COSMO-CLM

Climate Limited-area Modelling Community

Current activities in the CLM-Community

Barbara Früh & CLM WG coordinators

COSMO – GM
September 05, 2018
St. Petersburg, Russia

DWD

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Outlook

Science

- Groundwater and Runoff Formulation

- Land use change in climate simulations

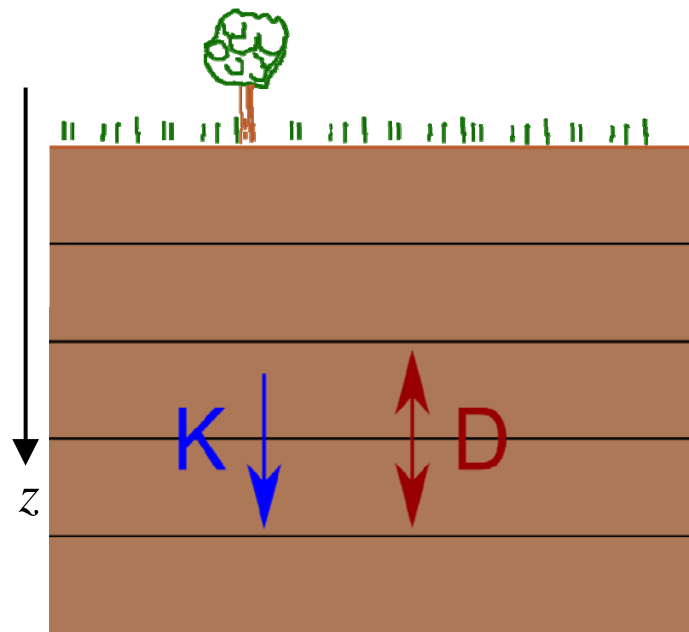- ICON for regional climate applications

Community Issues

- CORDEX CORE

- … and many more

A Groundwater and Runoff Formulation for Weather and Climate Models

ETH *zürich*

Schlemmer L., C. Schär, D. Lüthi and L. Strebel, 2018, *J. Adv. Model. Earth Syst.*

Traditionally:

Soil water parameterization ignore lateral water fluxes
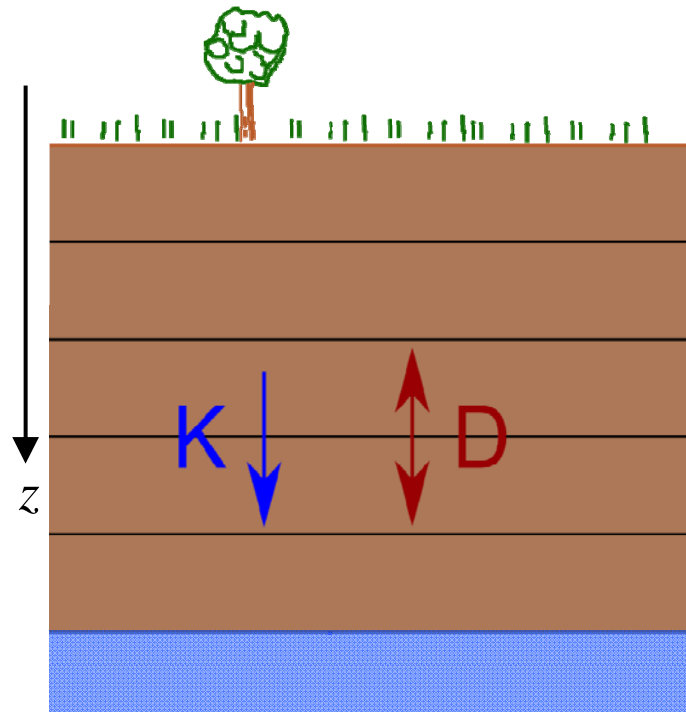
Main issue:

➢ **Runoff is unaware of gravitational effects in sloping terrain.**

Open lower boundary condition: Water drips out from bottom of soil column (= groundwater runoff)

A Groundwater and Runoff Formulation for Weather and Climate Models

ETH zürich

Schlemmer L., C. Schär, D. Lüthi and L. Strebel, 2018, *J. Adv. Model. Earth Syst.*

