

Coupling CLM3.5 with the COSMO regional model

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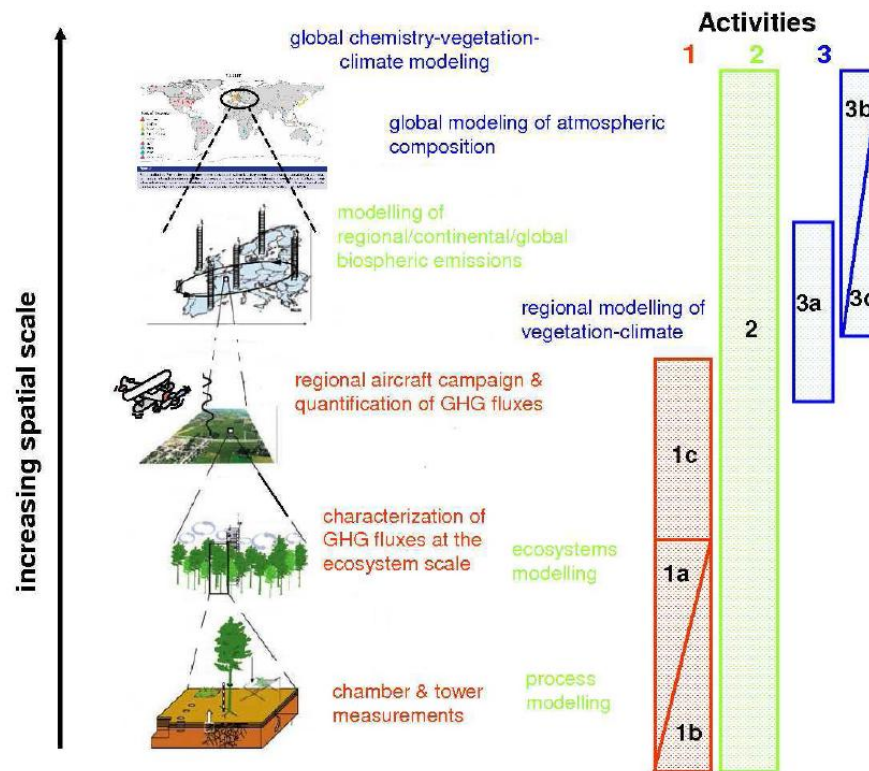
LMWG meeting, Breckenridge, June 2008

