

# ***Betekenis van de Regionale Atlas (IPCC AR5 projecties met RCPs) voor België - Waarnemingen in België***

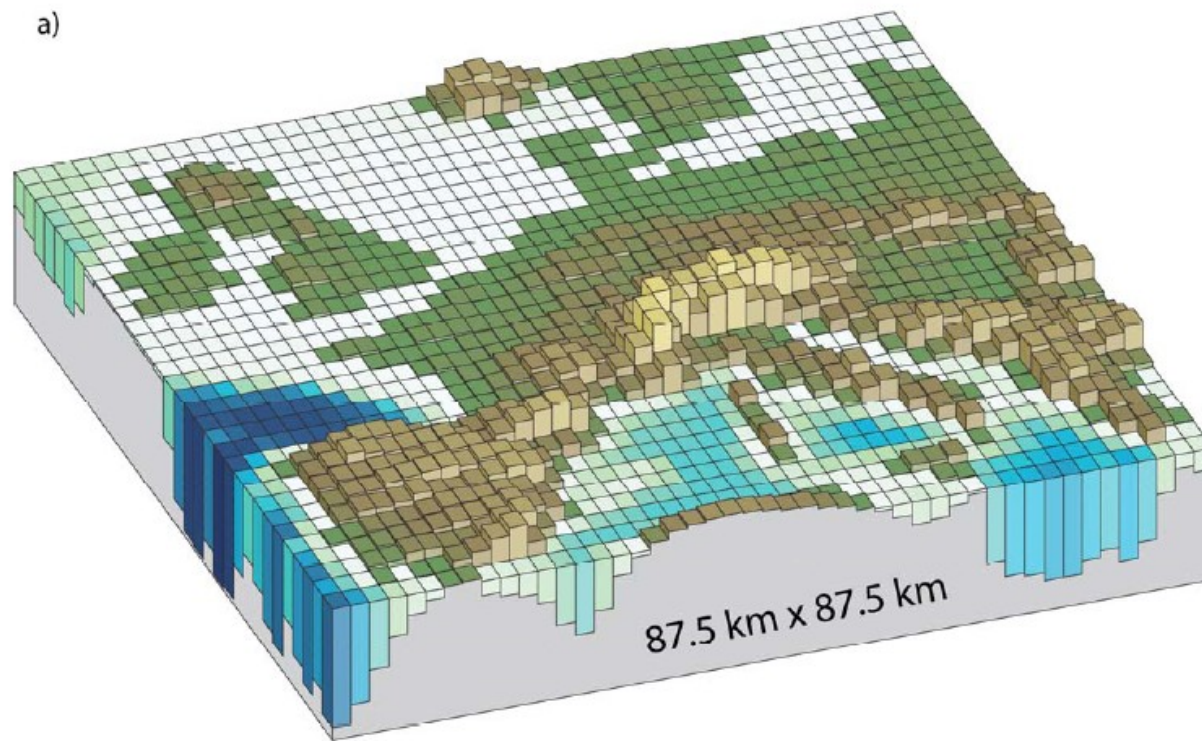
Piet Termonia



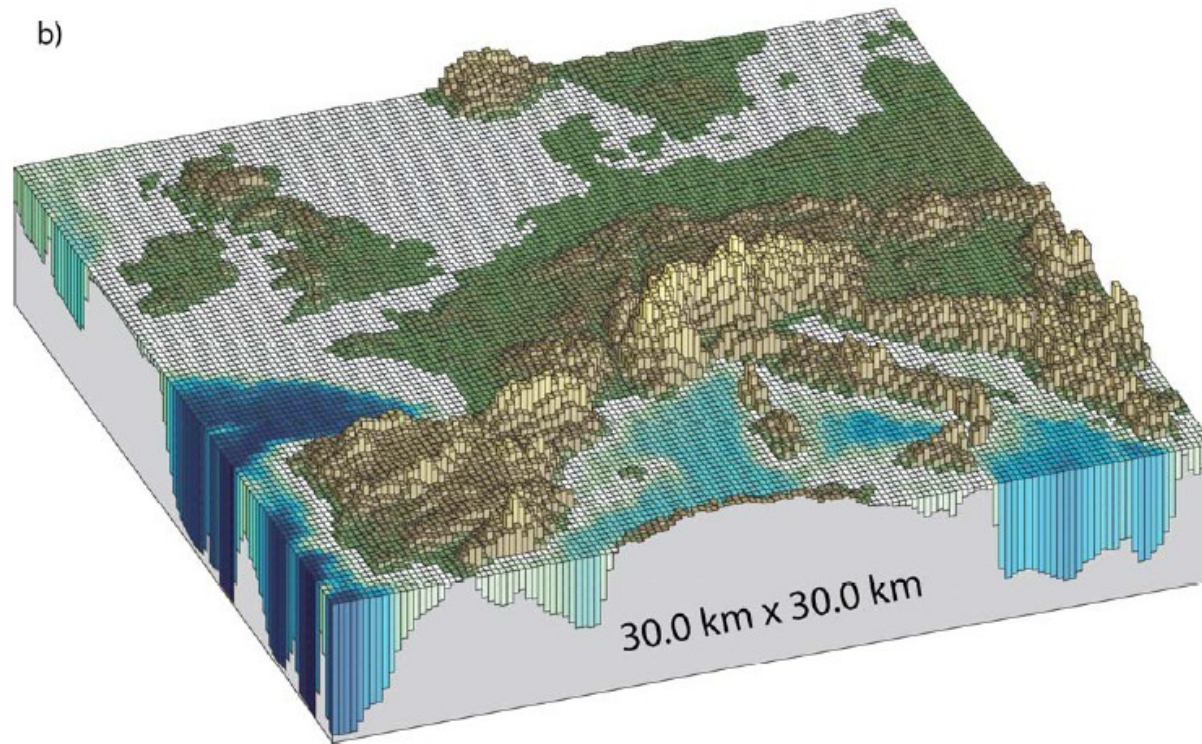
# Inhoud

- Computermodellen: waarom en hoe.
- Naar het regionale niveau:
  - AR5 regionale klimaatatlas
  - Belgische activiteiten
- Klimaatinformatie op basis van waarnemingen

a)



b)