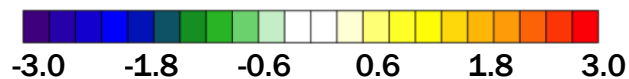**New formulation with groundwater:**
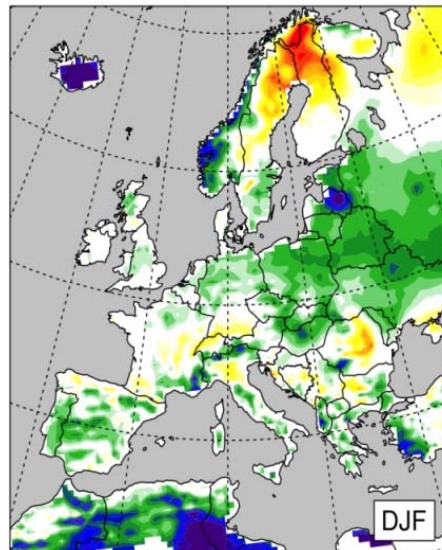
Slope-dependent formulation of groundwater runoff formation from saturated portion of soil column.
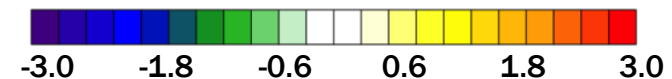
Formation of groundwater table.

Results

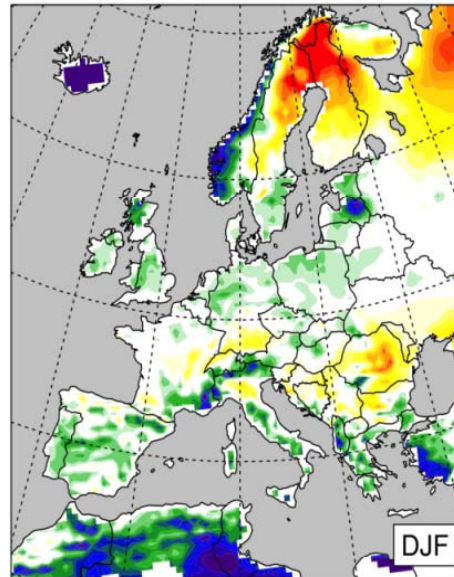REVISED: T2m bias [K]

Temperature biases in CCLM
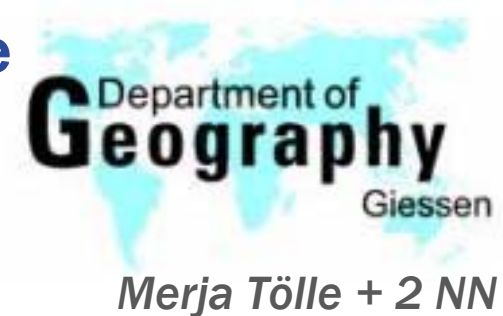simulations with Δx=50 km
(ERA driven 1981-1990)

CTRL: T2m bias [K]

DJF cold-bias slightly reduced, positive
bias over North-Eastern Europe increased

Reducing uncertainty on regional & local climate induced by land-atmosphere feedbacks

Department of **Geography** Giessen

started on September 01, 2018 (3 years)

Merja Tölle + 2 NN

Quantification of the impact of ...

- **Transient land use/cover map**

... land use change to detected past climate trends, to the future, and to changes in climate variability in Europe on regional and local scale

