Evaluation of CCLM simulations for CORDEX-Europe

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The Model CCLM

- **CSOMO-CLM** (**CCLM**) is the climate version of the local weather forecast model **COSMO**
  - used by several European weather services (i.p. DWD)
  - for operational weather forecast

- CORDEX simulations for Europe are supported by
  - **ETH Zuerich**: Daniel Luethi, Sven Kotlarski
  - **Helmholtz-Centre Geesthacht**: Burkhard Rockel, Beate Geyer
  - **M&D at MPI-M Hamburg**: Stephanie Legutke, Martina Schubert
  - **BTU Cottbus**: Klaus Keuler, Kai Radtke

- CCLM runs are also performed for CORDEX-Africa

Climate Limited-area Modelling Community

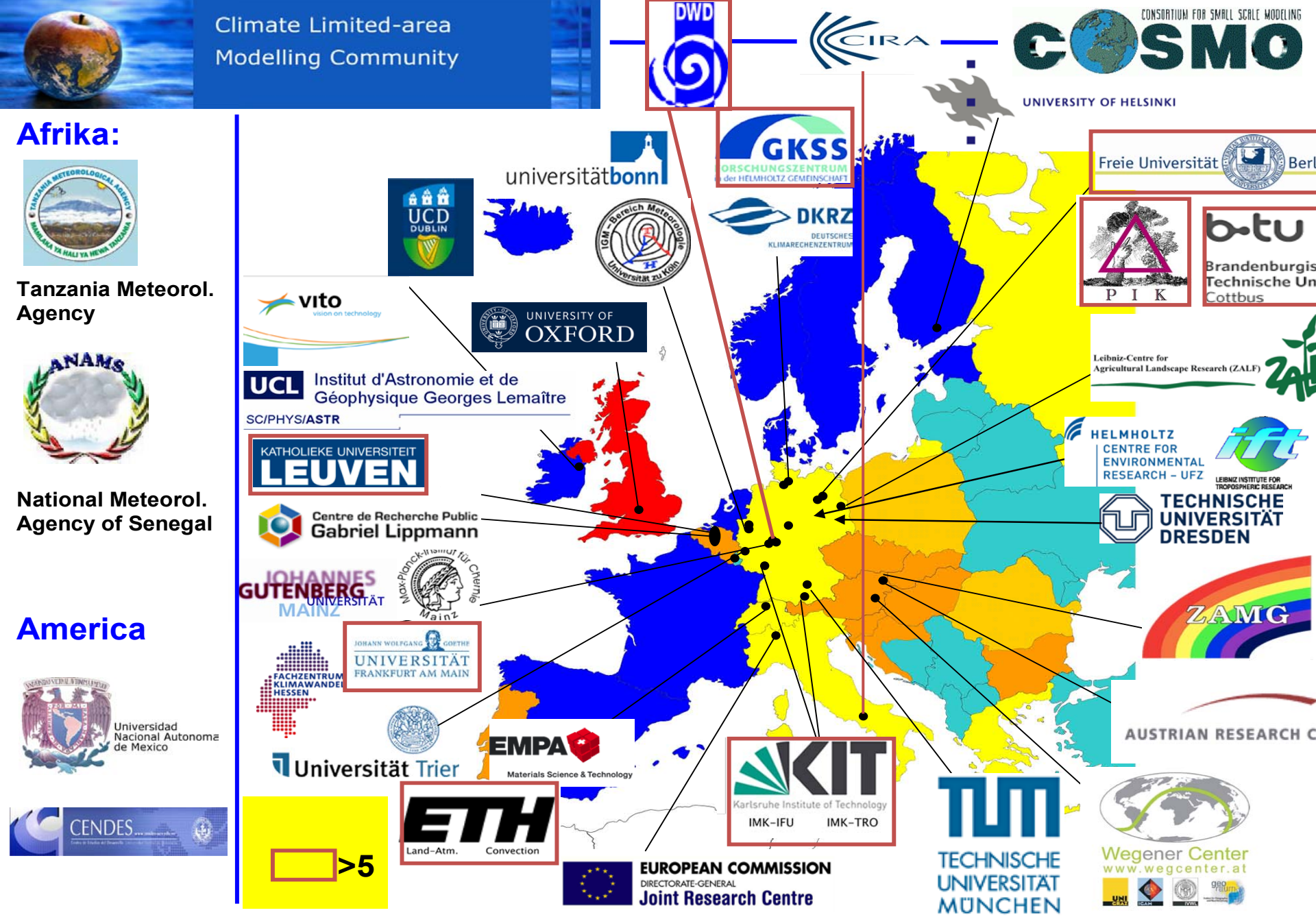
Afrika:

