



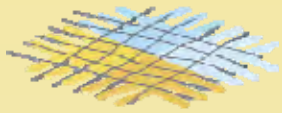
Perspektiver for klimamodellering

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(CRES)

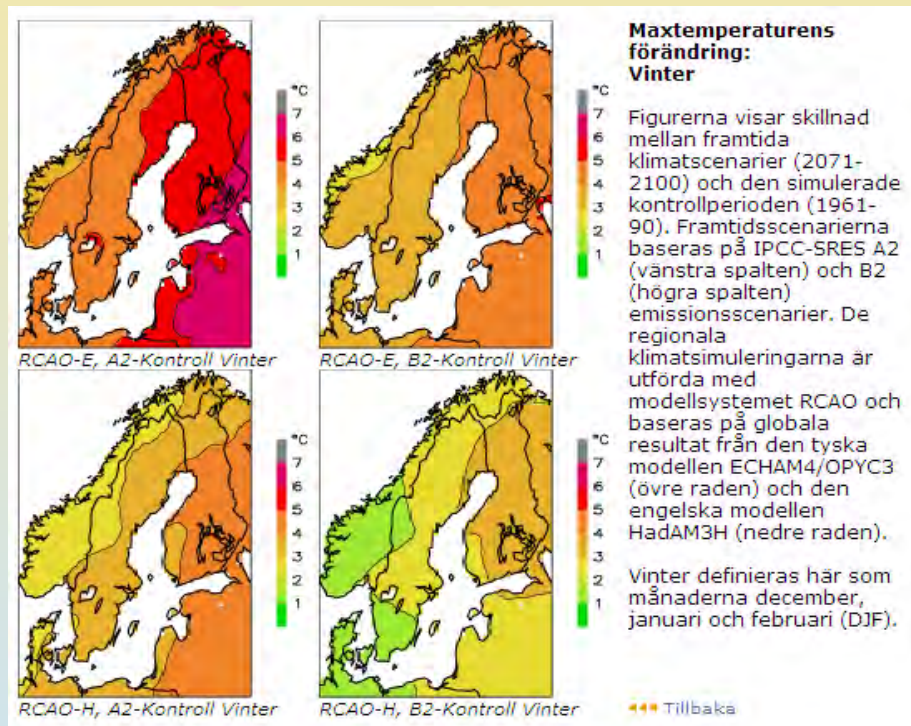
HYACINTS koblet model team

Mit program

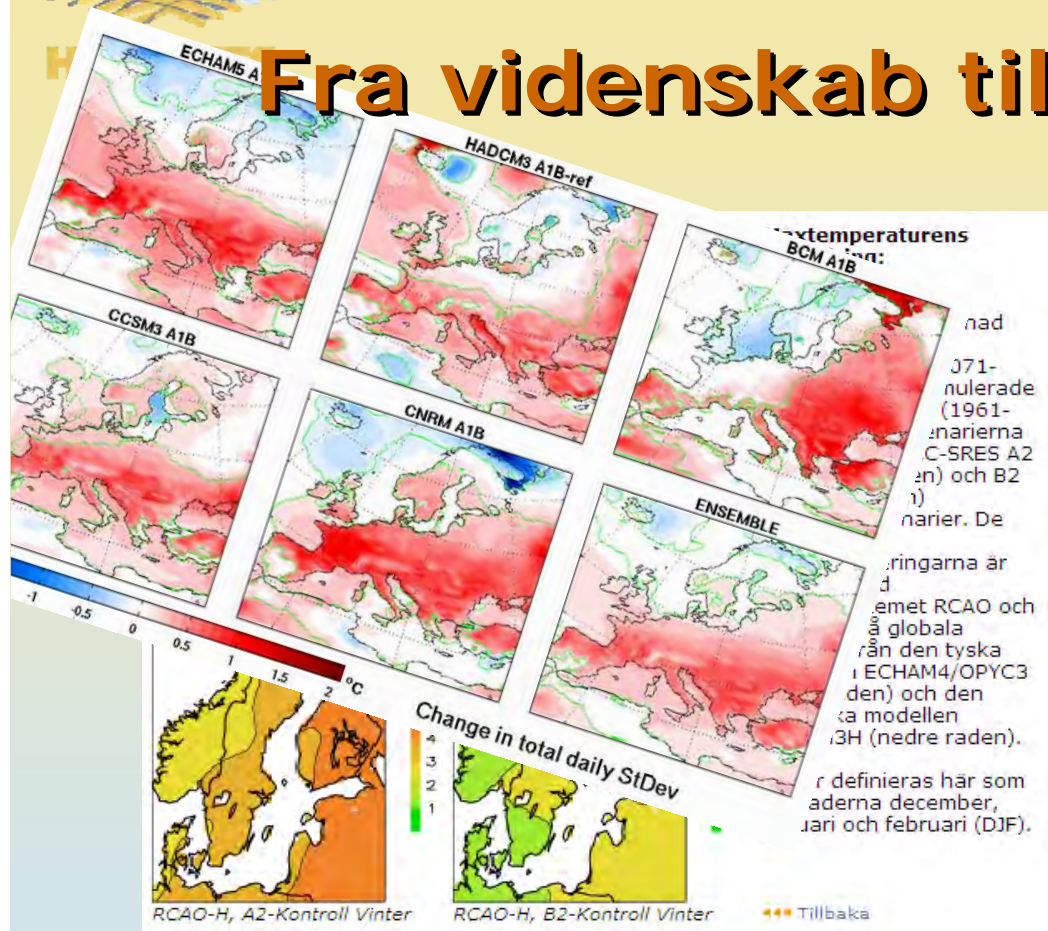
- Regionalt klima
 - Lidt om usikkerheder
 - Hvordan forudser vi fremtidens klima?
 - Hvad kan vi sige om nøjagtigheden?
- Hvorfor kobling?
 - Hvad kommer med som vi ikke har?
- Opsamling