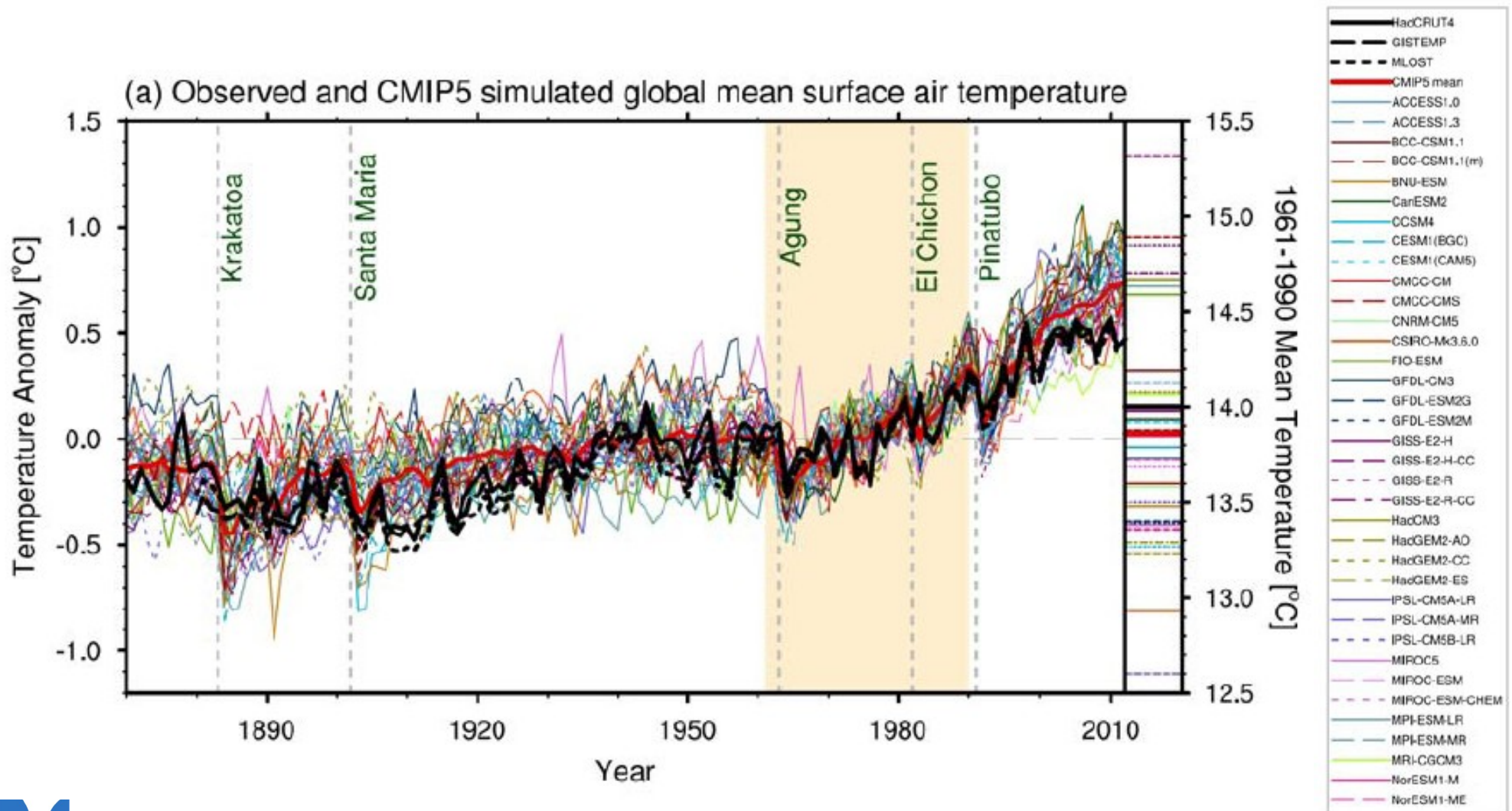


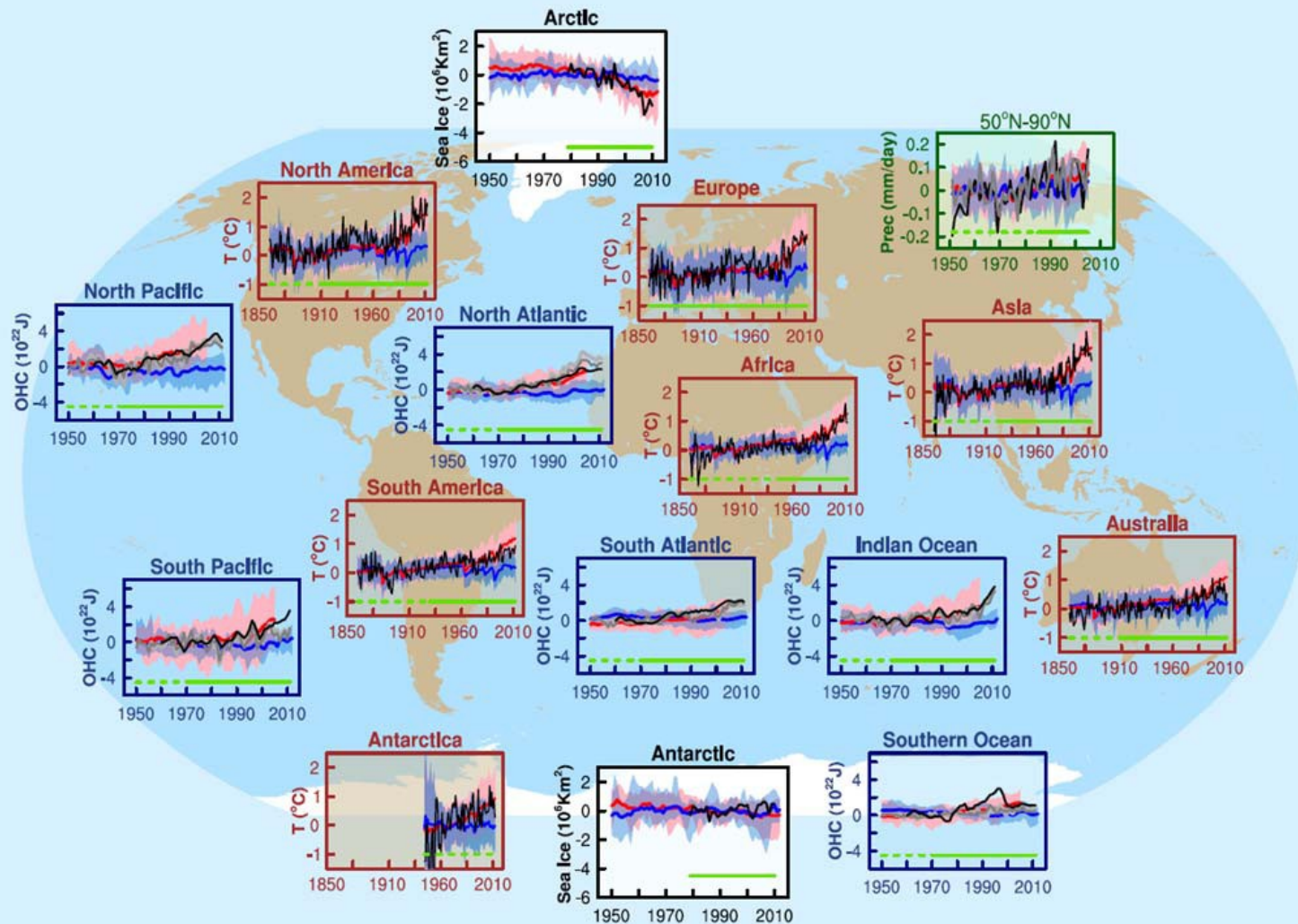
# Computersmodellen

- Computersmodellen zijn nodig voor beleidsvorming voor klimaatverandering.
- Modellen zijn een vereenvoudiging van de atmosfeer en hebben modelfouten.
- GCMs (Globale Circulatie Modellen) worden ontwikkeld in diverse onderzoekscentra in de wereld.
- Door ze te combineren in projecties kunnen we hun betrouwbaarheid inschatten. Dit werd uitgevoerd in het Coupled Model Intercomparison Project Phase 5 (CMIP5).
- Het is de (unieke) verdienste van het IPCC om de gecombineerde output bruikbaar te maken.

