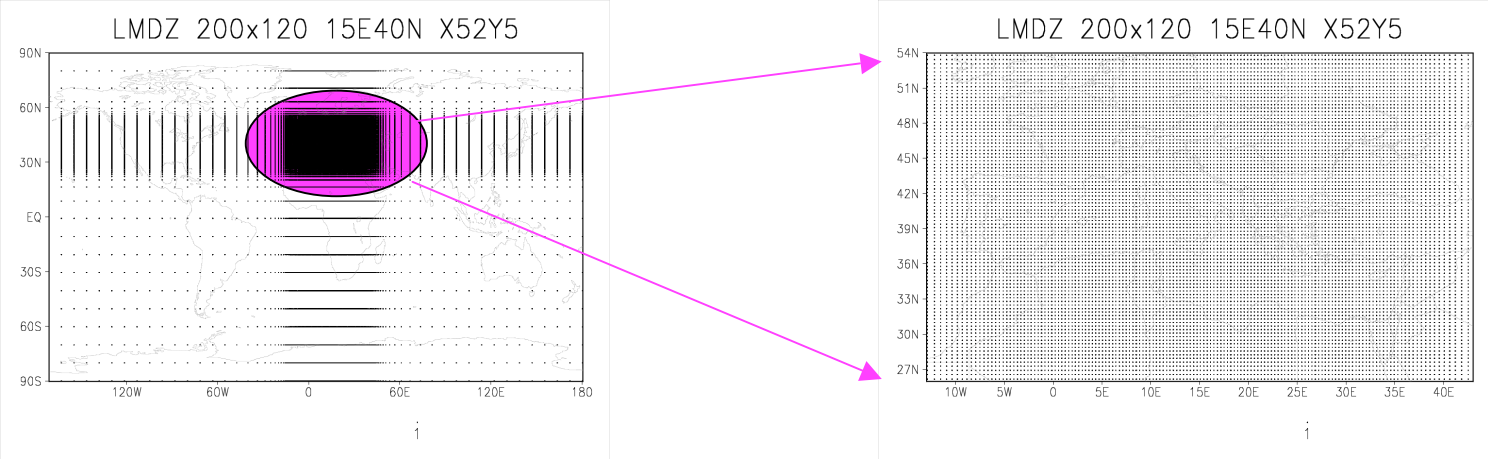
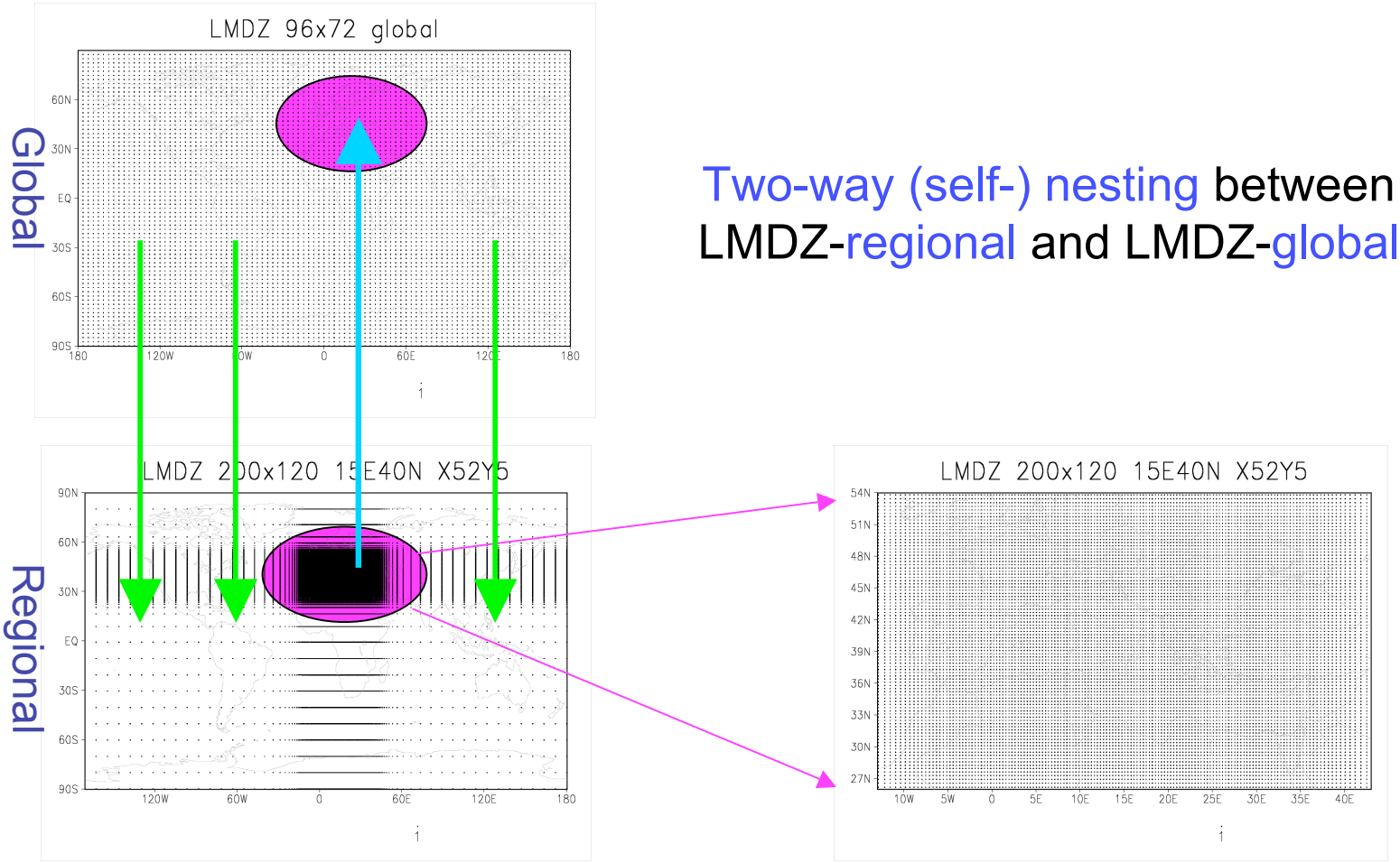
LMDZ-Mediterranean model