HYACINTS Fra videnskab til beslutninger



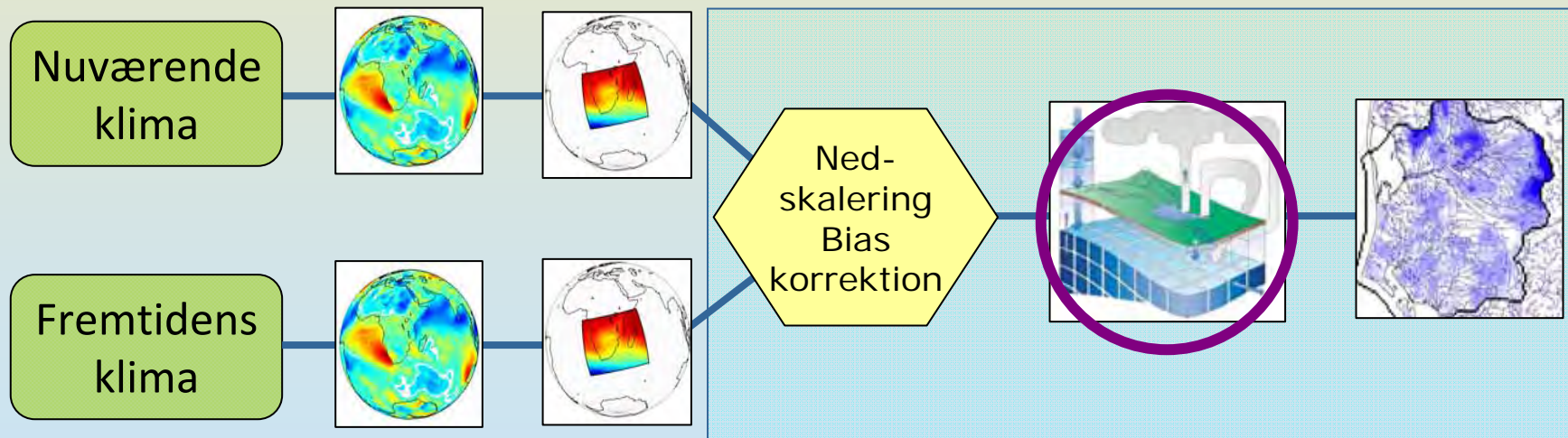
Fra videnskab til beslutninger



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 ... (1961-
 ...narierna
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 ...ringarna är
 ...d
 ...emet RCAO och
 ...globala
 ...än den tyska
 ...ECHAM4/OPYC3
 ...den) och den
 ...ka modellen
 ...3H (nedre raden).
 ...r definieras här som
 ...aderna december,
 ...ari och februari (DJF).

Usikkerheder

- Emissioner
- Klimamodeller
- Nedskalering / bias korrektion
- Hydrologisk model (geologi, formulering, parameter mm.)
- Naturlig variabilitet



Global

Regional

Hydrologi

Model

100-250 km

10-25 km

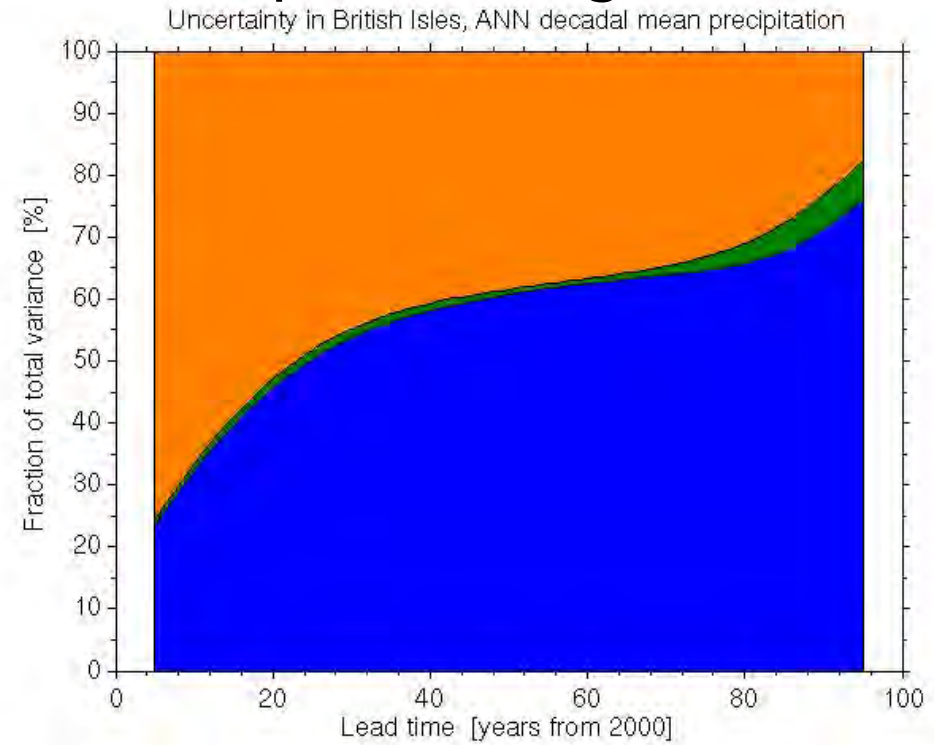
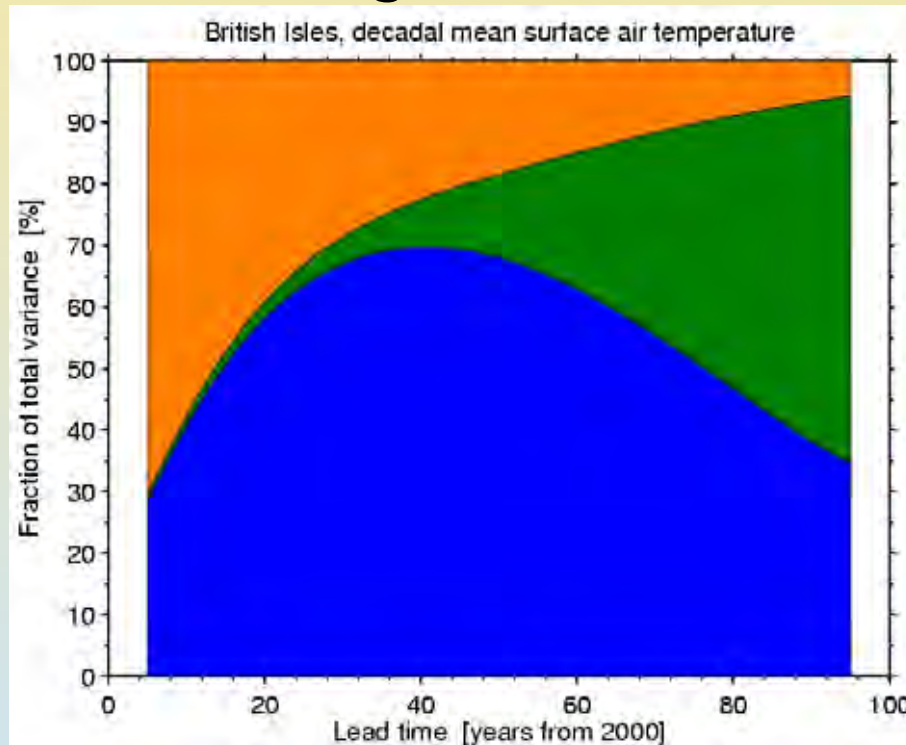
50-500 m

