

Climate change projections over the MED-CORDEX domain from a multiple physics ensemble of RegCM4 simulations : 50 km and 12 km resolution

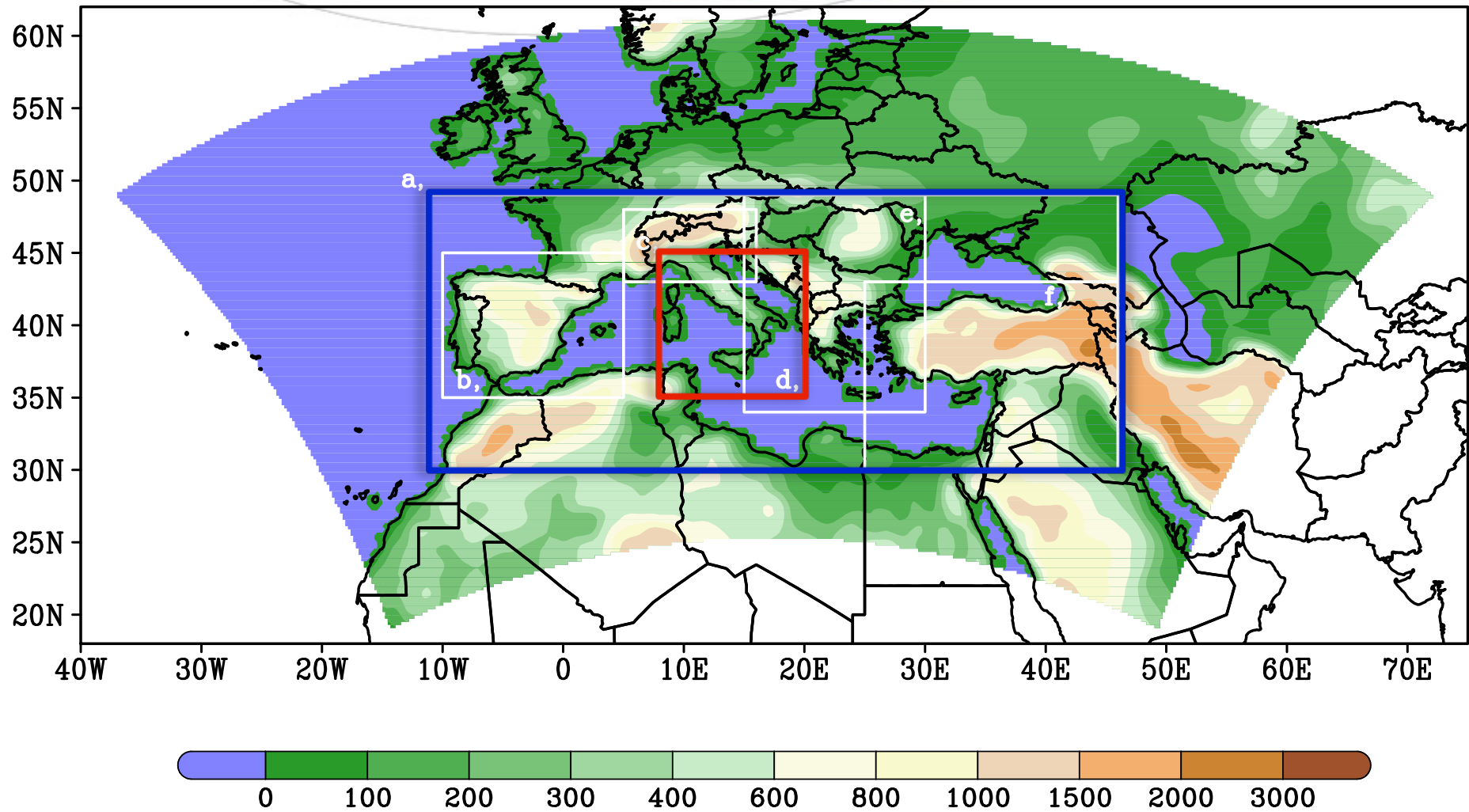
Erika Coppola¹, Cs. Torma, F. Giorgi¹, I. Güttler², F. Raffaele¹, G. Giuliani¹

¹ Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

² Croatian Meteorological and Hydrological Service, Zagreb, Croatia



CORDEX domain Europe

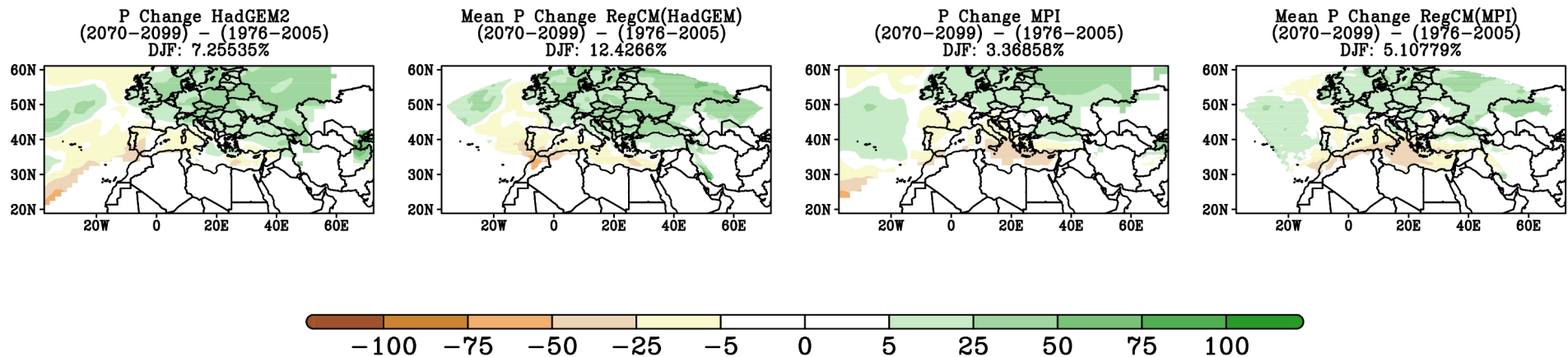


Simulation 1	Grell (FC80) scheme over land and Emanuel scheme over ocean rsmin = 200 (crop), xla = 6 (crop) rainsnowtemp = 1.2 °C irrigation during growing season
Simulation 2	As Simulation 1, but without irrigation.
Simulation 3	As Simulation 2, but only Emanuel scheme. rsmin = 45 (crop), xla = 6 (crop) cevap = 0.5E-2, elcrit = 0.00011
Simulation 4	As Simulation 3, but rsmin = 200 (crop), xla = 4 (crop) cevap = 0.1E-1, elcrit = 0.011
Simulation 5	Grell (FC80) scheme over land and Emanuel scheme over ocean CLM3.5
Simulation 6	Grell (AS74) scheme rsmin = 45 (crop), xla = 6 (crop) rainsnowtemp = 1.2 °C

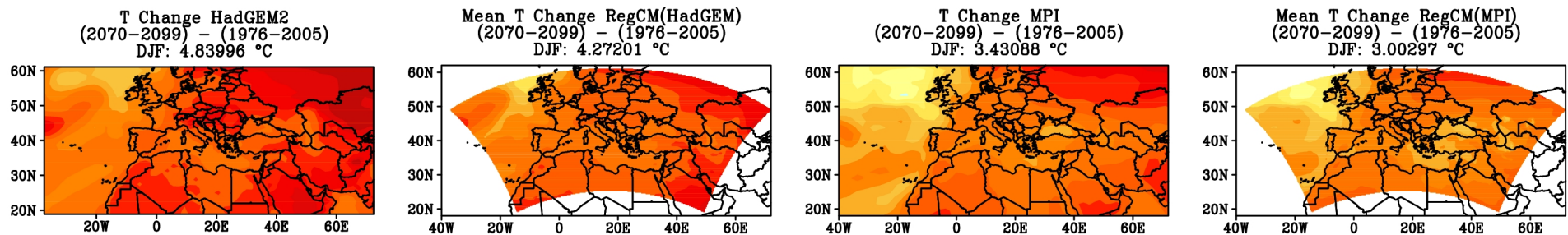
* 2 + 2 = 14 TOT

DJF

Precipitation 2070-99 compared to 1975-2004

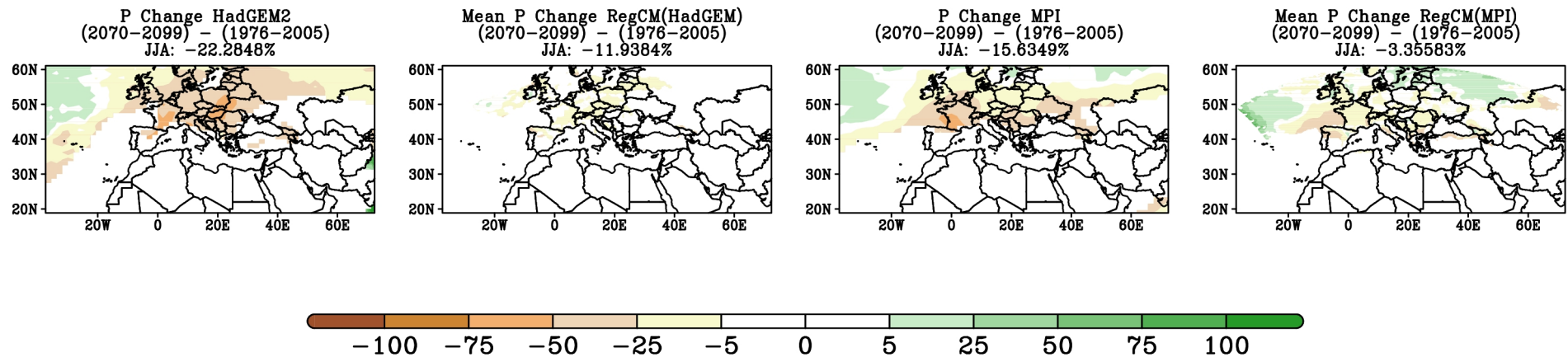


Temperature 2070-99 compared to 1975-2004

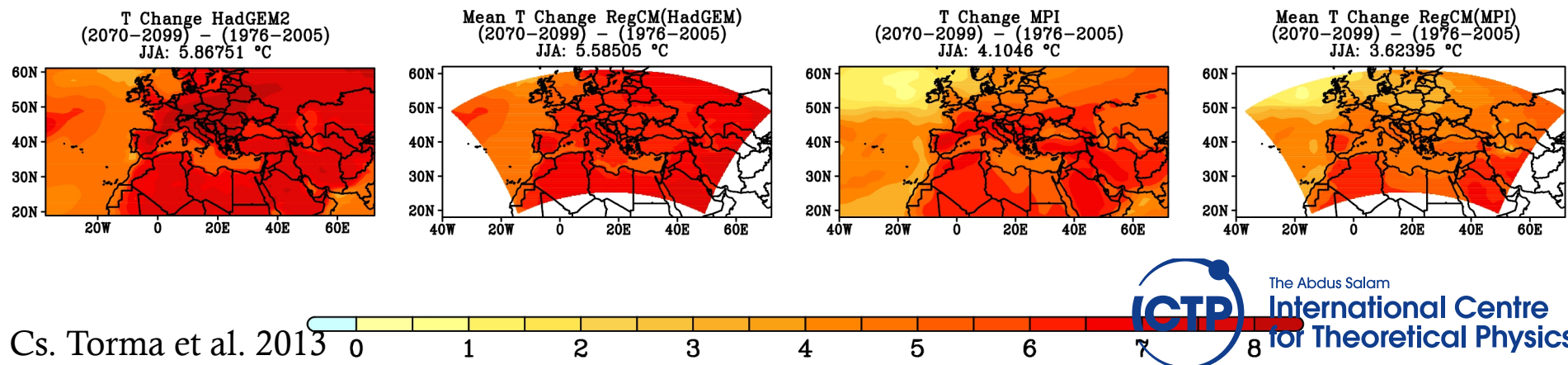


JJA

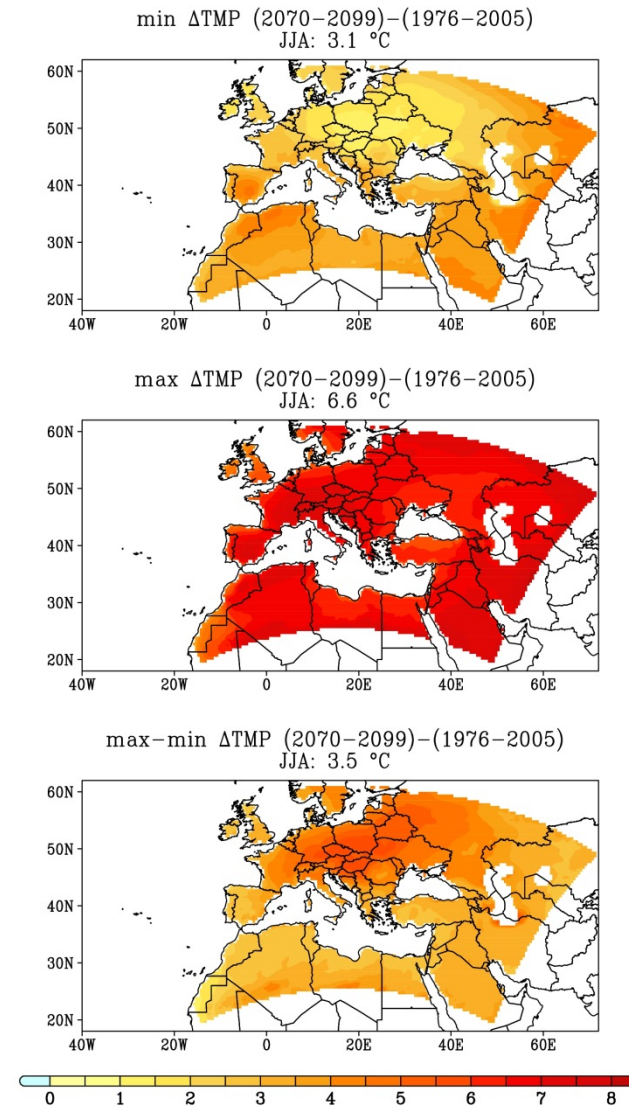
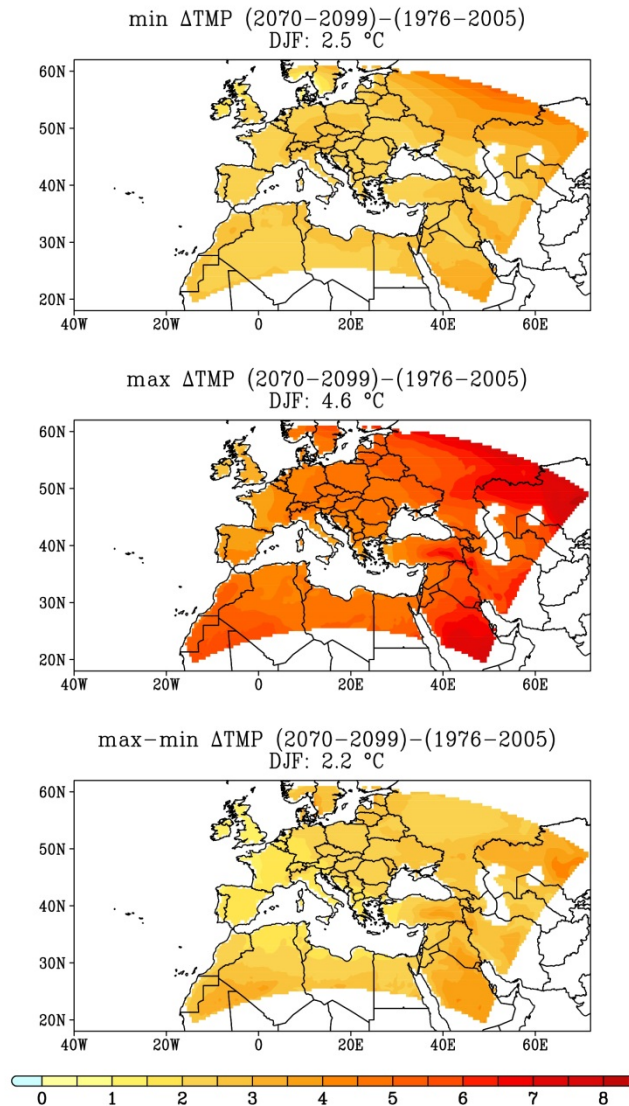
Precipitation 2070-99 compared to 1975-2004



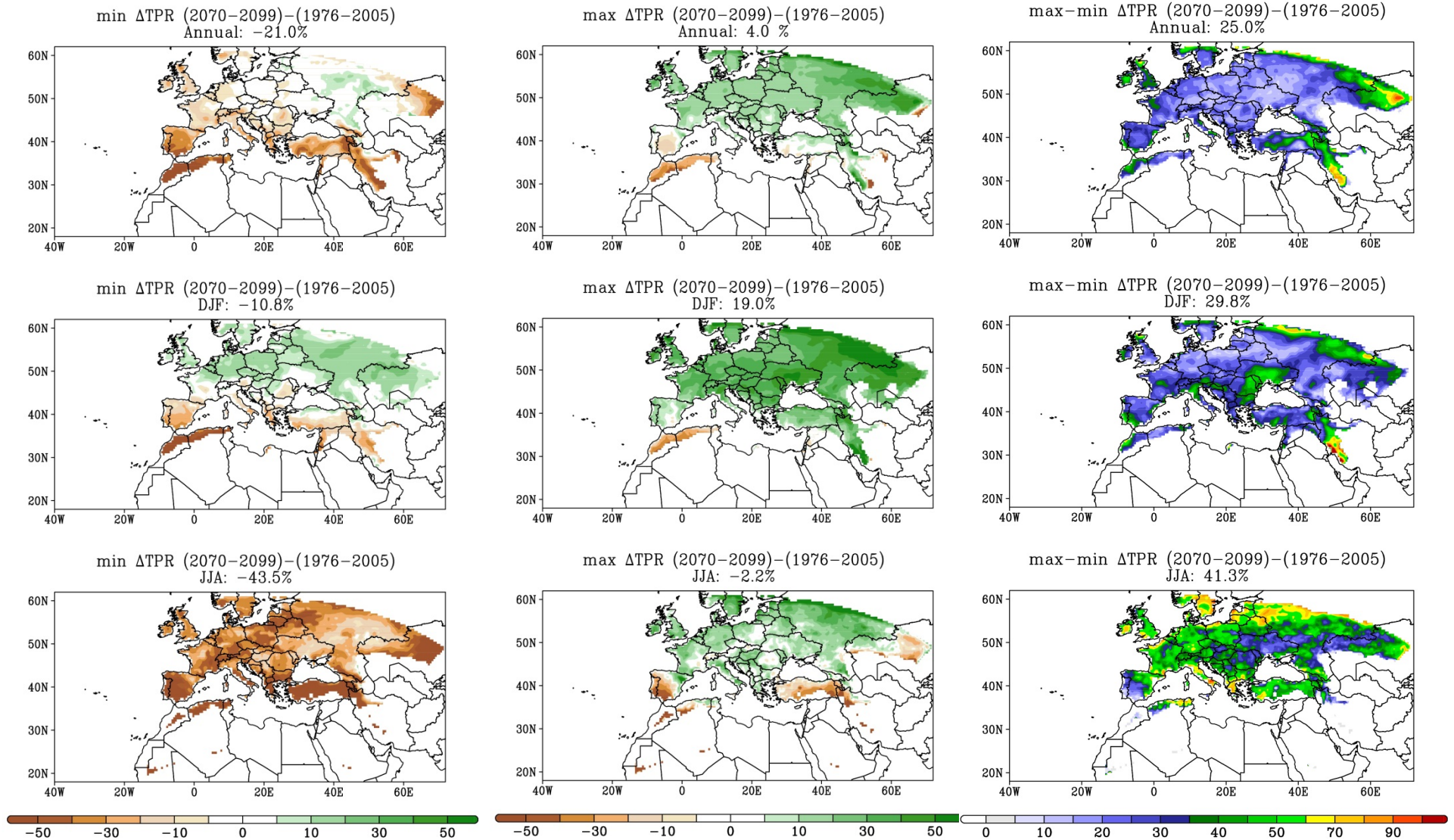
Temperature 2070-99 compared to 1975-2004