© M. Tölle, JLU

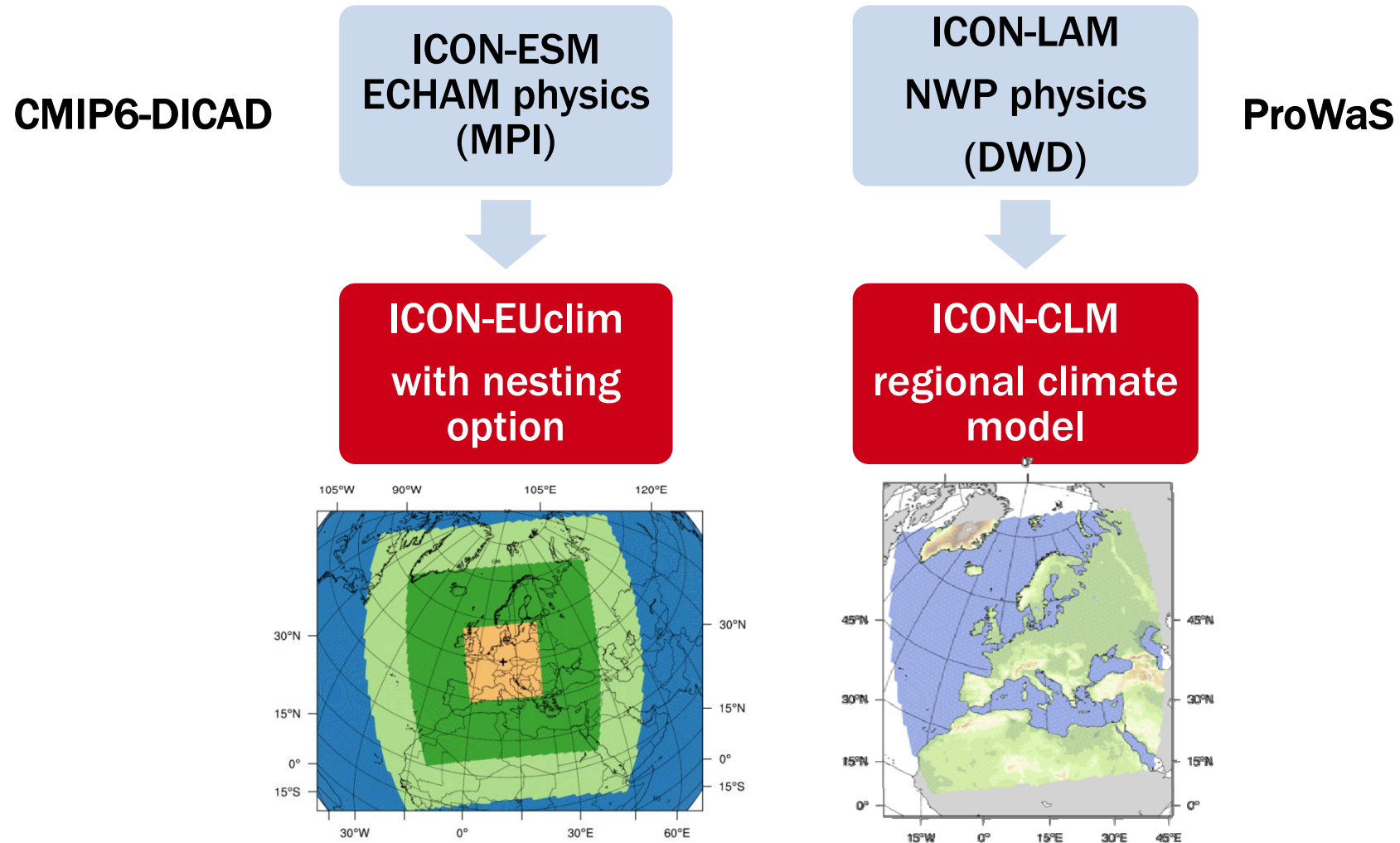- **Phenology**

... of seasonally varying phenology

- **Spatial resolution**

... spatial resolution and heterogeneity on the magnitude and robustness of land use change induced climate changes in Europe

ICON development for regional climate studies

CMIP6-DICAD

ICON-ESM
ECHAM physics
(MPI)

ICON-LAM
NWP physics
(DWD)

ProWaS

ICON-EUclim
with nesting option

ICON-CLM
regional climate model

State of implementation

- ICON-CLM installed on Cray (DWD) and Mistral.
- 1st version ICON-CLM (based on ICON-LAM):
  - Ability to perform long simulation
  - More flexible output intervals for some variables and flexible input read-in (in case input data are not provided by GCM)
  - Regular update of SST/Sea-ice
  - Regular update of GHG
  - Common technical infrastructure for Cray and Mistral (set ups for other machines can be included)
  - Adaptation of evaluation tool E_TOOLS
  - Test suite for climatological application
  - Git-Server for ICON-CLM source code and ICON-CLM script packages

ICON-CLM experiment setups

**First test simulation**
(coarse & short)

- EU-CORDEX domain
- R02B06 (~40km)
- ERA-Interim as initial, lateral and lower boundary data
- period: 1979-1991