Skala

Hydrological Modelling for Assessing Climate Change Impacts at Different Scales - www.hyacints.dk

Relativ betydning af forskellige usikkerheder

England- 10 års middel temperatur og nedbør



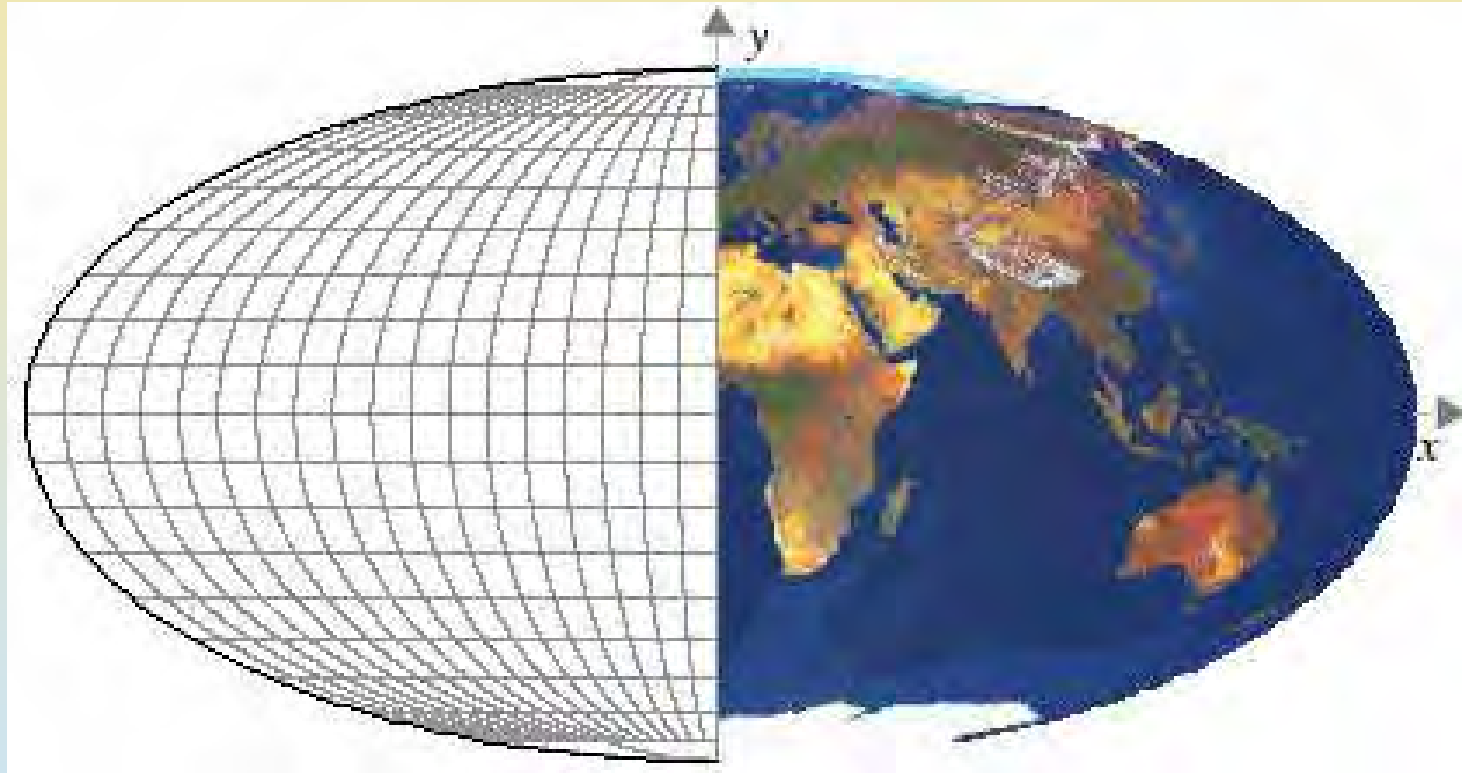
Blå: Klimamodel (GCMs)

Grøn: GHG emission scenario

Orange : Naturlig variabilitet

(Hawkins and Sutton, 2009 & 2010)