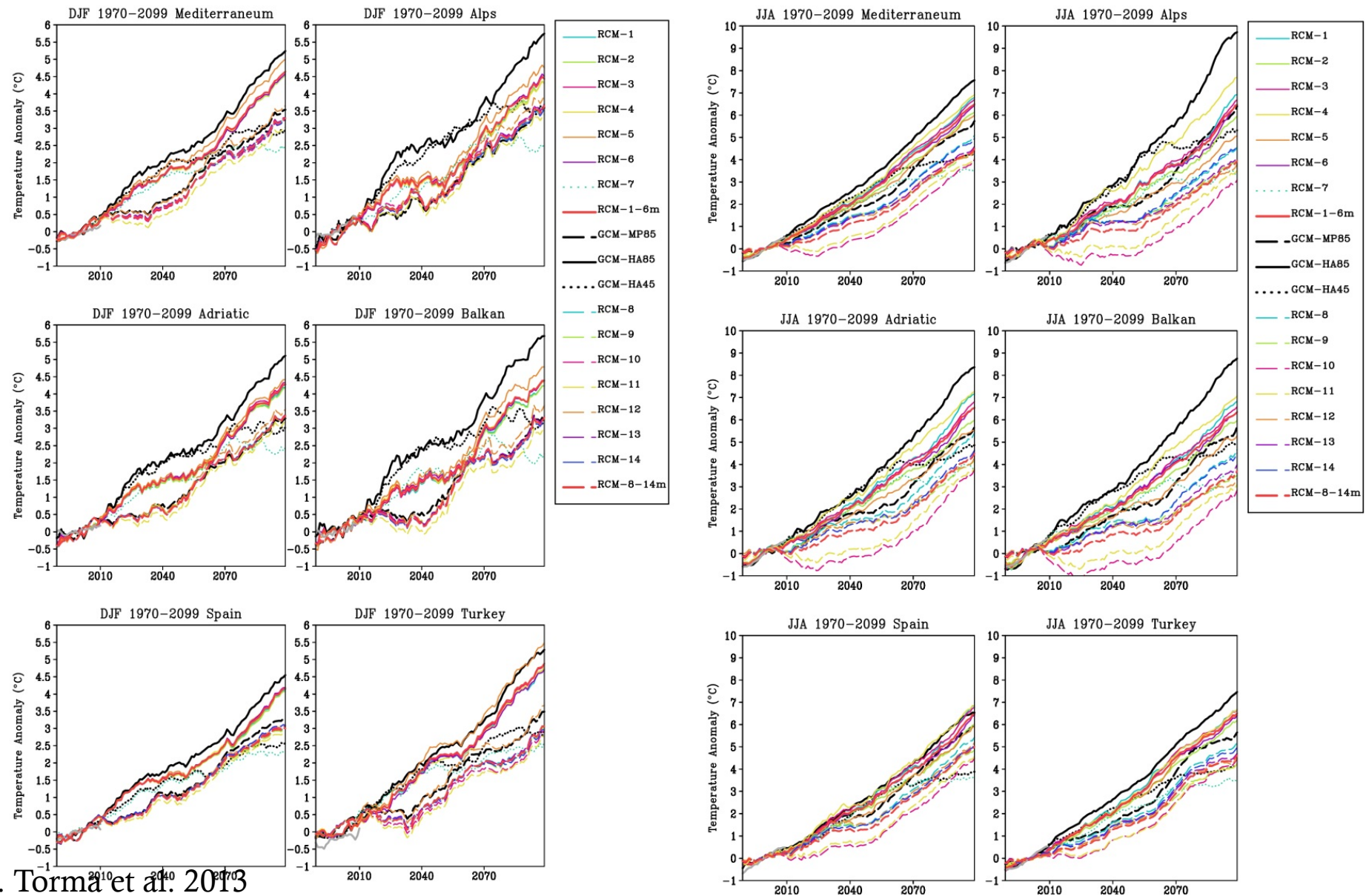
Min., max., spread of changes (t2m)



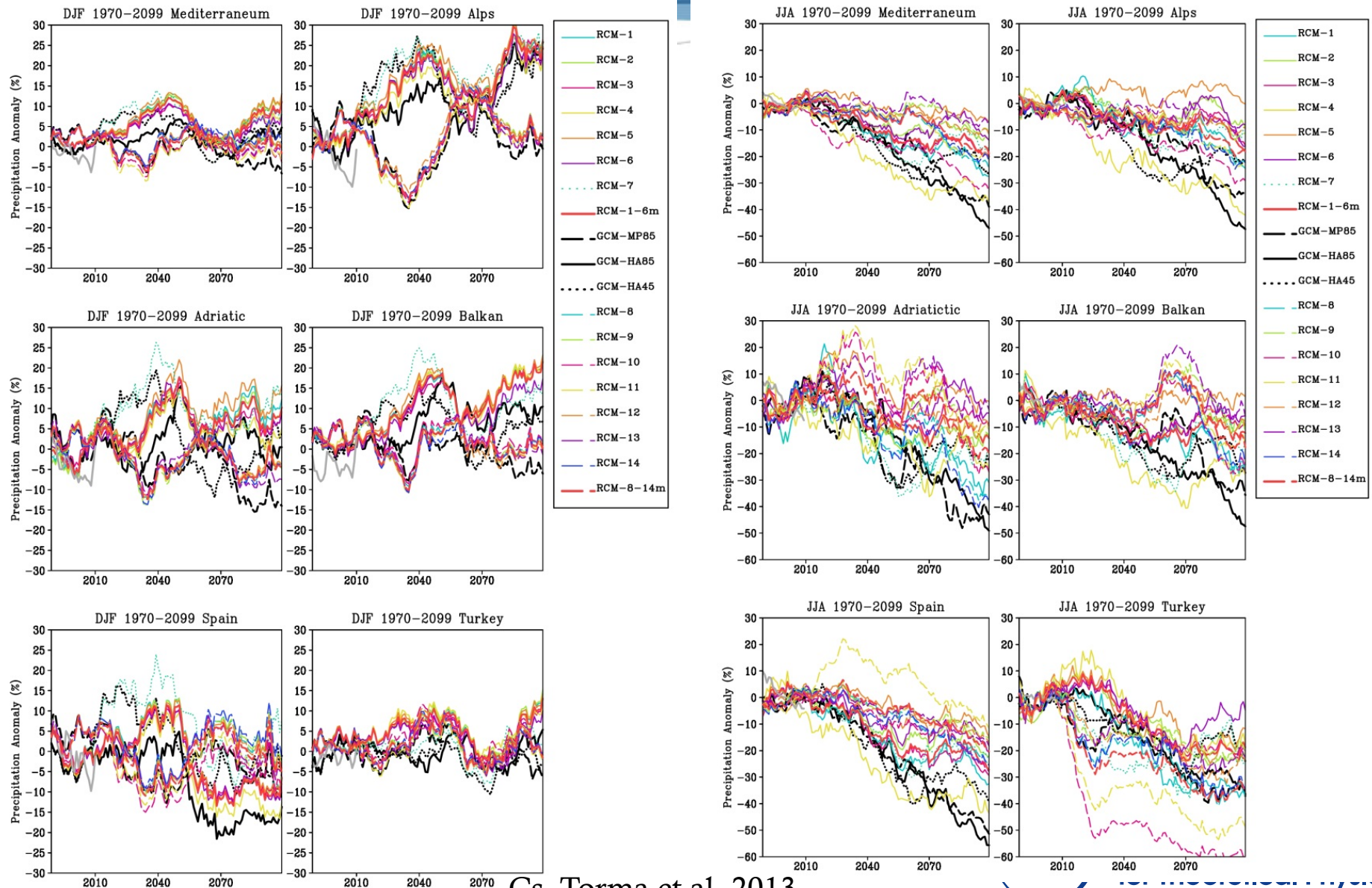
Min., max., spread of changes (tpr)



Simulated future temperature 20-year running mean area-average anomaly ($^{\circ}\text{C}$) in DJF and JJA over different regions over the period 1970-2099, relative to the period 1976-2005. (Only grid points over land were accounted for.)

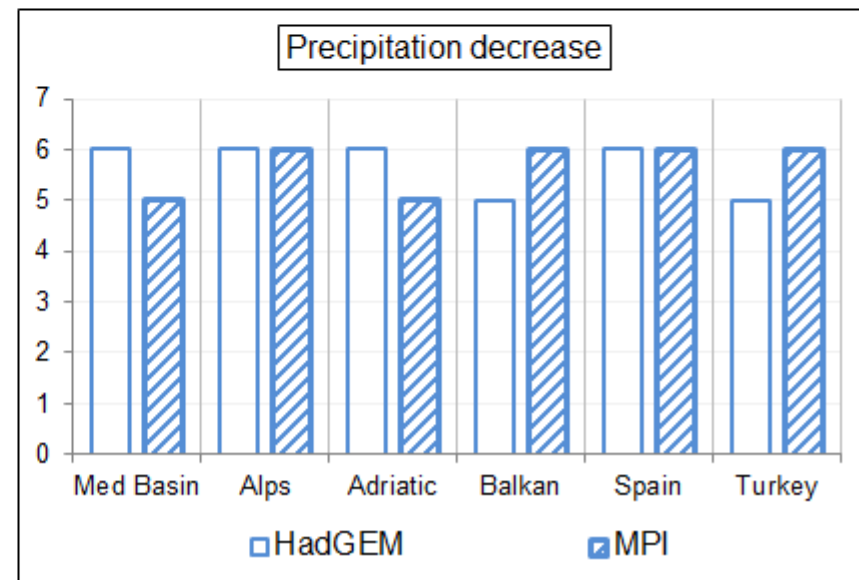
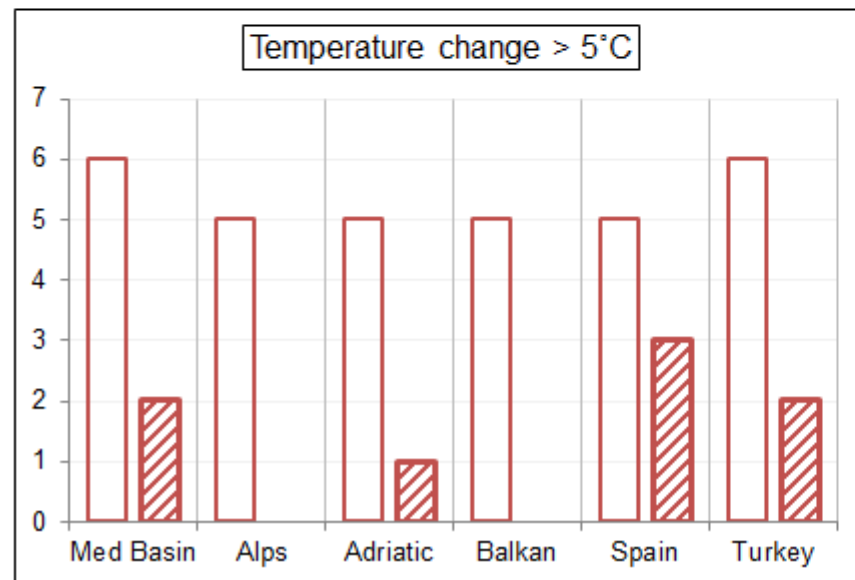
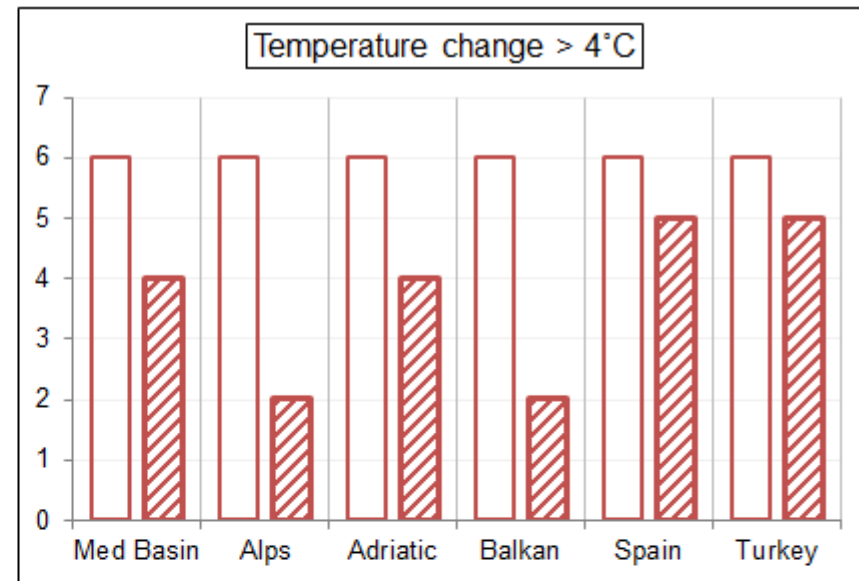
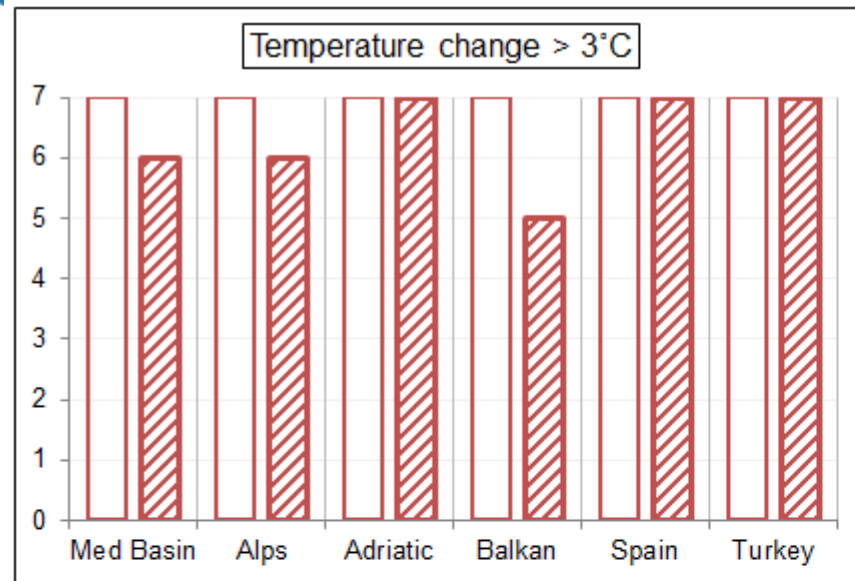


Simulated future precipitation 20-year running mean area-average anomaly (°C) in DJF and JJA over different regions over the period 1970-2099, relative to the period 1976-2005. (Only grid points over land were accounted for.)

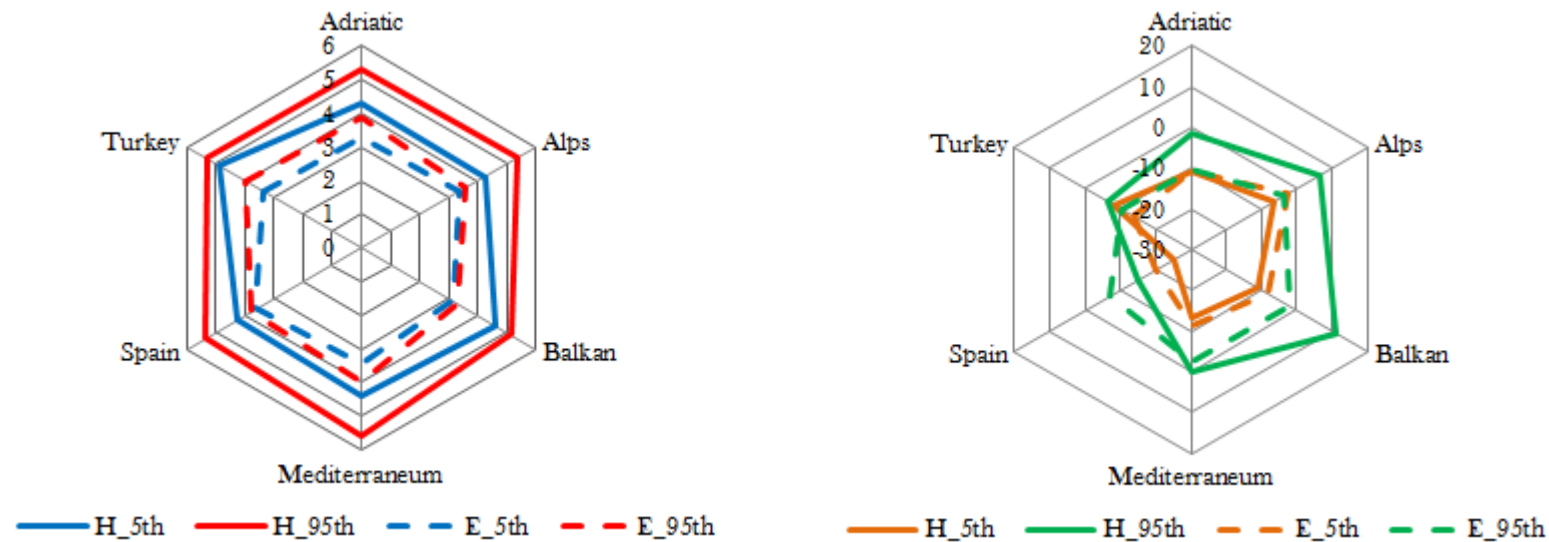


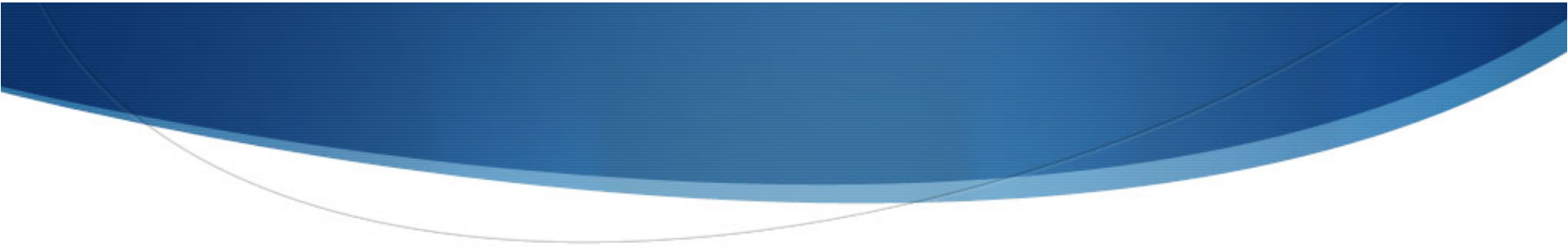
Cs. Torma et al. 2013

Exceeding given thresholds for each region. Columns with stripes stand for MPI driven simulations.



Simulated mean changes of 5th and 95th percentiles for temperature (°C) and for precipitation (%) for the six selected sub-regions. (Solid lines stand for HadGEM simulations and dashed lines illustrates MPI driven simulations.) The left panel show the changes of percentile for temperature (red: 95th, blue: 5th) and the right panel for precipitation (green: 95th, brown: 5th) for 2070-2099 relative to the 1976-2005 control period.



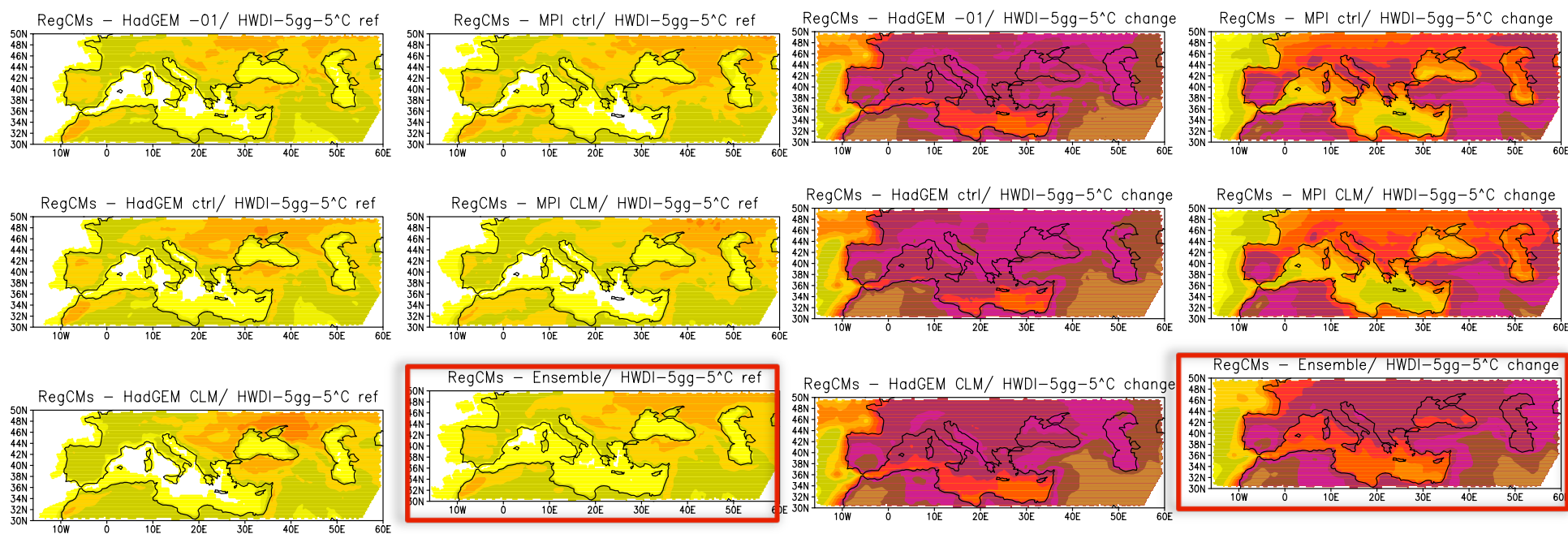


Heat Wave Day Index (HWD): Number of heat wave days, where a heat wave occurs when for at least N_d consecutive days the daily maximum temperature exceeds the long term average by at least N_t degrees.