Tanzania Meteorol. Agency

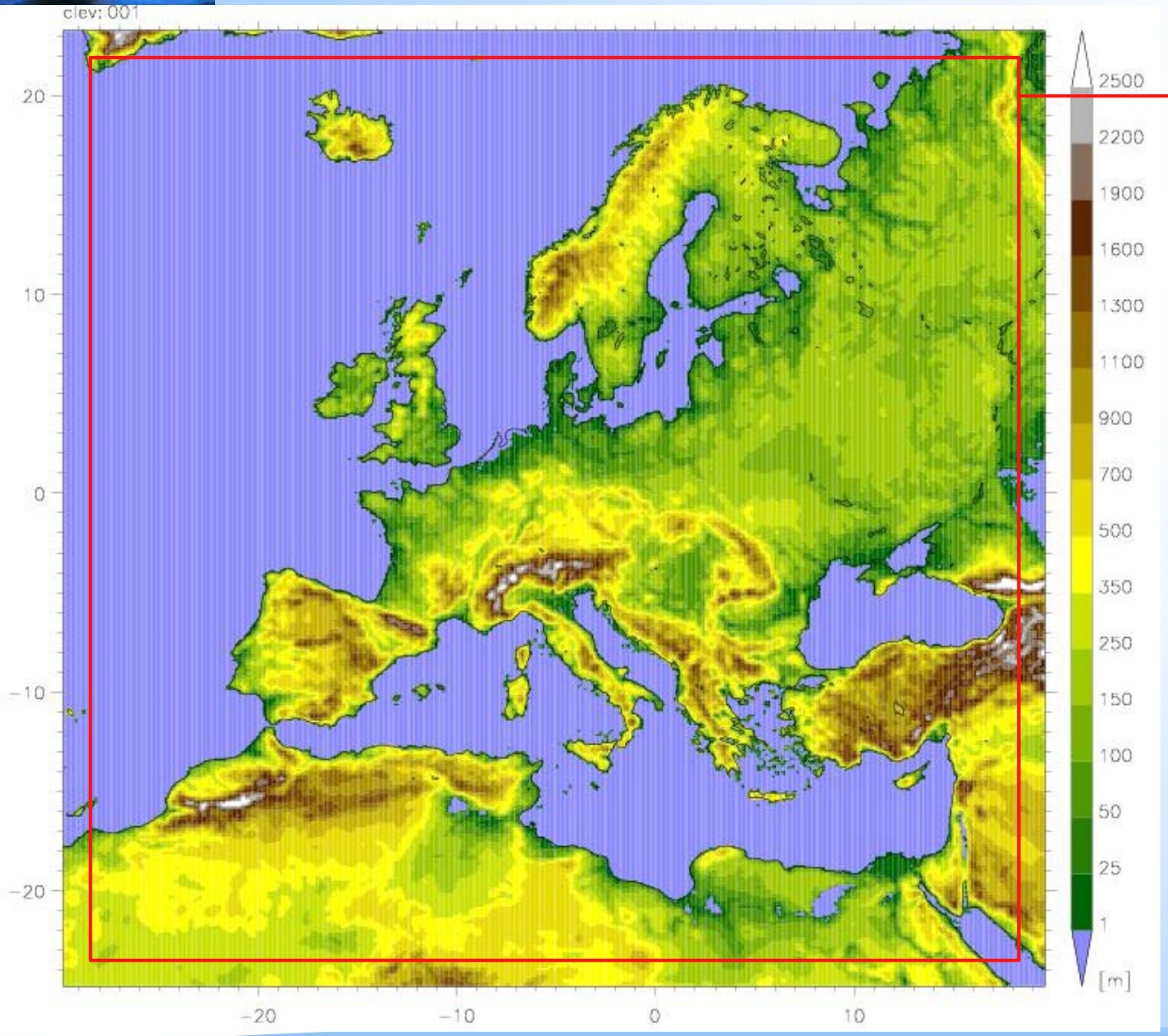
National Meteorol. Agency of Senegal

America

Universidad Nacional Autonoma de Mexico



The model domain



CORDEX domain

boundary zone with 13 additional grid boxes