Klimamodeller



Klimamodeller

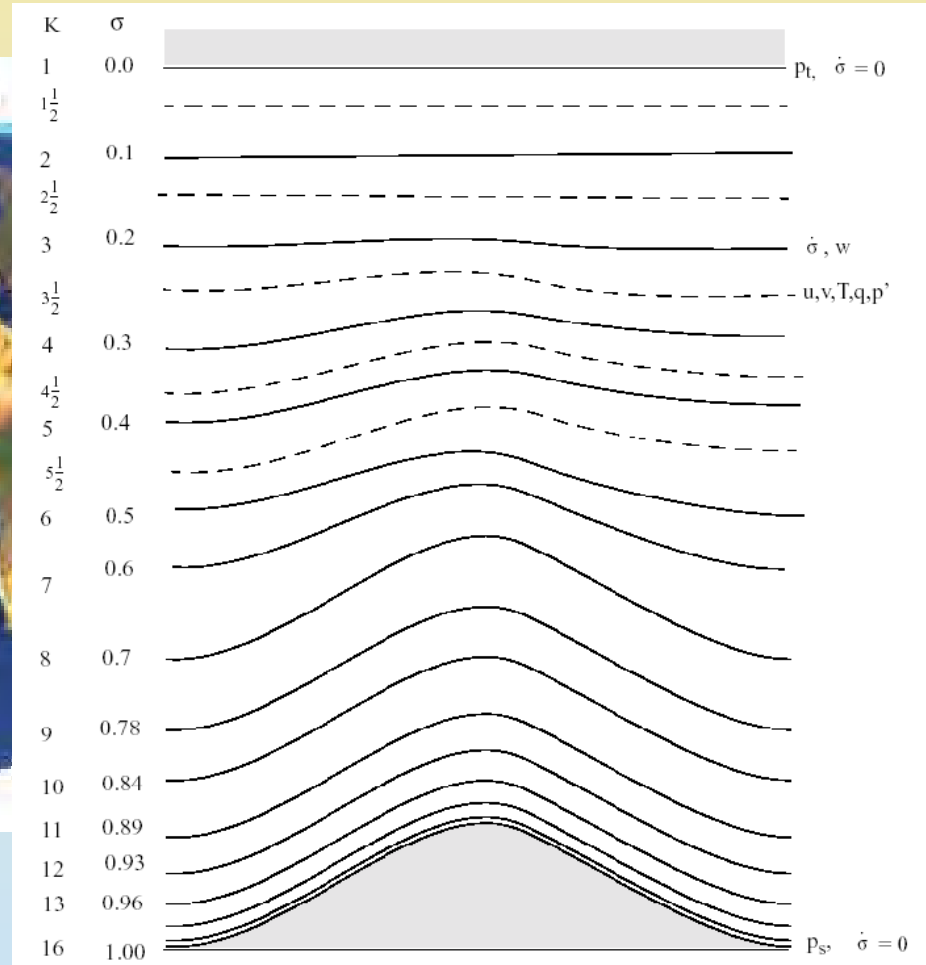
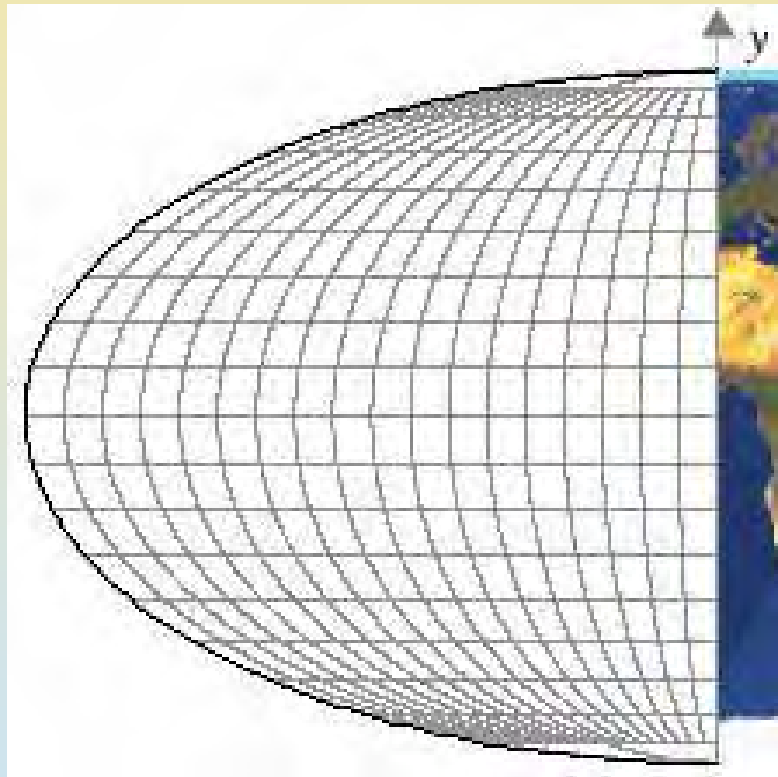
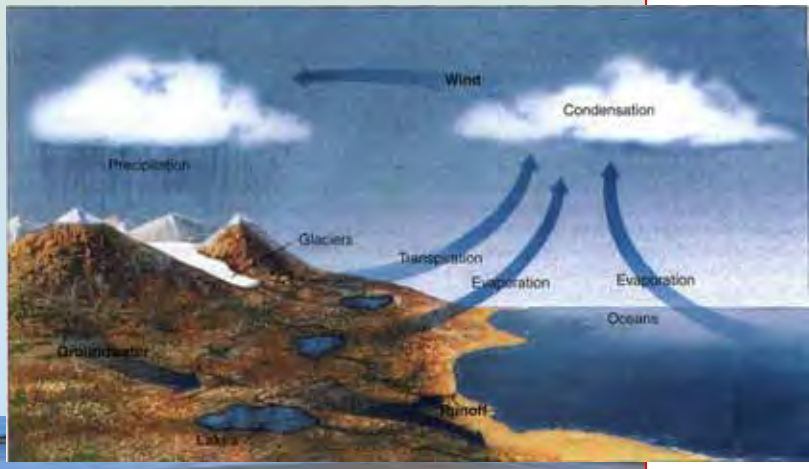