Reanalysis run

- EU-CORDEX domain
- R02B08 (~10km)
- ERA-Interim as initial, lateral and lower boundary data
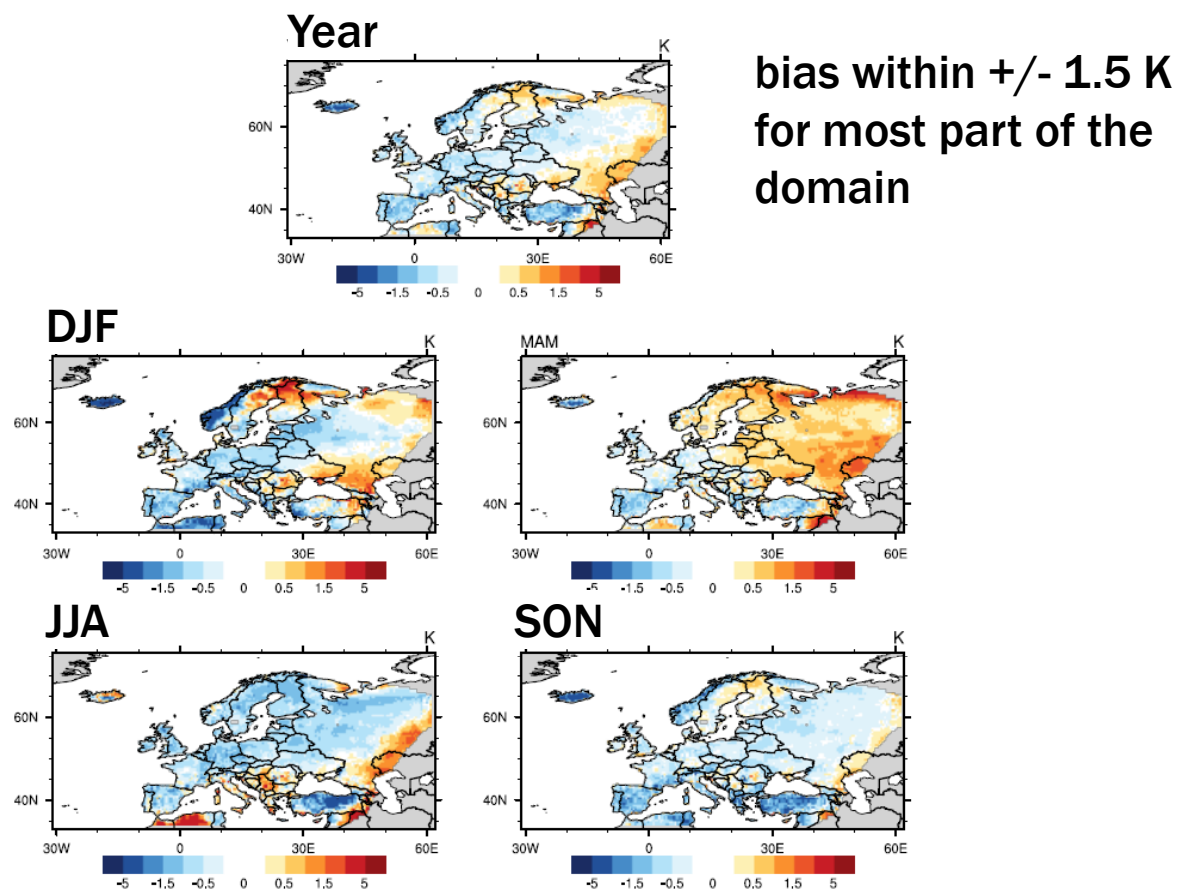- period: ERA-Interim period 1979-2016