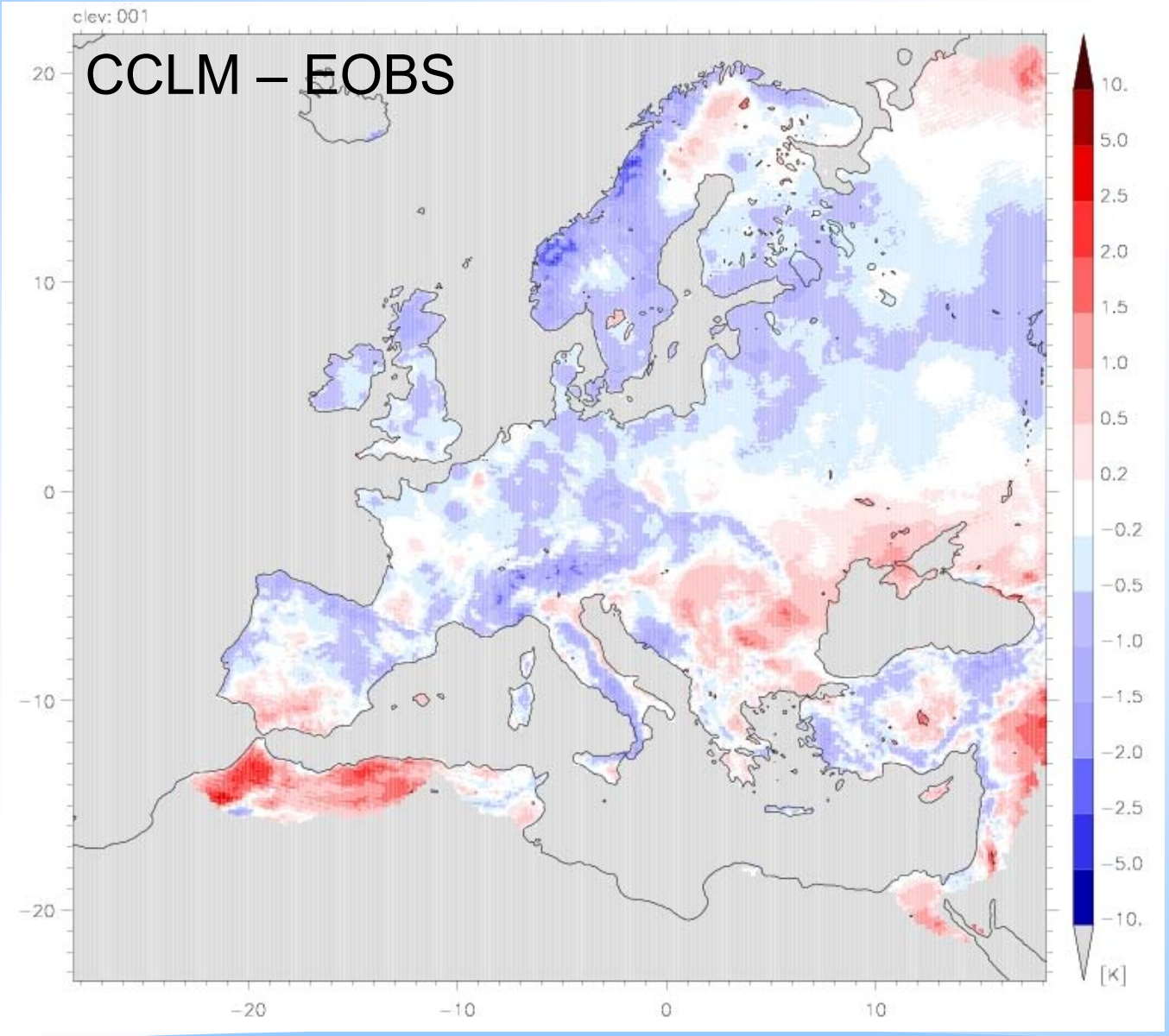
0.11° resolution

450 x 438 x 40 grid points

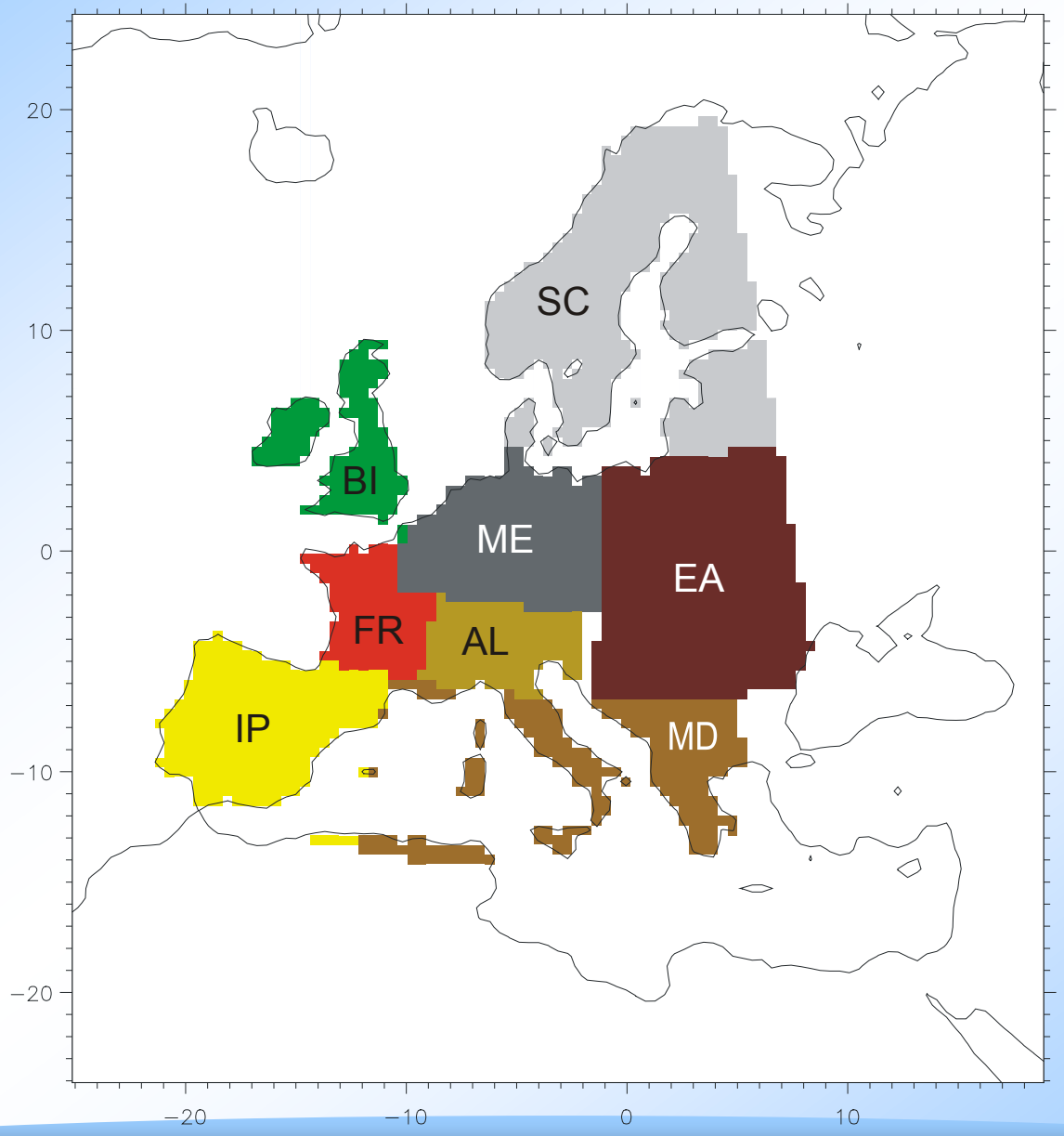
10 soil layers down to 15 m

ERA-Interim driven simulation 1989-2008

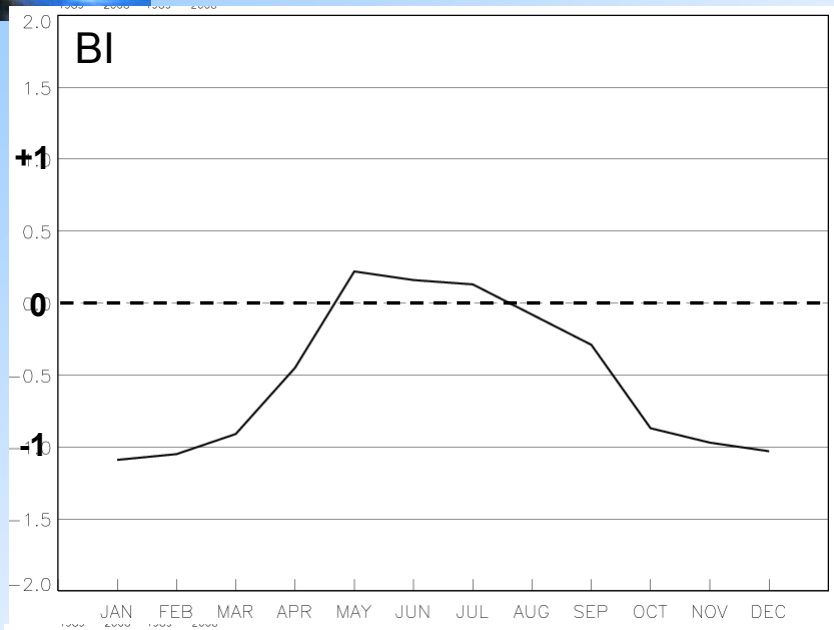
tas (T_2M), annual mean bias