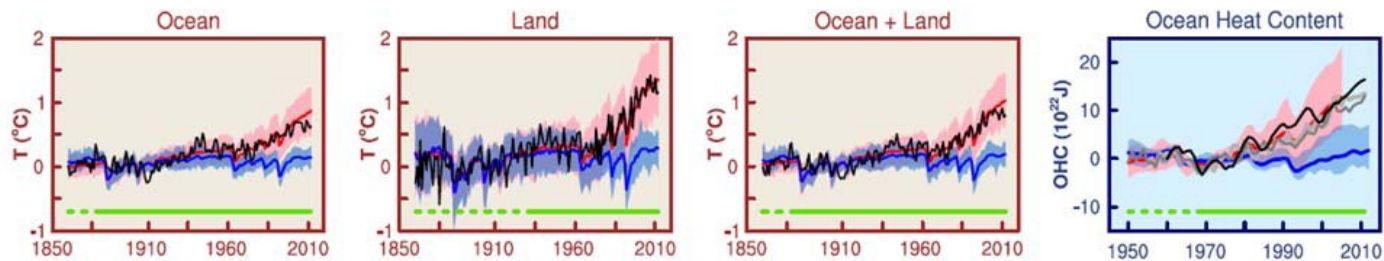


# Een ensemble van GCMs





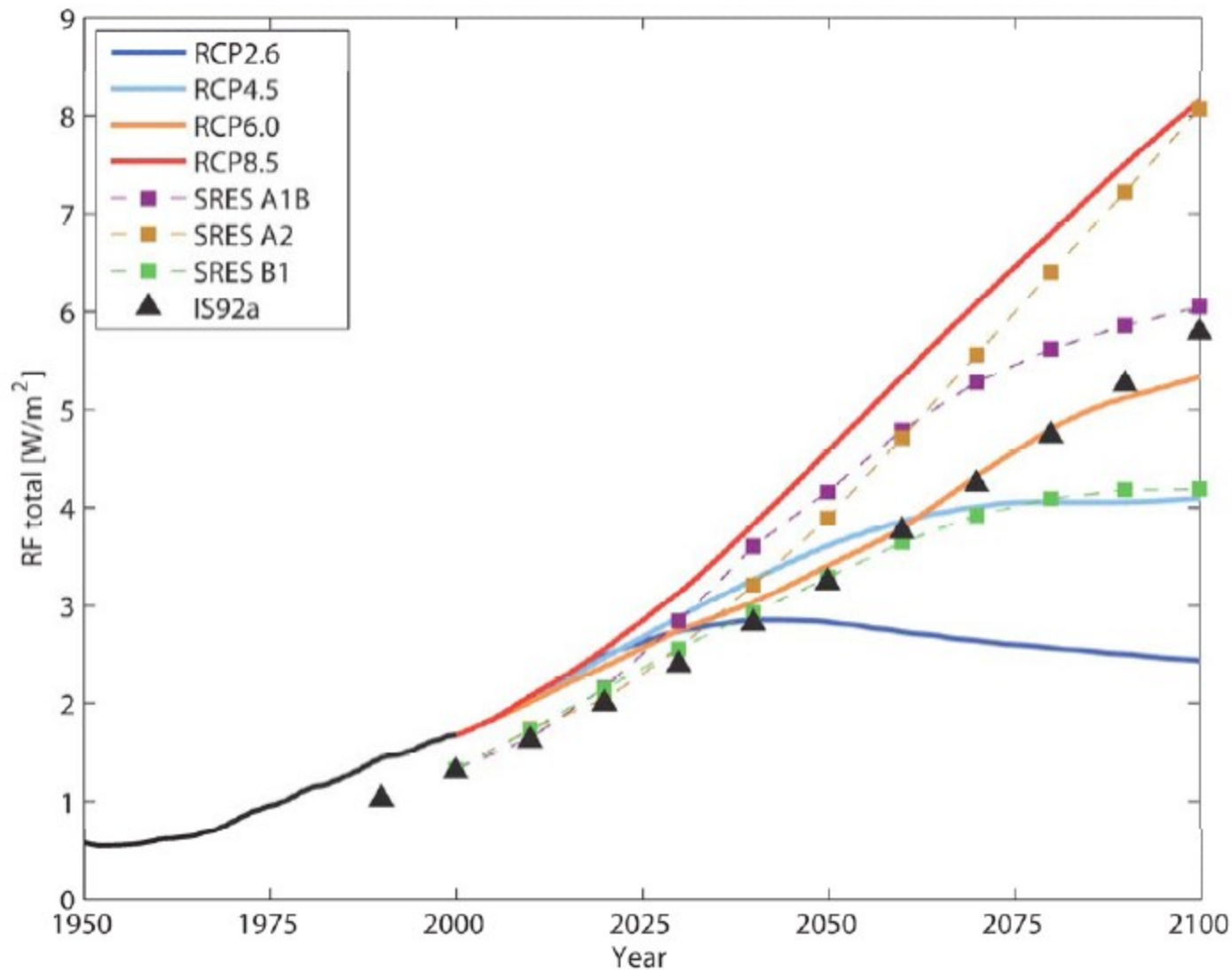
### Global



— Observations  
 ■ Models using only natural forcings  
 ■ Models using both natural and anthropogenic forcings

— OHC Levitus12  
 — OHC Ishii and Kimoto09 (updated)  
 — OHC Domingues08 (updated)

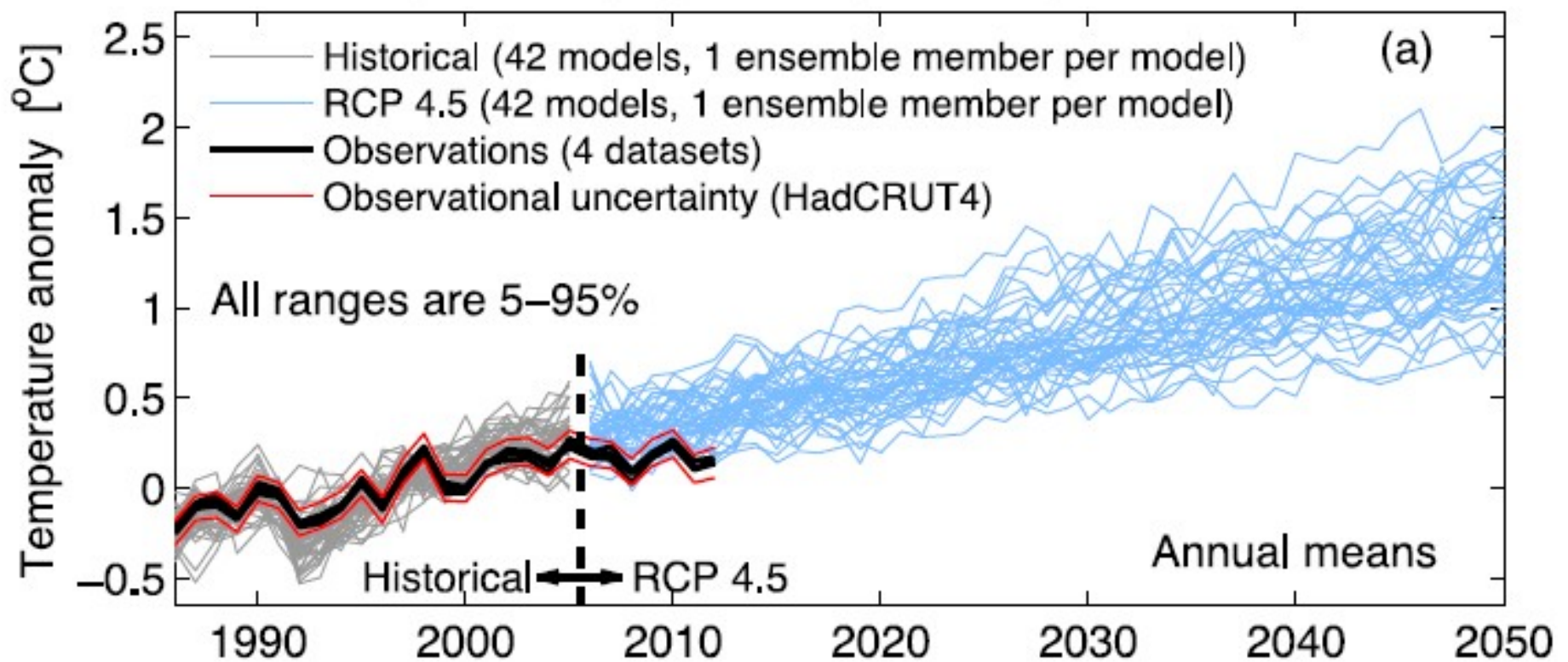
# Representatieve Concentratie Paden vs. Emissie scenario's



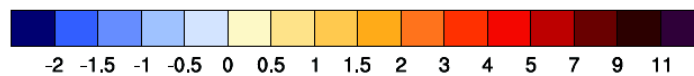
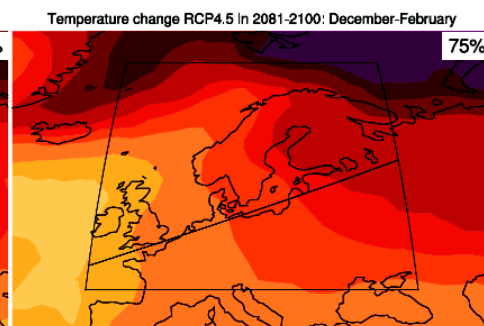
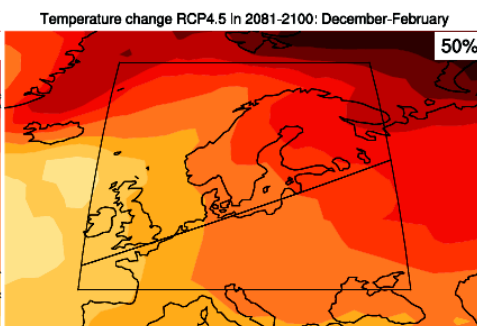
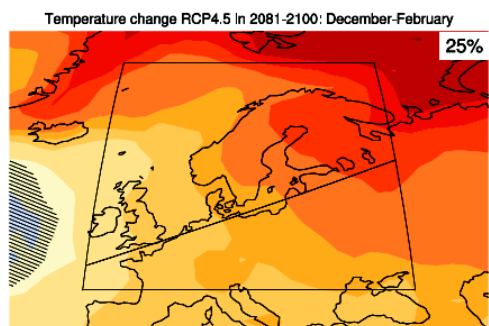
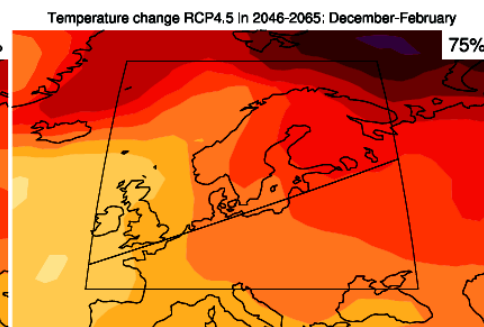
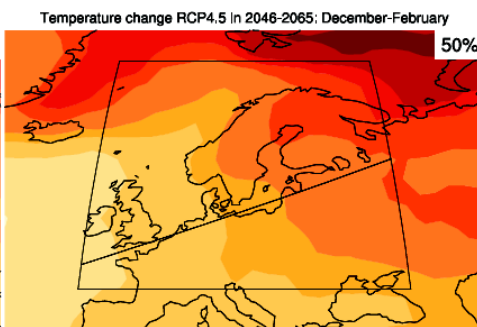
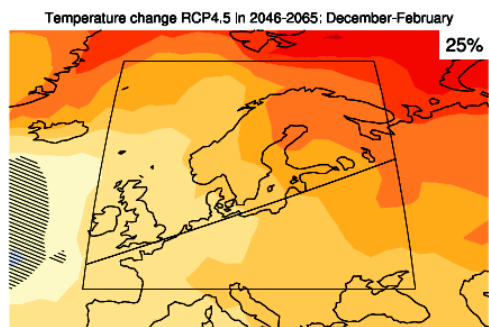
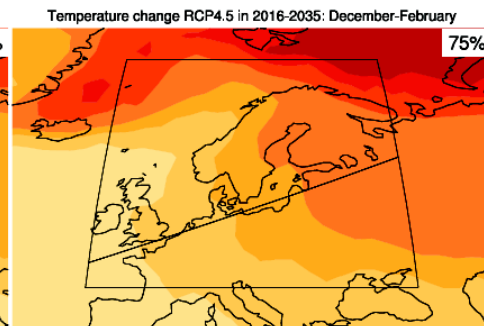
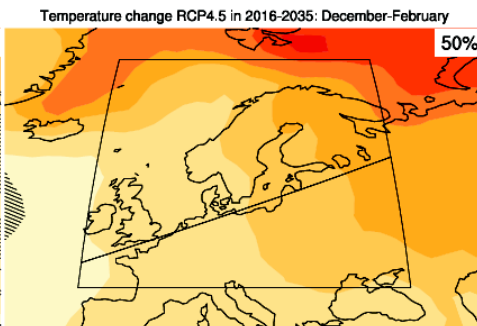
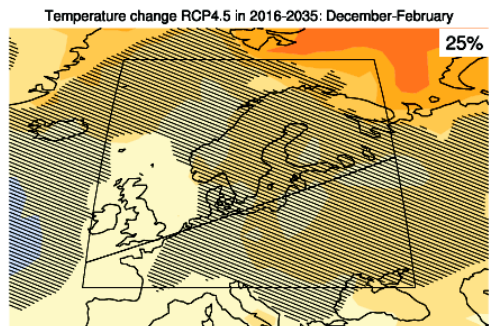
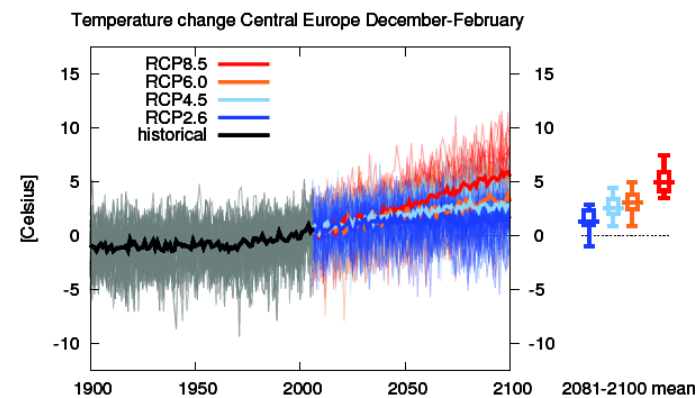
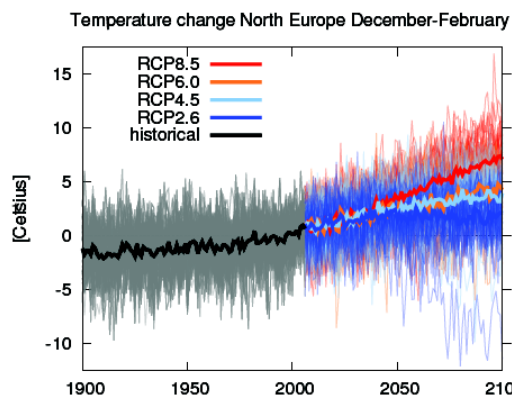