The Land-Climate Interactions group @ ETH

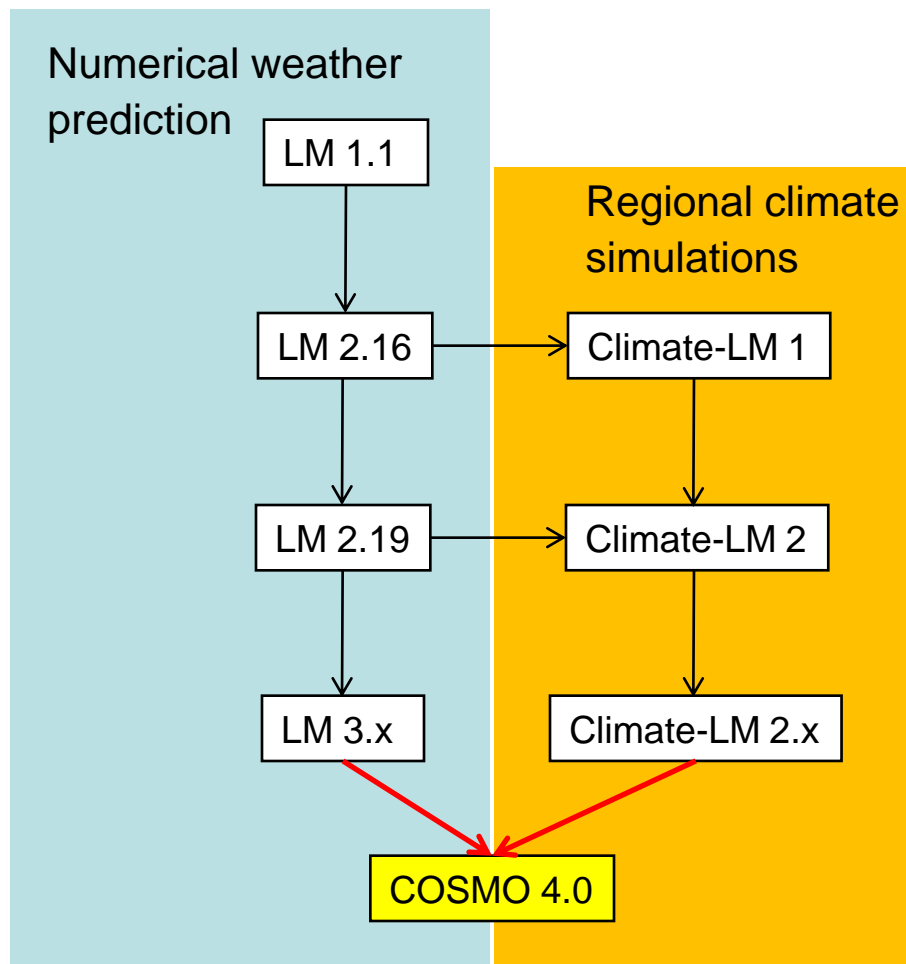


- 2 projects using CLM3.5 are starting in the group:
 - PhD Paulo Oliveira: Past and future trends in the hydrological cycle (poster).
 - Coupling of CLM3.5 with COSMO (started by Reto Stöckli)

- ETH-Funded project MAIOLICA (started april 2008).
- Goal: “explore the links between the atmosphere and the biosphere within the Earth system”.



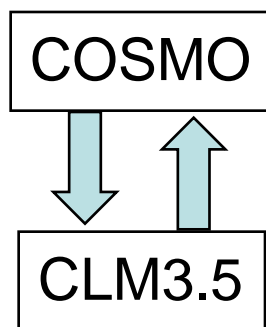
- Activity 3a: “understanding of regional interactions of the biosphere with the climate at the scale of the European continent, for both present and future climate conditions”.



- Non-hydrostatic mesoscale model.
- Community Model shared with several institutions in Europe: GKSS, ETH Zurich, JRC, DWD, MeteoSwiss, ...
- Resolution typically around 50km for climate simulations over Europe.

- TERRA is currently integrated in COSMO as the land surface component.
- TERRA is mostly a “soil model” without explicit representation of vegetation processes.
- A more detailed land surface scheme is needed in order to represent biosphere-atmosphere interactions (coupling between photosynthesis and transpiration, root uptake, phenology, carbon cycle...).

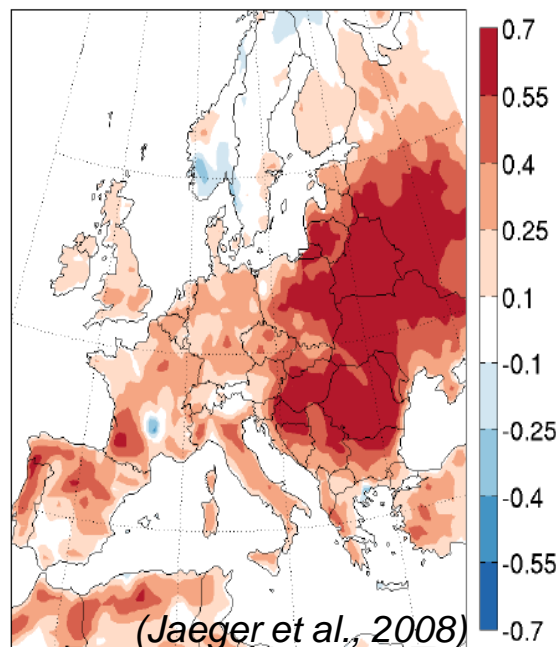
The new COSMO-CLM RCM:



- The new model represents an advance in the regional climate modelling community (e.g., EU-projects PRUDENCE & ENSEMBLES).

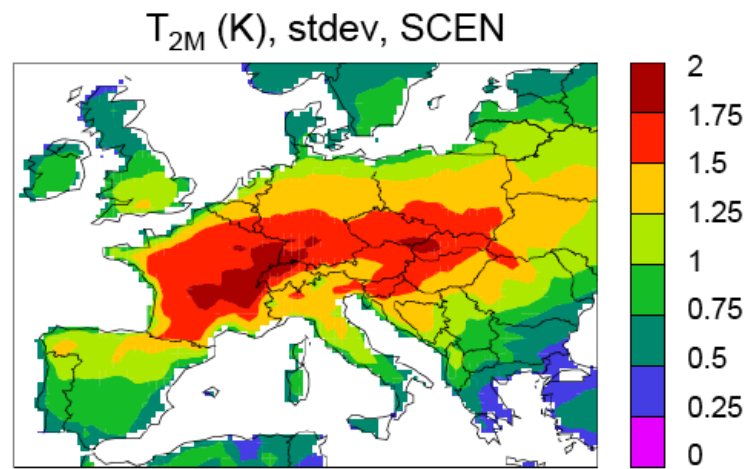
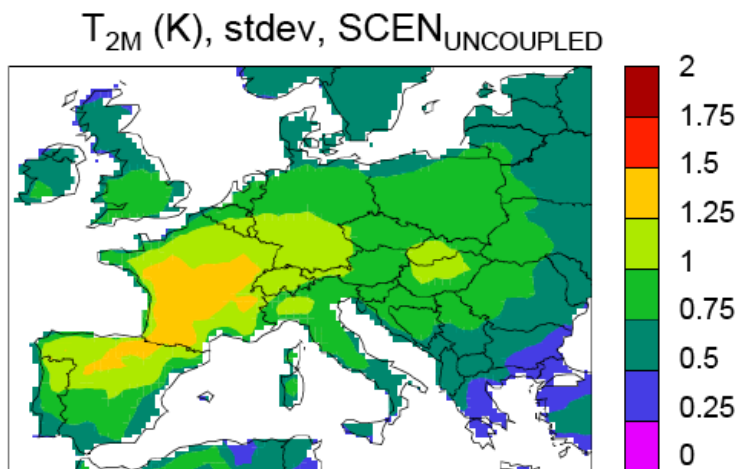
- There is systematic biases in simulations of European climate by RCMs (e.g., RCMs within PRUDENCE).