Dry Spell Length Index (CDD): Maximum number of consecutive dry days, where a dry day is defined as having precipitation below 1 mm/day.

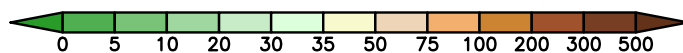
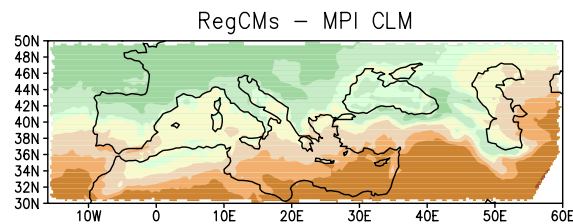
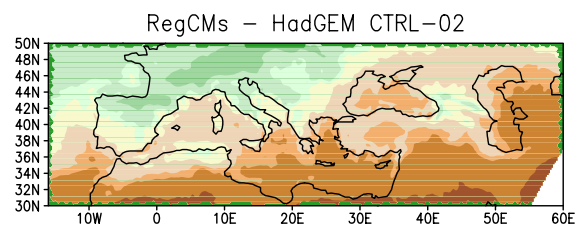
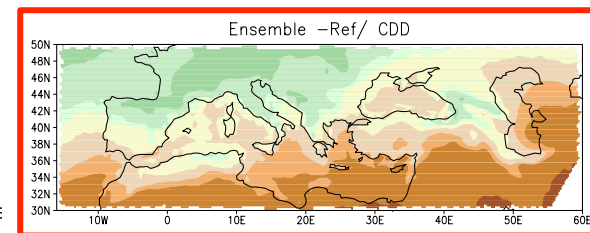
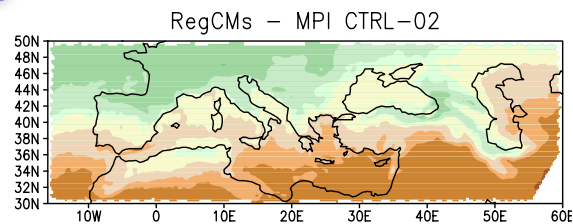
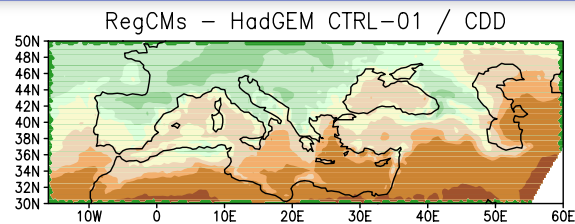
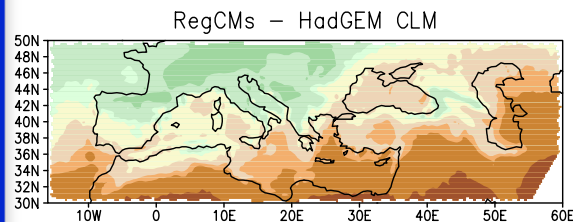
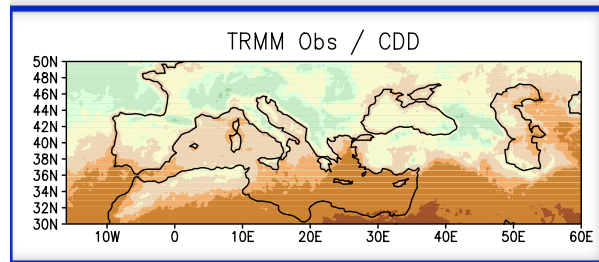
Heavy precipitation Index (R95): Percent of total precipitation above the 95% percentile

Heat Wave Day Index (HWD)



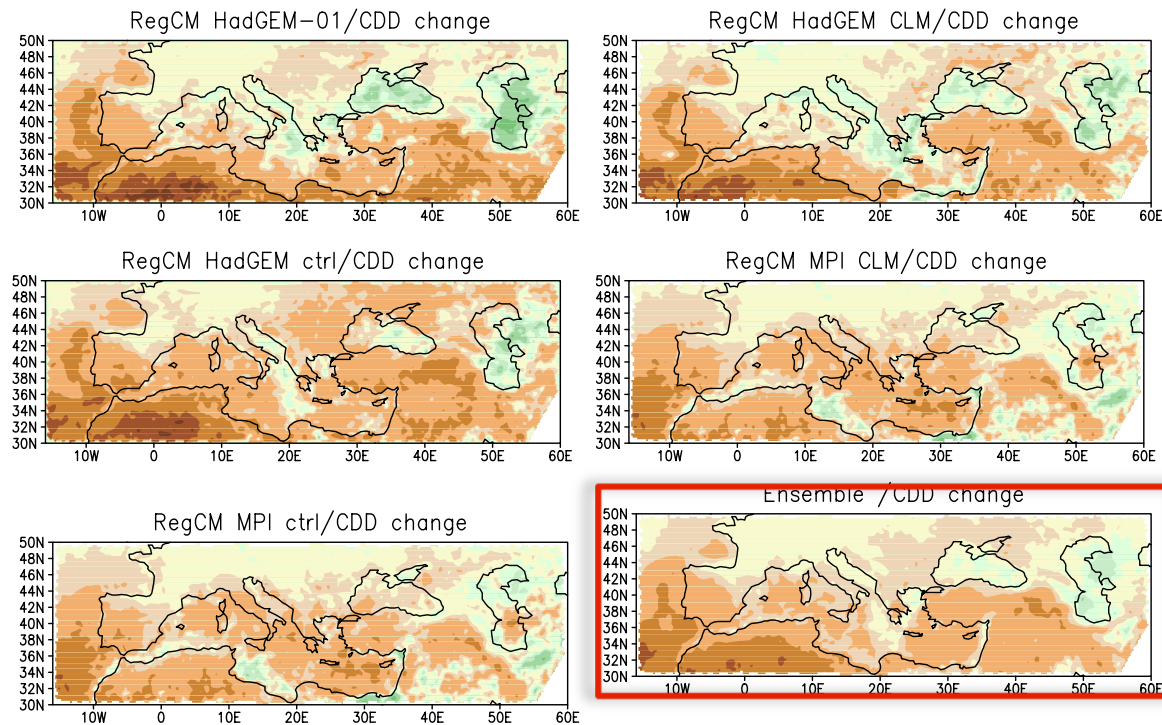
Dry Spell Length Index (CDD)

Present

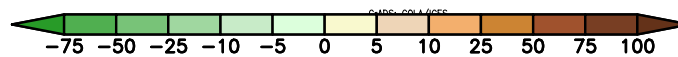


Dry Spell Length Index (CDD)

Change



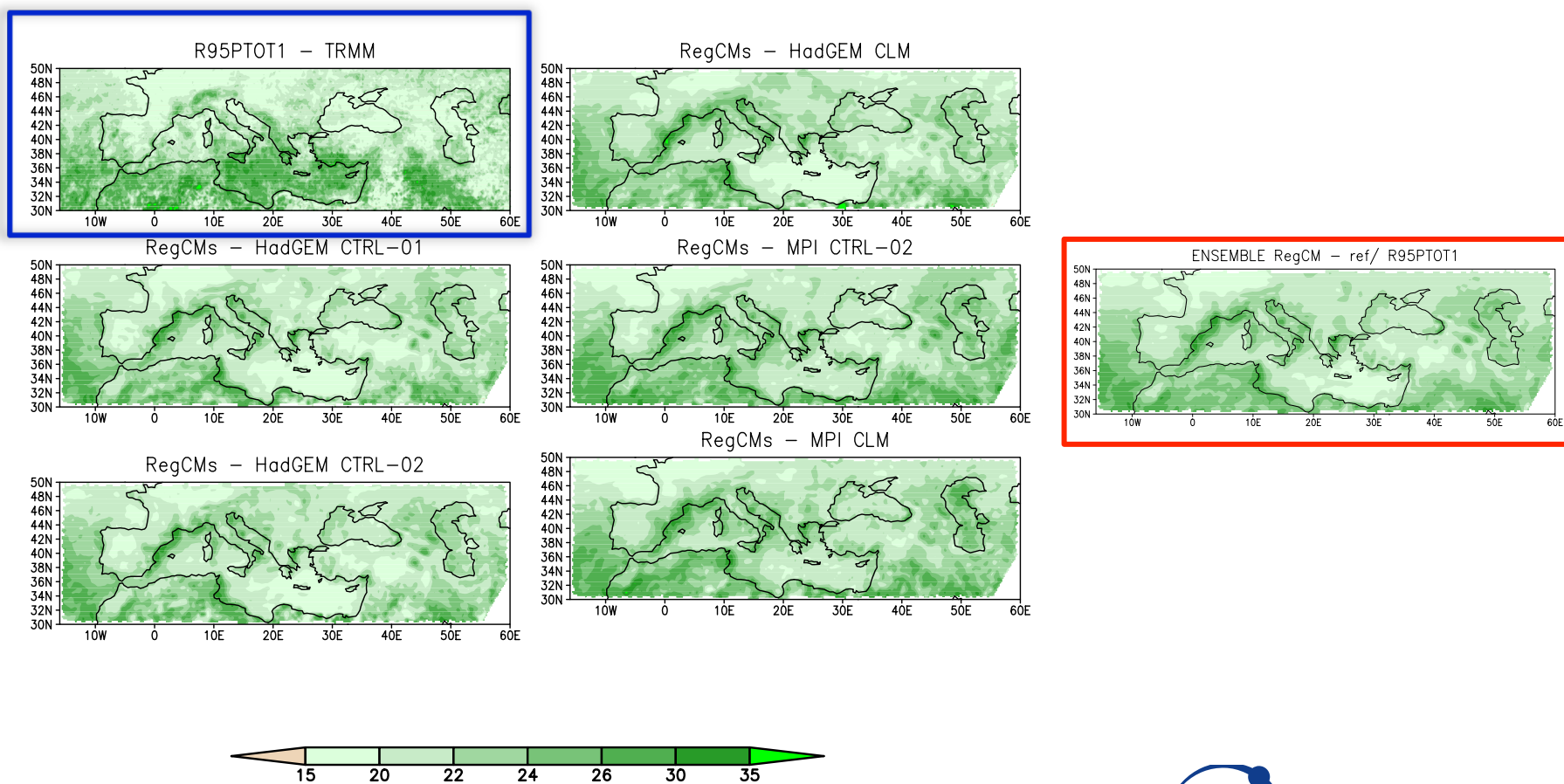
GRADS: COLA/IGES



The Abdus Salam
International Centre
for Theoretical Physics

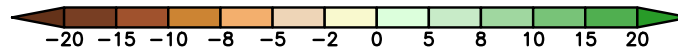
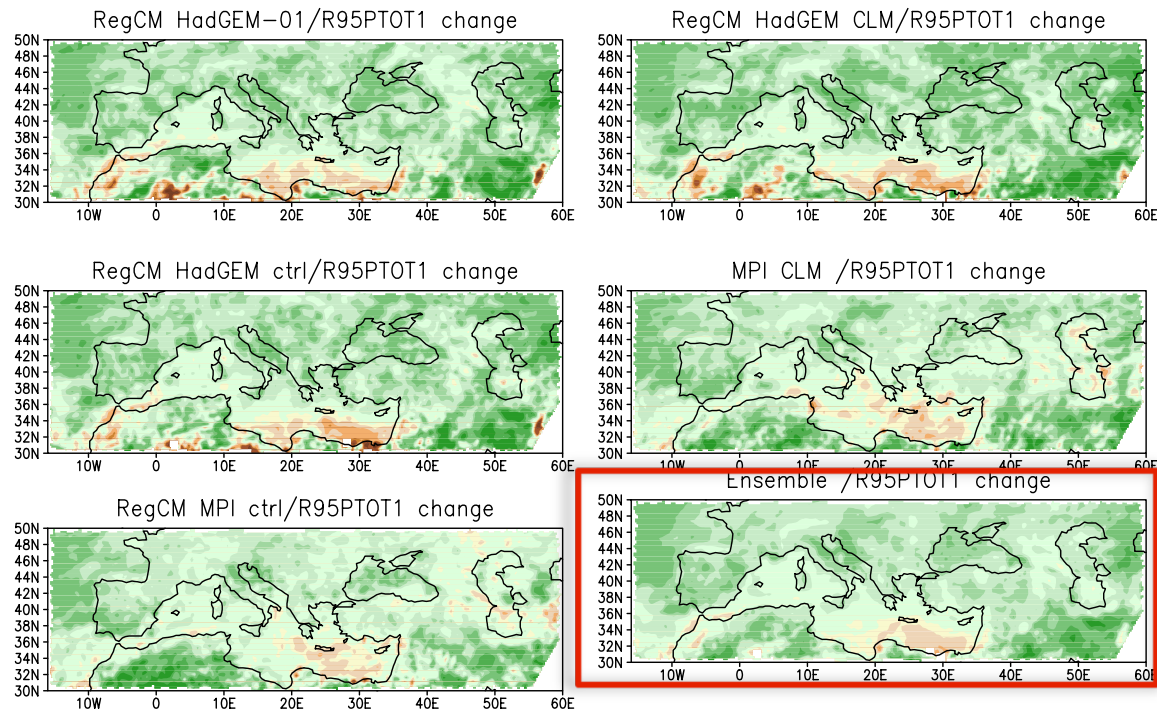
Heavy precipitation Index (R95)

Present

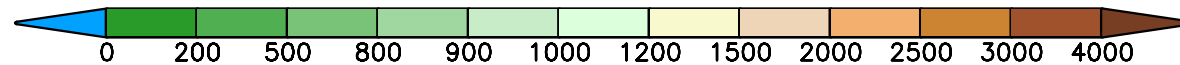
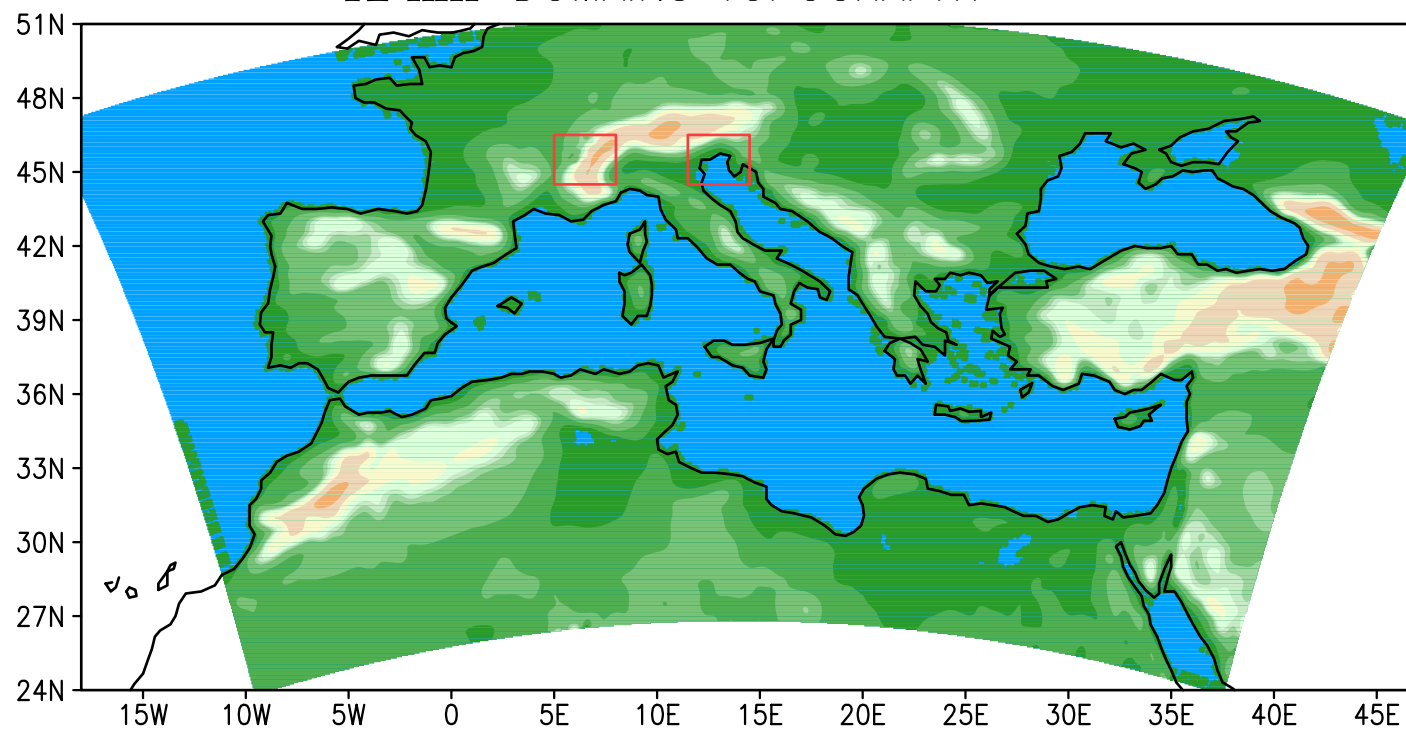


Heavy precipitation Index (R95)

Change

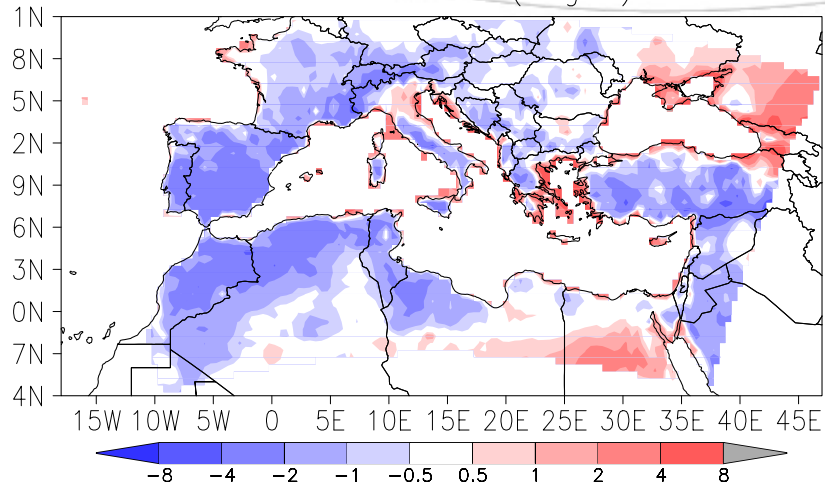


12 km DOMAINS TOPOGRAPHY

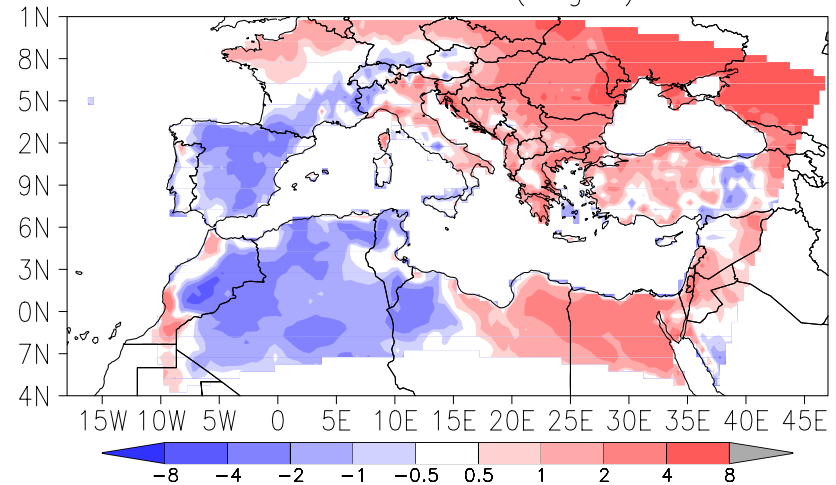


12 km Temperature and Precipitation bias

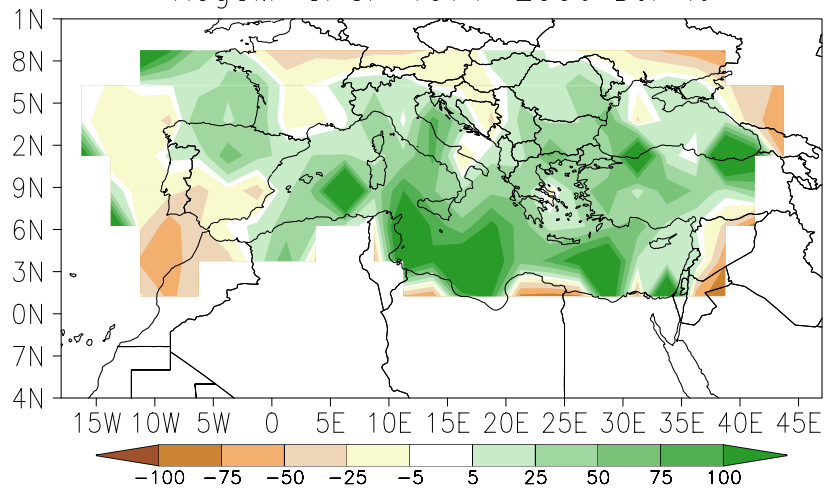
BIAS TEMP DJF (deg C)