# Projections (RCP 4.5)

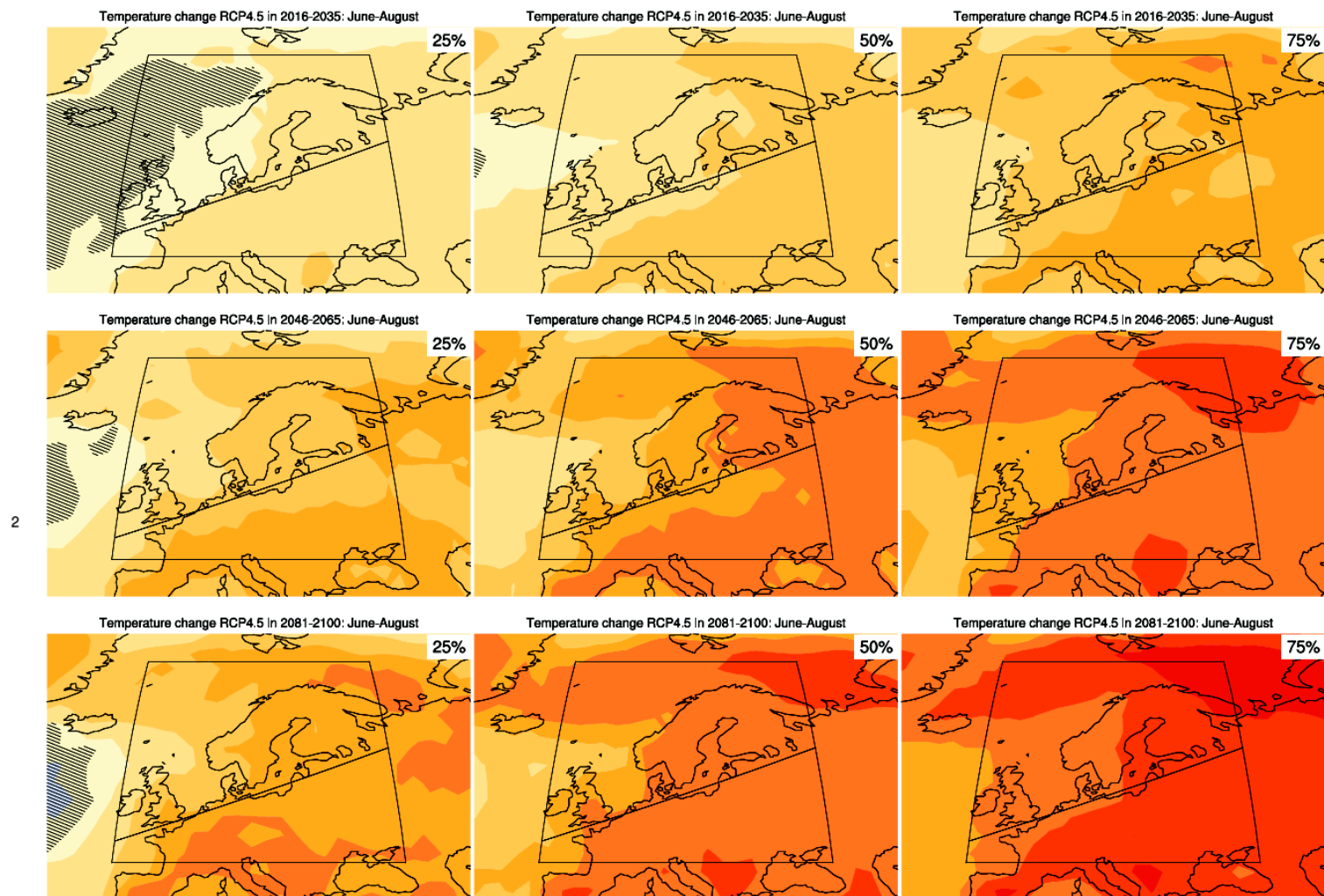
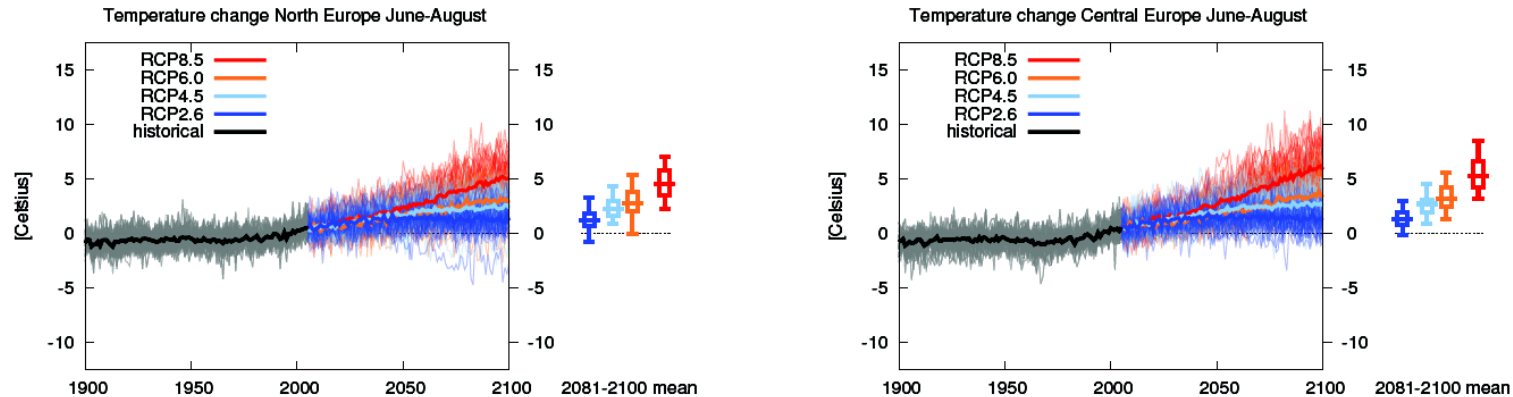
Global mean temperature projections (RCP 4.5), relative to 1986–2005