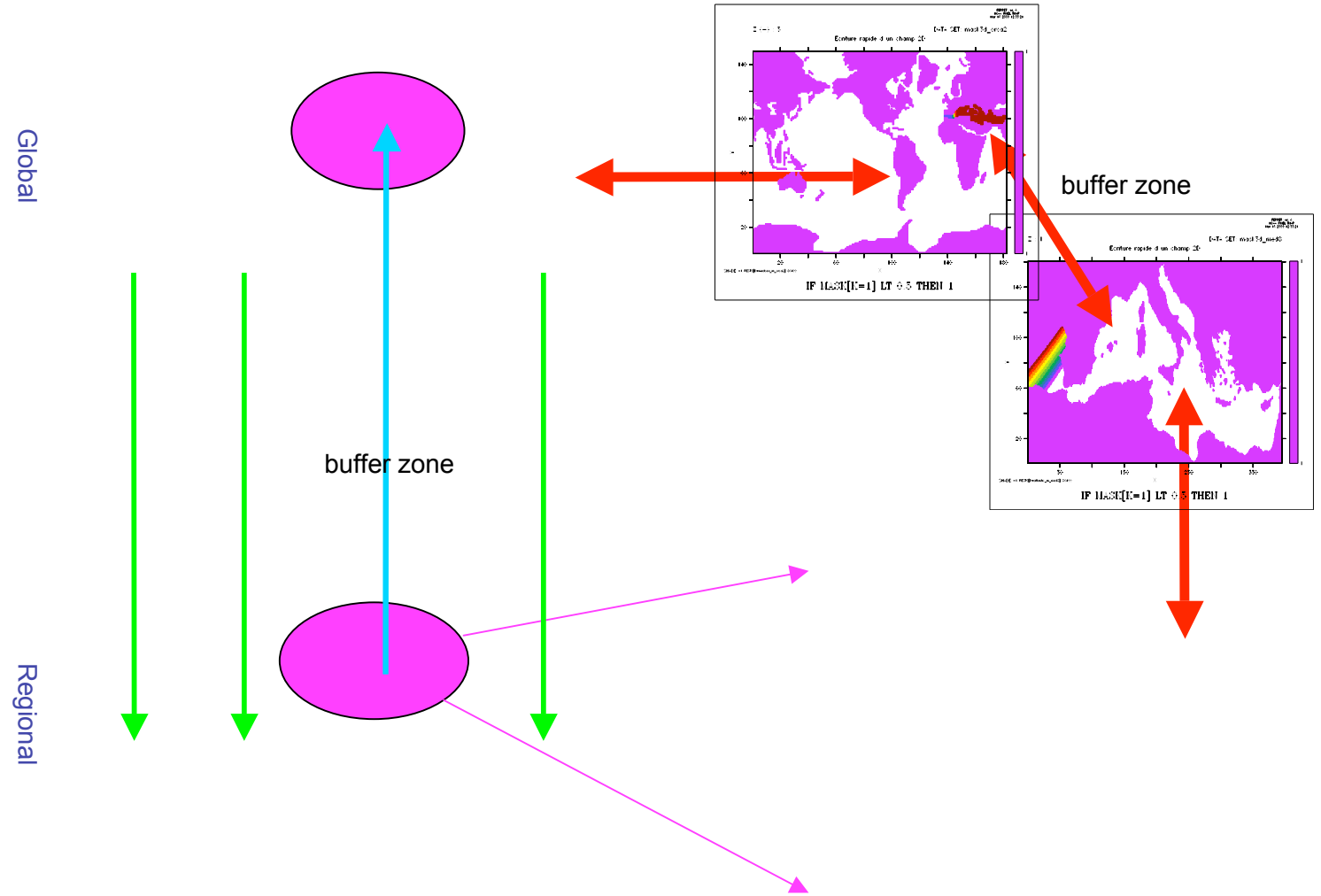


- LMDZ-Med is a global atmospheric GCM with variable grid and a zoom over the Mediterranean basin. Local resolution: 30 km.
- It is run as a regional climate model, with nudging conditions (every 6 hours) from a global model (LMDZ-g, ERA40, IPCC, etc.) at low resolution outside the zoom. The model is free to have its own behaviours inside the zoom.



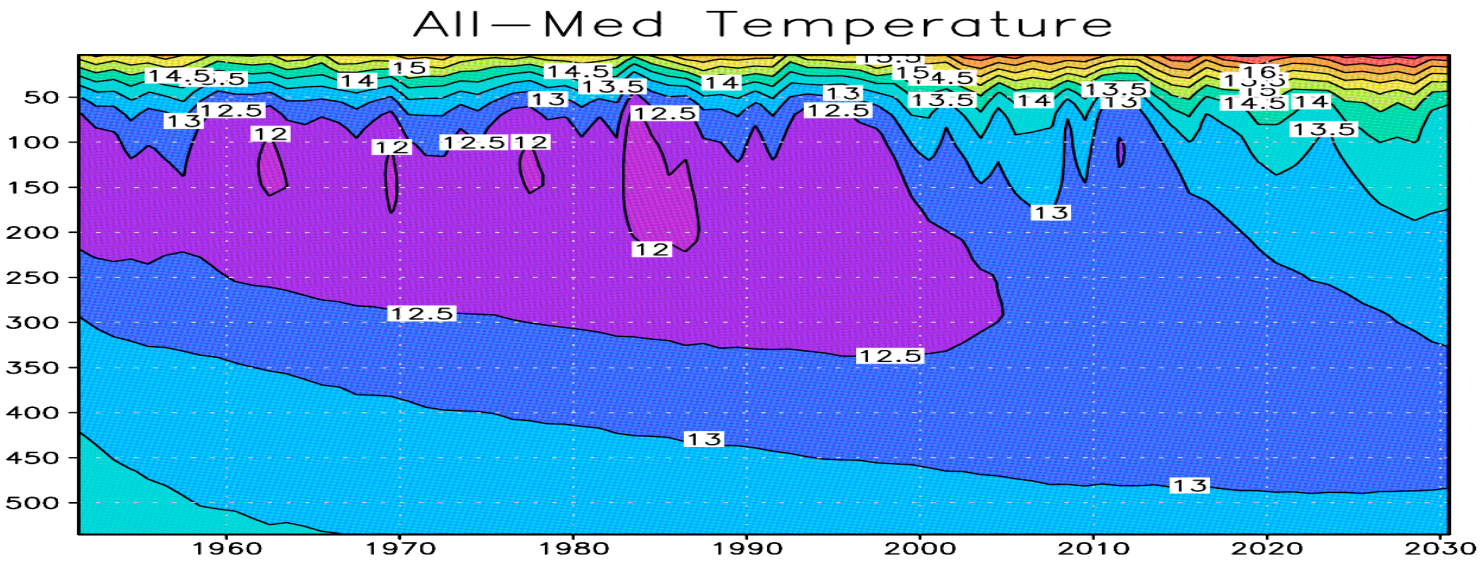
Two-way (self-) nesting between LMDZ-regional and LMDZ-global