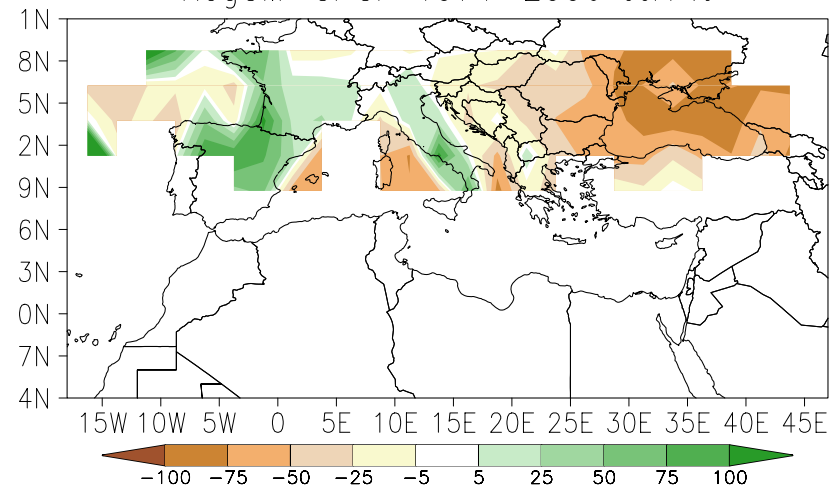
BIAS TEMP JJA (deg C)



RegCM-GPCP 1971-2006 DJF %

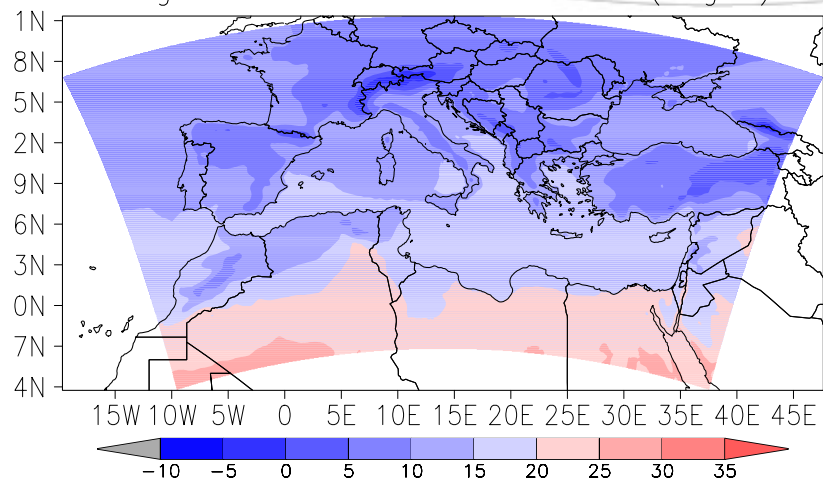


RegCM-GPCP 1971-2006 JJA %

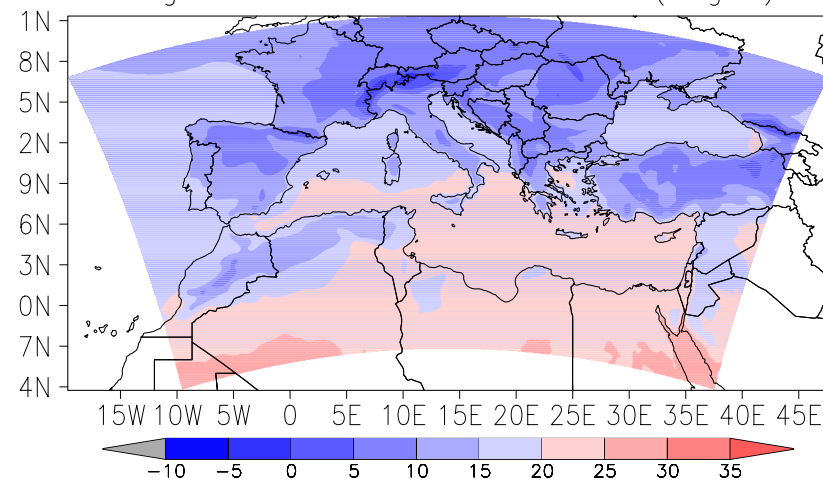




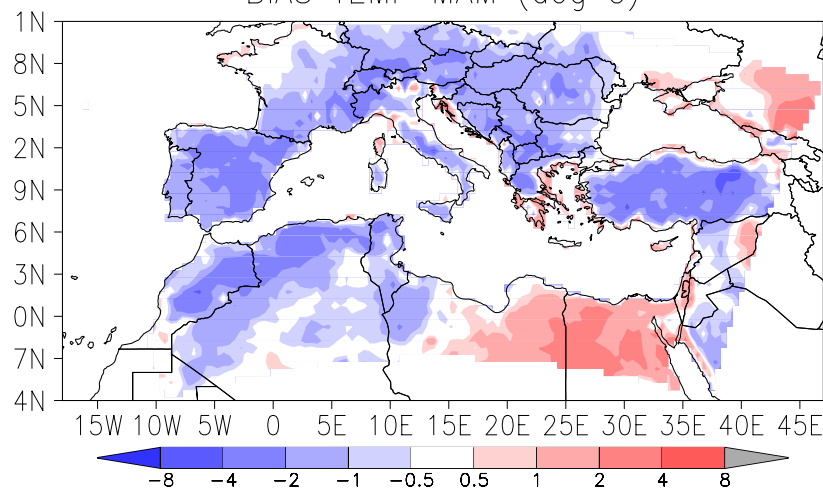
RegCM4 TEMP 1975–2006 MAM (deg C)



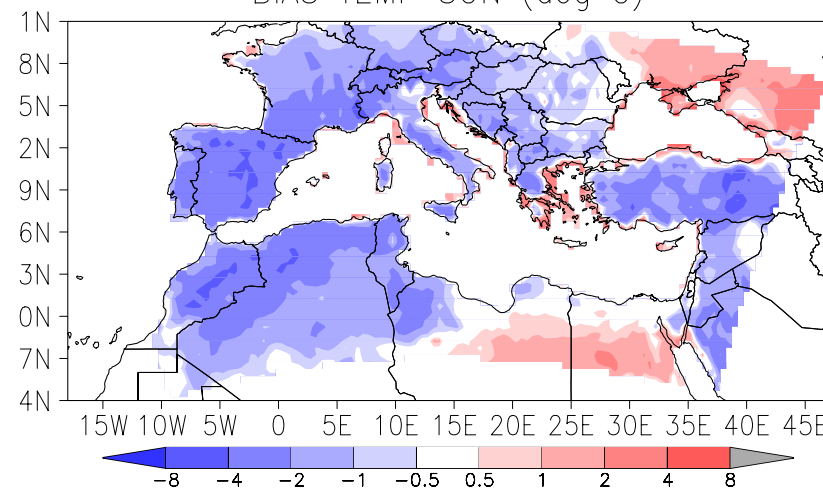
RegCM4 TEMP 1975–2006 SON (deg C)



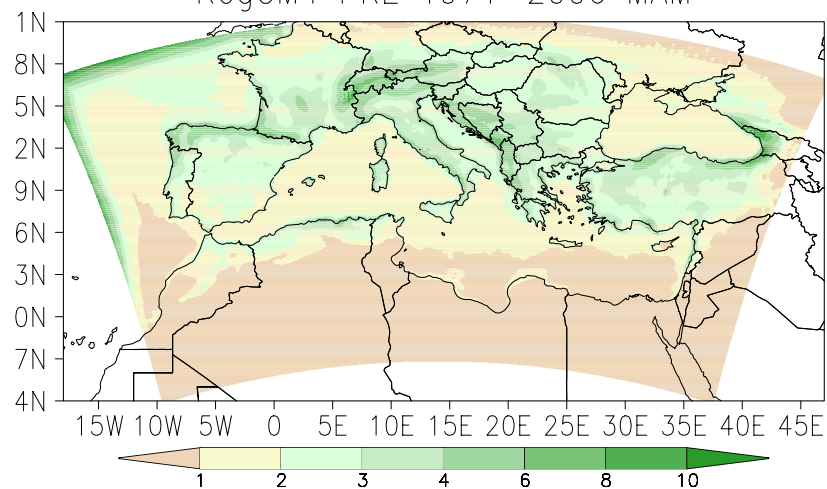
BIAS TEMP MAM (deg C)



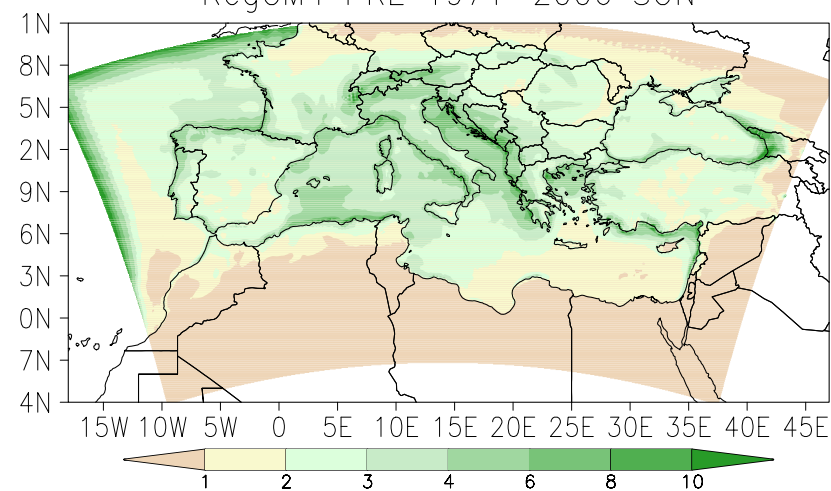
BIAS TEMP SON (deg C)



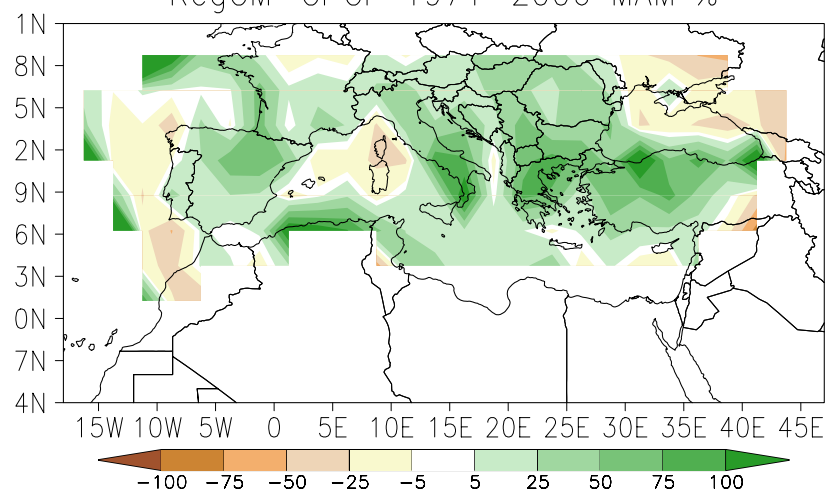
RegCM4 PRE 1971–2006 MAM



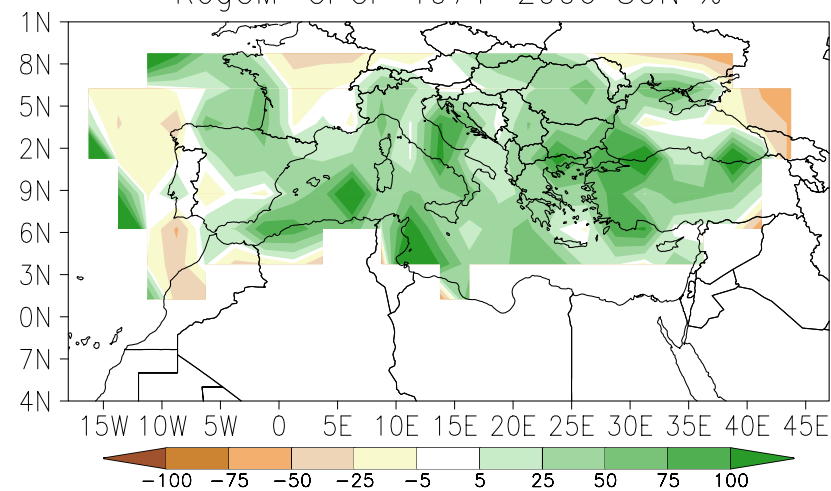
RegCM4 PRE 1971–2006 SON



RegCM–GPCP 1971–2006 MAM %



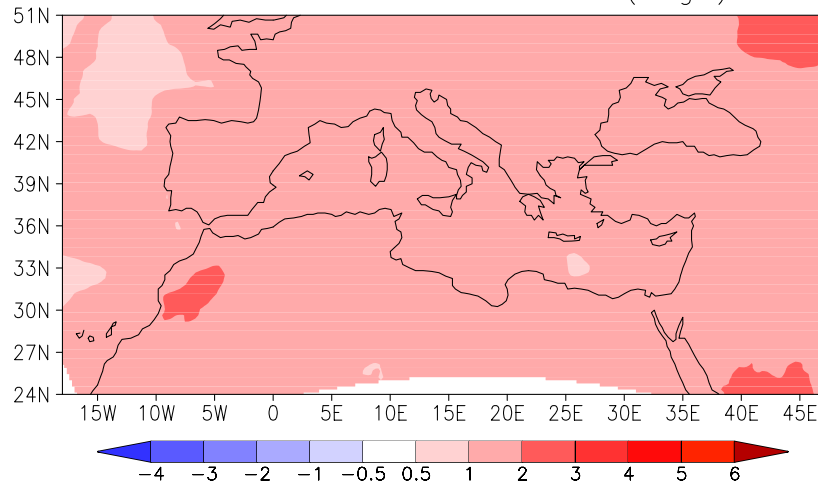
RegCM–GPCP 1971–2006 SON %



Temperature and precipitation change: 2030-20 compared to 1975-2004

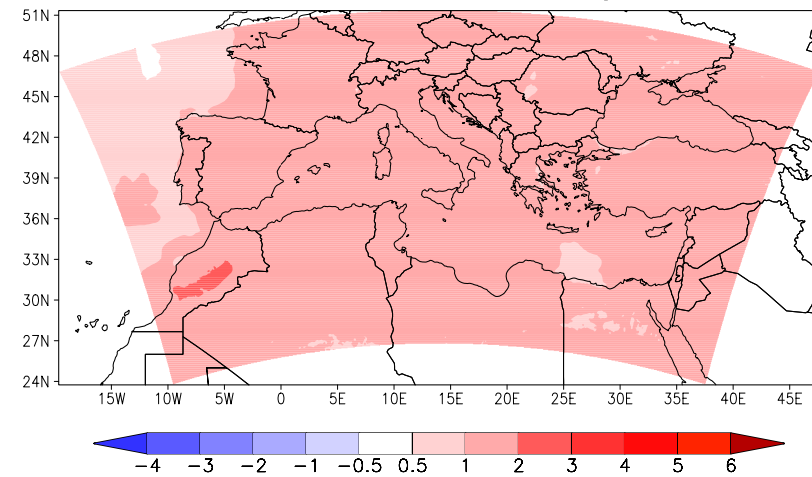
50 km

TEMP CHANGE 50km – DJF (degC)

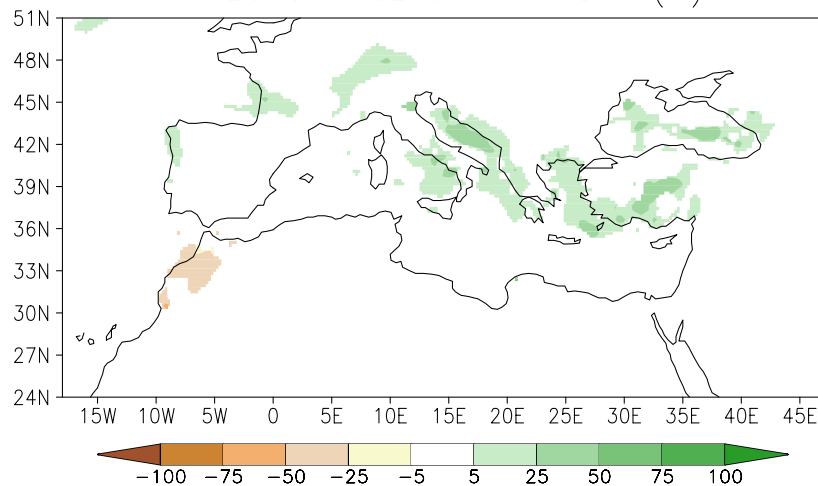


12 km

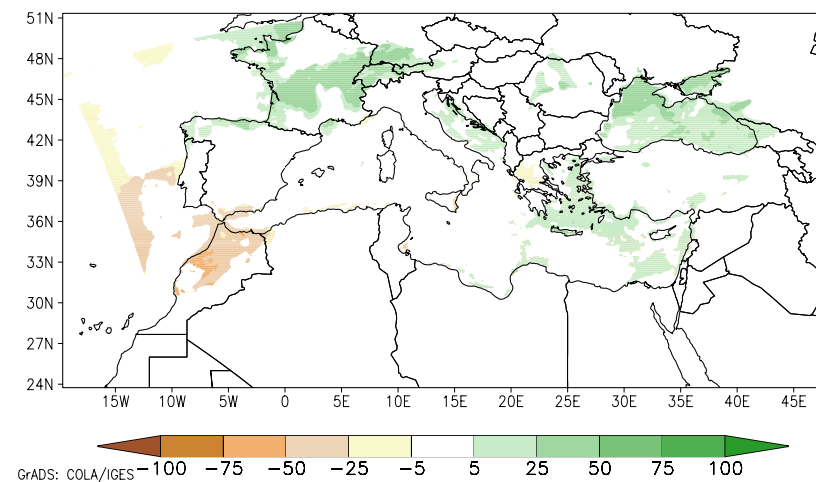
TEMP CHANGE DJF degC



PREC CHANGE 50km – DJF (%)



PREC CHANGE DJF %



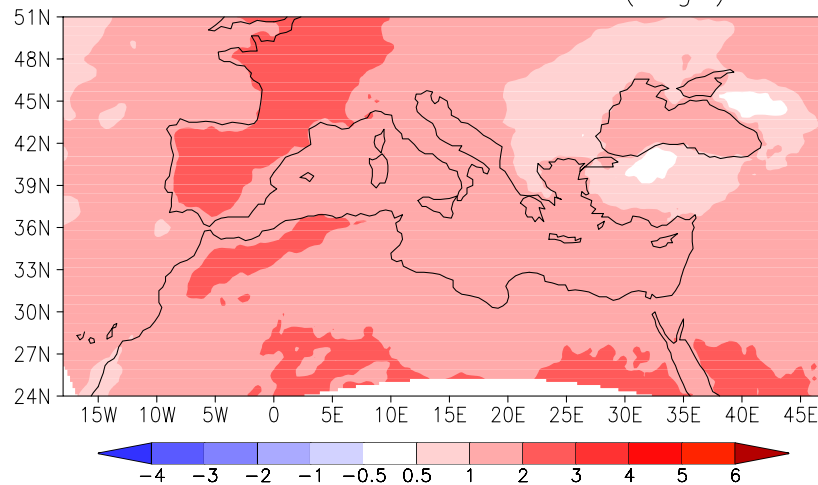
GrADS: COLA/IGES -100 -75 -50 -25 -5 5 25 50 75 100