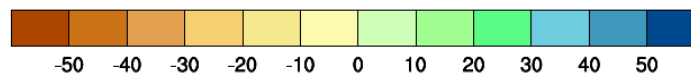
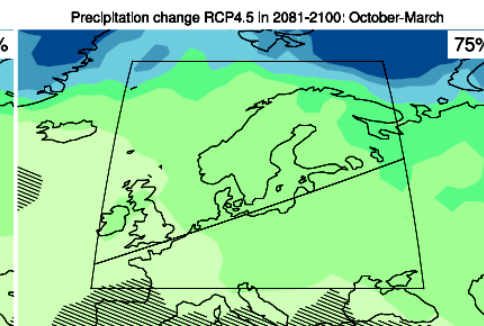
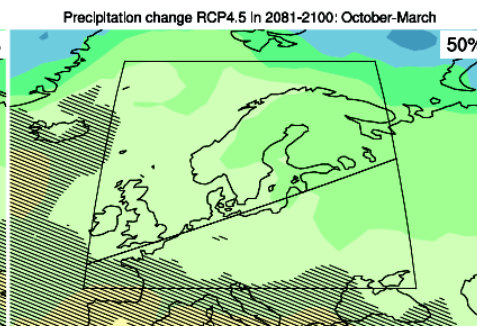
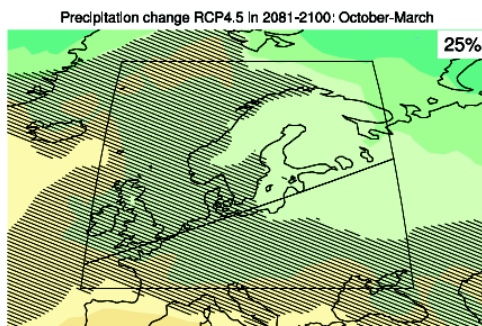
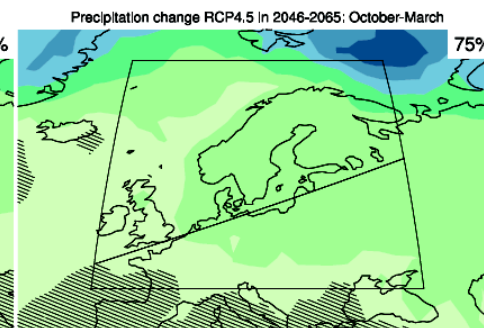
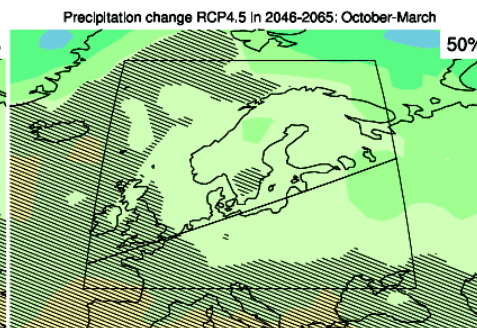
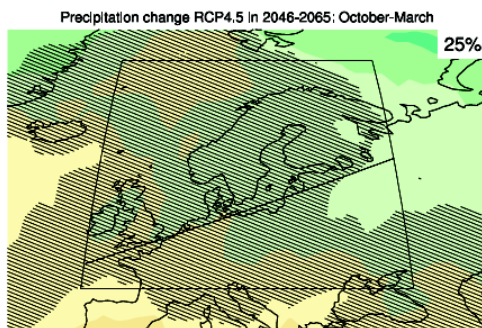
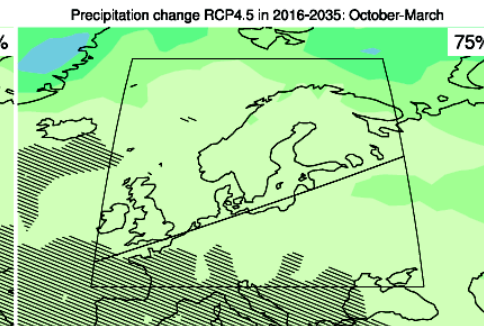
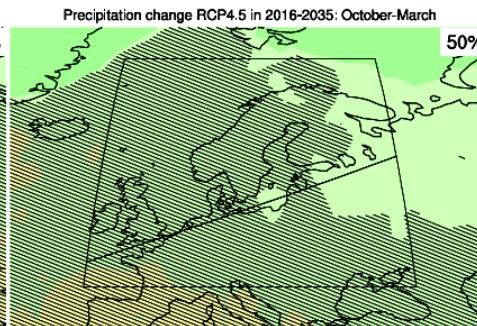
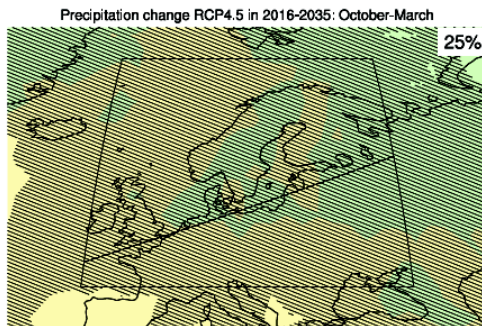
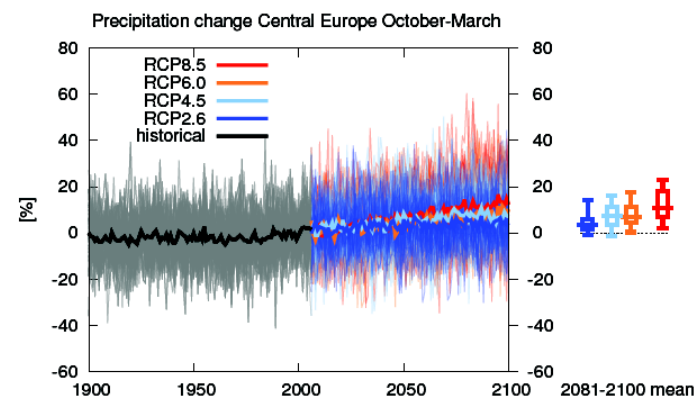
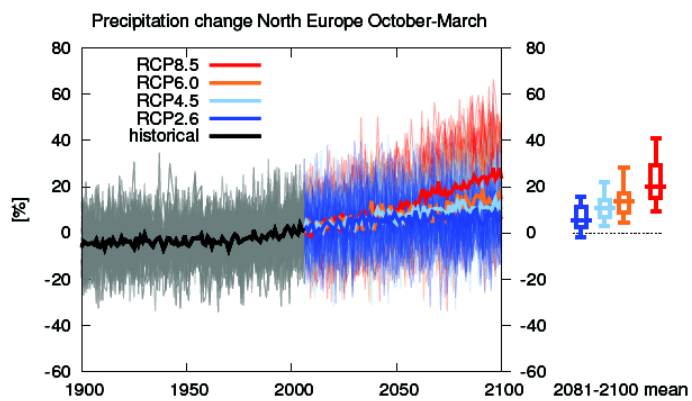


[°C]



[°C]





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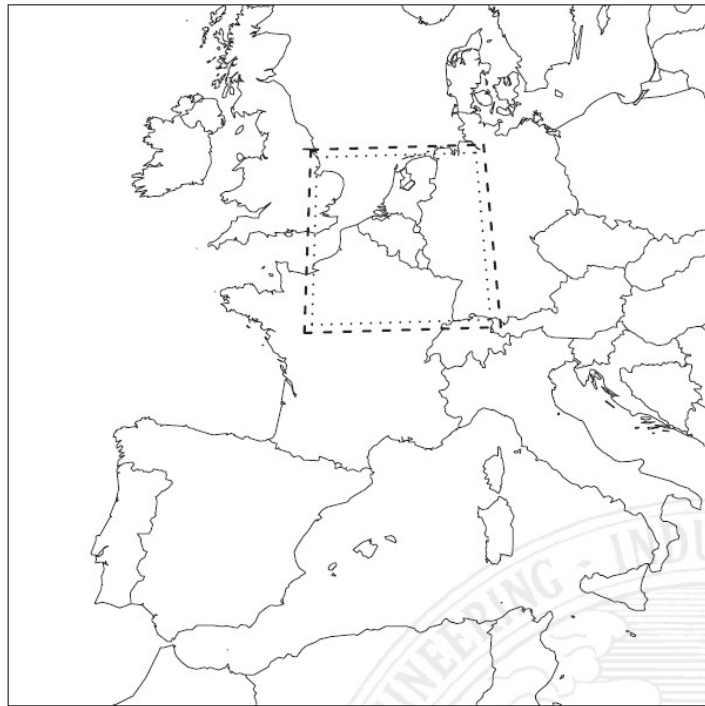
# Regionale klimaatmodellering in België