RCP run

- EU-CORDEX domain
- R02B08 (~10km)
- MPI-ESM as initial, lateral and lower boundary data
- period: time slides or transient run
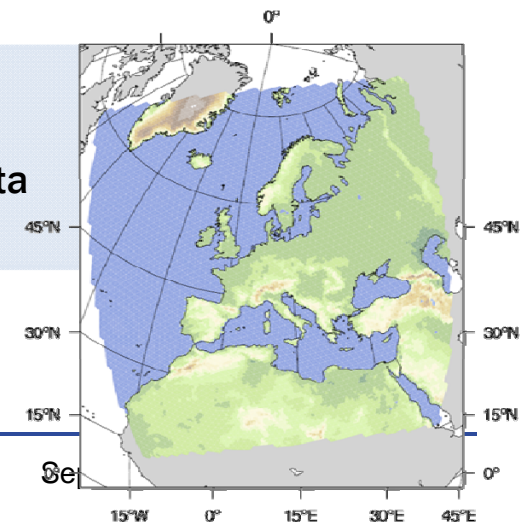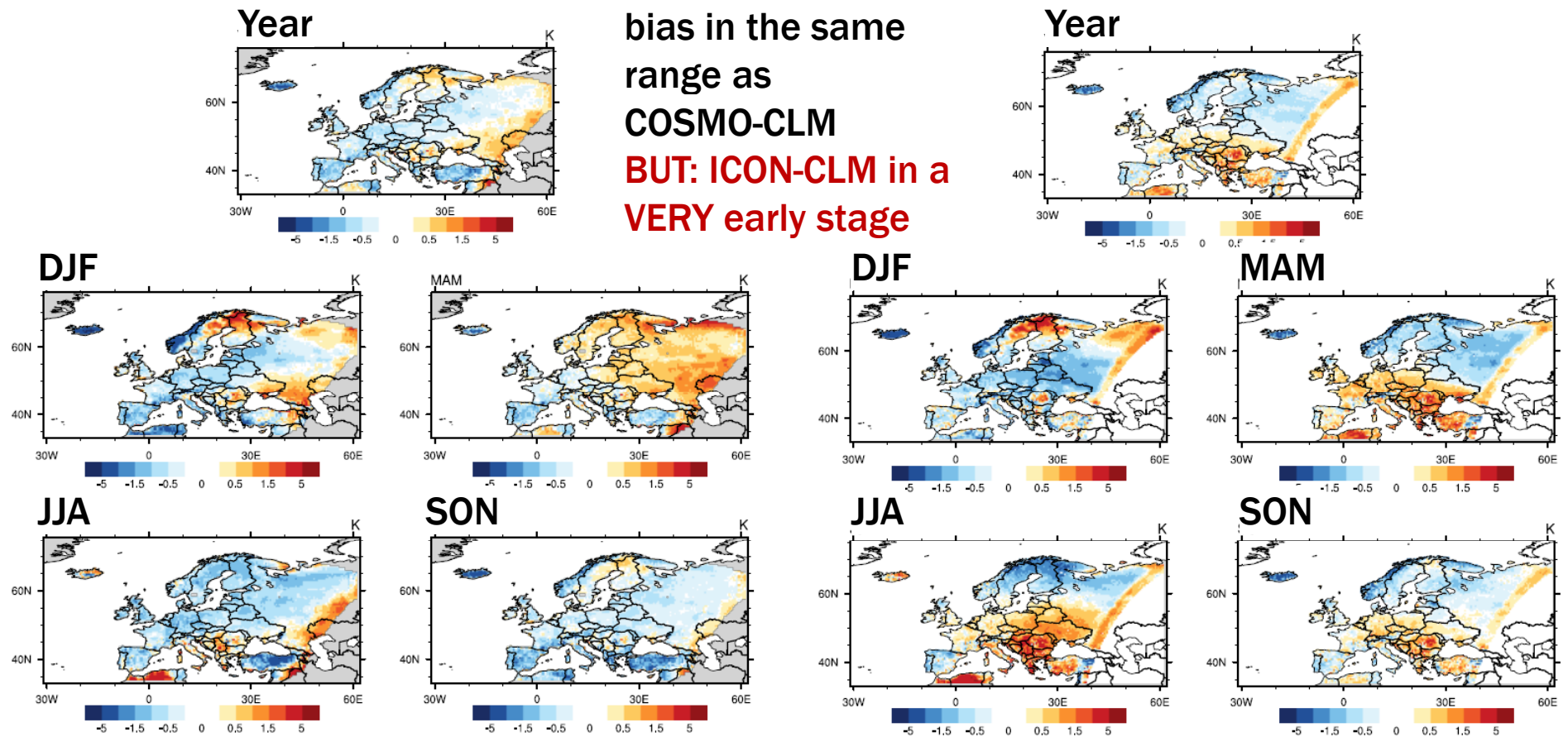
Test run results - bias vs. EOBS

ICON-CLM (R2B6) (1979 – 1991)

Year

bias within +/- 1.5 K
for most part of the
domain

DJF

JJA   **SON**

Test run results - bias vs. EOBS

ICON-CLM (R2B6) (1979 – 1991)

COSMO-CLM (50km) (1981 – 2000)