Schematic of the two-way nesting for an optimal traitment of scale interaction

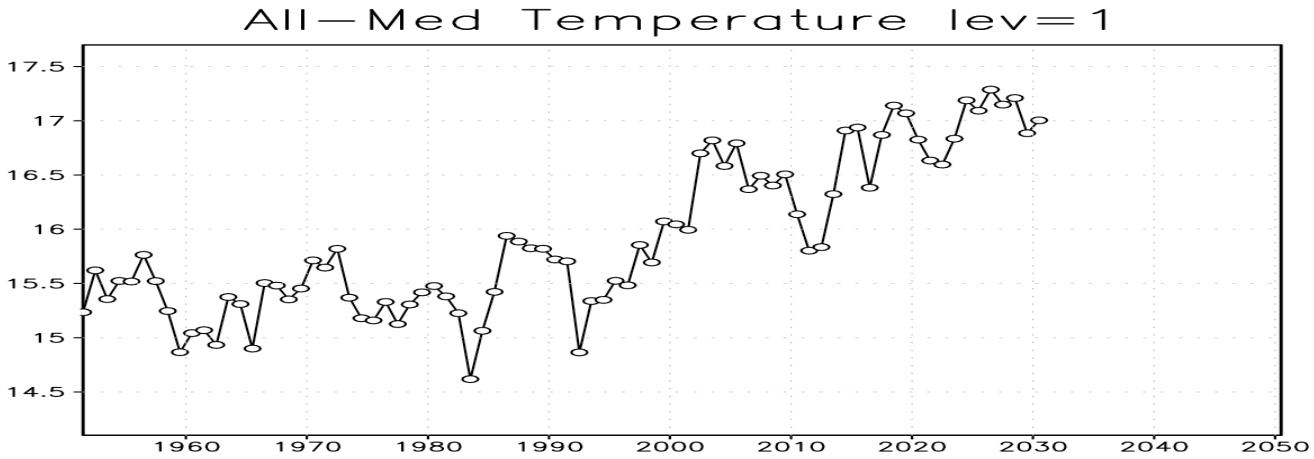


- Global O-A coupled model: LMDZ-global / ORCA2
- Regional O-A coupled model: LMDZ-regional / MED8
- Two atmospheric models are coupled through buffer zones
- Two oceanic models are also coupled through buffer zones

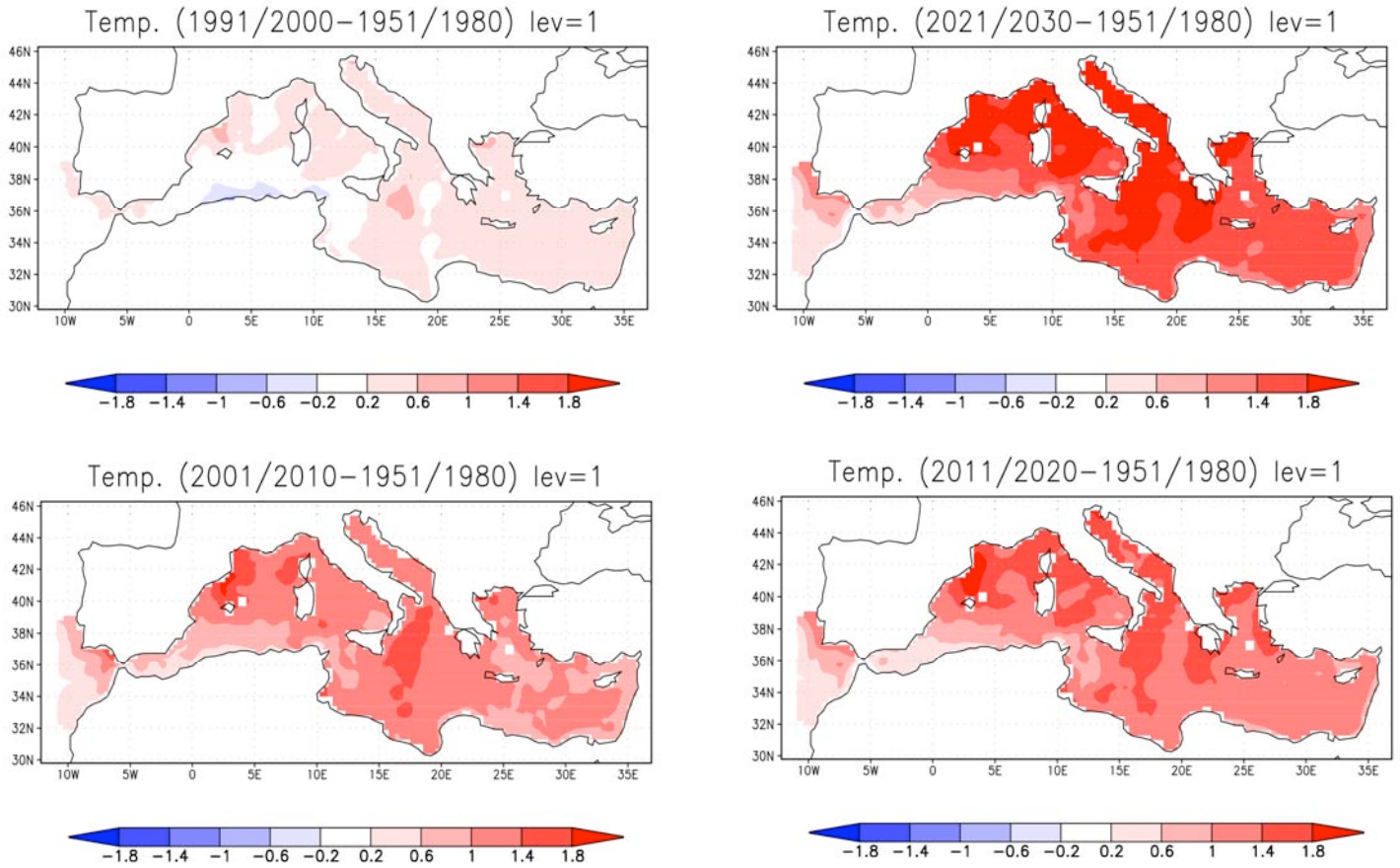
Schematic of the quardruple coupling in IPSL