- Koninklijk Meteorologisch Instituut, KULeuven, MUMM (KBIN), UCL, UGent, VITO
- Activiteiten:
  - Klimaatscenario's berekenen met
    - Dynamische klimaat modellen
    - Statistische methoden (statistische downscaling)
  - Impact:
    - Extreme neerslag en overstromingen
    - hittegolven
    - stedelijke invloeden



# Regionale klimaatscenario's van hoge resolutie (3-4 km) KMI en KULeuven: technieken om in te “zoomen”

— 40 km domain    - - 25 km and 4 km domain    ···· 10 km domain

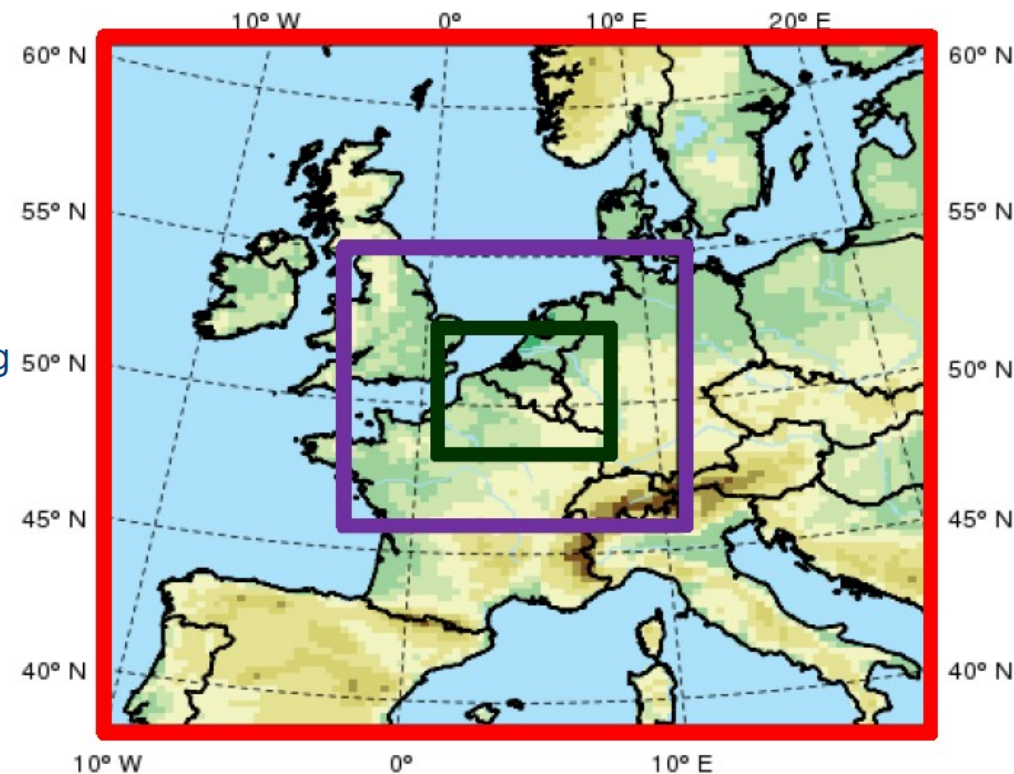


MACCBET runs:  
Driedubbele nesting  
strategie

Domein met:

-  25km celgrootte
-  7 km celgrootte
-  3 km celgrootte

FIG. 1. Domains corresponding to the different simulations at 40-km, 25-km, 10-km, and 4-km horizontal resolution.



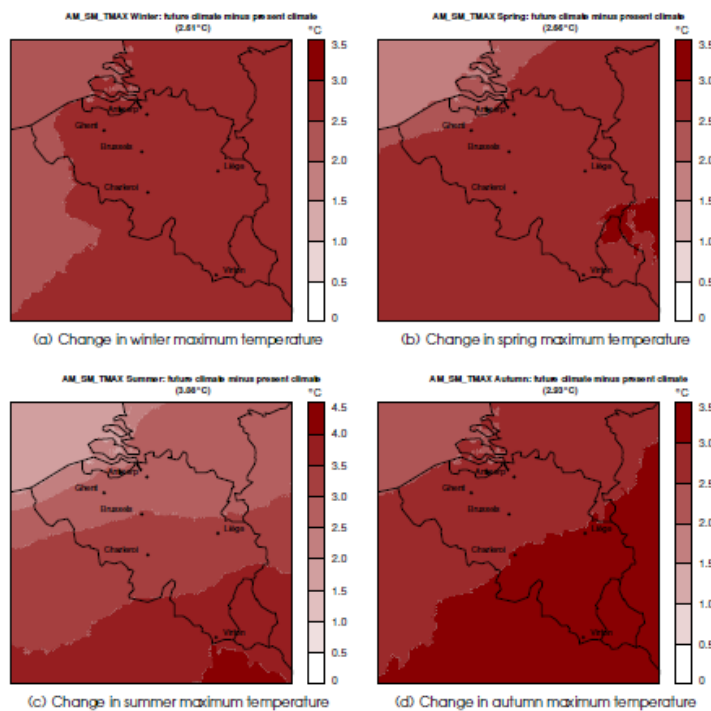


Figure 7: 30-year (2071-2100) seasonal mean anomaly relative to the 30-year mean for the period 1961-1990 for maximum temperature.

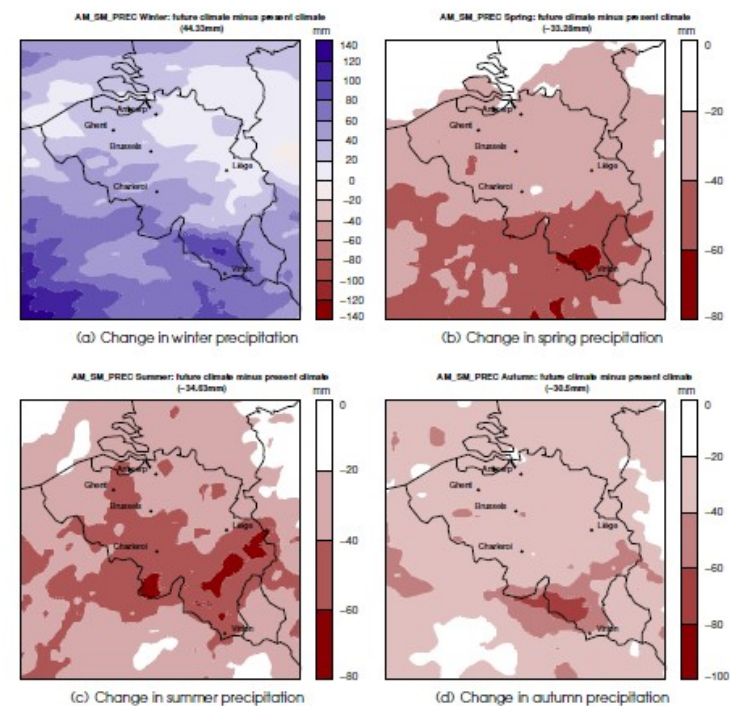
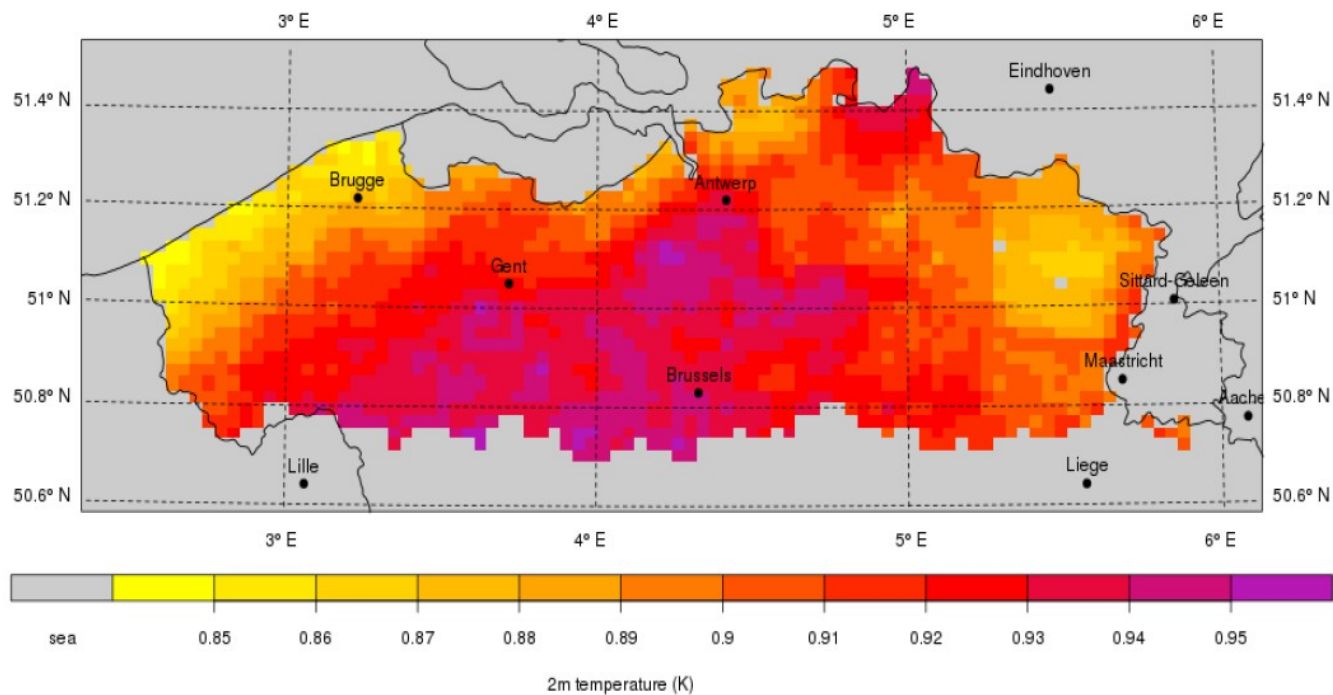


Figure 8: 30-year (2071-2100) seasonal mean anomaly relative to the 30-year mean for the period 1961-1990 for precipitation.