Temperature and precipitation change: 2030-20 compared to 1975-2004

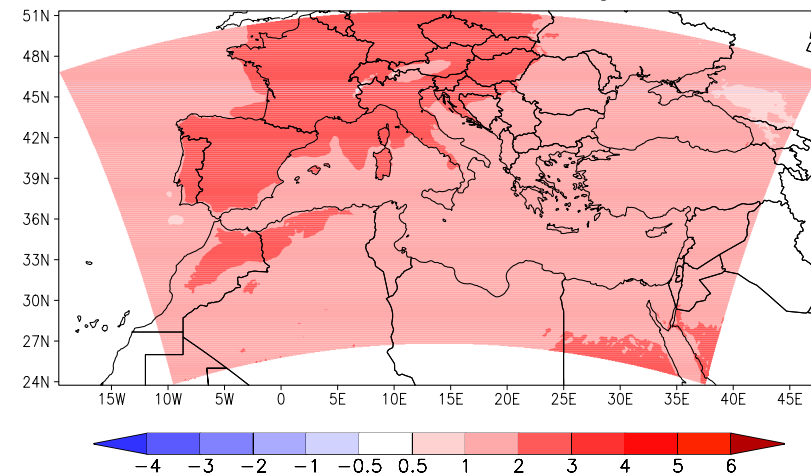
50 km

12 km

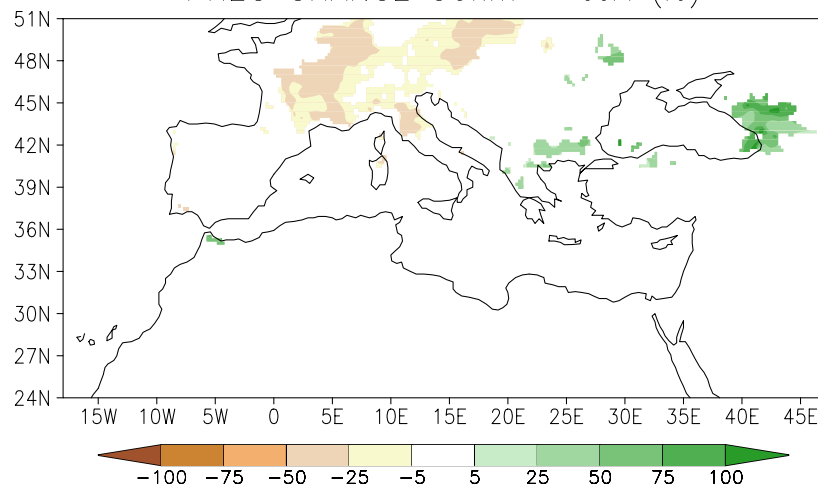
TEMP CHANGE 50km – JJA (degC)



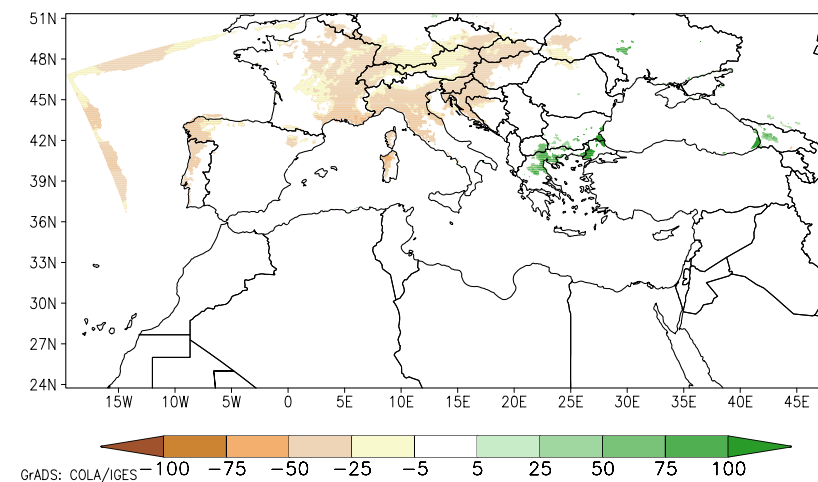
TEMP CHANGE JJA degC



PREC CHANGE 50km – JJA (%)

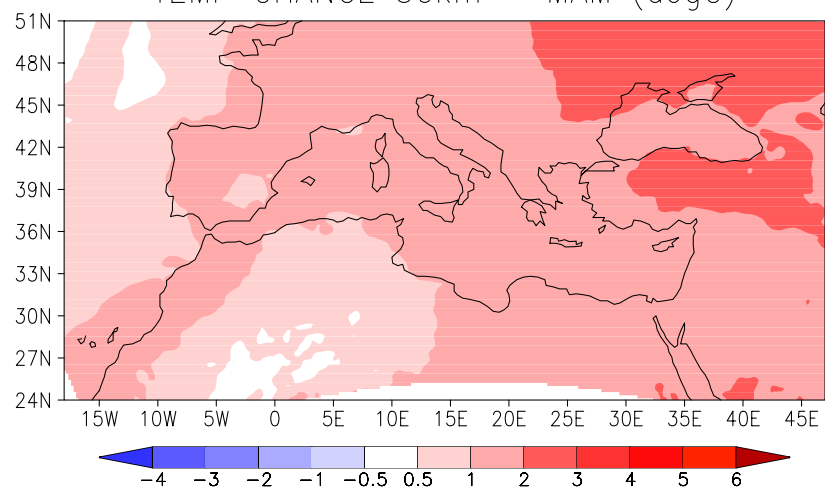


PREC CHANGE JJA %

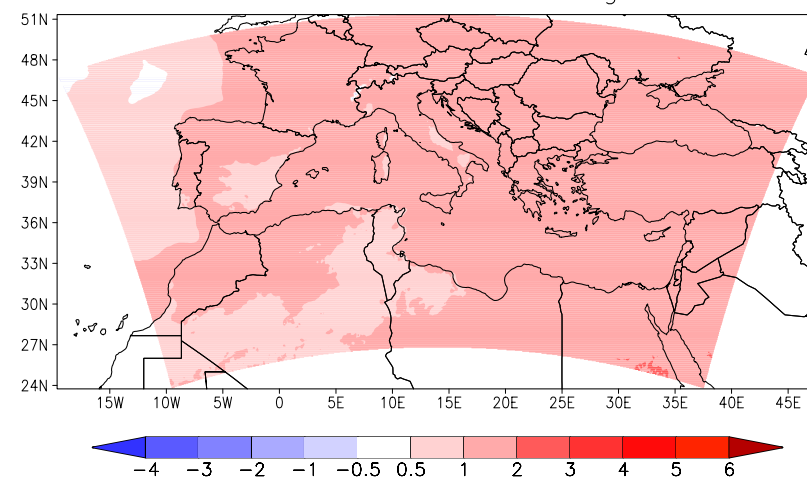


GrADS: COLA/IGES -100 -75 -50 -25 -5 5 25 50 75 100

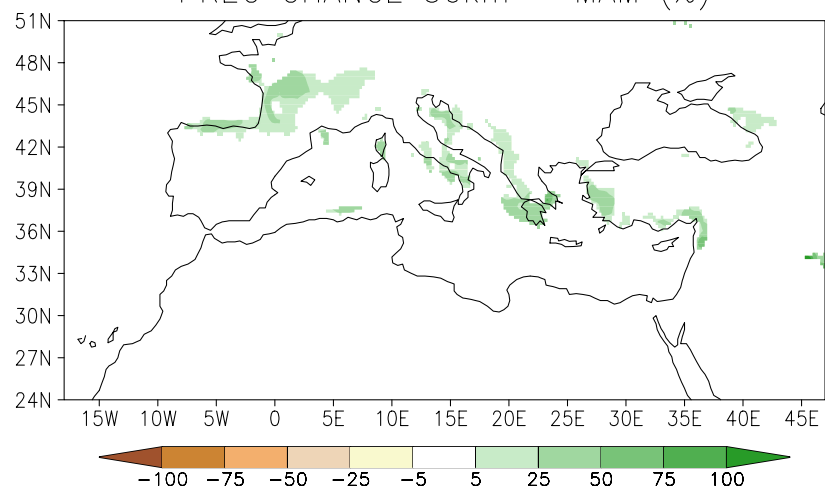
TEMP CHANGE 50km – MAM (degC)



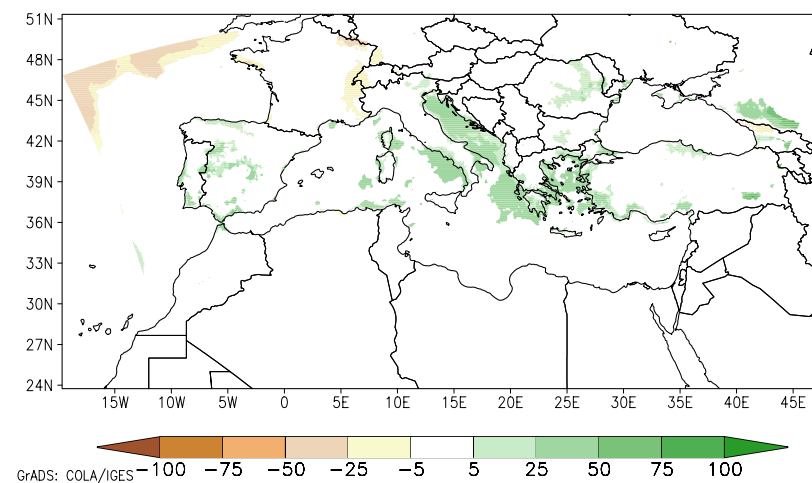
TEMP CHANGE MAM degC



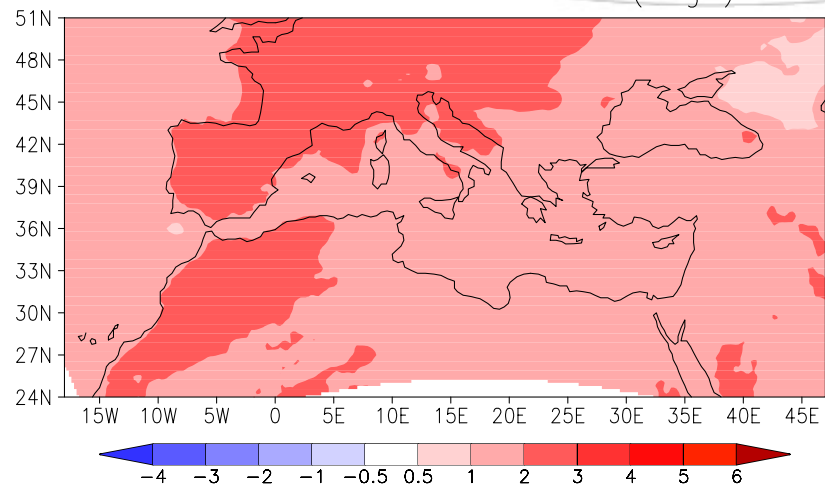
PREC CHANGE 50km – MAM (%)



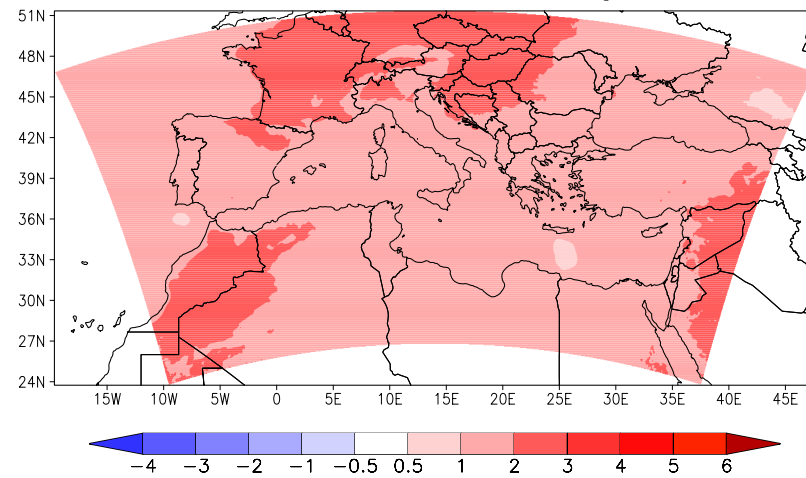
PREC CHANGE MAM %



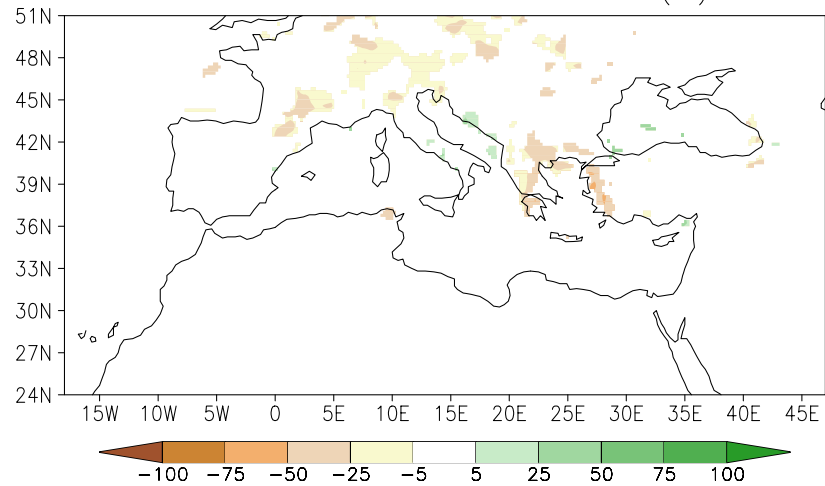
TEMP CHANGE 50km – SON (degC)



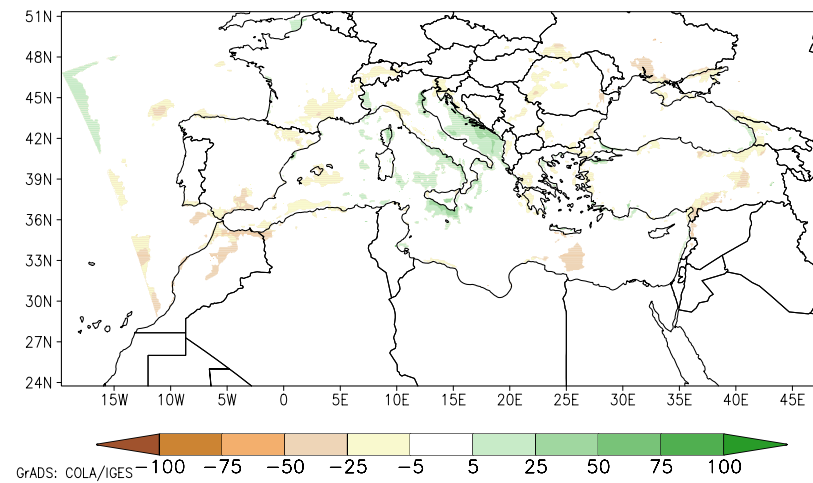
TEMP CHANGE SON degC



PREC CHANGE 50km – SON (%)

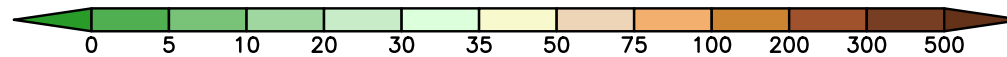
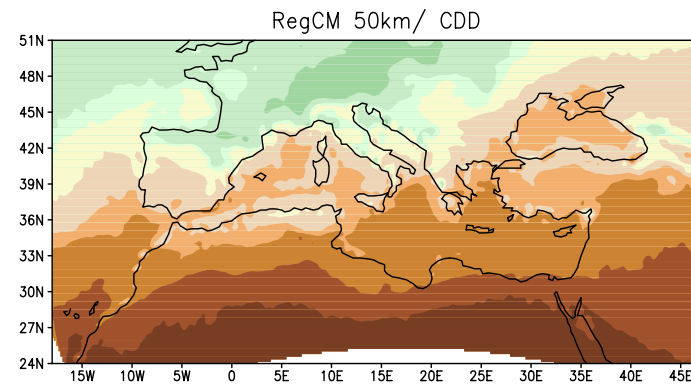
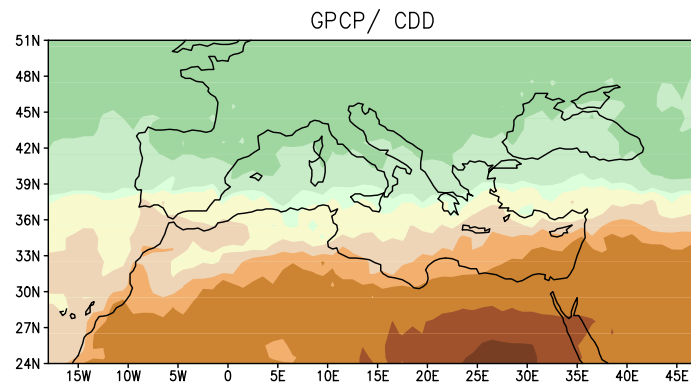
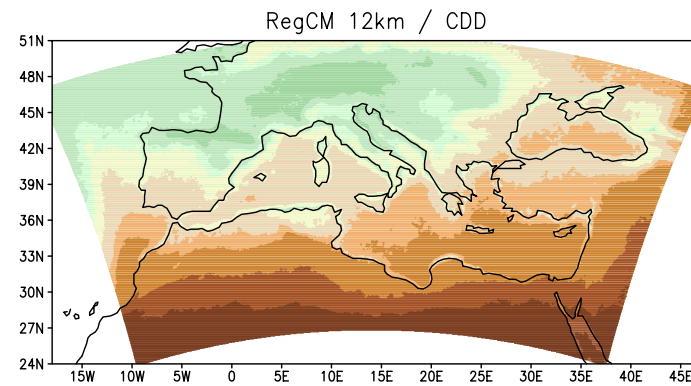
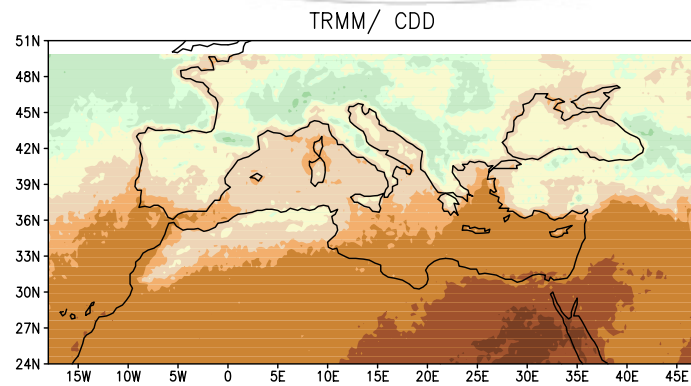


PREC CHANGE SON %



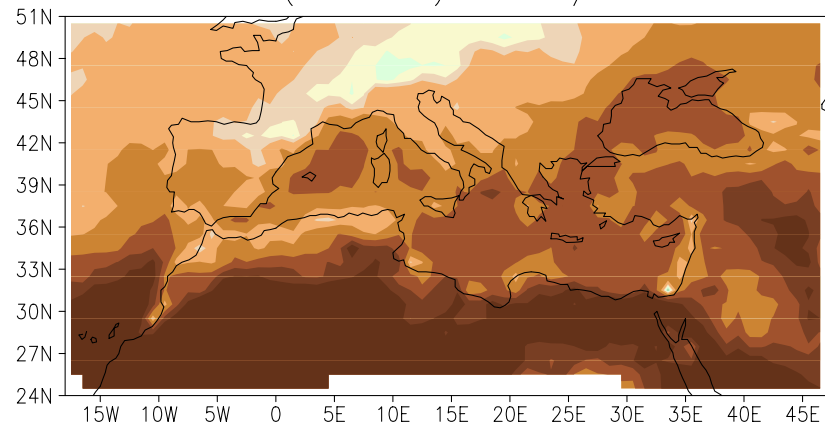
GRADS: COLA/IGES

Dry Spell Length Index (CDD)