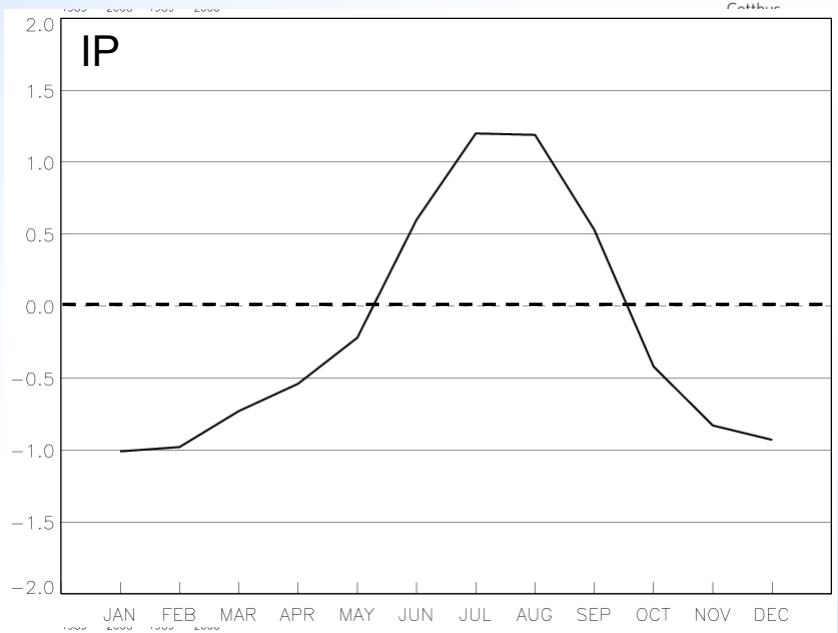


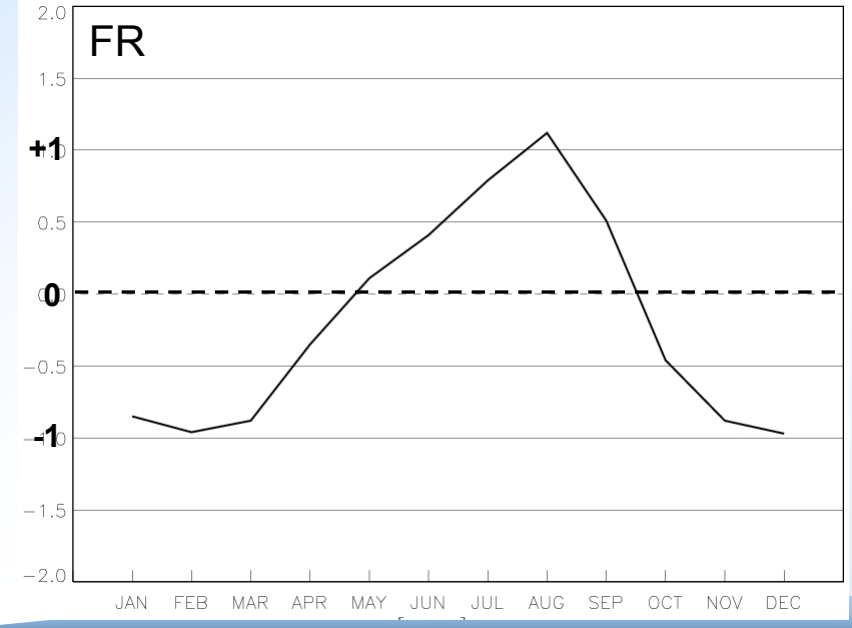
Evaluation on sub-regions

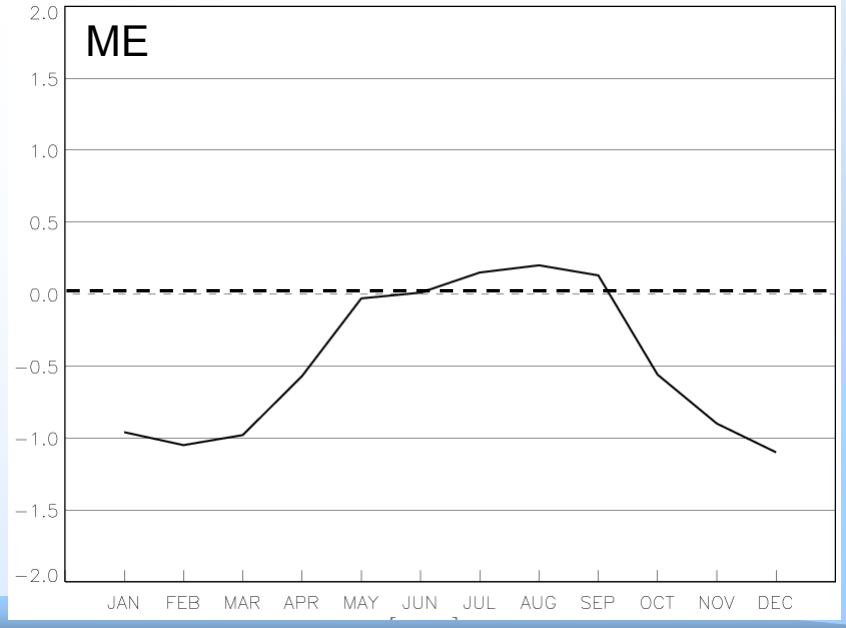


tas (CCLM – EOBS), mean annual cycle









tas (CCLM – EOBS), mean annual cycle