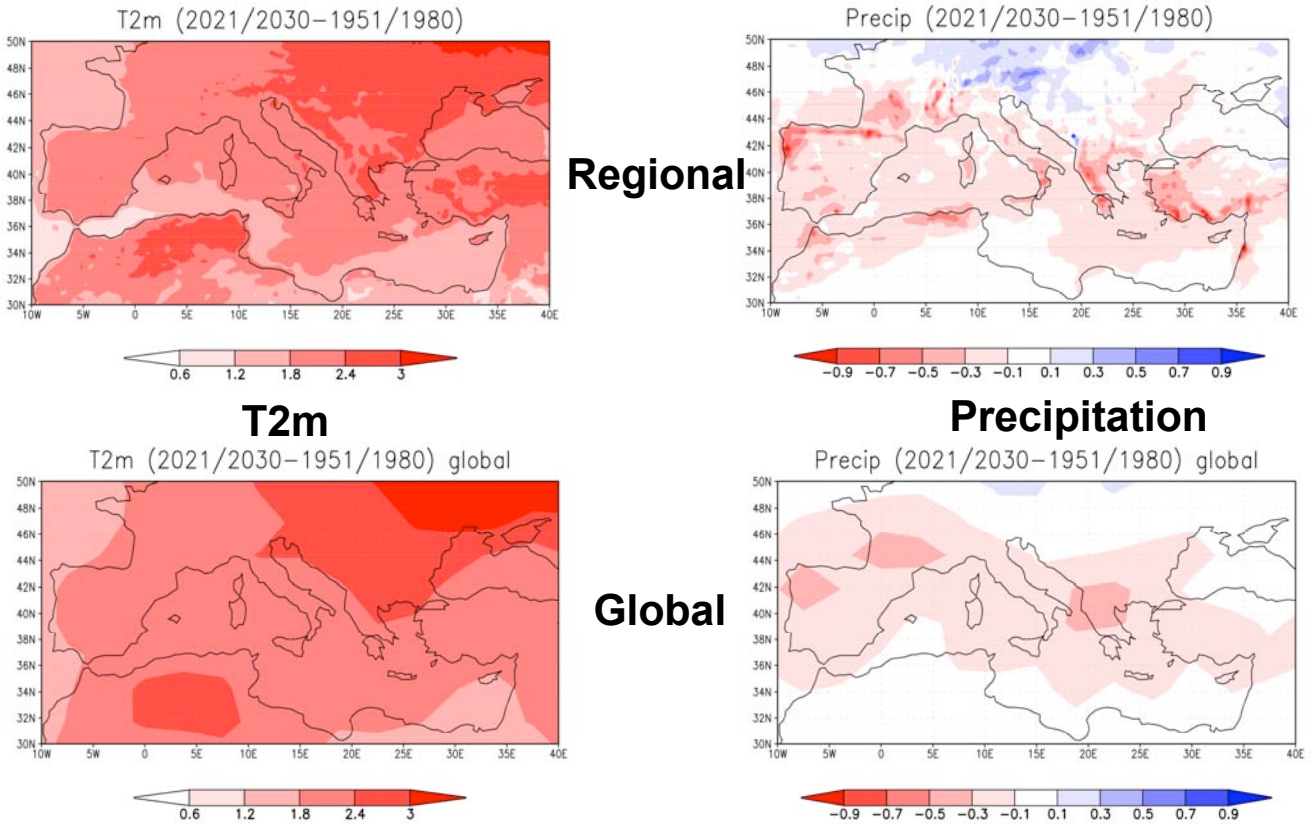
Evolution of all Mediterranean temperature vertical profile(°C)



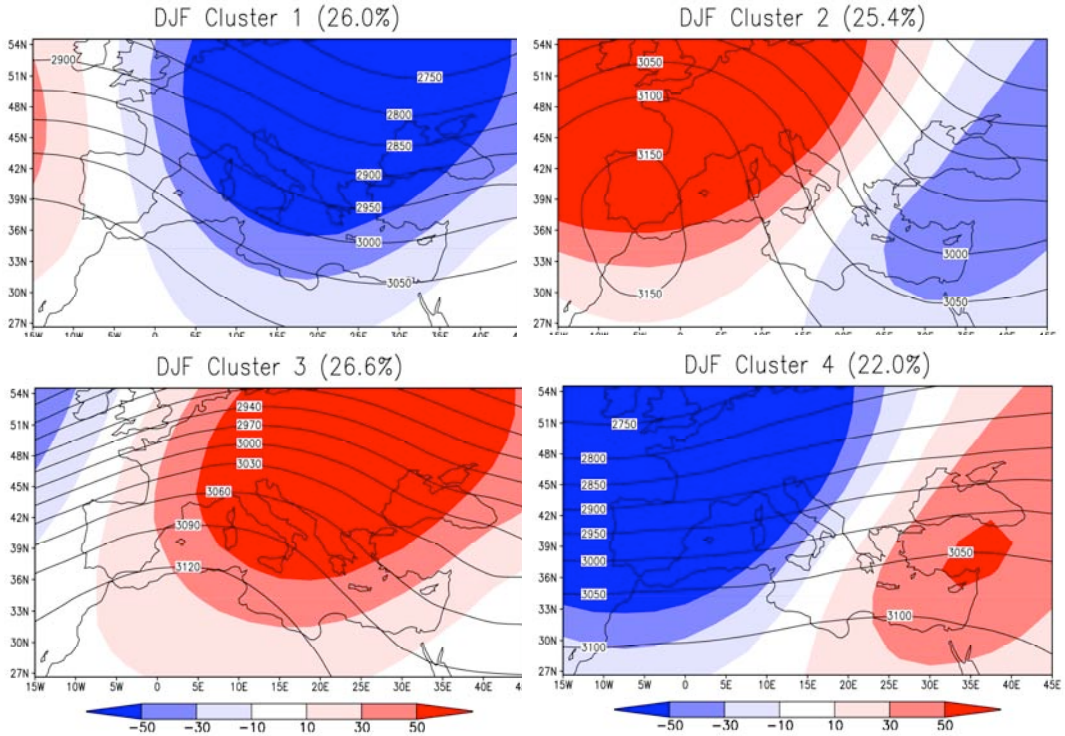
All Mediterranean SST (°C) evolution in function of time (year)



Changes of sea surface temperature for different periods of the simulation, in comparision with the reference period 1951/1980. Units: °C