# Hydrological climate change impact research for Belgium

**belspo: CCI-HYDR**  
climate change scenarios  
for hydrological impact analysis  
incl. extremes

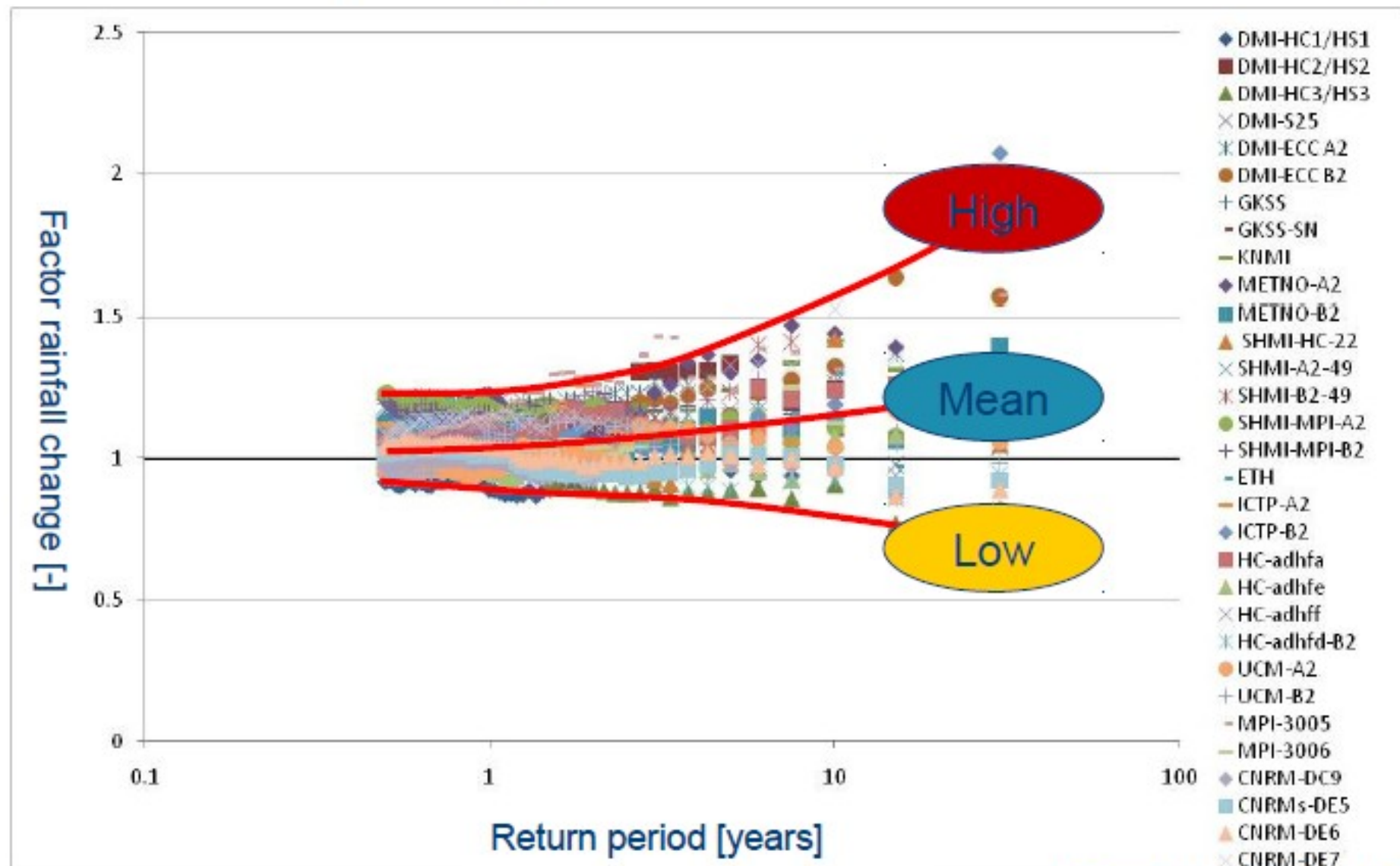


- Waterbouwkundig Laboratorium : impacts on high and low flows
- VMM:
  - impacts on floods (non-navigable rivers 1st category)
  - update urban drainage design guidelines
- INBO: impact on nature  
incl. comparison with KNMI'06 scenarios
- MIRA-S & NARA 2009
- BELSPO: SUDEM-CLI: interfacing climatology –hydrology – ecology
- EU-FP7: Theseus: correlation with storm surge and wave scenarios Belgian Coast
- ...



# Climate scenarios

Uccle, extreme daily rainfall (summer, 1961-1990 -> 2071-2100):



# Stedelijke effecten (VITO, KMI)

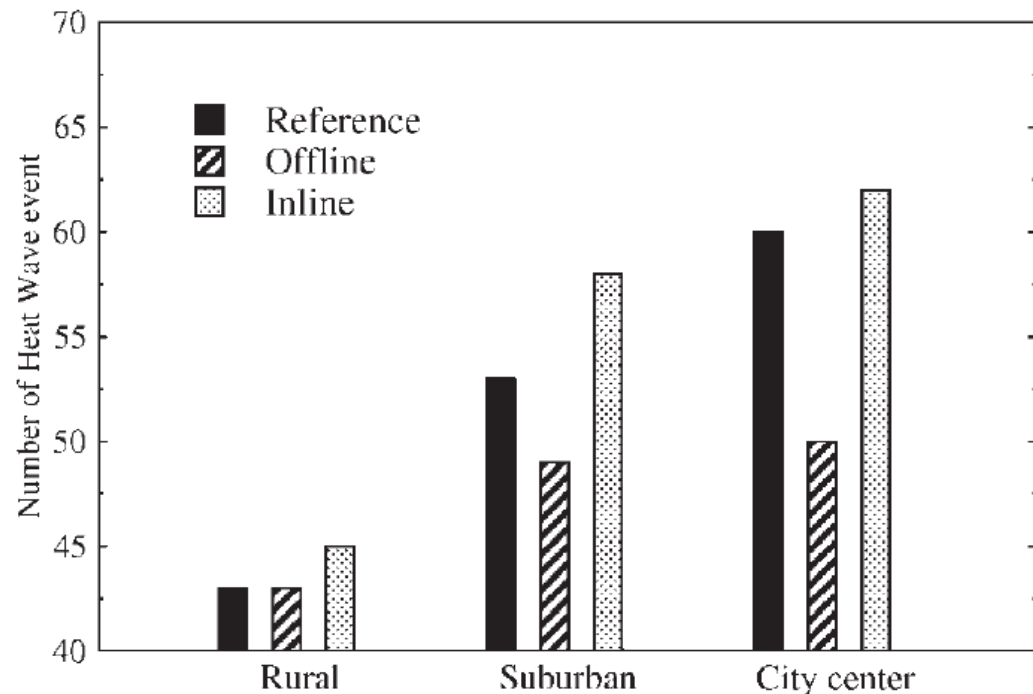
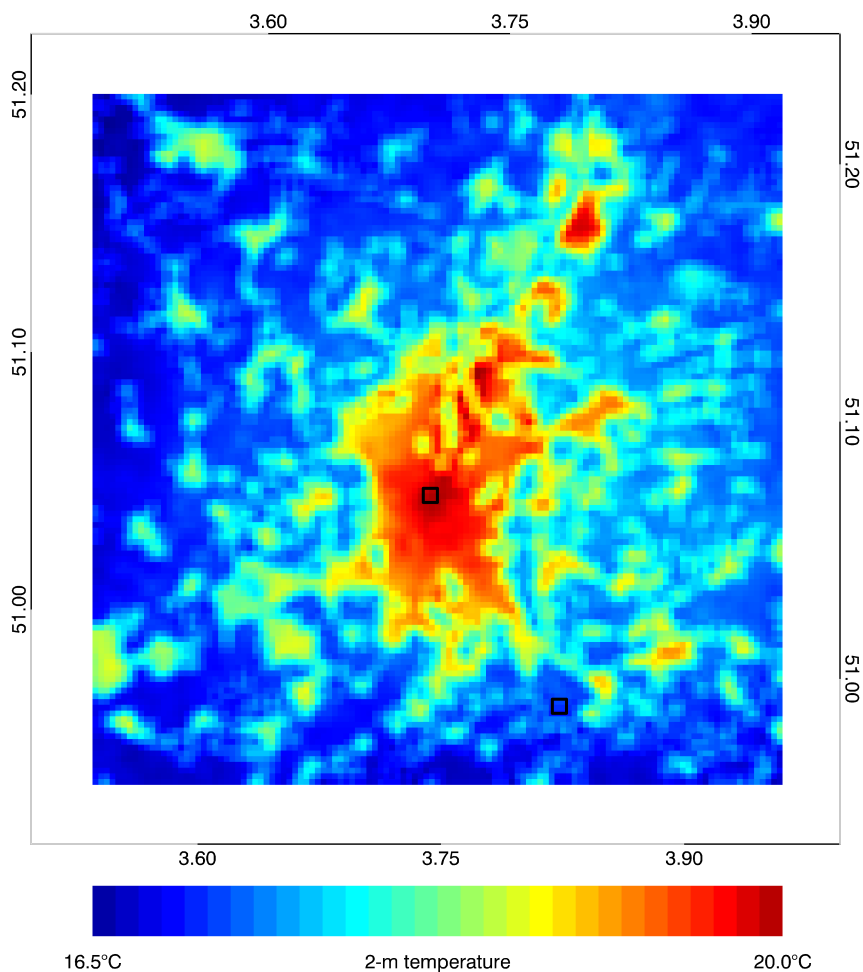
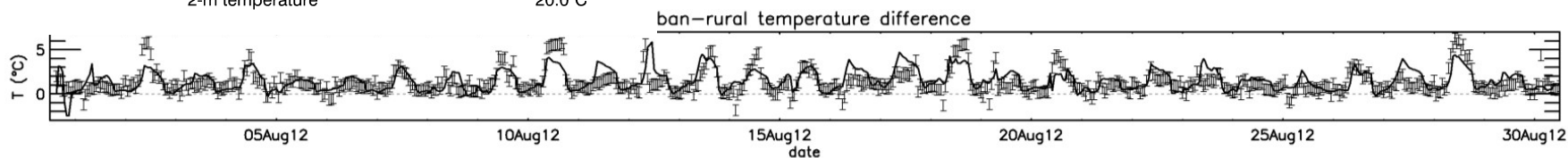