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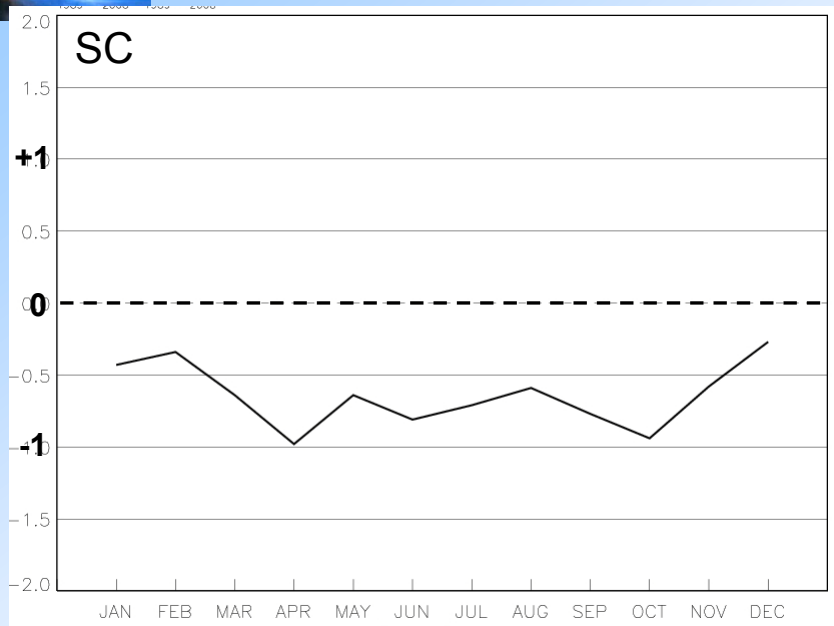
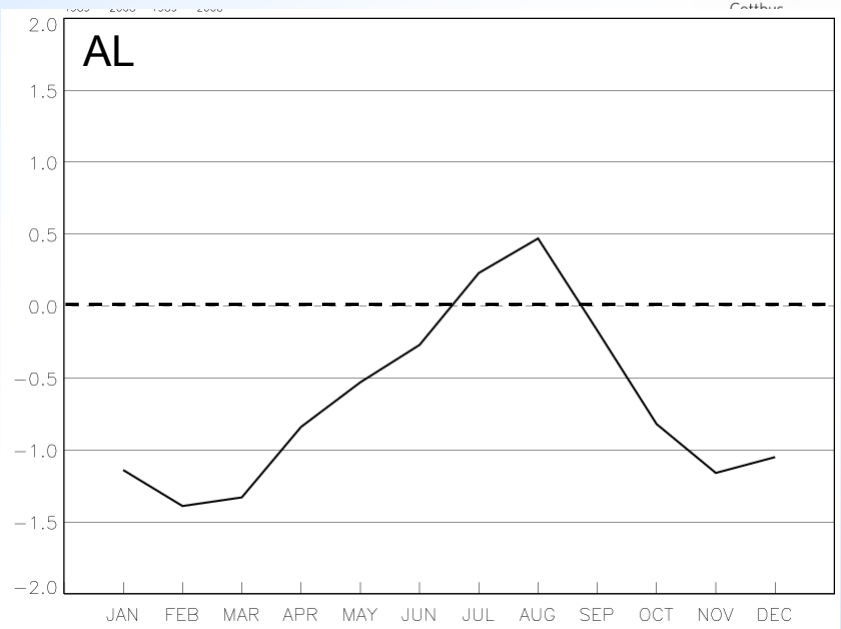
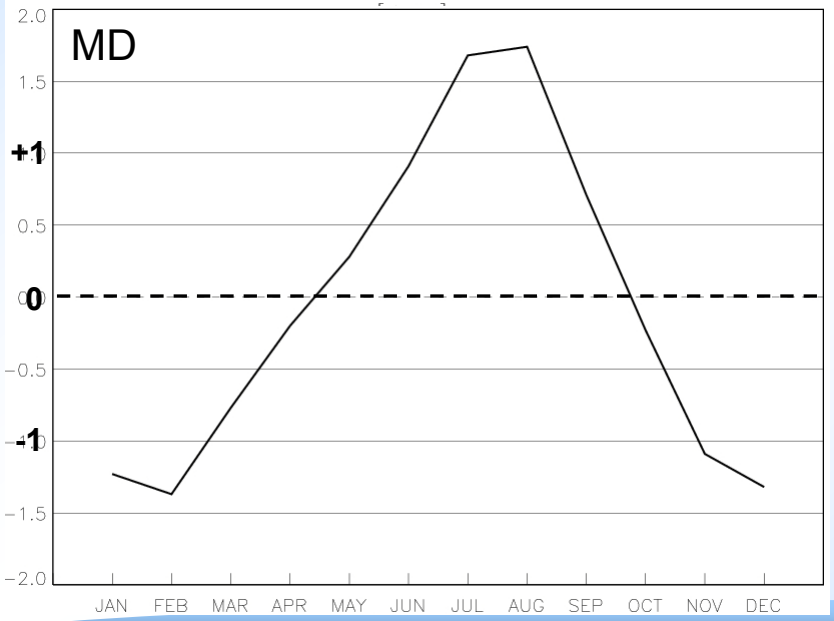
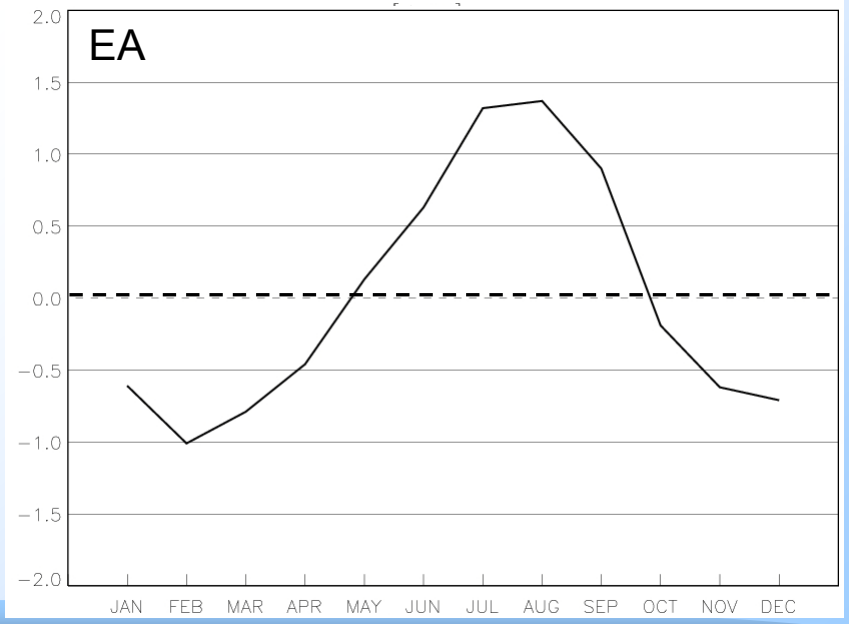
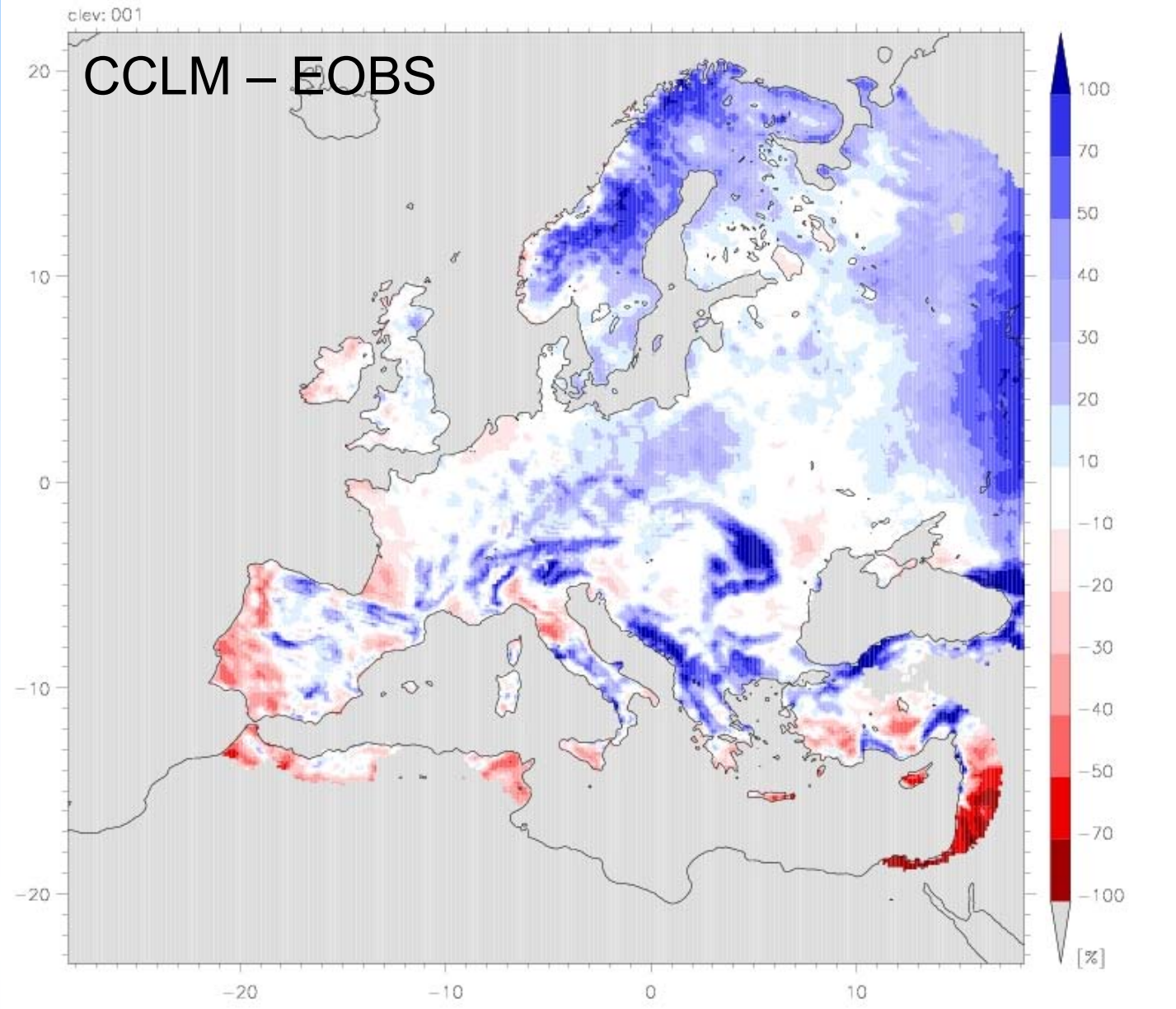