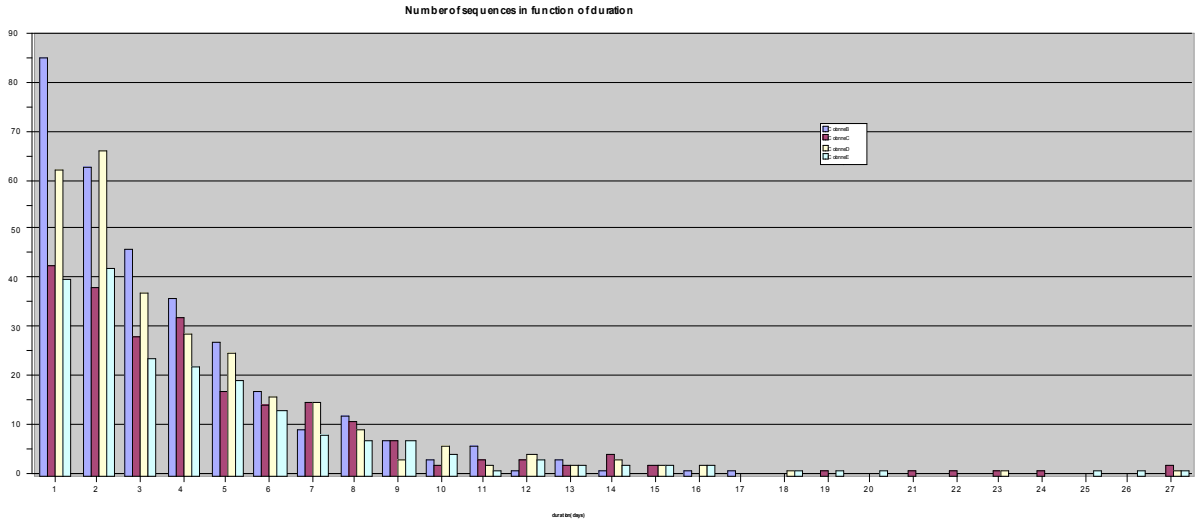


Changes of surface air temperature (°C) and precipitation (mm/day) for the period 2021/2030, in comparision with the reference period 1951/1980. The regional simulation is consistent with the global one, but gives much more spatial details



Dynamic circulation regimes (1951/2000) in winter over the Mediterranean basin, as represented by the 700-hPa geopotential height. Colour shading indicates the anomalous fields compared to the general mean field for DJF.

Number of sequences in function of their durations, statistics realized for the 49 DJF seasons from 1951 to 2000. A few episodes can event last as long as 27 days for the regimes 2, 3 and 4.



An example of the two-way nesting atmospheric system

Two configurations:

•LMDZ-regional forced by prescribed lateral boundary conditions;

•Two-way nesting system between LMDZ-regional and LMDZ-global.

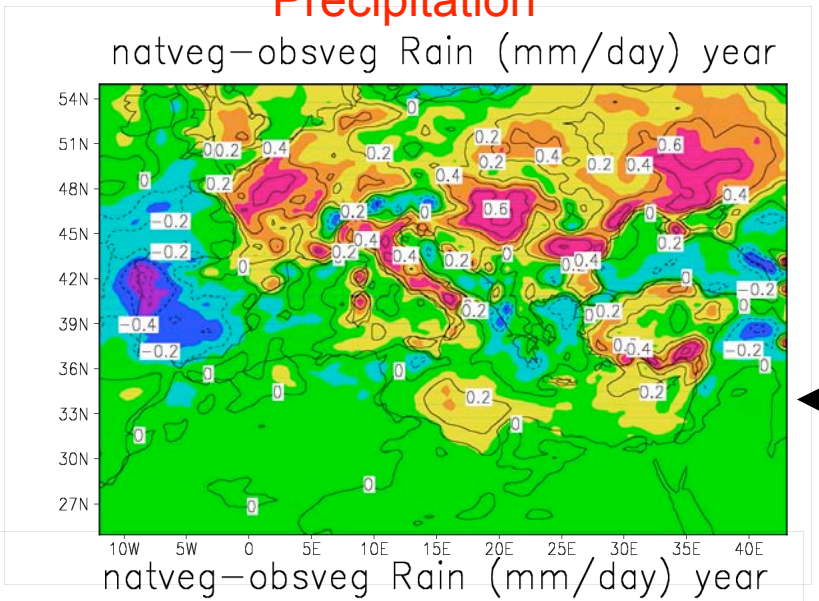
Two experiments (10 years for each simulation):

•ObsVeg: Observed Vegetation of present day,

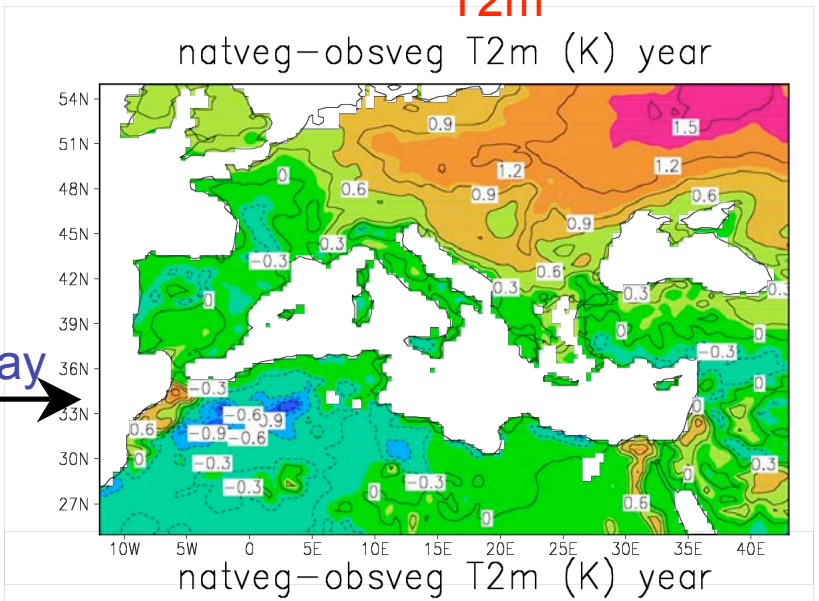
•NatVeg: Natural vegetation in the Mediterranean basin – idealized situation without any anthropogenic land use (statistical model).