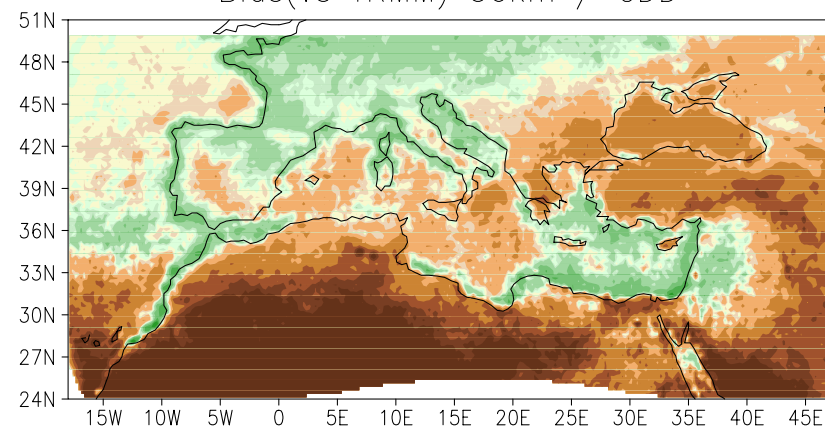




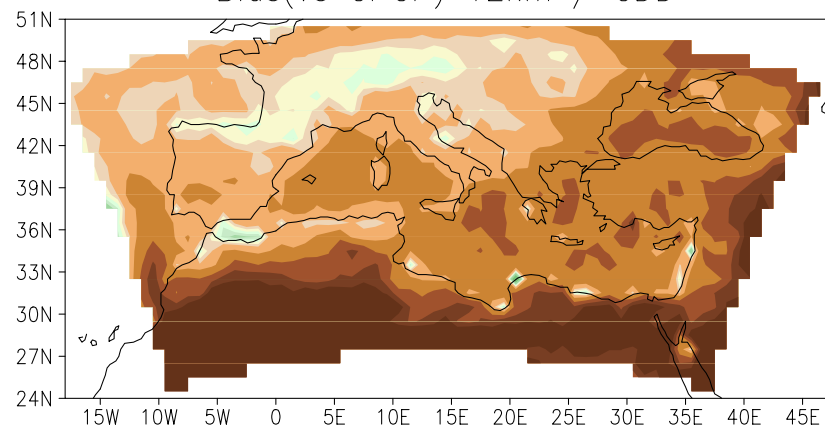
Bias(vs GPCP) 50km / CDD



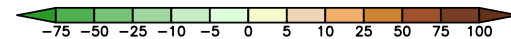
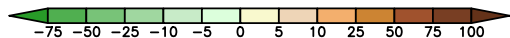
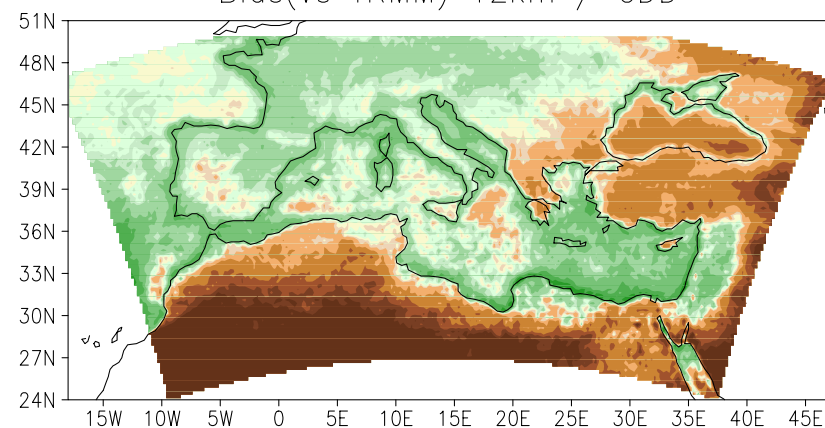
Bias(vs TRMM) 50km / CDD

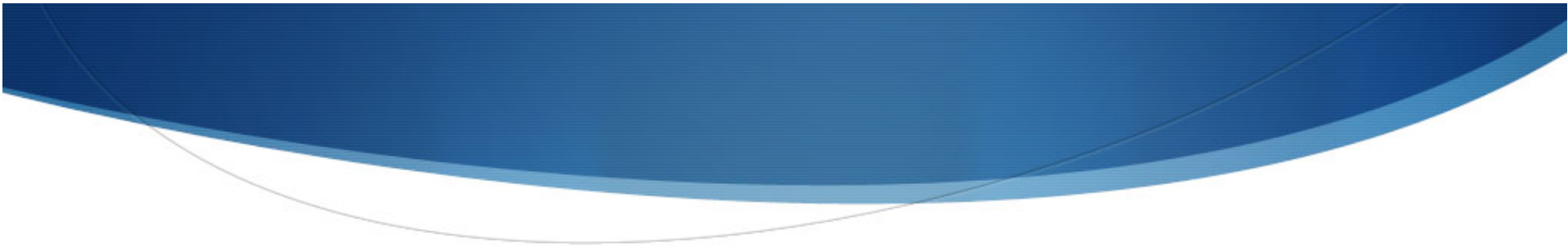


Bias(vs GPCP) 12km / CDD

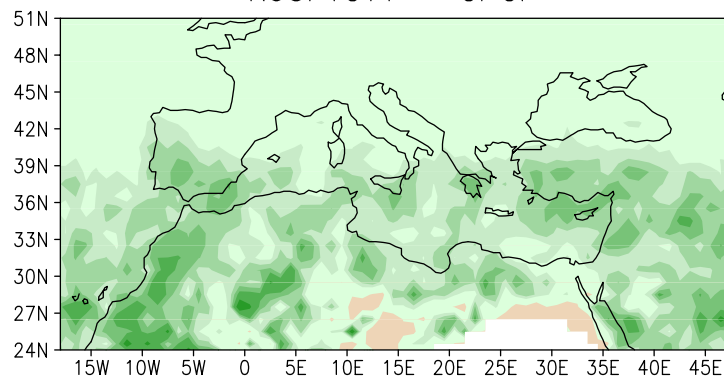


Bias(vs TRMM) 12km / CDD

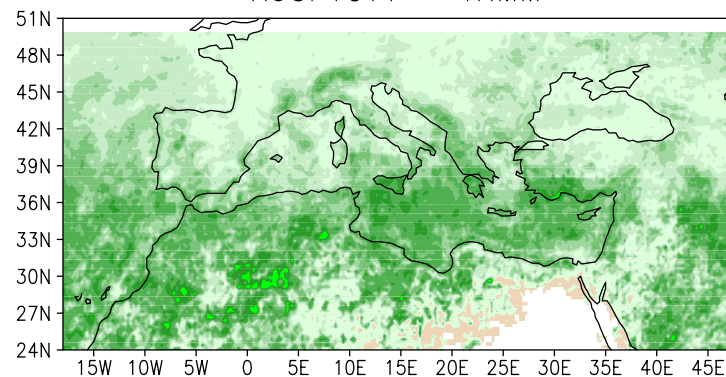




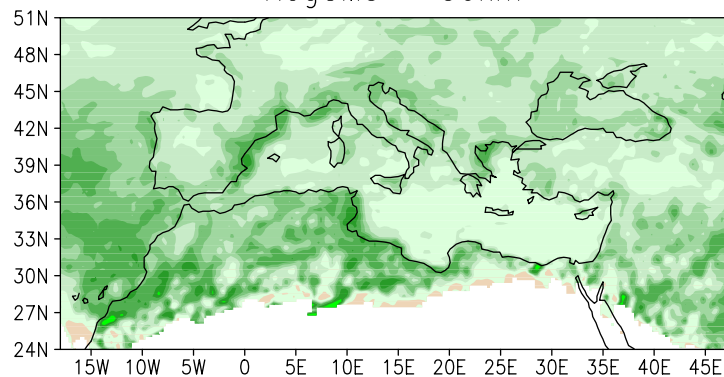
R95PTOT1 – GPCP



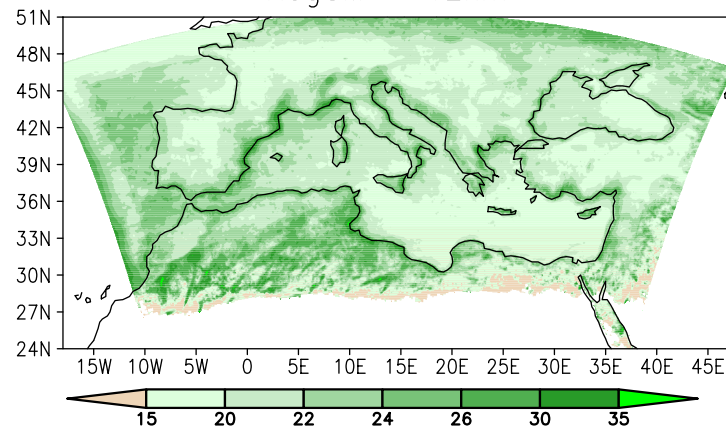
R95PTOT1 – TRMM



RegCMs – 50km

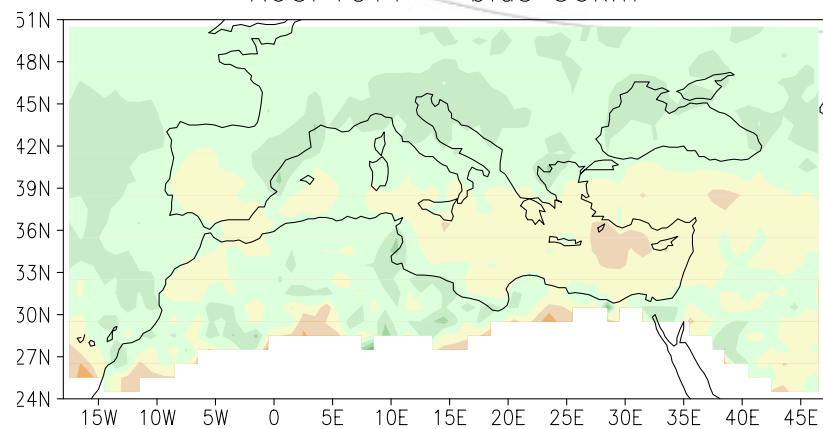


RegCM – 12km

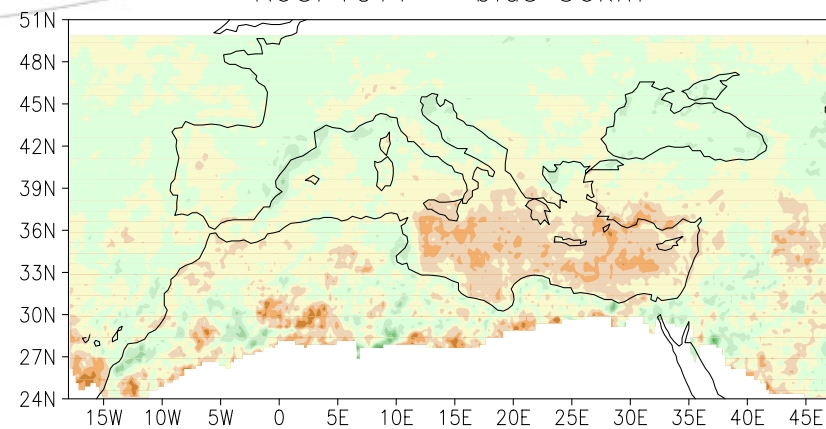




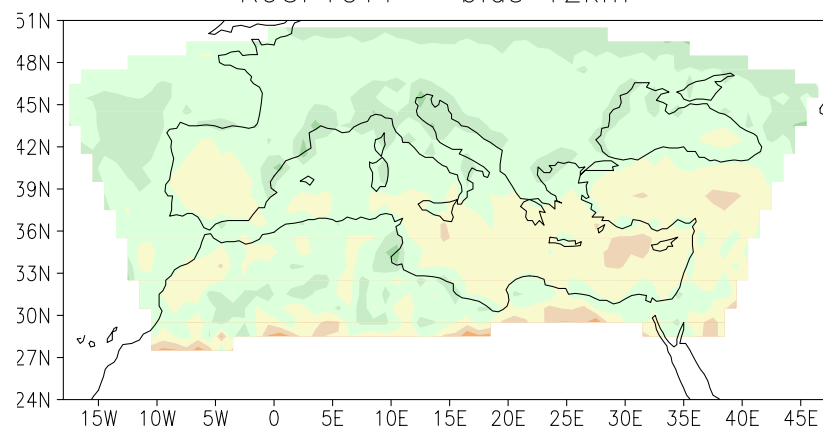
R95PTOT1 – bias 50km



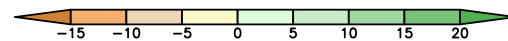
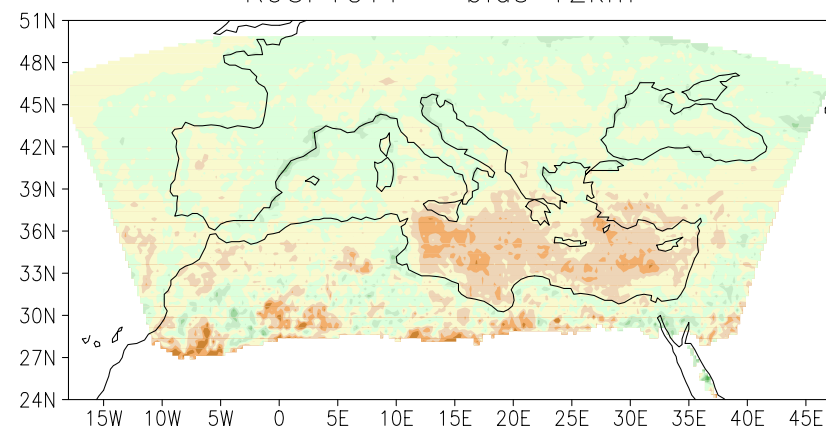
R95PTOT1 – bias 50km

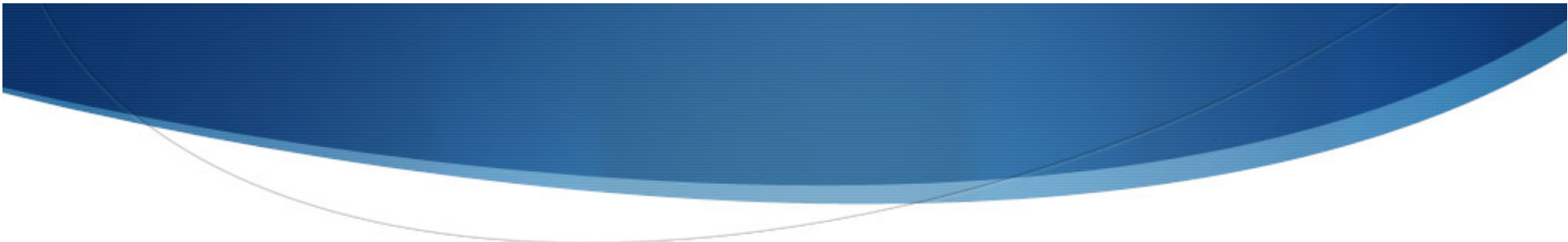


R95PTOT1 – bias 12km

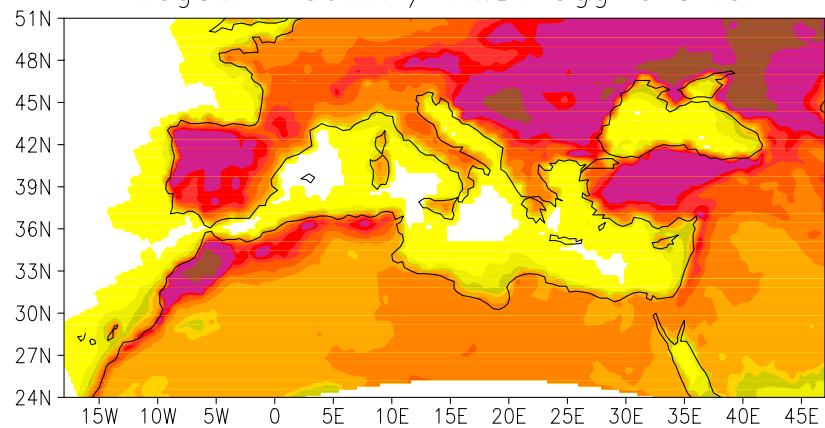


R95PTOT1 – bias 12km

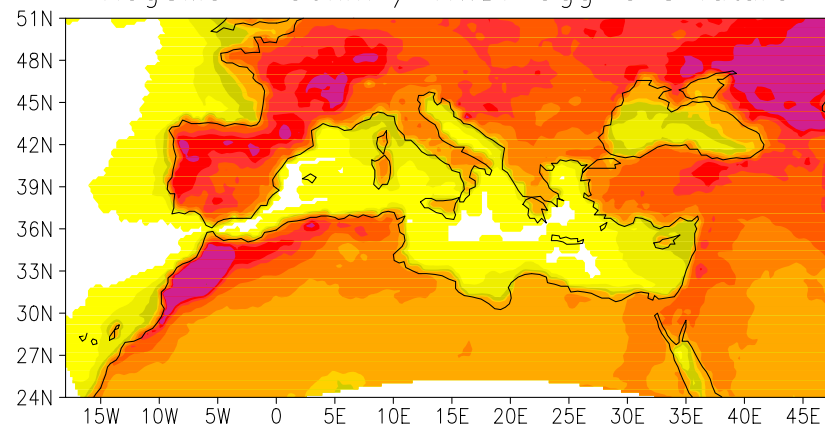




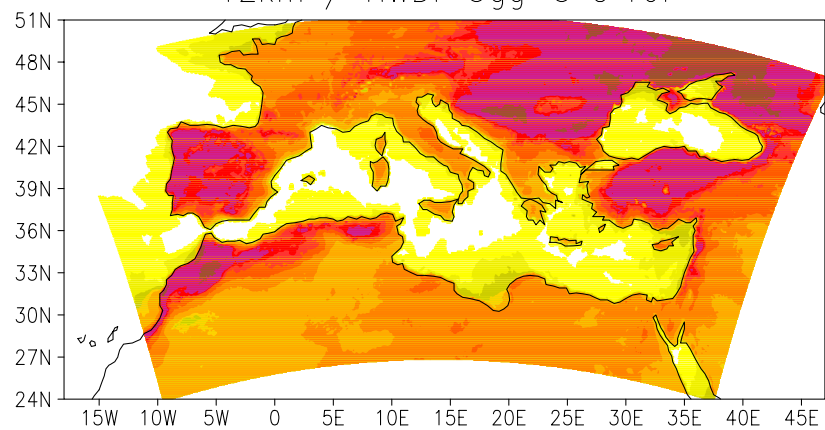
RegCM - 50km / HWDI-5gg-5°C ref



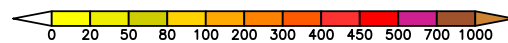
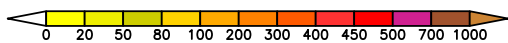
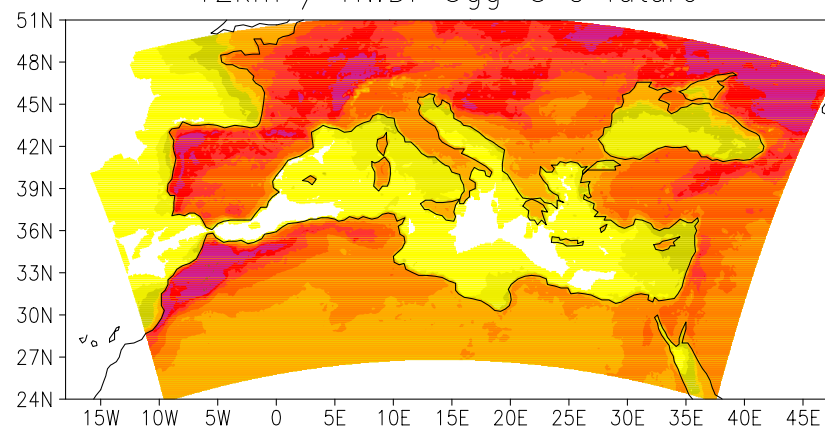
RegCMs - 50km / HWDI-5gg-5°C future



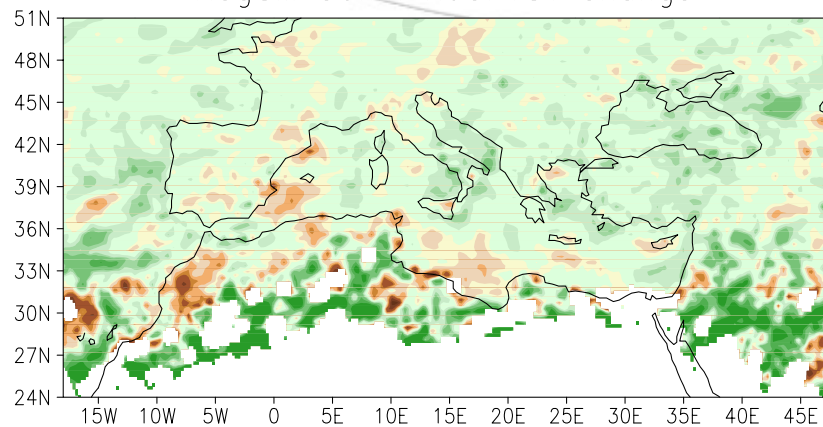
12km / HWDI-5gg-5°C ref



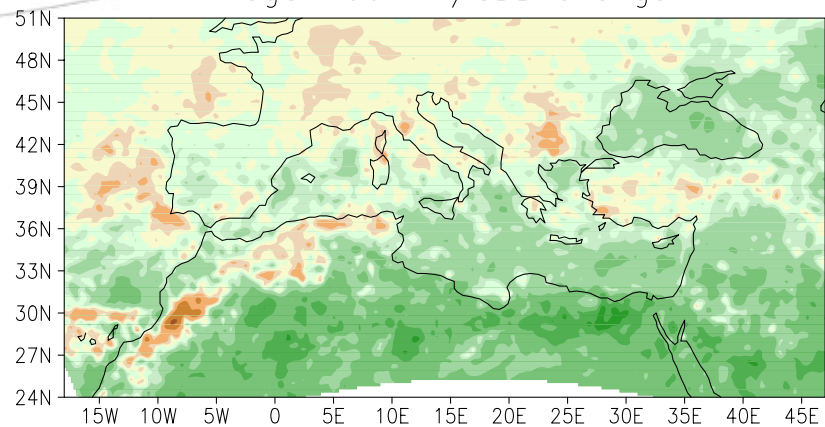
12km / HWDI-5gg-5°C future



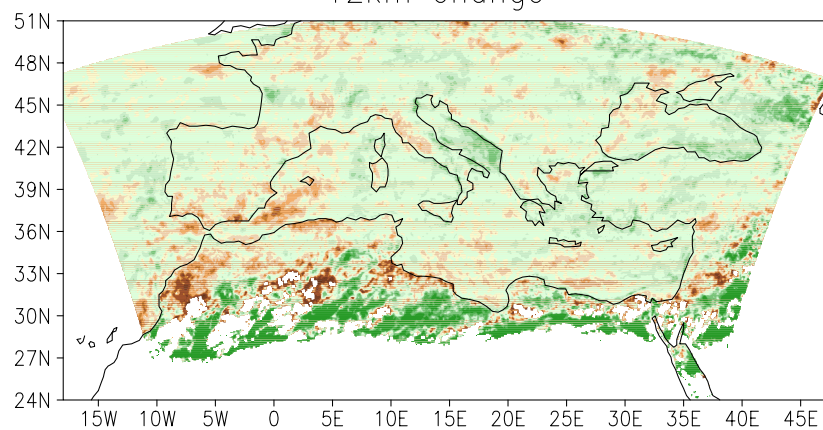
RegCM 50km R95PTOT change



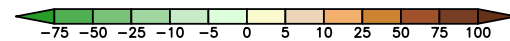
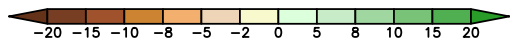
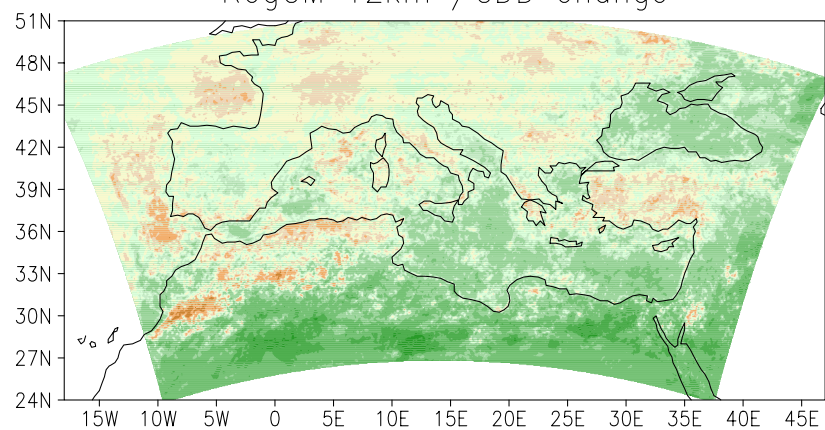
RegCM 50km /CDD change



