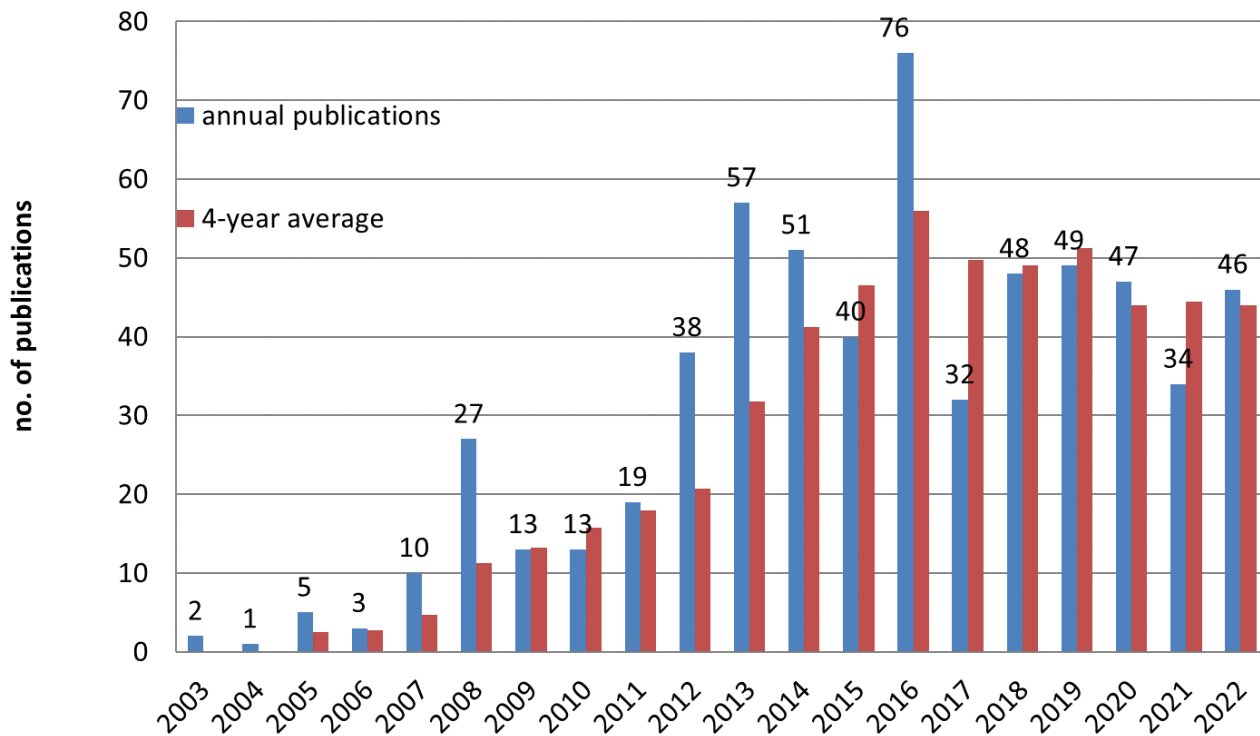
Germany: 26
Europe: 27
World: 28

Total: 81



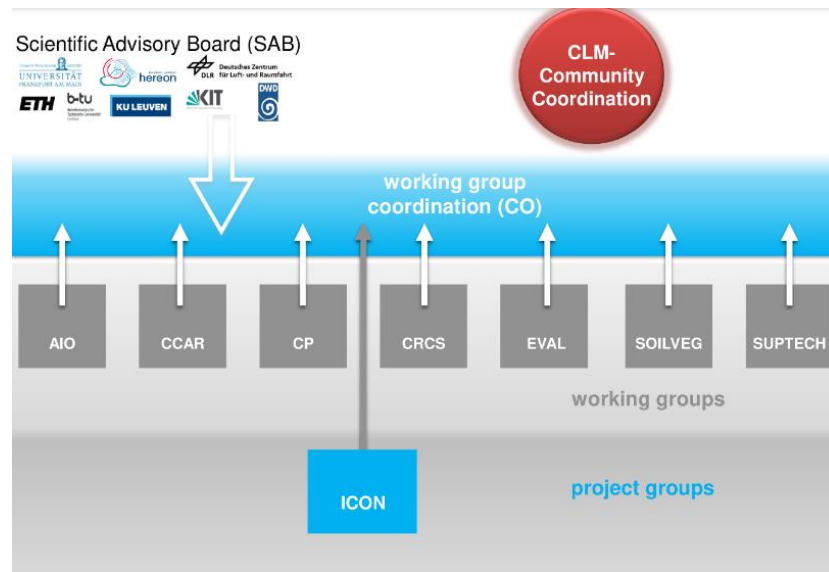


CLM-Community development of publications



Structure of working groups

- PG ICON
 - will be closed next week (purpose fulfilled)
- WG Model Development (MoDev)
 - Vote on proposal next week
 - coordinate and take care of ICON-CLM development/maintenance in the future
 - WG / development independent platform for exchange about technical and development related topics



Meetings/Events 2023

ICCARUS 2023:

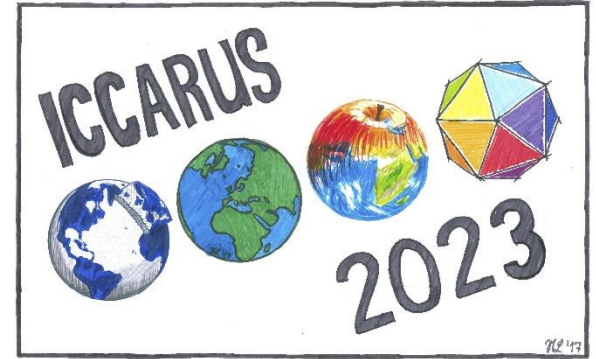
06 - 10 March 2023 (hybrid meeting)

ICON-LAM/ICON-CLM training course

Maybe in March 2023

CLM-Community Assembly 2023 (decision next week)

18 - 22 September 2023 (Leuven, Belgium)



Other topics

- CLM-Community documents have been updated (vote next week)
- Management tool has been extended (automatic e-mail lists, Wiki, possibility add material to WGs and events
 - Should replace RedC and Webpage in the future
- Unification of all DKRZ projects / data in one project (CLMcom, pd1309)
- Standard references for COSMO and ICON
 - COSMO: <http://cosmo-model.org/content/model/documentation/journals/default.htm?core>
 - ICON: <https://code.mpimet.mpg.de/projects/iconpublic/wiki/Documentation>
- Zenodo group for CLM-Community: <https://zenodo.org/communities/clmcom>

Overview

1. Community issues
2. **ICON-CLM development**
3. COPAT2 (COordinated PArameter Tuning 2)
4. Contribution CORDEX – CMIP6