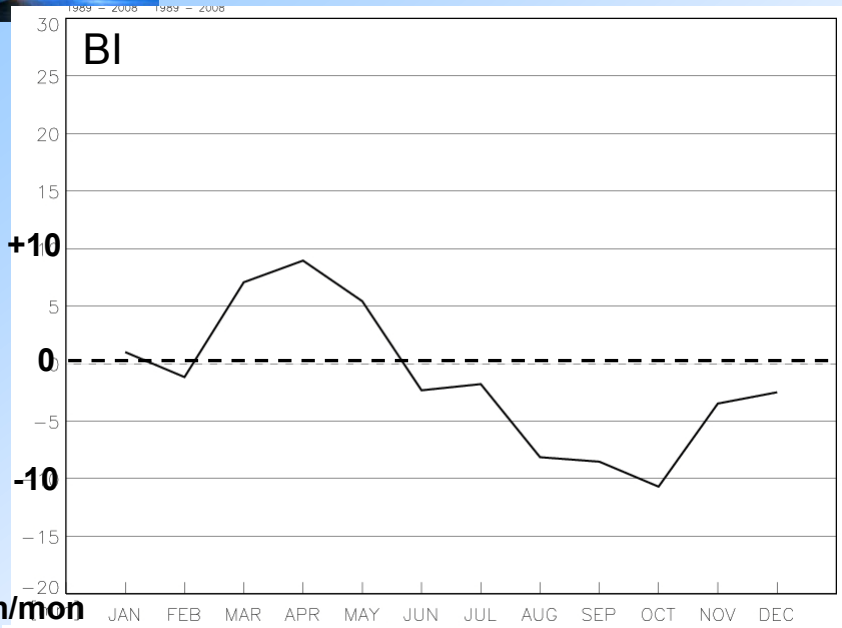


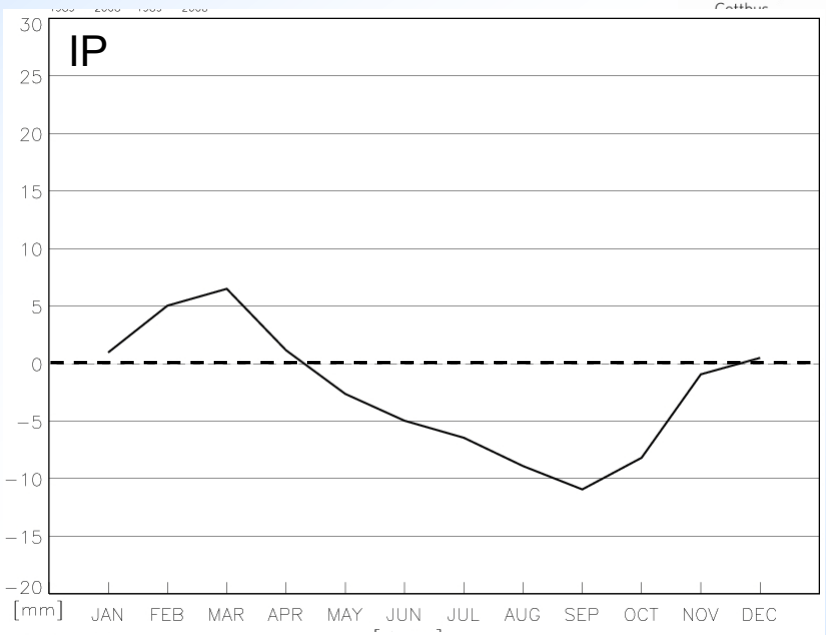


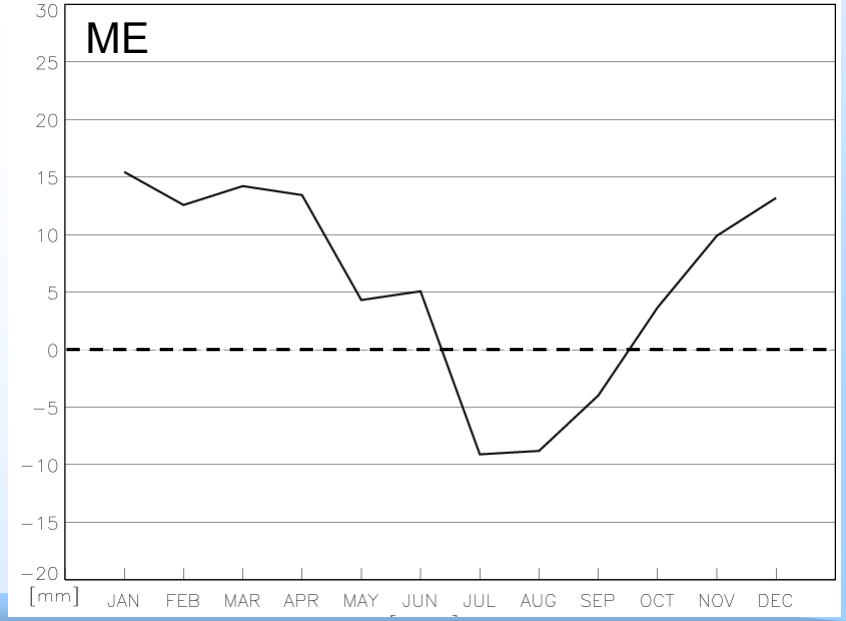
pr, relative annual mean bias



pr (CCLM – EOBS), mean annual cycle







pr (CCLM – EOBS), mean annual cycle

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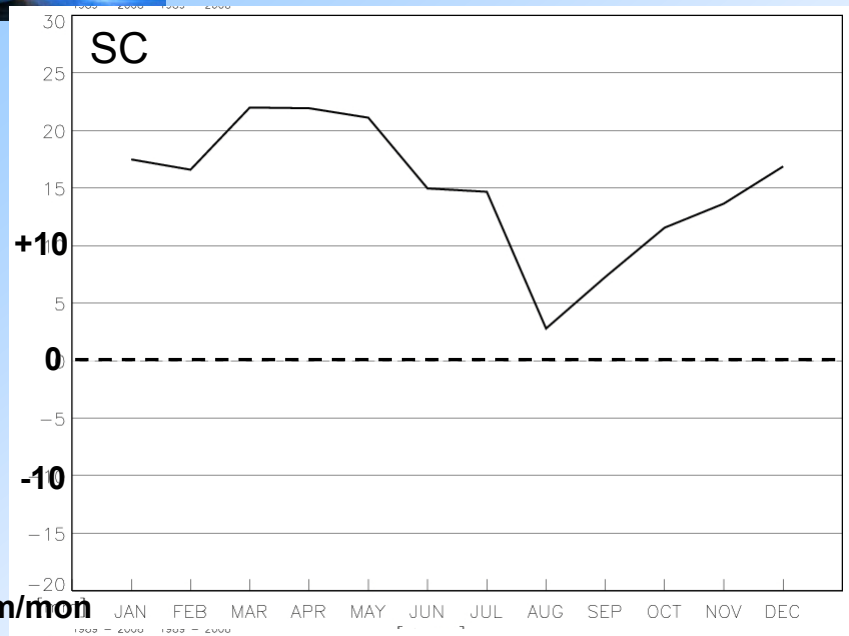