Year

Year

bias in the same
range as
COSMO-CLM
**BUT: ICON-CLM in a
VERY early stage**

DJF MAM

JJA **SON**

DJF **MAM**

JJA **SON**
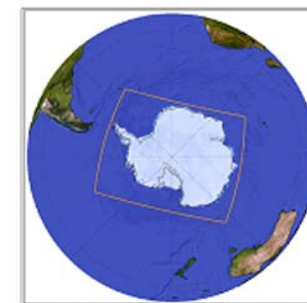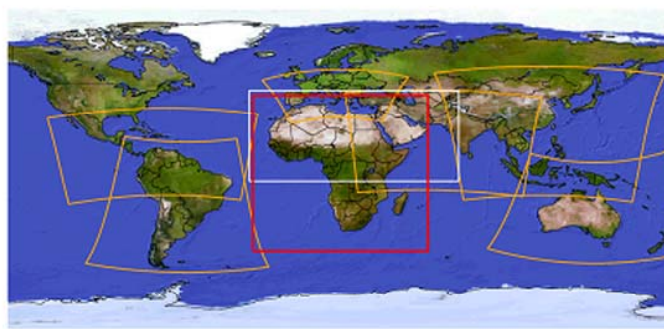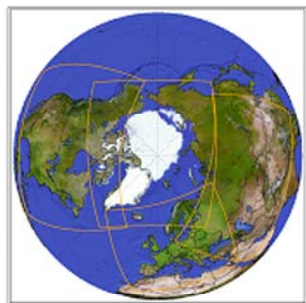
CORDEX Coordinated Output for Regional Evaluations (CORE)

**Main goal:** provide core set of comprehensive and homogeneous projections for most CORDEX domains.

- 12 core set of domains which are planned to be simulated according to the CORDEX-CORE protocol.

- Contributing groups: RegCM (ICTP), REMO (GERICS) and CLM-Community

- CLM-Community will contribute with 5-6 domains (distributed within the community)

- Current status: ongoing testing on different domains to find the best model configuration.

CORDEX Coordinated Output for Regional Evaluations (CORE) CORDEX protocol

- **Grid spacing**: 0.22° (Europe 0.11°)
- **Simulation period**: ERA-Interim simulation for each domain from 1979-2015
  minimum simulation period 1970 (target 1950) - 2100
- **Driving GCMs**: HadGEM, NORESM, MPI-ESM
- **Scenarios** : RCP2.6, RCP8.5
- **Archive**: standard CORDEX protocol
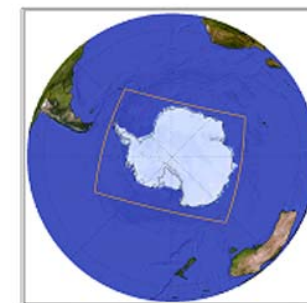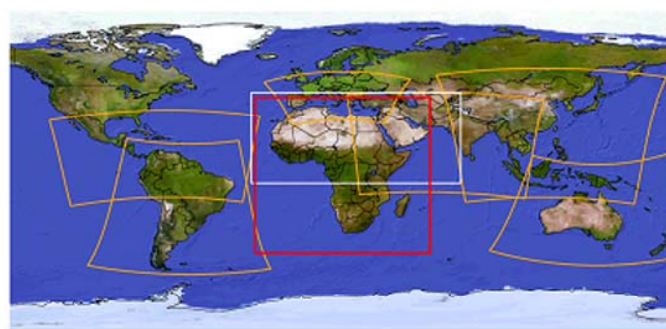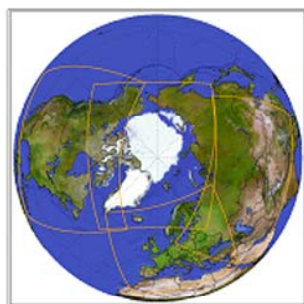
CLM Web Server

- **hacker attack** to CLM web server

- need to set up a new server

- **consequences**:
  - CLM-Community homepage will be divided in two parts:
    - a public part &
    - a secure part for the tools (web pep, namelist tool, registration, …); secure part will only be available for CLM-Community members
  - everyone who wants to access the tools must apply for CLM-Community membership
  - everyone has to change password once the webpage is available again

COSMO – COSMO-CLM reunification

1. **COSMO-CLM SCA** requires help from some experts in checking the namelists and looking into the results.
   Reunification starts with the release of COSMO5.5

2. Reunification to be realized with **COSMO6**
   intended to be finished in **December 2018**.

3. COPAT like evaluation for finding the recommended model version
   intended to be finished in **September 2019 (tight plan due to late v5.05)**

4. **COSMO6.0-CLM** will be the version to which **ICON-CLM** climatological evaluation run will be compared

CLM-Community Coordination

... will change!

- Barbara Früh will step back as CLM-Community Coordinator
  in September **2019**

- Christian Steger (DWD) is planned as successor

- to be confirmed at the CLM Assembly 2018
  (September 18 – 21 in Karlsruhe)

Next Meetings ....

18 - 22 March 2019
ICCACUS 2019

08 - 12 April 2019
ICON-LAM/COSMO-CLM training course

17 – 20 September 2019

CMCC - Centro Euro-Mediterraneo sui Cambiamenti Climatici

CIRA – Italian Aerospace Research Center

Cava de' Tirreni, Italy

Thank you very much for your attention!!!