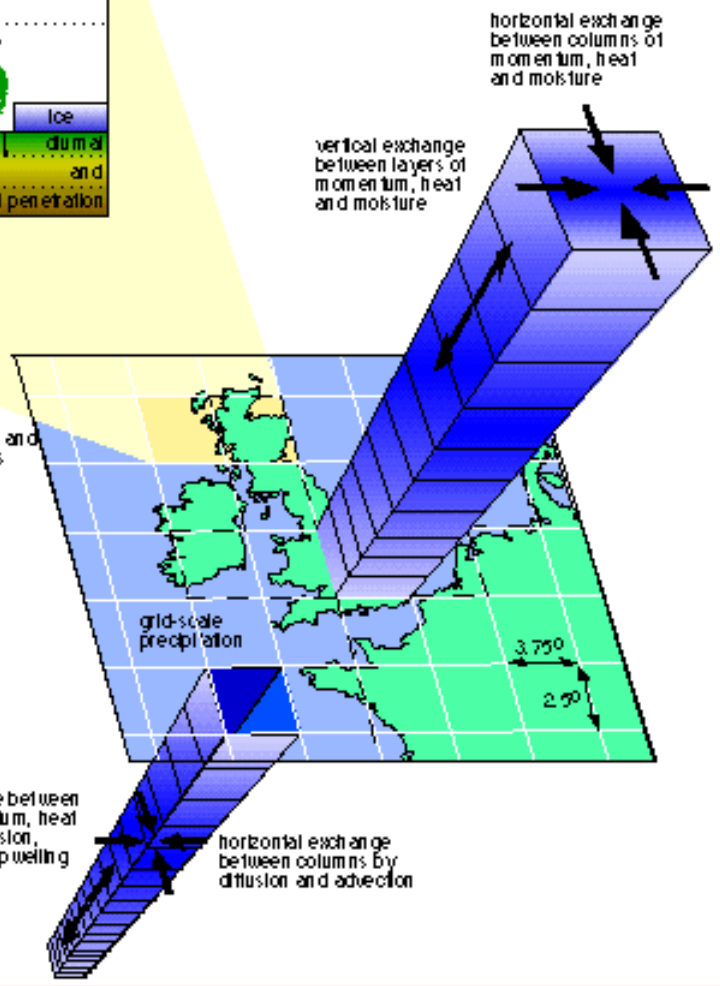
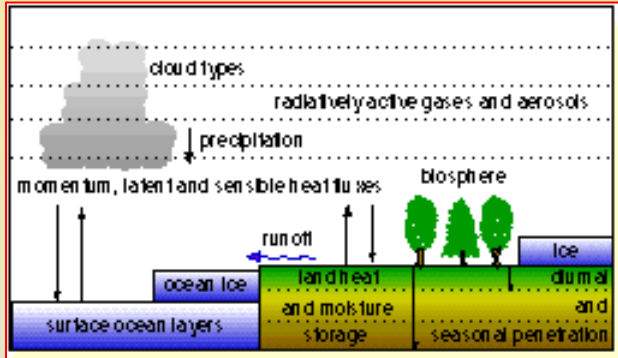
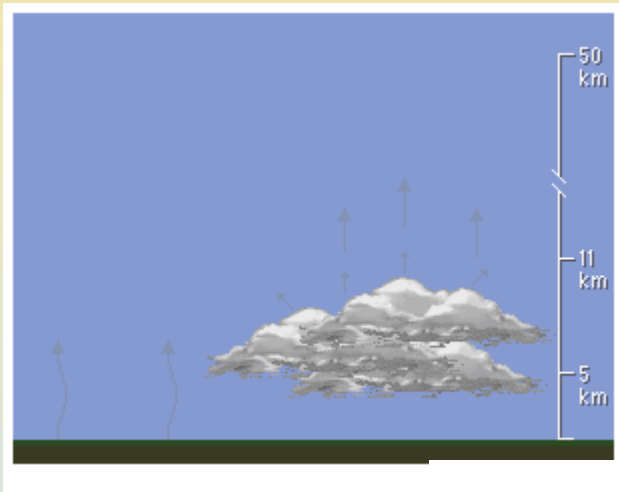