ICON-CLM development – Changes from CLM-Community

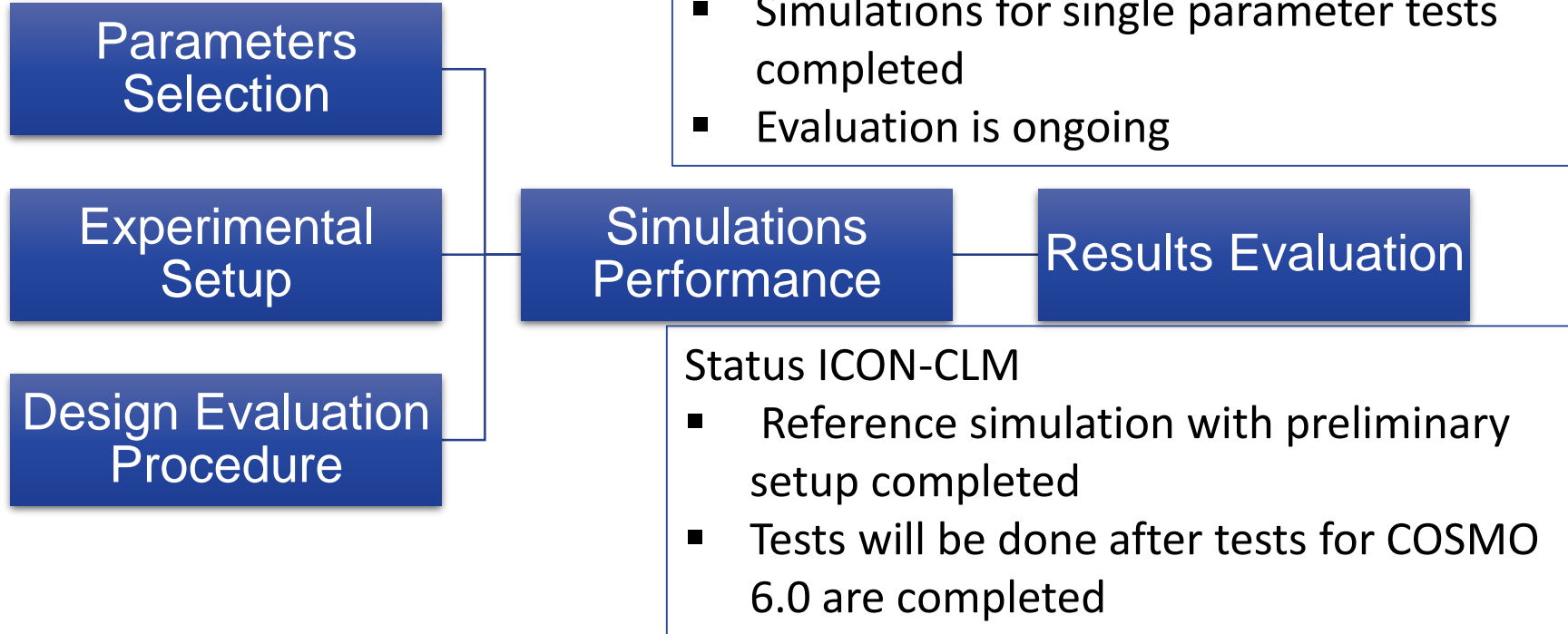
- Input
 - Time dependency of SST and sea ice
 - Time dependency of greenhouse gas concentrations
- Output
 - Precipitation accumulation over output interval
 - Runoff accumulation over output interval
 - Implementation of sunshine duration
 - Implementation of melting rate as output variable
 - Additional variables for soil moisture budget
- Other
 - Variable setting of number/thickness of hydrologically active soil levels
 - Soil moisture budget correction

Everything
available in
ICON 2.6.5

Overview

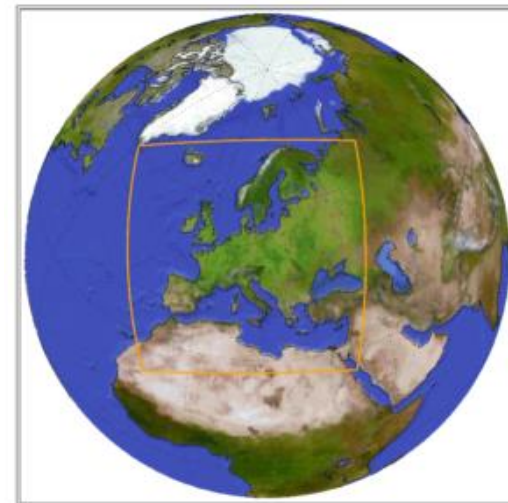
1. Community issues
2. ICON-CLM development
3. **COPAT2 (COordinated PArameter Tuning 2)**
4. Contribution CORDEX – CMIP6

General Strategy COPAT2



Experimental Design COSMO-CLM 6.0

- Target domain: EURO-CORDEX (EUR-11)
- Target resolution: ~12 km
- Reference simulation for period 1979-2000 with configuration based on NWP configuration
- 1st set of simulation over period 1979-1985
- 2nd set of extended simulations over period 1979-1990
- Additional test simulations for more recent period
- All simulations are performed on the systems of the German Climate Computing Center (DKRZ):
 - MISTRAL (decommissioned)
 - LEVANTE