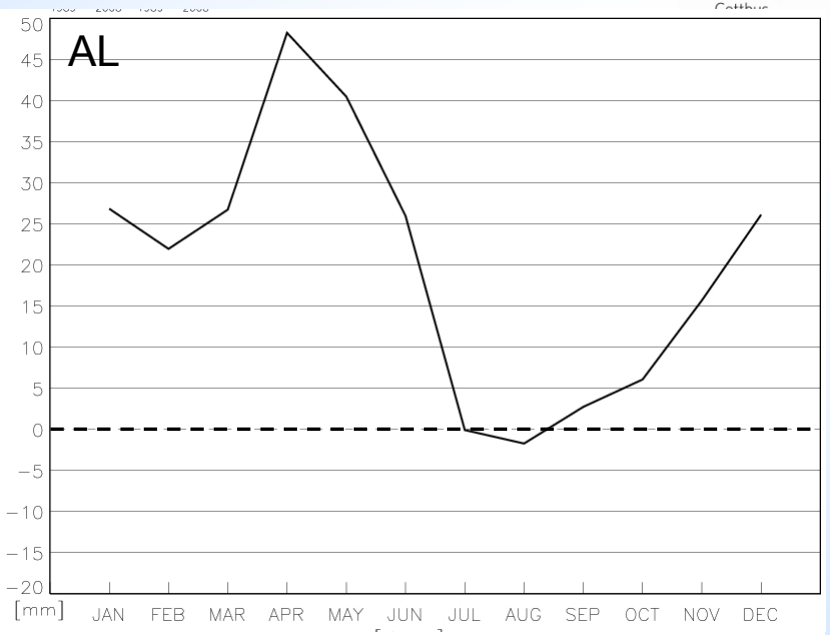

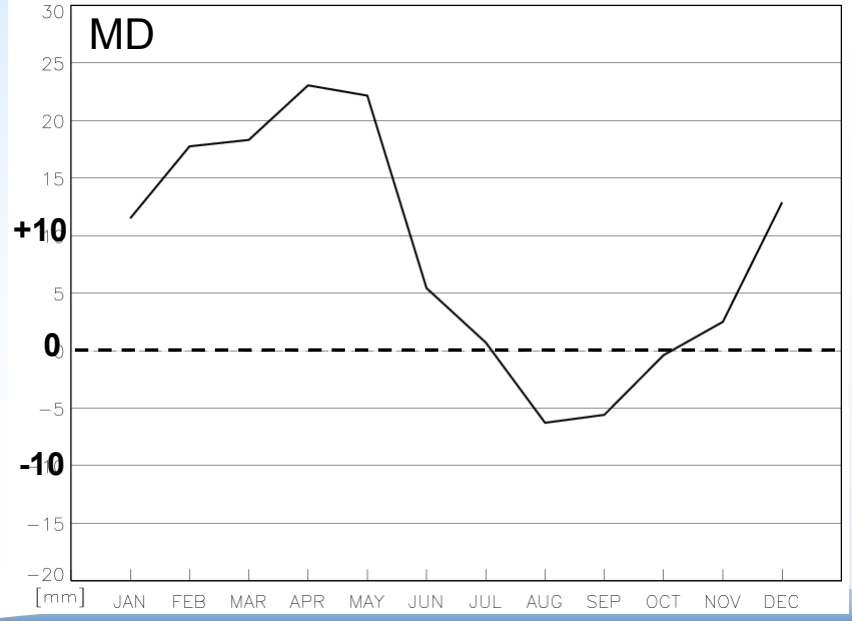

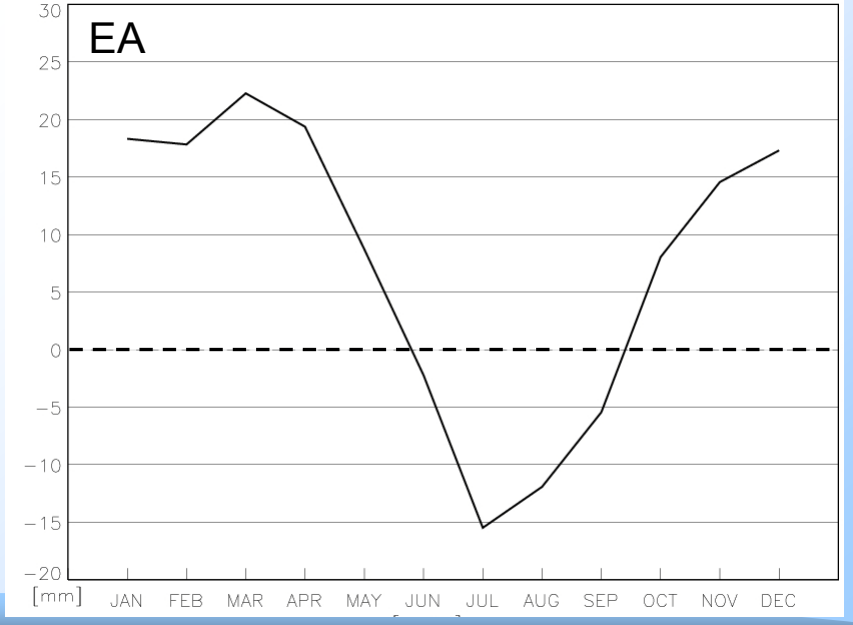

clt (cloud cover), annual mean bias

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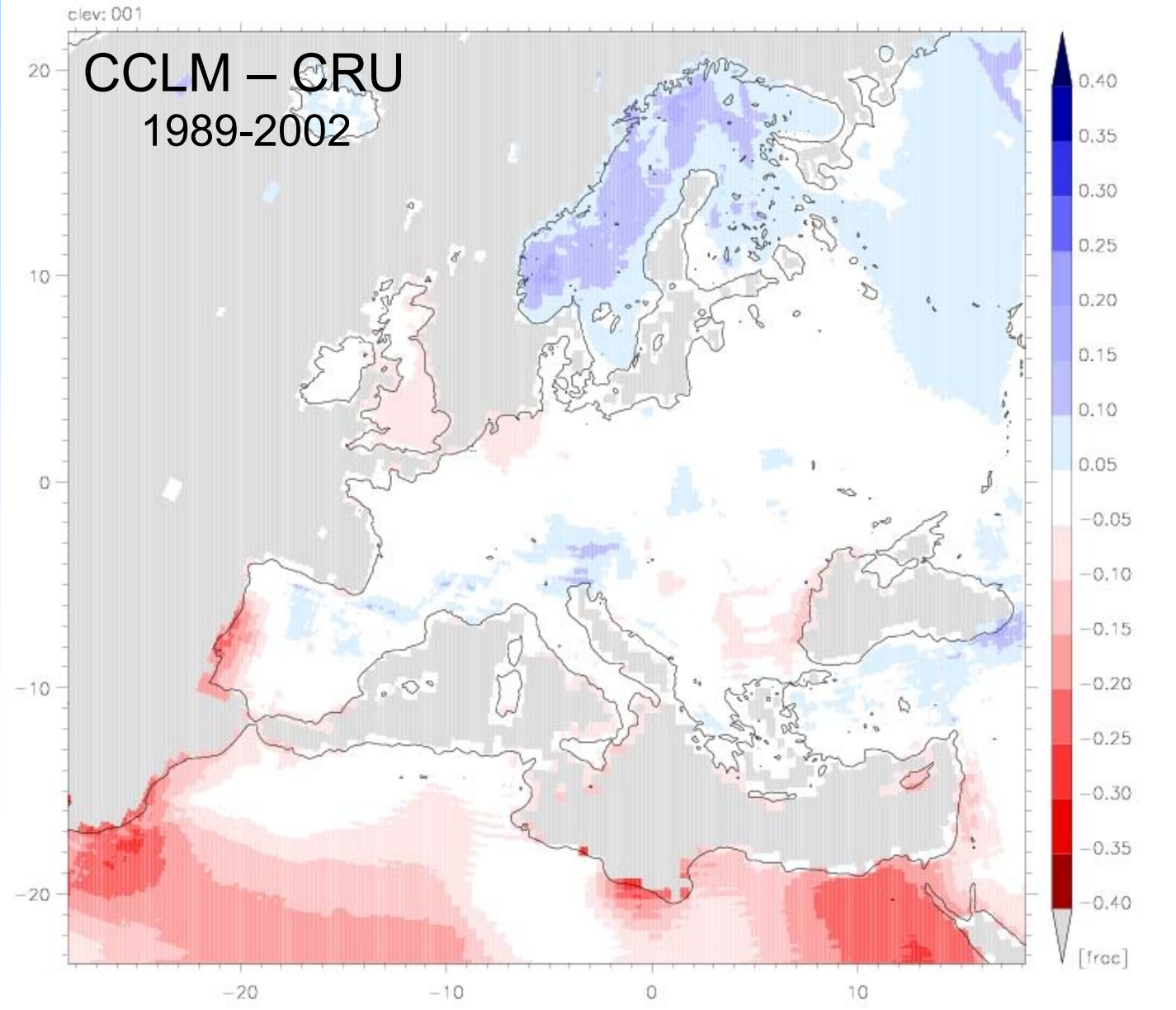