Figure 1.2 Schematic representation of the vertical structure of the model. The example is for 15 vertical layers. Dashed lines denote half-sigma levels, solid lines denote full-sigma levels.

Model fysik (numeriske metoder)



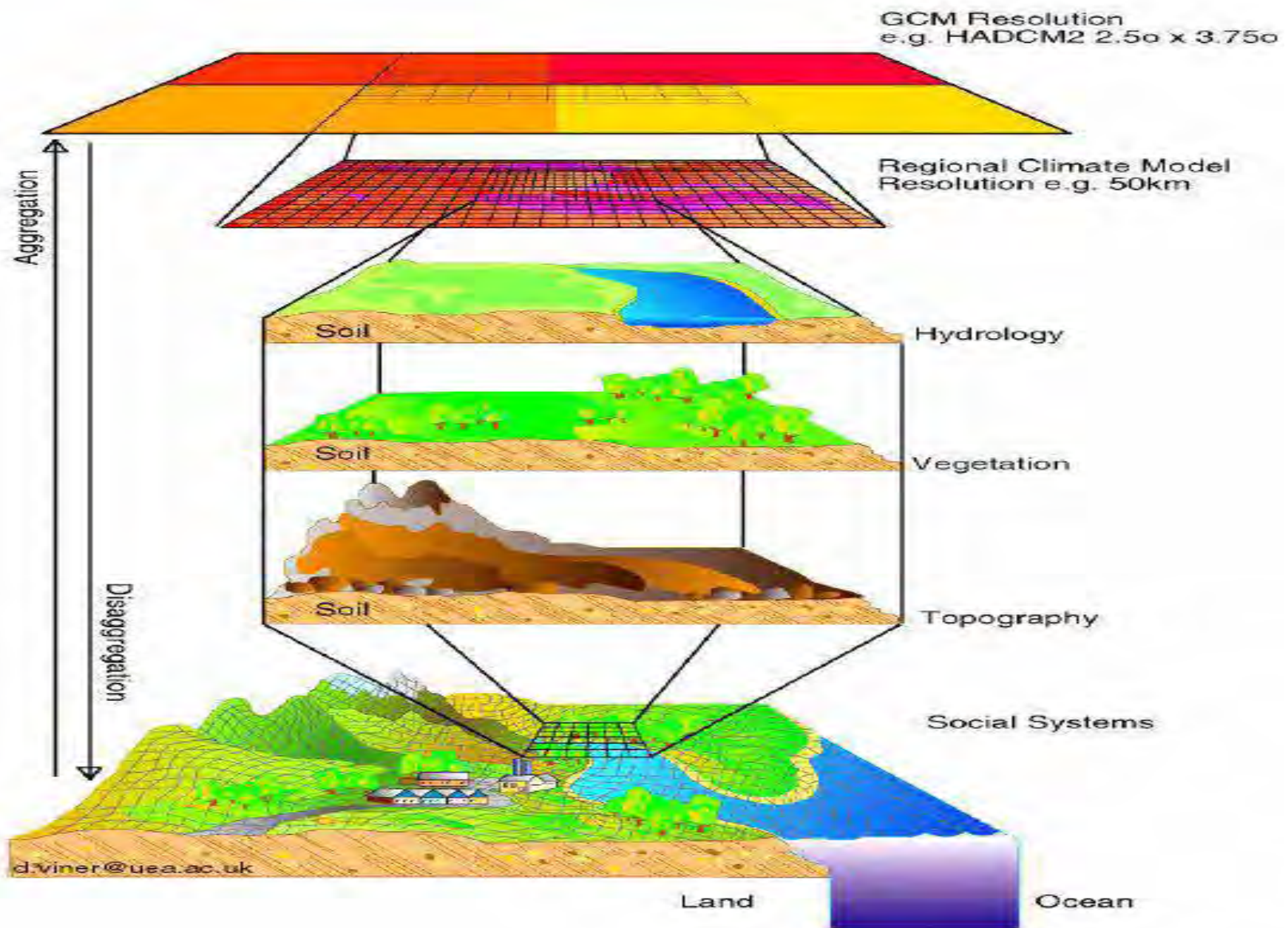
orography, vegetation and surface characteristics included at surface on each grid box

grid-scale precipitation

vertical exchange between layers of momentum, heat and salts by diffusion, convection and upwelling

horizontal exchange between columns by diffusion and advection

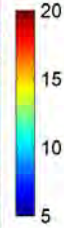
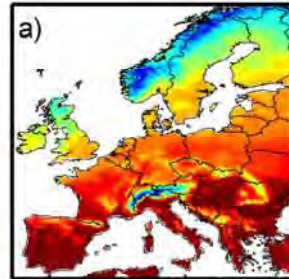
er@uea.ac.uk



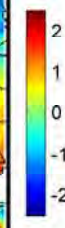
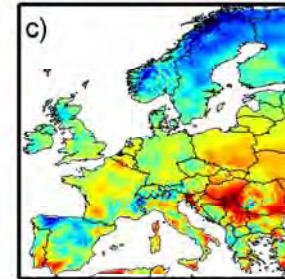
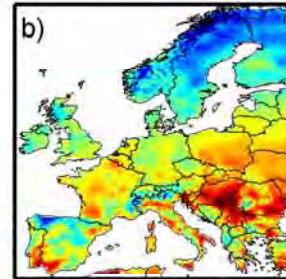
ENSEMBLES

Sommer temperaturer - ERA40 driven

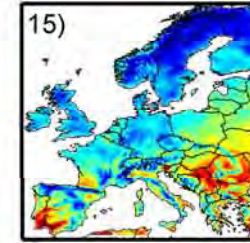
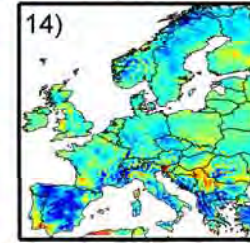
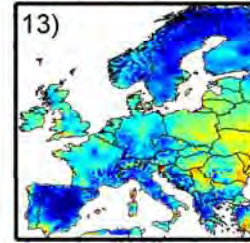
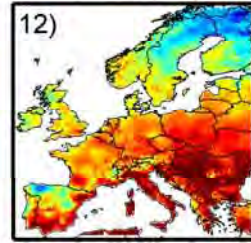
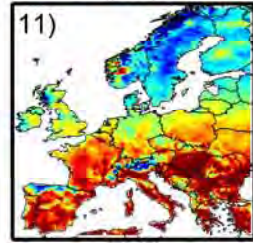
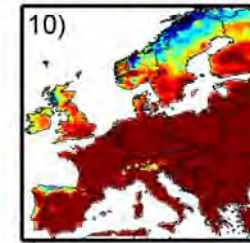
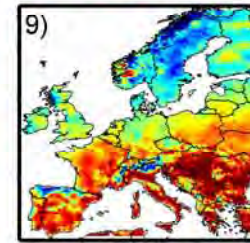
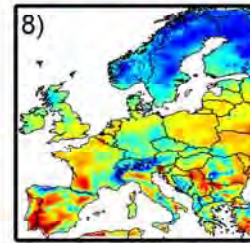
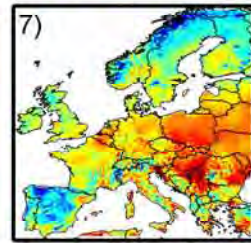
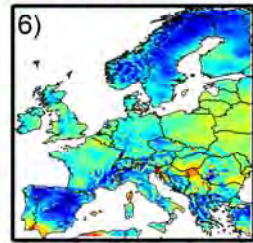
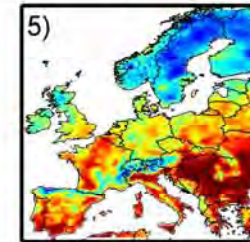
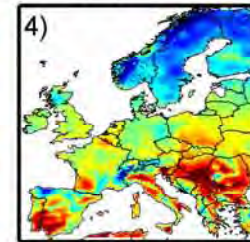
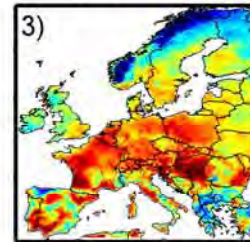
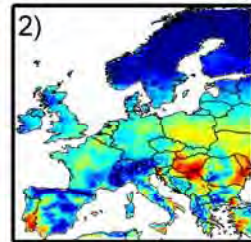
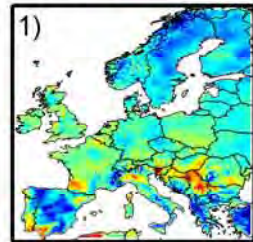
OBS