Figure 15. Change in the number of heat wave event in the future climate from the reference, offline, and inline runs of the ARPEGE-Climat driven simulations at the city centre of Brussels, the Uccle suburban station, and the Brussegem rural station.



# Climate atlas of Belgium

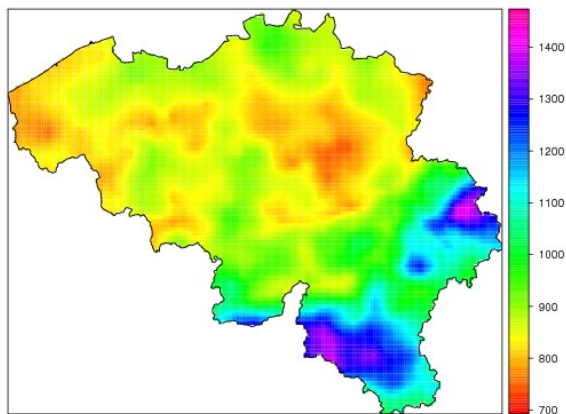
Extended climatological information for Belgium in the form of **climate maps** and **reference timeseries**.

- Parameters: air temperature  
precipitation quantities  
solar radiation  
sunshine duration
- Climate maps reference period:  
1981 – 2010 (temperature and precipitation)  
1995 – 2005 (solar radiation, sunshine duration)
- Derived from:  
observations in climatological stations  
Meteosat satellite data (solar radiation and sunshine duration)
- Currently in progress. Available on [www.meteo.be](http://www.meteo.be) in 2014.

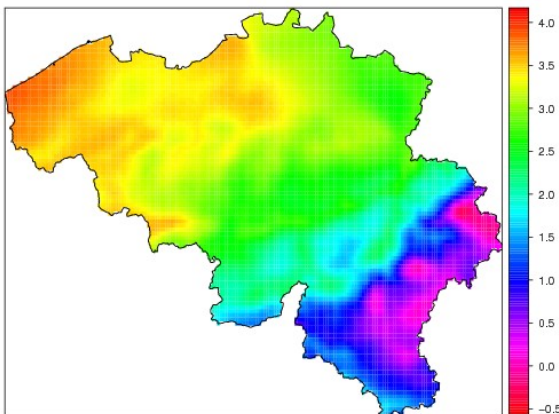


# Climate atlas of Belgium

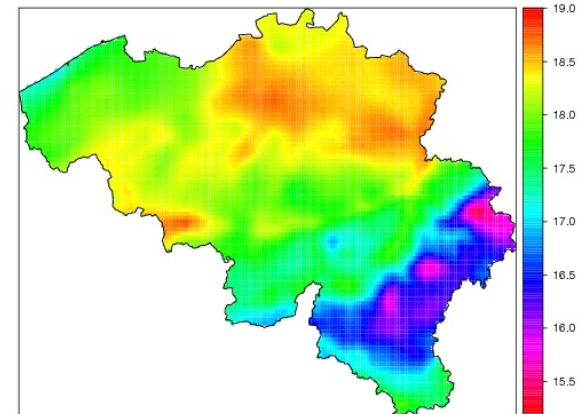
Annual, seasonal and monthly normals, e.g.,



mean annual precipitation quantities

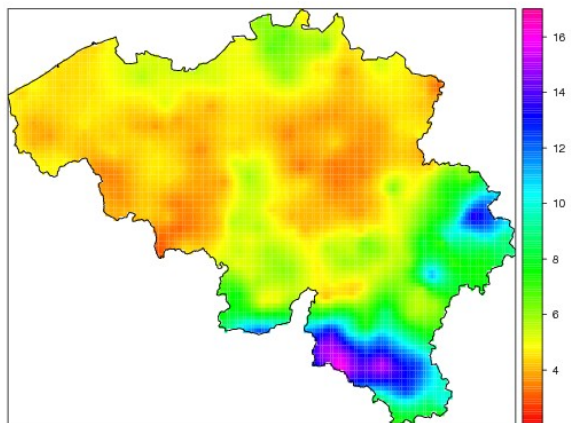


mean temperature of January

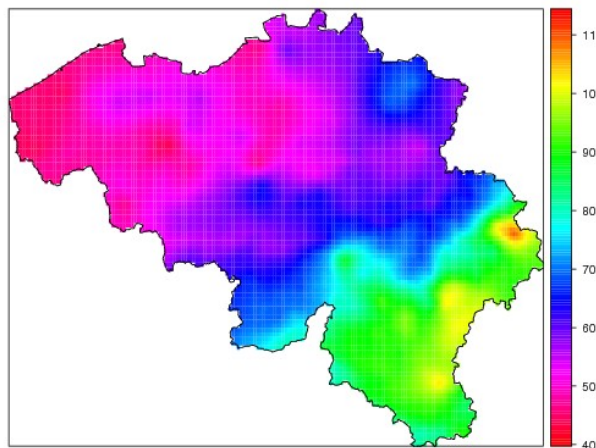


mean temperature of July

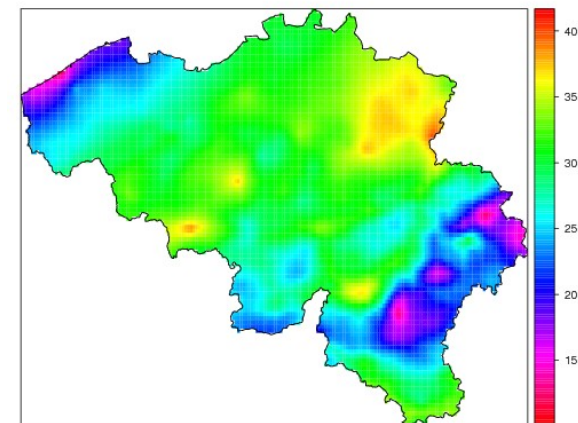
Number of days per year with observations above/below a threshold, e.g.,



Average num. of days per year with more than 20 mm of precipitation



Average num. of days per year with frost (daily minimal temperature < 0°C)



Average num. of summer days per year (daily maximal temperature ≥ 25°C)

# Samenvatting

- CMIP5 projecties worden vertaald naar het regionale niveau.
- Daarnaast zijn er activiteiten om zeer gedetailleerde scenario's te berekenen, die gebruikt kunnen worden voor lokale studies.
- Het KMI beschikt over een uitgebreide databank van lange tijdsreeksen waarvan klimaatatlaskaarten getekend kunnen worden.