Source: <https://cordex.org/domains/cordex-region-euro-cordex/>



1st
Phase

Test single configuration options → determine potential parameters improving model performances

COSMO-CLM 6.0

Dynamics

e.g.: Bott advection
with deformat
correction

C202,C203,C204,C205

Physics

e.g.: explicit calculation
of skin surface energy
budget

C210,C212,C213,C214

Turbulence

e.g.: new ICON
Turbulence scheme

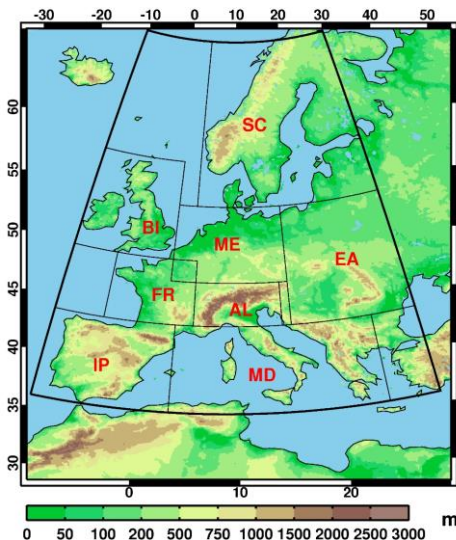
**C220,C221,C222,C223,
C224, C225**

2nd
Phase

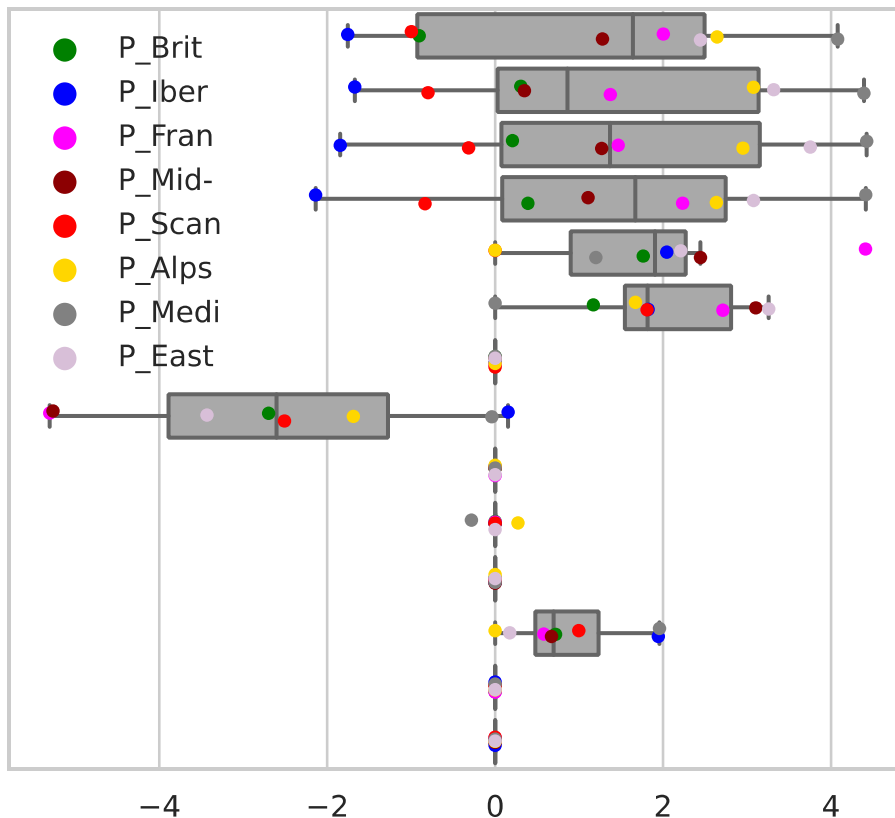
Test Combined configuration changes



Prudence Regions



- C2C202(1.4,0.9)
- C2C203(1.1,1.2)
- C2C204(1.6,1.5)
- C2C205(1.4,1.2)
- C2C210(1.7,1.5)
- C2C212(2.5,2.1)
- C2C213(0.0,0.0)
- C2C214(-3.6,-2.5)
- C2C220(0.0,0.0)
- C2C221(0.0,-0.0)
- C2C222(0.0,0.0)
- C2C223(0.6,0.9)
- C2C224(0.0,0.0)
- C2C225(0.0,0.0)