Ens
Mean



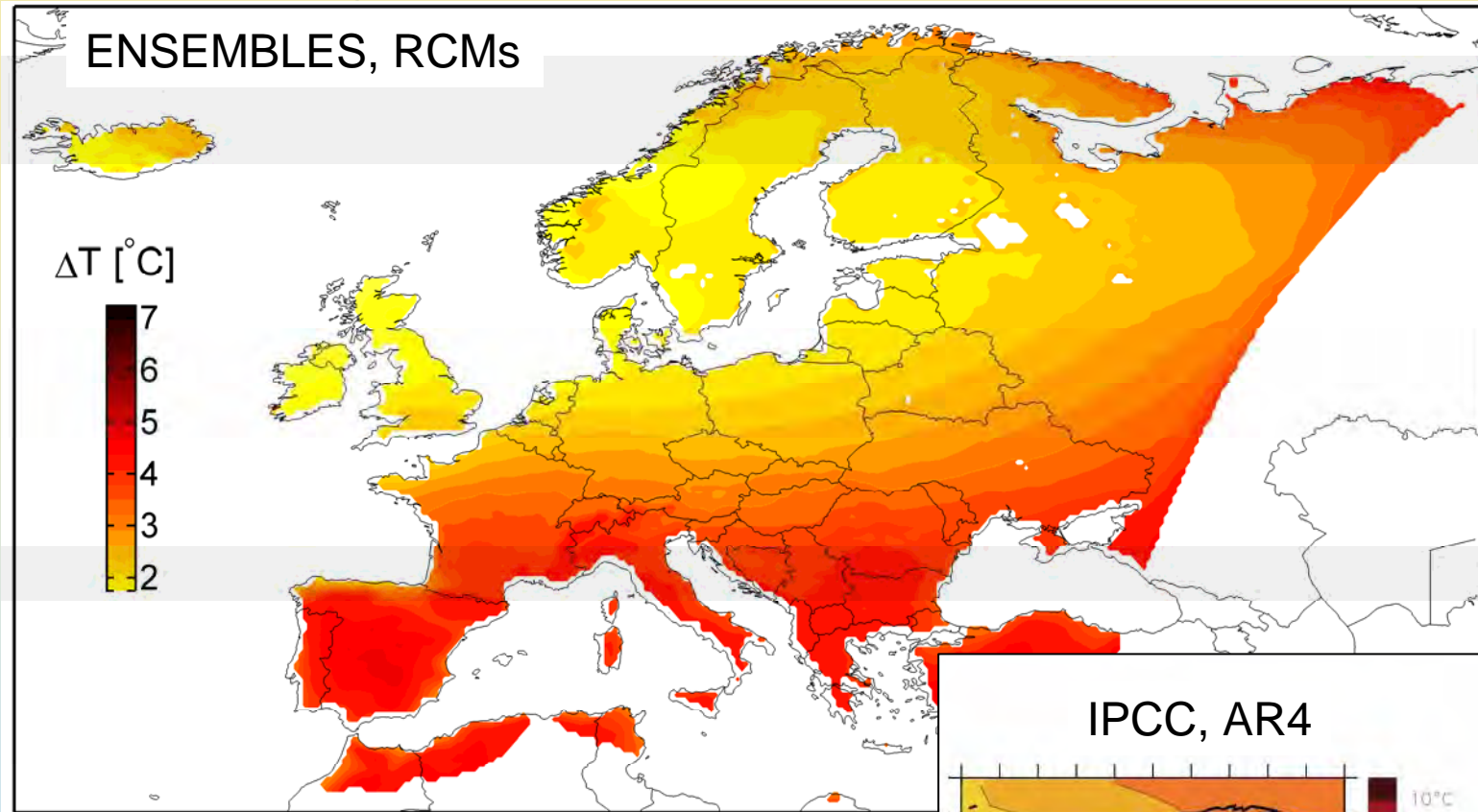
Bias



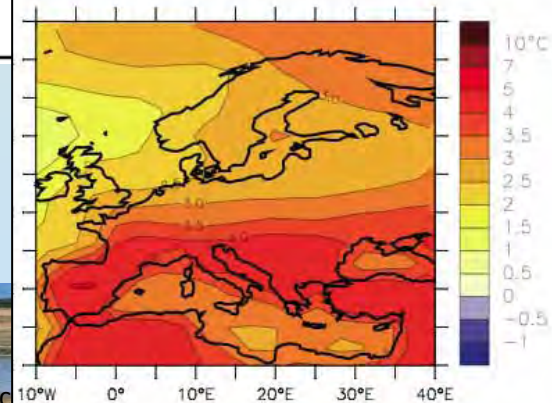
Christensen et al. (2010)

JJA

$$\langle T_{\text{change}} \rangle = \langle T_{2071-2100} - T_{1961-1990} \rangle$$