Difference (NatVeg – ObsVeg)

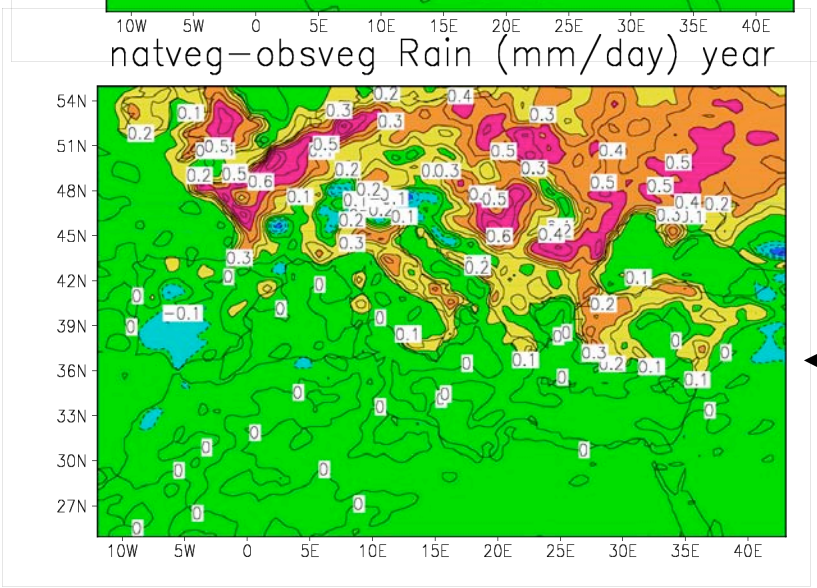
Precipitation



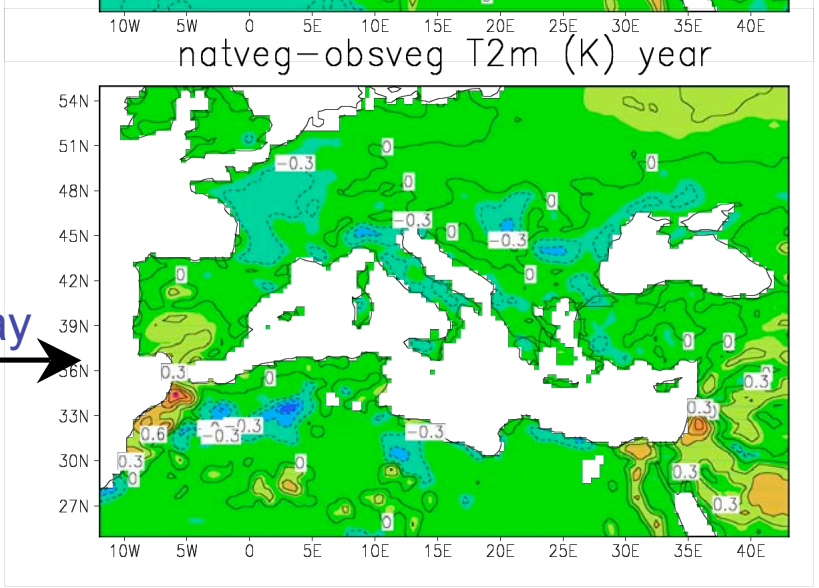
T2m



2-way



1-way

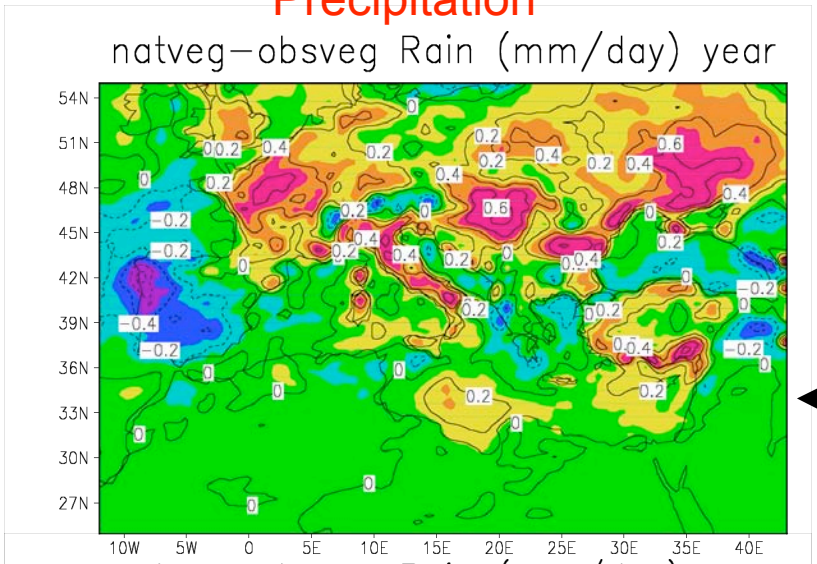


Precipitation

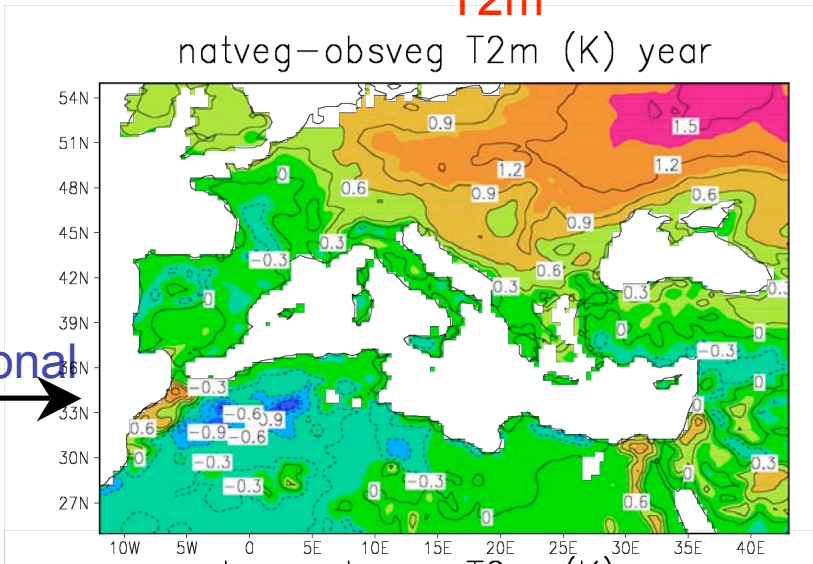
T2m

Difference (NatVeg – ObsVeg)