DYN

PHY

TUR



Overview

1. Community issues
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4. **Contribution CORDEX – CMIP6**



EURO-CORDEX GCM selection

GCM name	Run	Marks/Criteria	TCR Plausible range (1.2K-2.4K)
NorESM2-MM	r1i1p1f1	1/17	1.33
MIROC6	r1i1p1f1	1/20	1.55
MPI-ESM1-2-HR	r1i1p1f1	1/20	1.66
CNRM-ESM2-1	r1i1p1f2	1/19	1.86
(CESM2)	r2i1p1f1	1/18	2.06
CMCC-CM2-SR5	r1i1p1f1	1/15	2.09
IPSL-CM6A-LR	r1i1p1f1	2/16	2.32
EC-Earth3-Veg	r1i1p1f1	2/15	2.62
UKESM1-0-LL	r1i1p1f2	2/19	2.79

Transient Climate Response (TCR):

The change in the global mean surface temperature, averaged over a 20-year period, centered at the time of atmospheric CO₂ doubling, in a climate model simulation in which CO₂ increases at 1% yr⁻¹ from pre-industrial. It is a measure of the strength of climate feedbacks and the timescale of ocean heat uptake.



CMIP6 - EURO-CORDEX “balanced” matrix

GCM RCM	EC-Earth3- Veg (*) r1i1p1f1	MPI- ESM1-2- HR r1i1p1f1	CNRM- ESM2-1 r1i1p1f2	NorESM2 -MM r1i1p1f1	MIROC6 r1i1p1f1	CMCC- CM2- SR5 (***) r1i1p1f1	CESM2 (****) r1i1p1f1	IPSL-CM6A- LR r1i1p1f1	UKESM1- 0-LL (**) r1i1p1f1
WRF	X	X		X					
ALADIN6x			X	X		X			
COSMO-CLM	X	X			X	X			
ICON-CLM	X	X			X	X			
ALADIN-43	X	X	X	X	X	X	X	X	
ALARO-0			X						
RegCM5	X	X		X					
REMO	X	X			X	X		X	
RACMO23E			X	X					X

X planned
X still to be
placed

SSP126, SSP370
3 GCMs per RCM
4 RCMs per GCM



CMIP6 - EURO-CORDEX “balanced” matrix

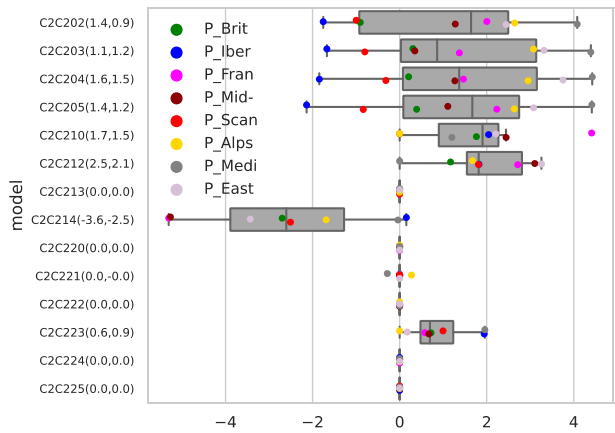
GCM RCM	EC-Earth3- Veg (*) r1i1p1f1	MPI- ESM1-2- HR r1i1p1f1	CNRM- ESM2-1 r1i1p1f2	NorESM2 -MM r1i1p1f1	MIROC6 r1i1p1f1	CMCC- CM2- SR5 (***) r1i1p1f1	CESM2 (****) r1i1p1f1	IPSL-CM6A- LR r1i1p1f1	UKESM1- 0-LL (**) r1i1p1f1
WRF	X	X		X					
ALADIN6x			X	X		X			
COSMO-CLM	X	X			X	X			
ICON-CLM	X	X			X	X			
ALADIN-43	X	X	X	X	X	X	X	X	
ALARO-0			X						
RegCM5	X	X		X					
REMO	X	X			X	X		X	
RACMO23E			X	X					X