IPCC, AR4

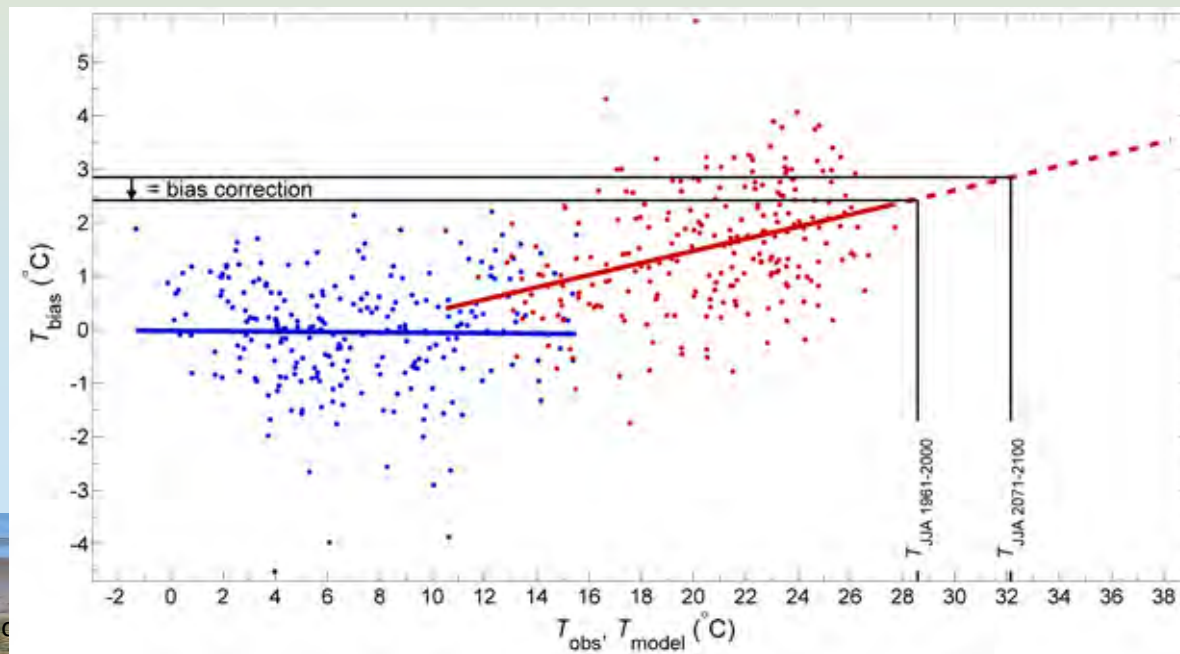
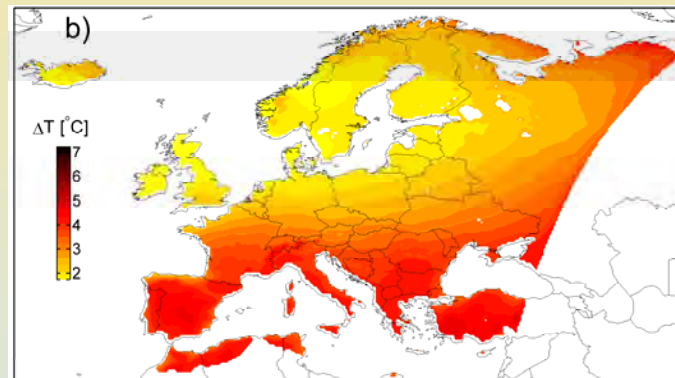


A1B scenario



$$\langle T_{\text{change}} \rangle = \langle T_{2071-2100} - T_{1961-1990} \rangle$$

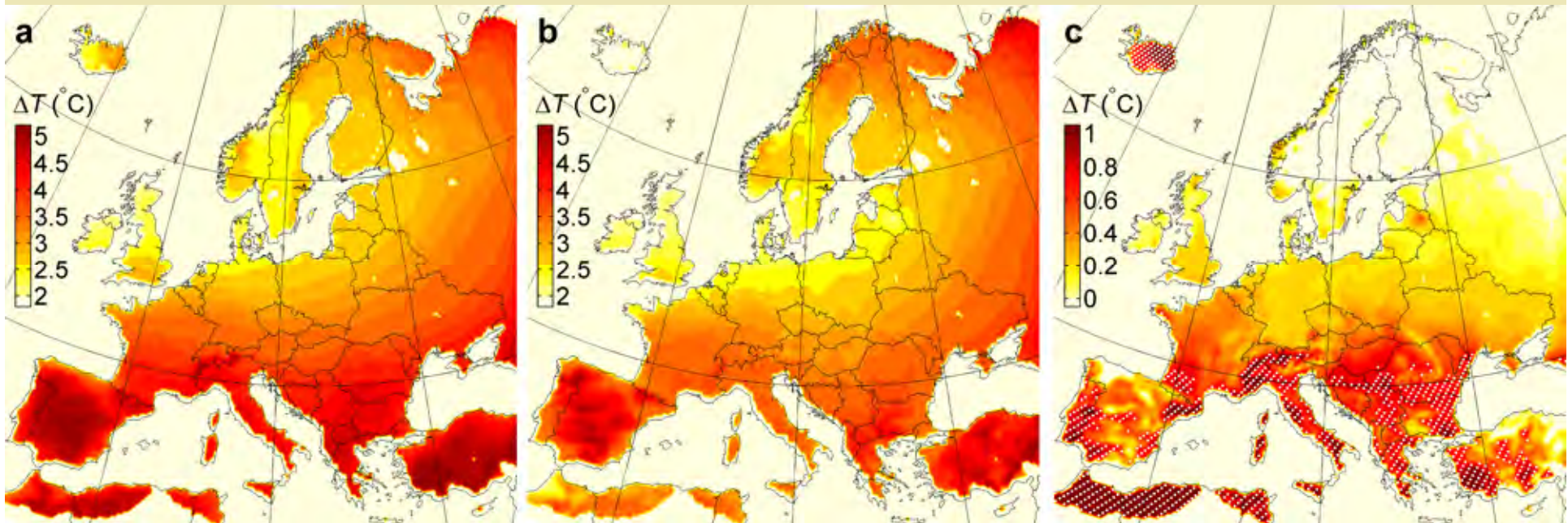
JJA



Hydrok



$$\langle T_{\text{change}} \rangle = \langle T_{2071-2100} - T_{1961-1990} \rangle - \langle BC \rangle$$



Boberg & Christensen (2012)

Opsamling

- Regionalt klima
 - Mange kilder til usikkerheder
 - Nogle kan reduceres
- Hvorfor kobling?
 - Bedre fysisk forståelse og beskrivelse i modellen øger troværdigheden
 - Giver mulighed for at reducere modelfejlen i forudsigelserne