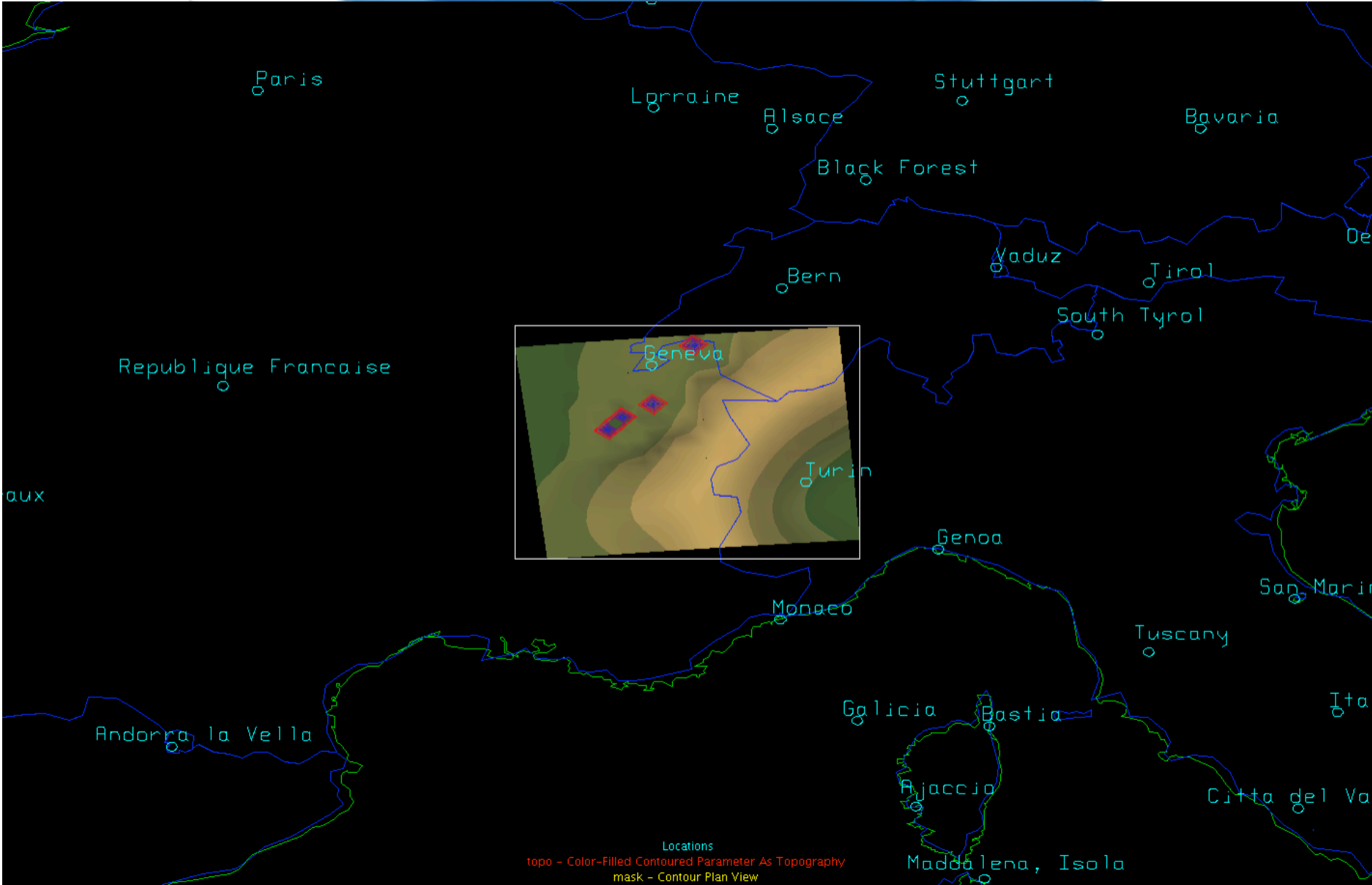
12km change

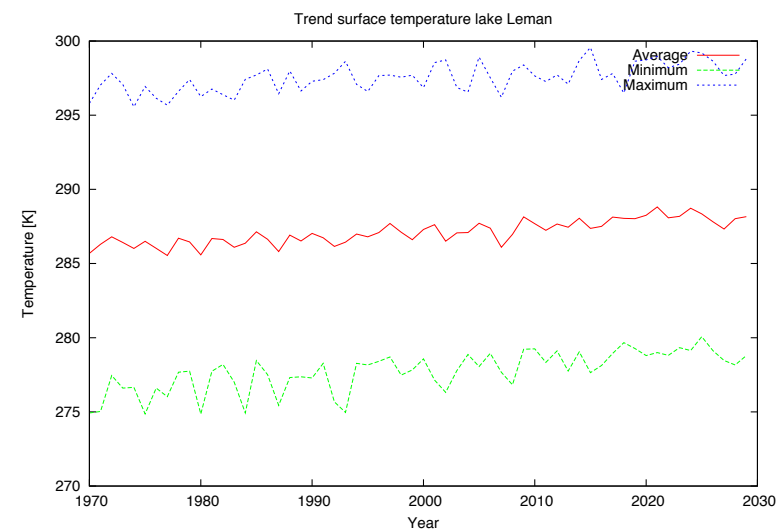
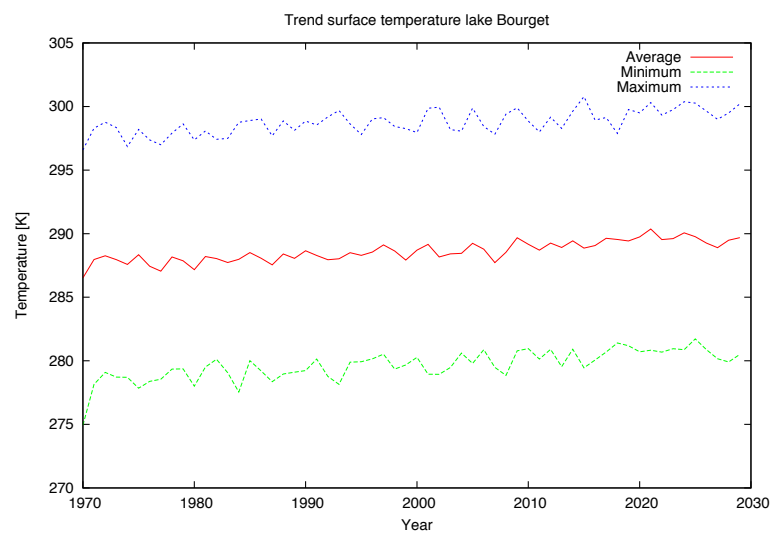
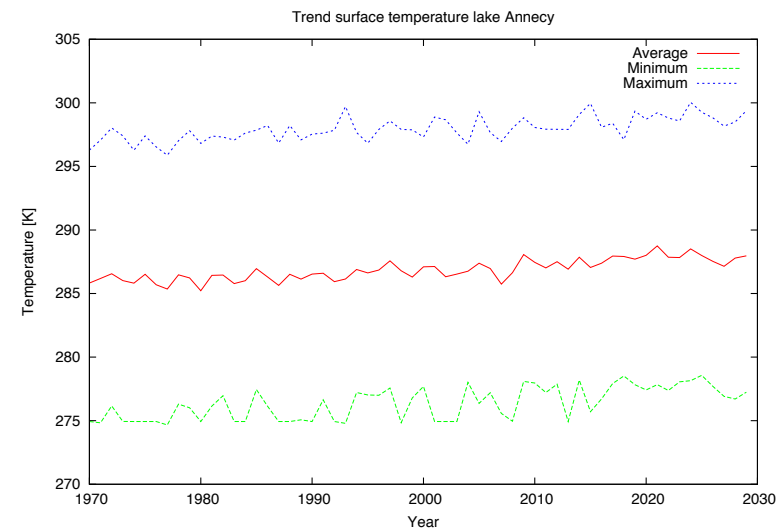
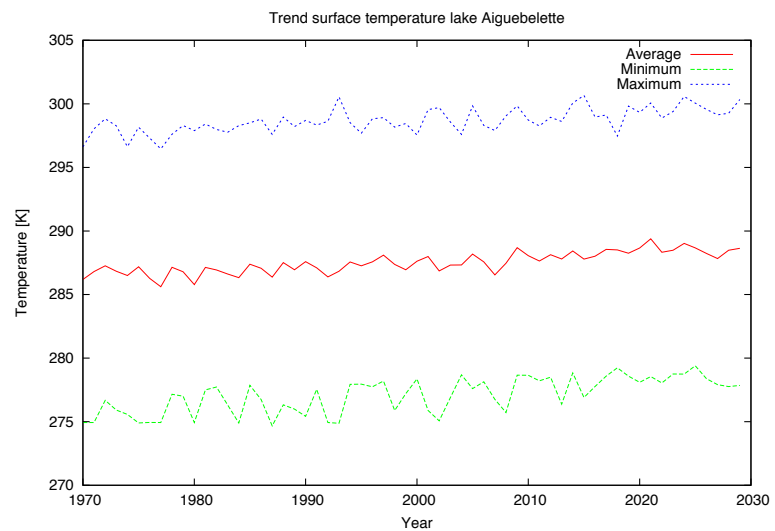
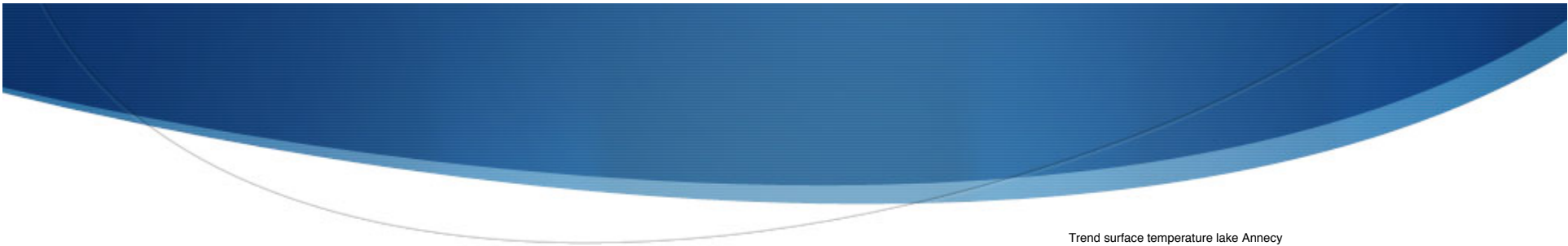


RegCM 12km /CDD change



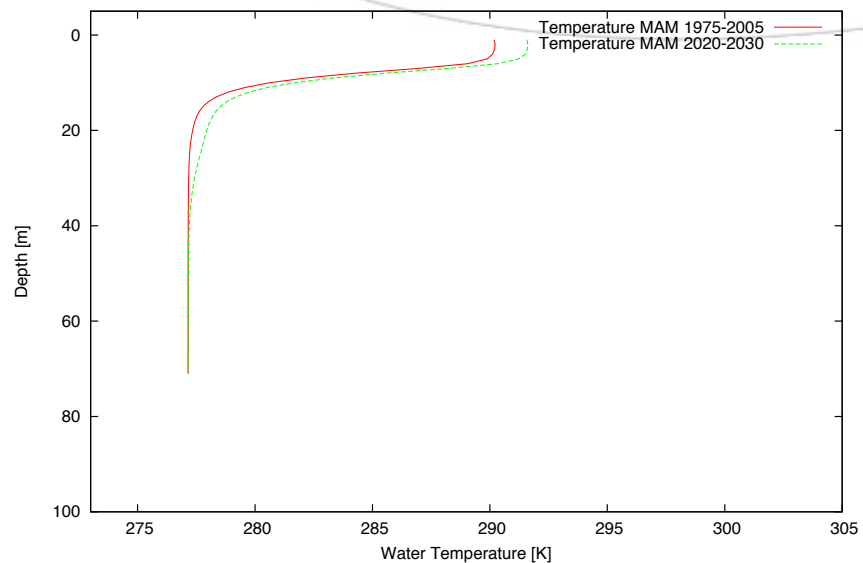
Case studies: Savoie lakes



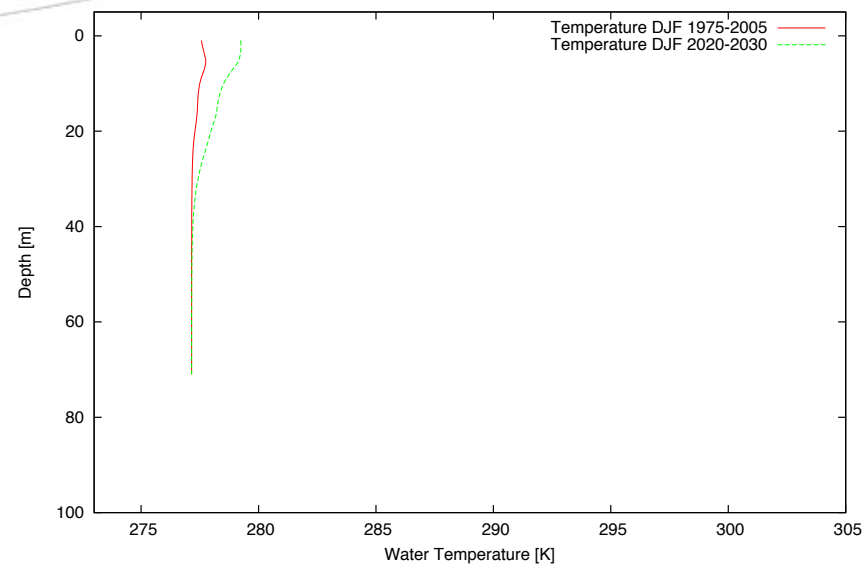




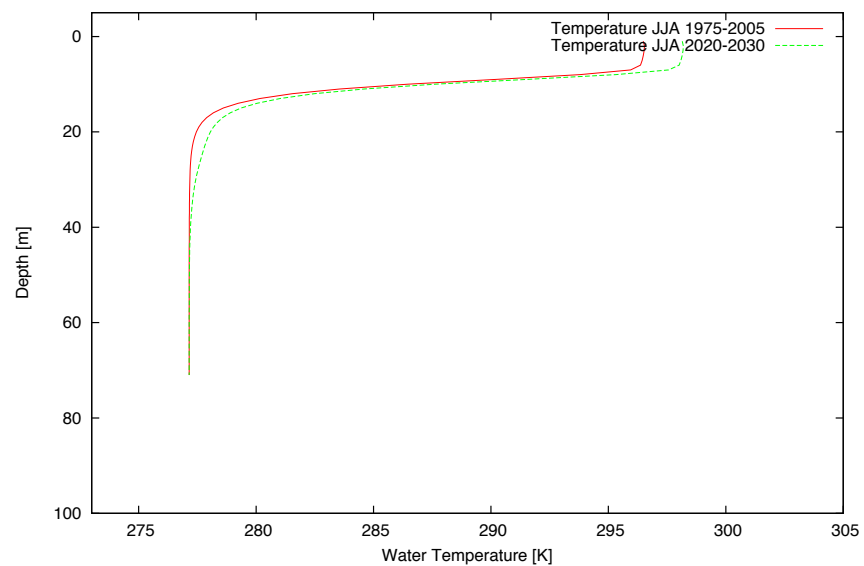
Change of lake Aiguebelette Temperature in MAM



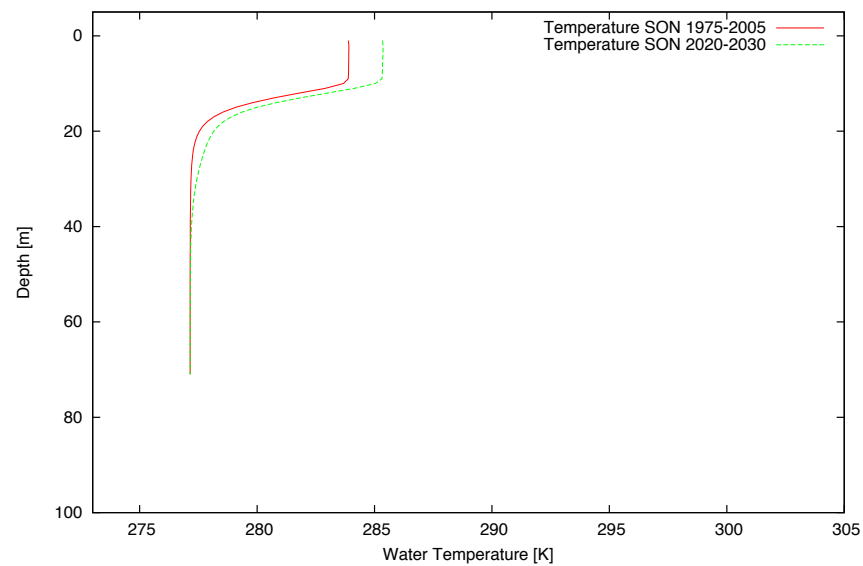
Change of lake Aiguebelette Temperature in DJF