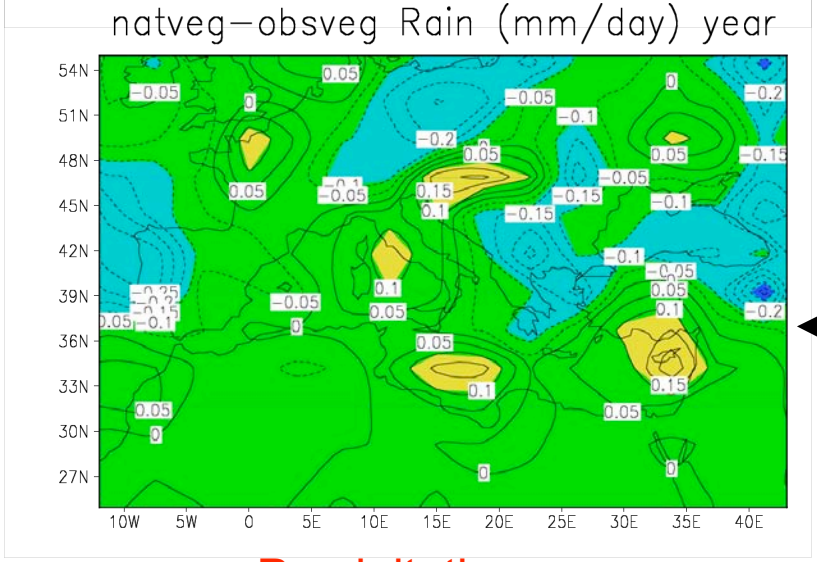
Precipitation



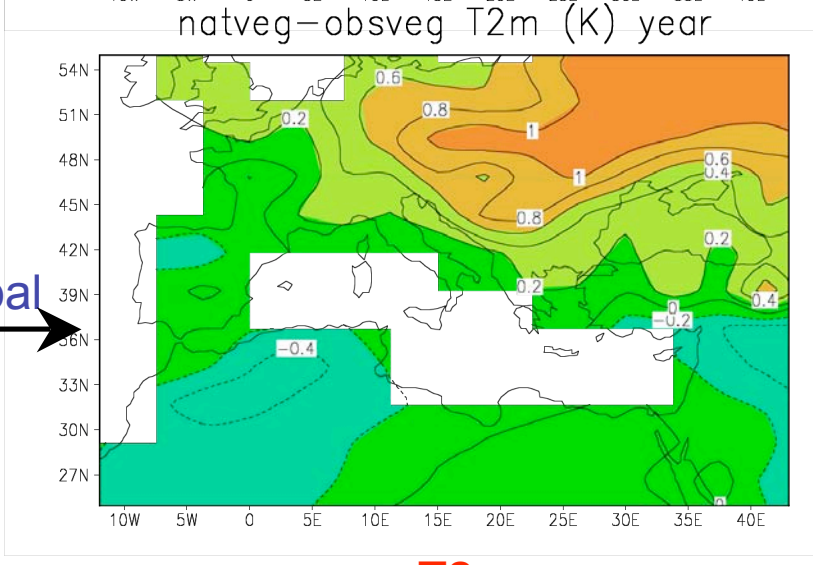
T2m



Regional



Global

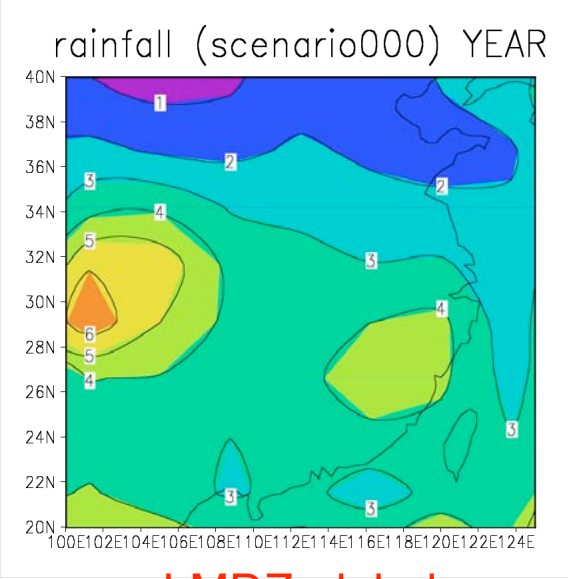


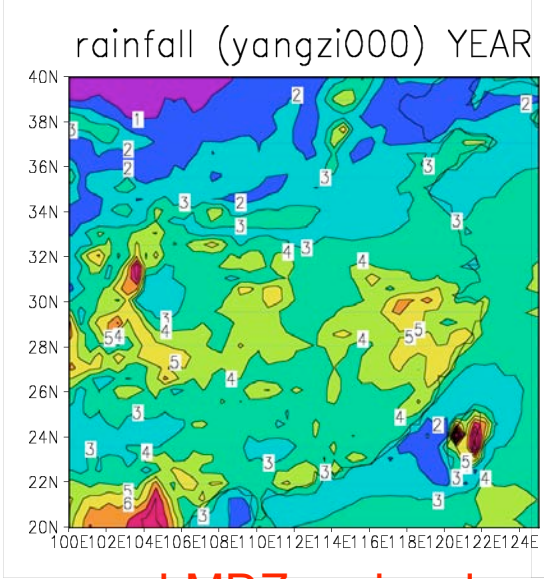
Precipitation

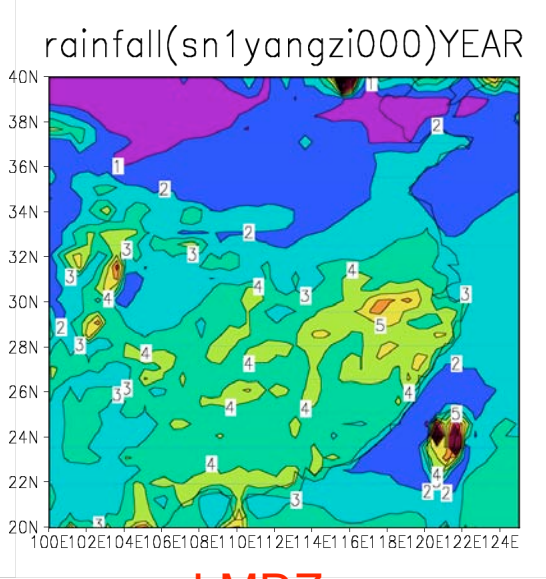
T2m

An example of LMDZr and LMDZg two-way nesting system for climate change scenario (Yangtze River Basin)

Annual-mean rainfall (mm/d) (top), and its future variation (bottom: 2050-2000)