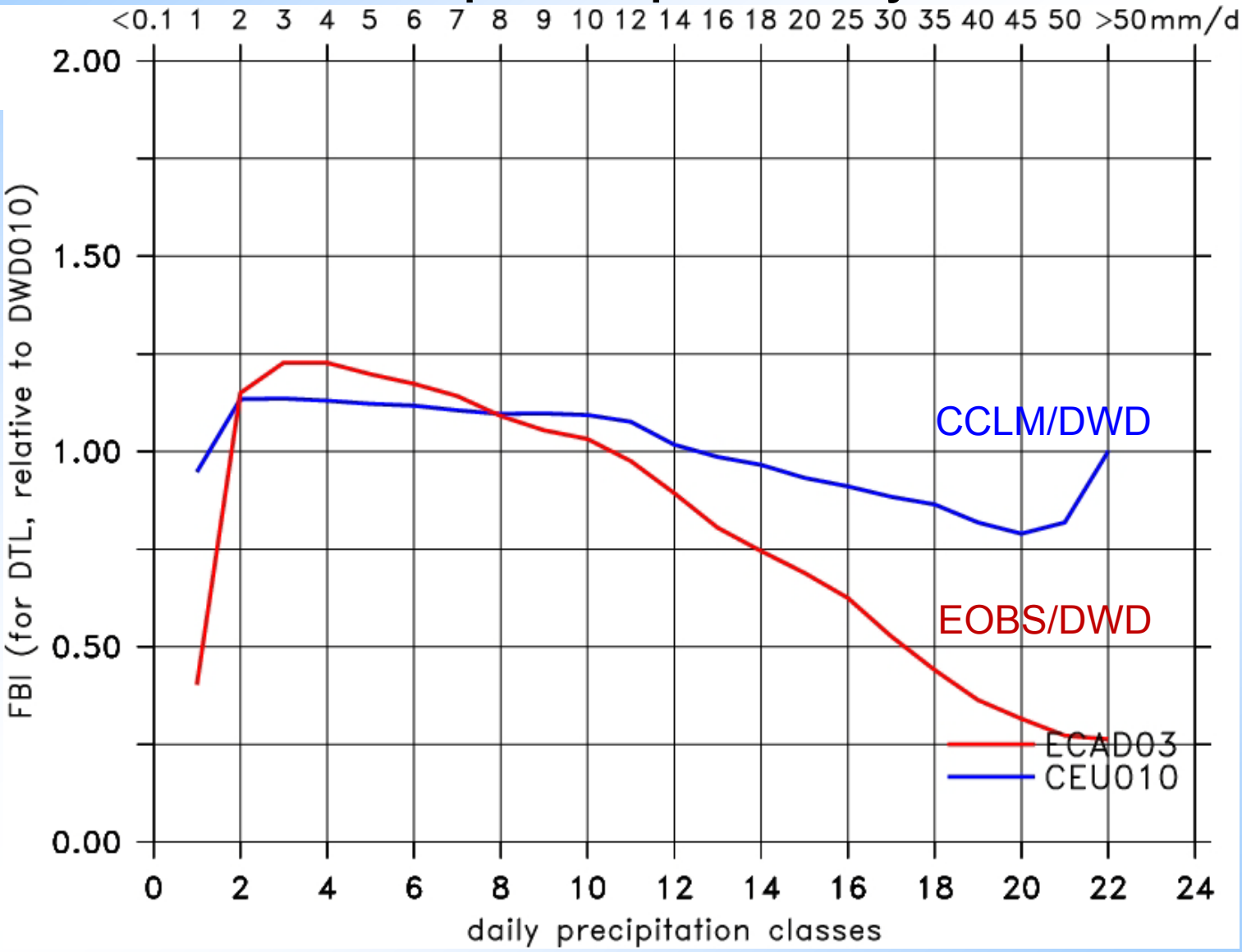
Annual mean deviations

Region	tas	pr	tasmax	tasmin	tasdtr	clt
BI	-0.5 K	-1.6 %	-1.1 K	+0.1 K	-1.1 K	- 4 %
IP	-0.2 K	-4.8 %	-0.6 K	+1.0 K	-1.6 K	- 1 %
FR	-0.2 K	-1.3 %	-0.7 K	+0.6 K	-1.3 K	±0 %
ME	-0.5 K	+10.0 %	-1.2 K	+0.3 K	-1.5 K	- 1 %
SC	-0.6 K	+25.5 %	-1.8 K	+0.4 K	-2.2 K	±0 %
AL	-0.7 K	+21.8 %	-1.5 K	+0.3 K	-1.8 K	+ 8 %
MD	-0.1 K	+17.1 %	-0.6 K	+0.9 K	-1.4 K	- 1 %
EA	±0.0 K	+16.0 %	-1.0 K	+0.8 K	-1.7 K	+ 1 %

Daily precipitation intensities

Ratio of frequencies per intensity class

$$\frac{\text{Sim. freq.}}{\text{Obs. freq.}}$$



Uncertainty of reference data

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Annual amounts of precipitation for sub-region Germany

Data set	CCLM	CRU	EOBS02	EOBS03	PIK	DWD
Annual amount	809 mm	719 mm	743 mm	744 mm	793 mm	807 mm
Deviation of CCLM		- 90 mm	-66 mm	-65 mm	-16 mm	-2 mm

← **Range of more than 10 %** →

Summary / Conclusions

- **CCLM evaluation run with ERA-Interim LBC provides satisfying results with some systematic tendencies**
  - weak cold bias of air temperature in winter
  - moderate overestimation (?) of annual precipitation
  - underestimation of daily maximum temperature
  - weak overestimation of daily minimum temperature
  - considerable underestimation of diurnal temperature range
  - insignificant annual bias of total cloud cover
  - realistic distribution of daily precipitation intensities (?)

- **Remaining problem**: quality of E-OBS precip. data
  - considerably influences the assessment of model quality

Intended scenario runs

- Simulations driven by **3 different AOGCMs**
  - for **historical** period (1950 – 2005)
  - and **two scenarios** (2006 – 2100)
    - RCP 8.5 und 4.5

- Selection of driving GCMs not finally fixed:
  - ECHAM6 / MPIOM HR
  - HadGEM2-ES (?)
  - EC-EARTH (??)
  - Availability ???

Thank You for Your Attention