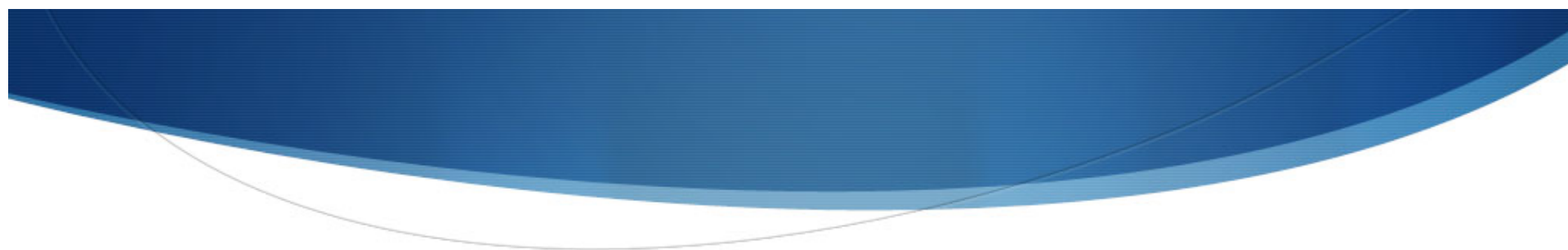


Change of lake Aiguebelette Temperature in JJA

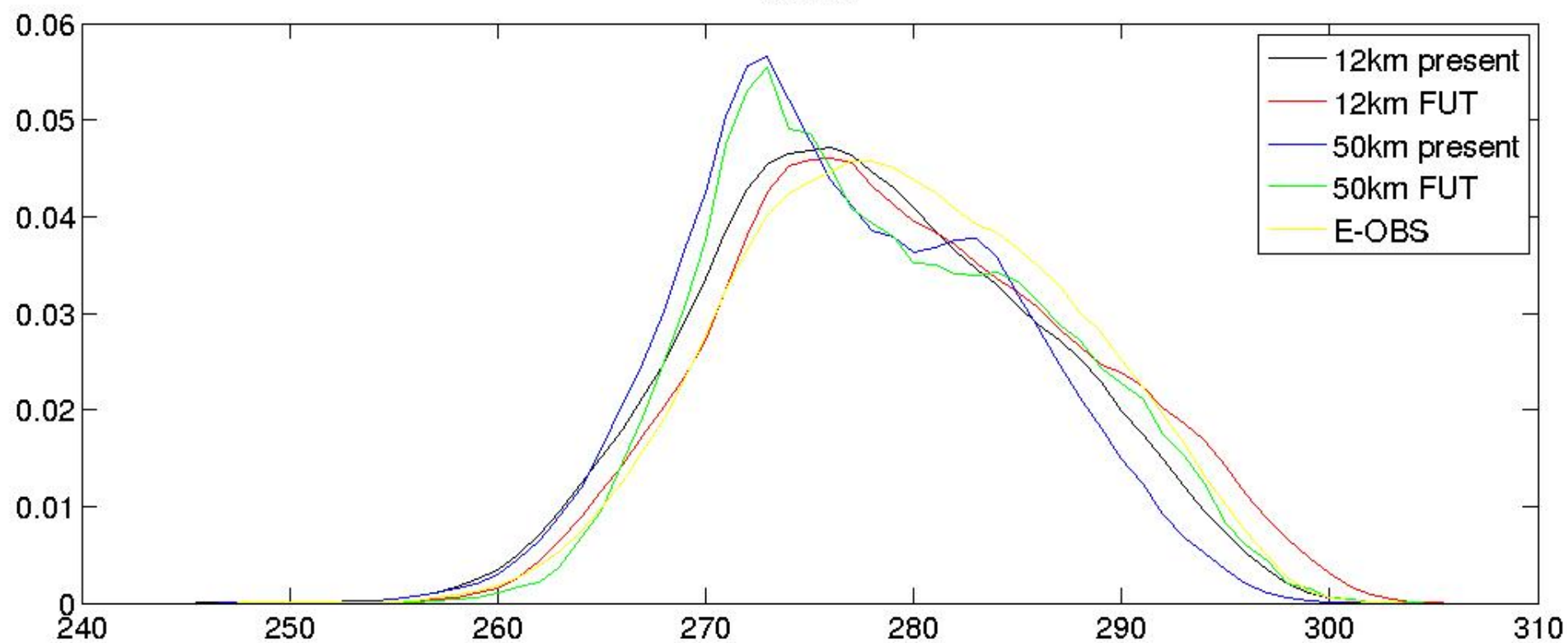


Change of lake Aiguebelette Temperature in SON

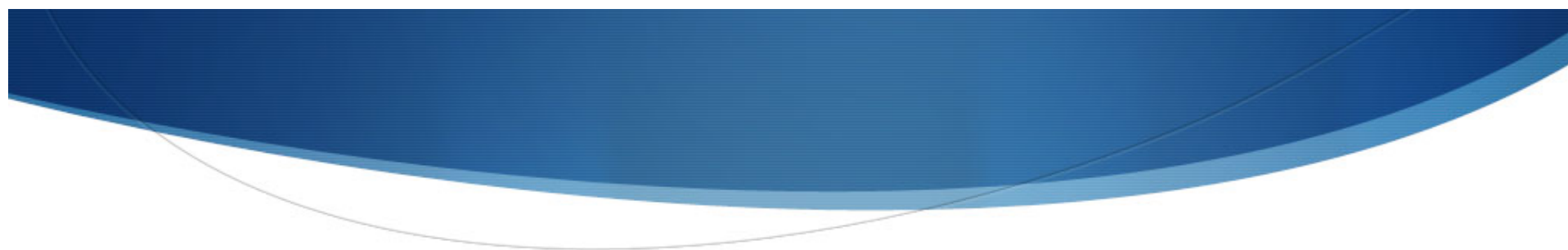




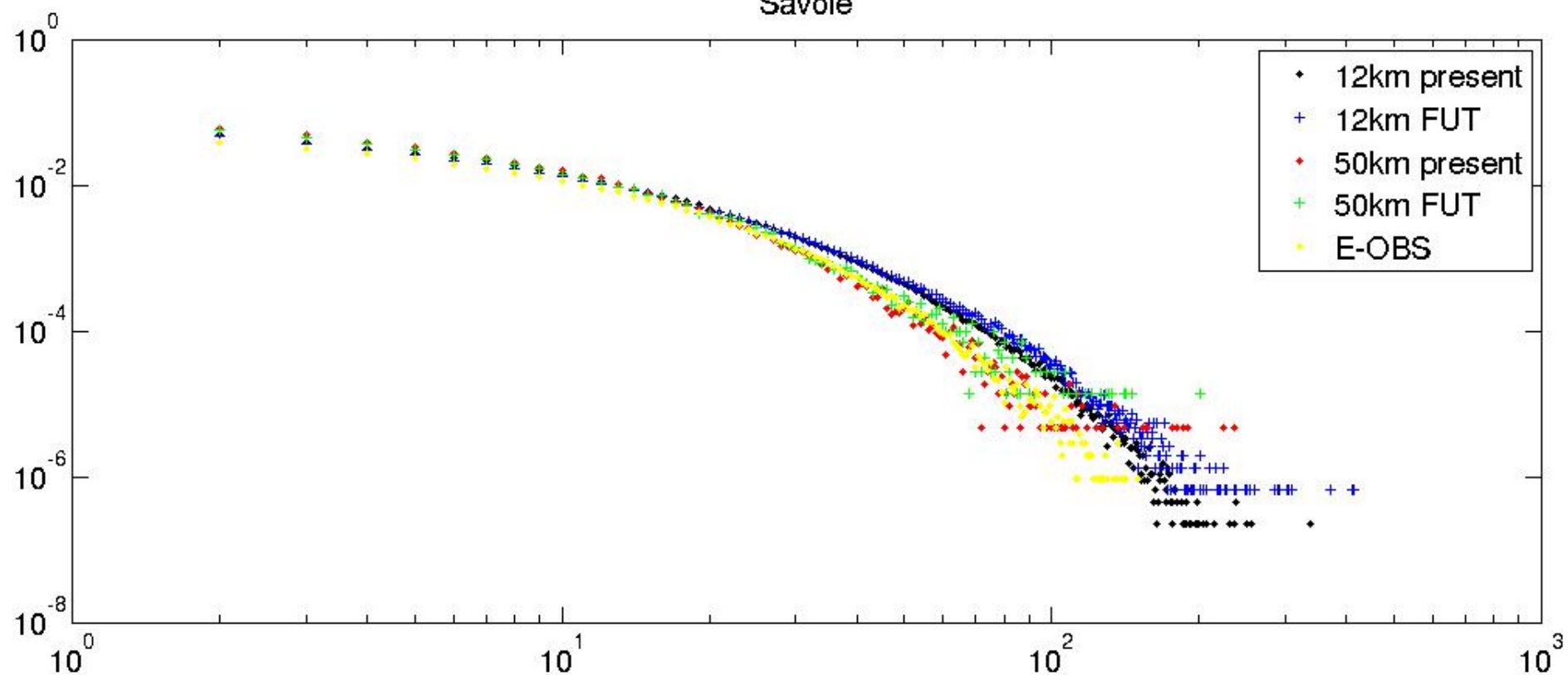
Savoie



Temperature [K]

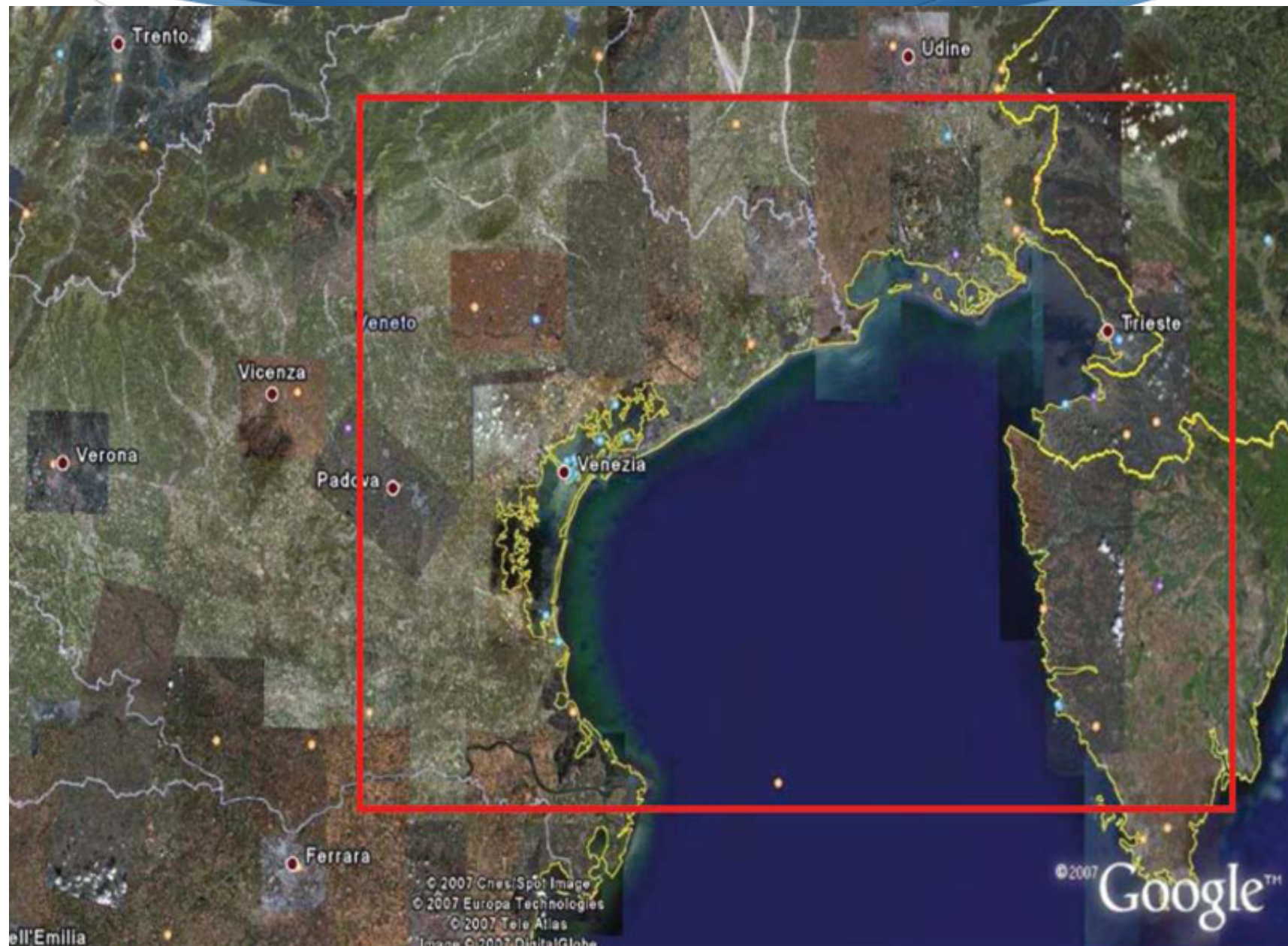


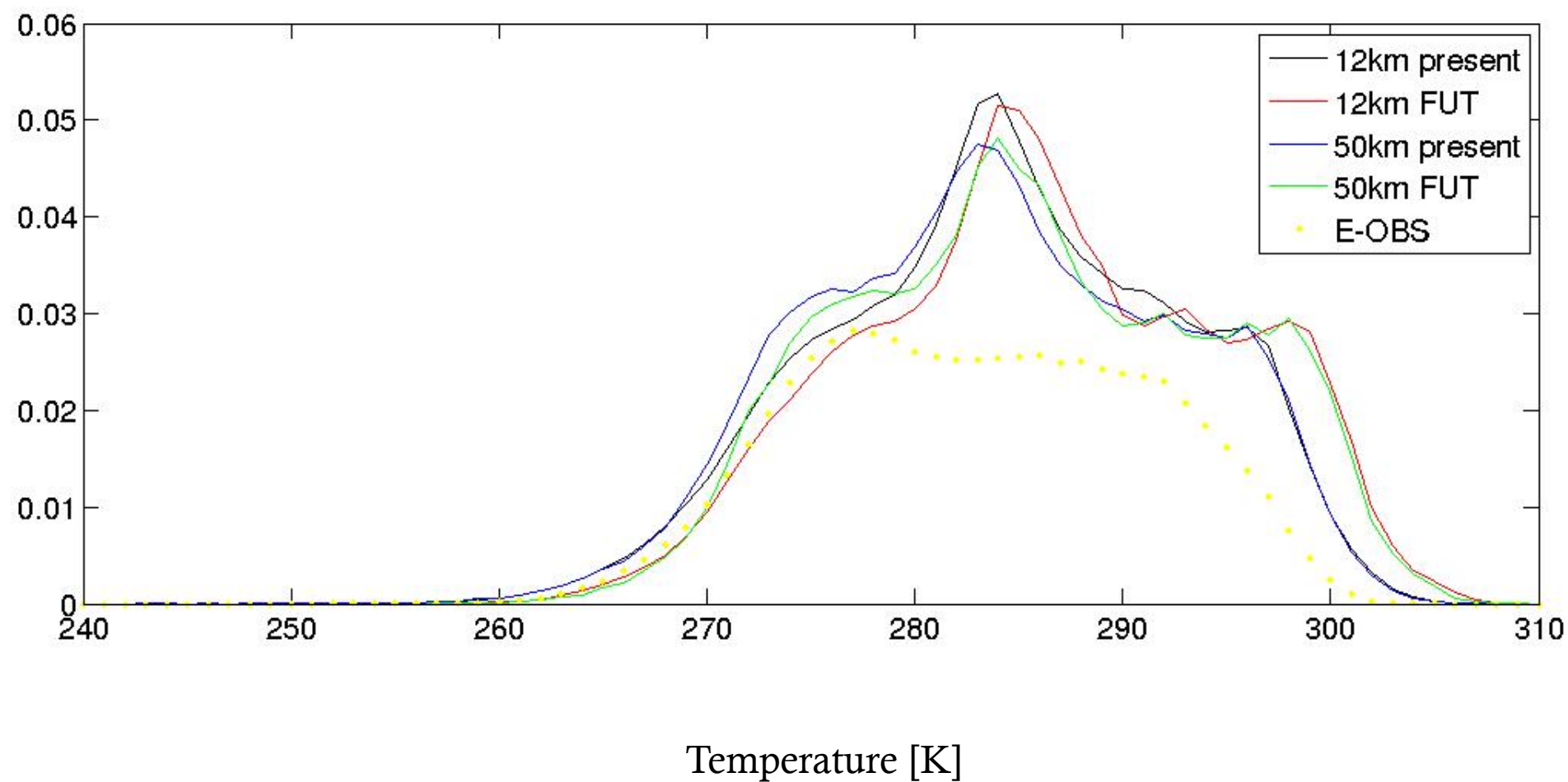
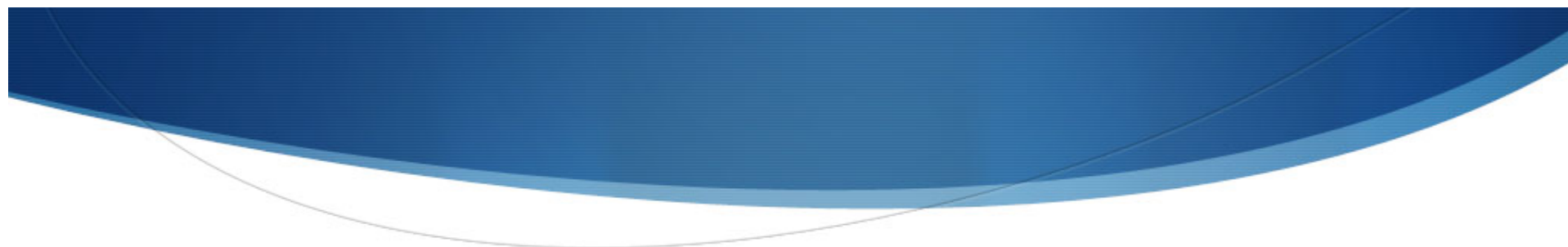
Savoie



Precipitation [mm/d]

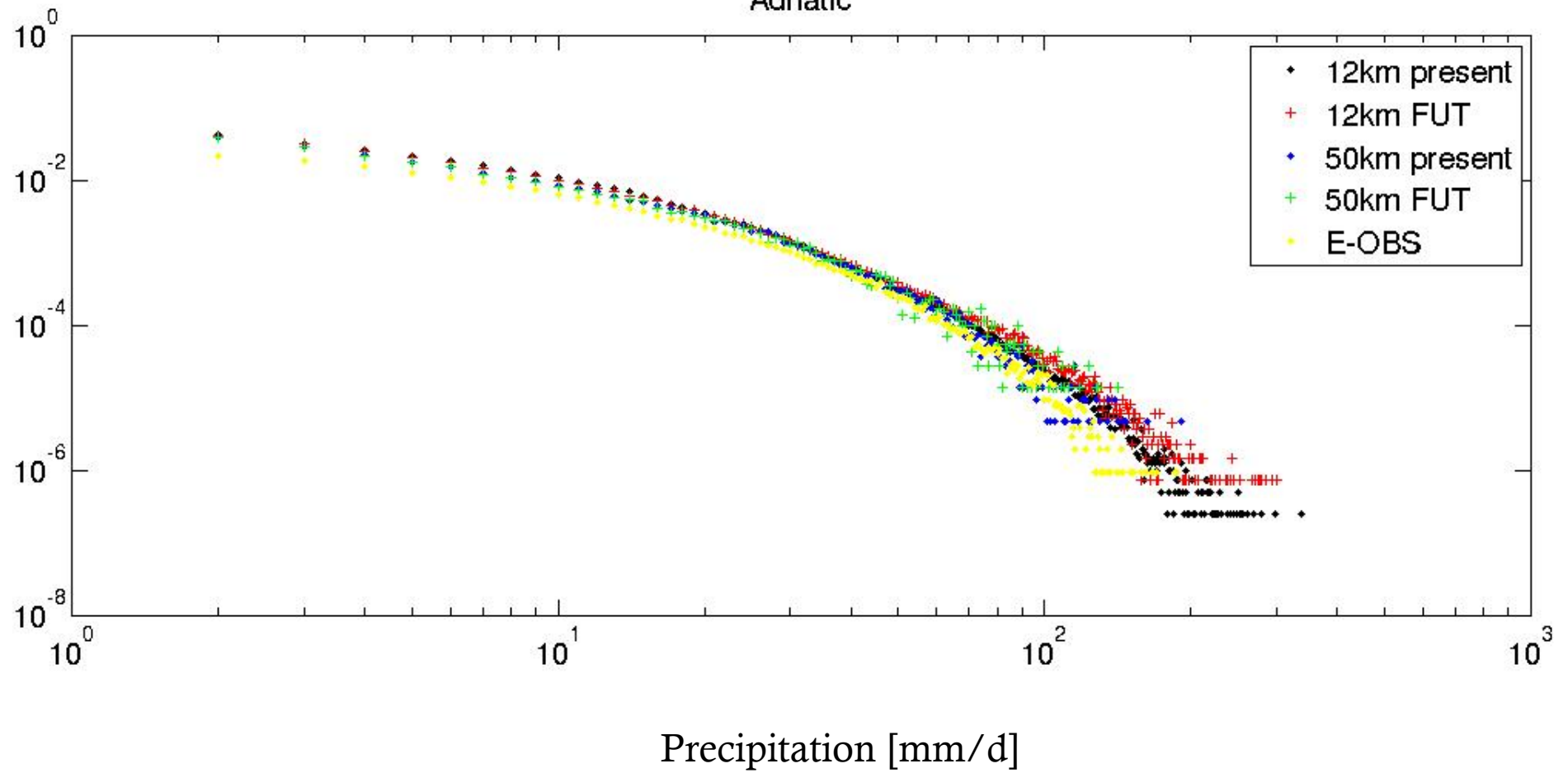
Case studies: North Adriatic Sea





Adriatic

Adriatic



2nd CLIMRUN training school

2-6 December 2013 at
Adriatico, Giambiagi Lecture Hall (80 seats) see
link:<http://www.ictp.it/visit-ictp/at-ictp/lecture-rooms.aspx#Giambiagi>
and the bigger informatics lab (max 50 seats).

participants (32 people) of the 1st school and the budget, we spent 11,261 EUR, so we
have 38,700 EUR left for the 2nd school