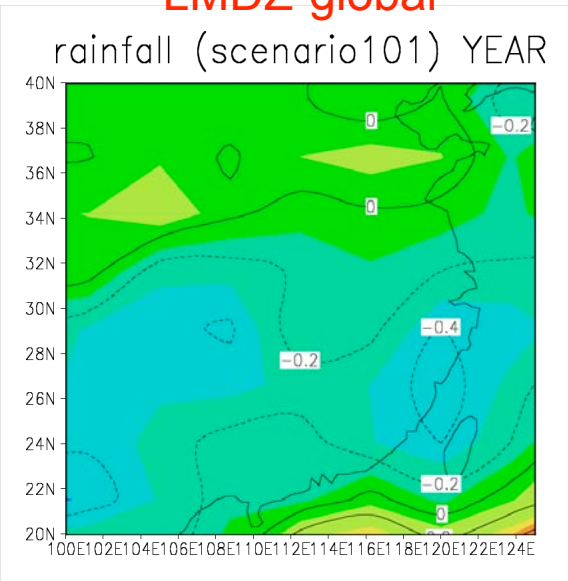


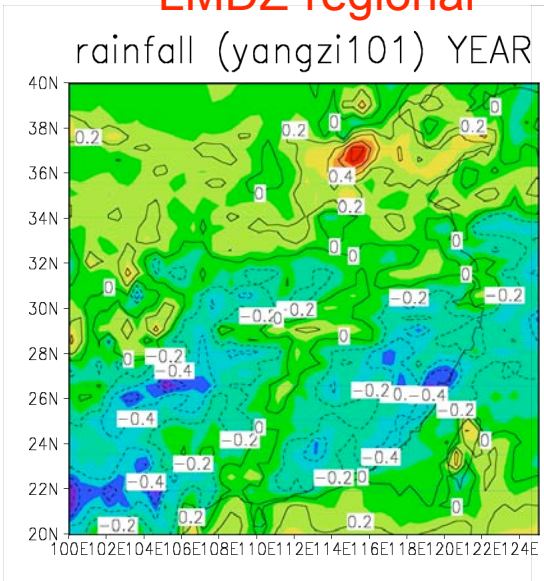


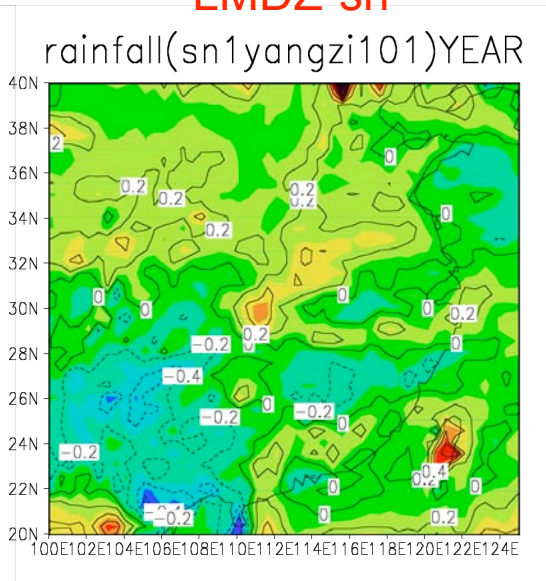
LMDZ-global

LMDZ-regional

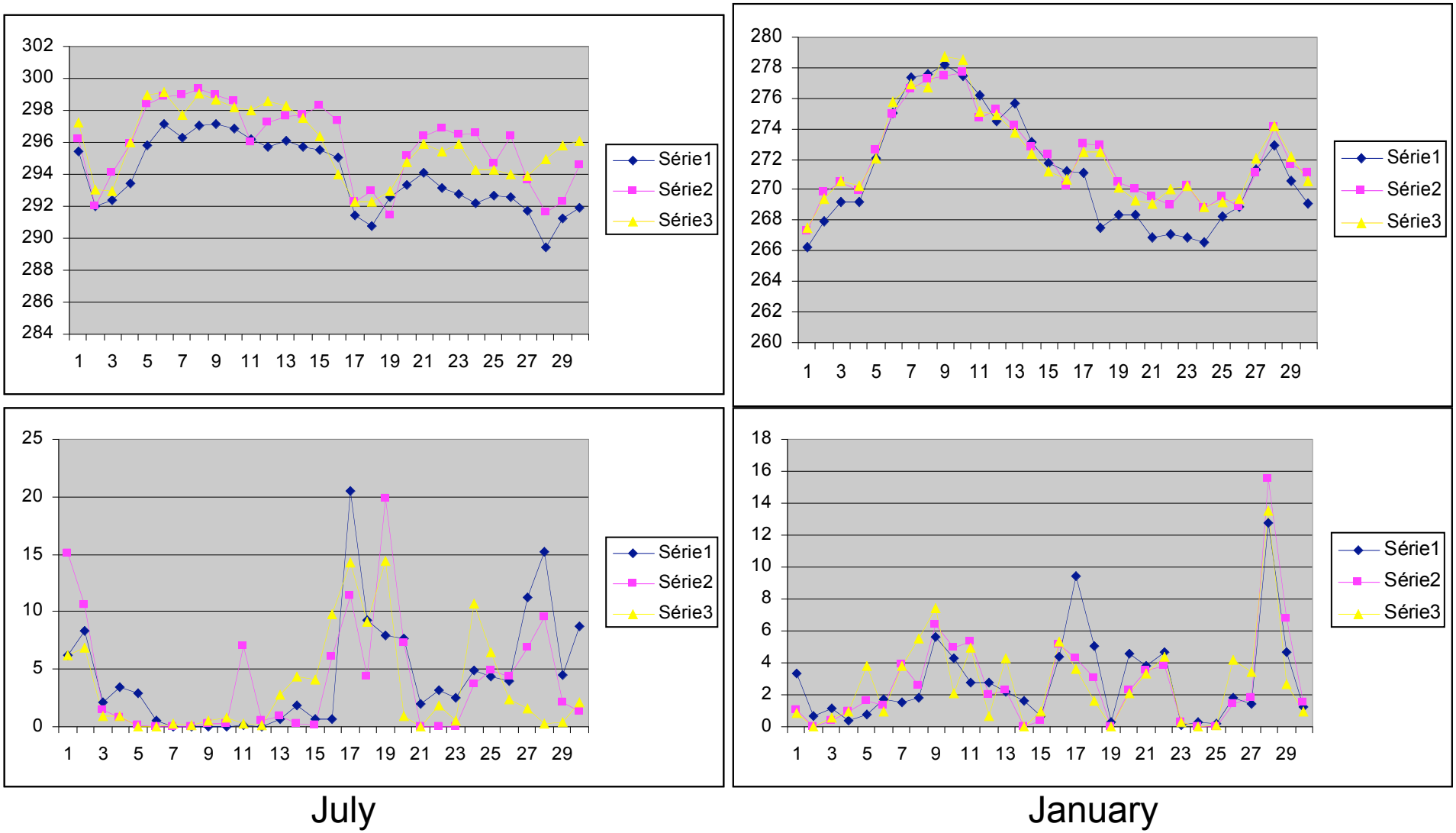
LMDZ-sn







An example of LMDZr and LMDZg two-way nesting system for eastern Europe



July

January

T2m and precipitation at 23°E/45°N: blue (2-way-nested global model); pink (2-way-nested regional model); yellow (1-way-nested regional model)