Summer temperature interannual variability: COSMO minus CRU



- Could some of these biases be alleviated by a better representation of land surface processes?
 - We will run a 20th century simulation with COSMO-CLM3.5 driven by ERA40 and compare it with existing simulations with COSMO and other RCMs (e.g. PRUDENCE, ENSEMBLES).

- Identify land surface feedbacks and processes relevant for future climate projections over Europe.
- ✓ Atmosphere-sol moisture coupling.

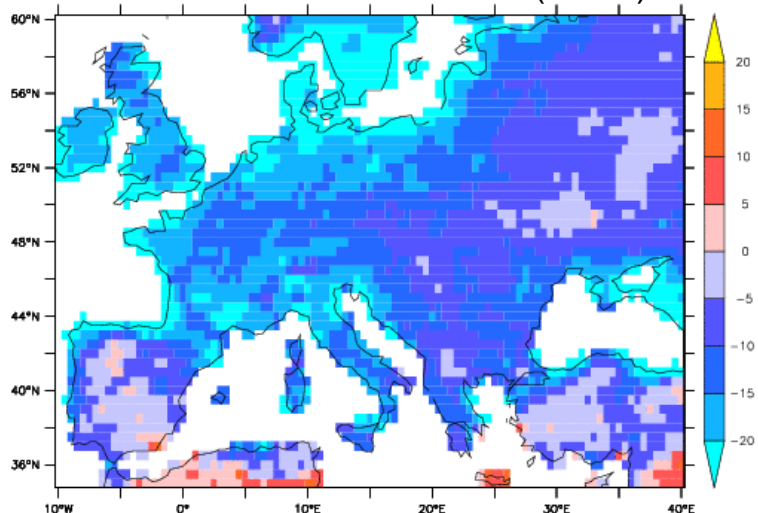


(Seneviratne et al, 2006)

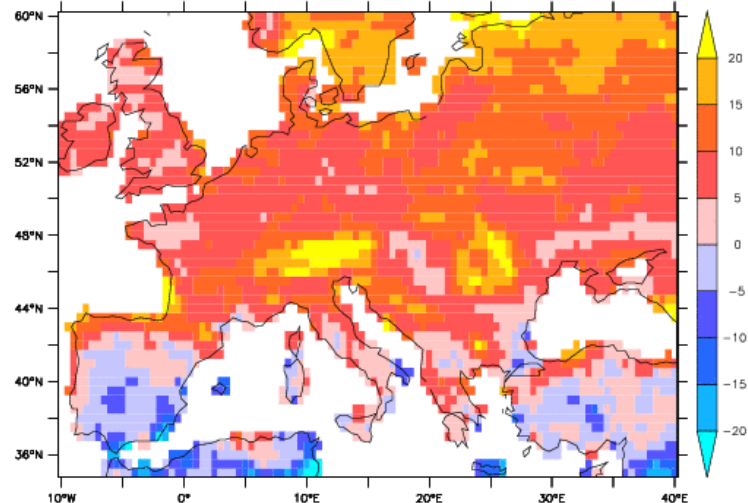
- Identify land surface feedbacks and processes relevant for future climate projections over Europe.
 - ✓ Atmosphere-sol moisture coupling.
 - ✓ Change in vegetation functioning and structure (LAI, stomatal conductance..).
 - ✓ Land cover change.
- Simulations over the 21st century will be carried out with the new COSMO-CLM3.5 driven by a CGM.

Comparison of COSMO-CLM3.5 versus COSMO (1 year run without spinup)

Annual mean latent heat (W/m^2)



Annual mean sensible heat (W/m^2)



Comparison with flux measurements at Tharandt (Germany)