X planned
X still to be
placed

SSP126, **SSP370**

3 GCMs per RCM

4 RCMs per GCM



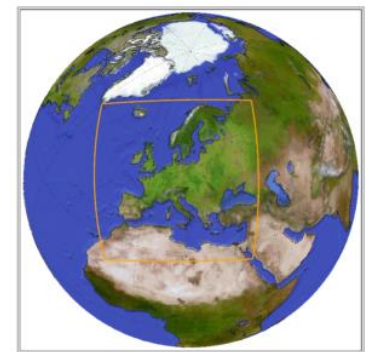
Dynamics
e.g.: Bott advection with deformat correction
C202,C203,C204,C205

Physics
e.g.: explicit calculation of skin surface energy budget
C210,C212,C213,C214

Turbulence
e.g.: new ICON Turbulence scheme
C220,C221,C222,C223,C224,C225

Questions?

GCM RCM	EC-Earth3-Veg (*) r1i1p1f1	MPI-ESM1-2-HR r1i1p1f1	CNRM-ESM2-1 r1i1p1f2	NorESM2-MM r1i1p1f1	MIROC6 r1i1p1f1	CMCC-CM2-SR5 (***) r1i1p1f1	CESM2 (***) r1i1p1f1	IPSL-CM6A-LR r1i1p1f1	UKESM1-0-LL (***) r1i1p1f1
WRF	X	X		X					
ALADIN6x			X	X		X			
COSMO-CLM	X	X			X	X			
ICON-CLM	X	X			X	X			
ALADIN-43	X	X	X	X	X	X	X	X	
ALARO-0			X						
RegCM5	X	X		X					
REMO	X	X			X	X		X	
RACMO23E			X	X					X





Additional slides

ICON-CLM development – next steps

- Recommended setup for first version of ICON-CLM -> COPAT2
- more flexible initialization for GCMs (different input formats and variables (e.g. W_SO or SMIL), vertical interpolation of soil layers of GCM to ICON layers)
- optimization of NetCDF output (CF conform variable names, attributes and time stamps/time bounds/cell methods); currently done in postprocessing)
- Work on converter for CMIP6 GCMs (has already started and is ongoing)
- Technical tests (compiler settings, parallelization, bit identical results, ...) on all machines on which the model should be used
- Creating a buildbot test for ICON-CLM

Observational Datasets: ERA5, Eobs

Target Variables: T_2M, TOT_PREC, TMAX_2M, TMIN_2M, DTR, CLCT, PMSL

Metrics

Need of simplified approach, with single metric for ranking different experiments



Discussion is still ongoing

- **Score points of evidence:** for a given metric (e.g. BIAS), ratio of points with significant improvement/worsening
- Consideration of **Standardized RMSE:** averaging first over a set of pre-defined regions (PRUDENCE)
 - 1- Variables become quasi-gaussians
 - 2- Reduce uncertainty related to chaotic nature of the system



Overview test simulations COSMO

- <https://hcdc.hereon.de/clm-community/wiki/eval/copat2/phase1c/>

Contribution to CORDEX – CMIP6

- GCM selection:
 - Suggestion of EURO-CORDEX GCM selection group has been accepted
 - More GCMs can be added if data becomes available

Contribution to CORDEX – CMIP6

- GCM selection:
 - Suggestion of selection group has been accepted
 - More GCMs can be added if data becomes available
- EURO-CORDEX balanced matrix
 - Goal: homogenous ensembles for a subset of scenarios
 - At least 2 scenarios (SSP126 and SSP370)
 - ~ 3 GCMs per RCM
 - ~ 4 RCMs per GCM