

ADAPTACLIMA - EPAL

Adaptar o Ciclo Urbano da Água a Cenários de
Alterações Climáticas - EPAL



Introdução – Filipe Duarte Santos

6 Julho 2011



ADAPTACLIMA-EPAL

Introdução

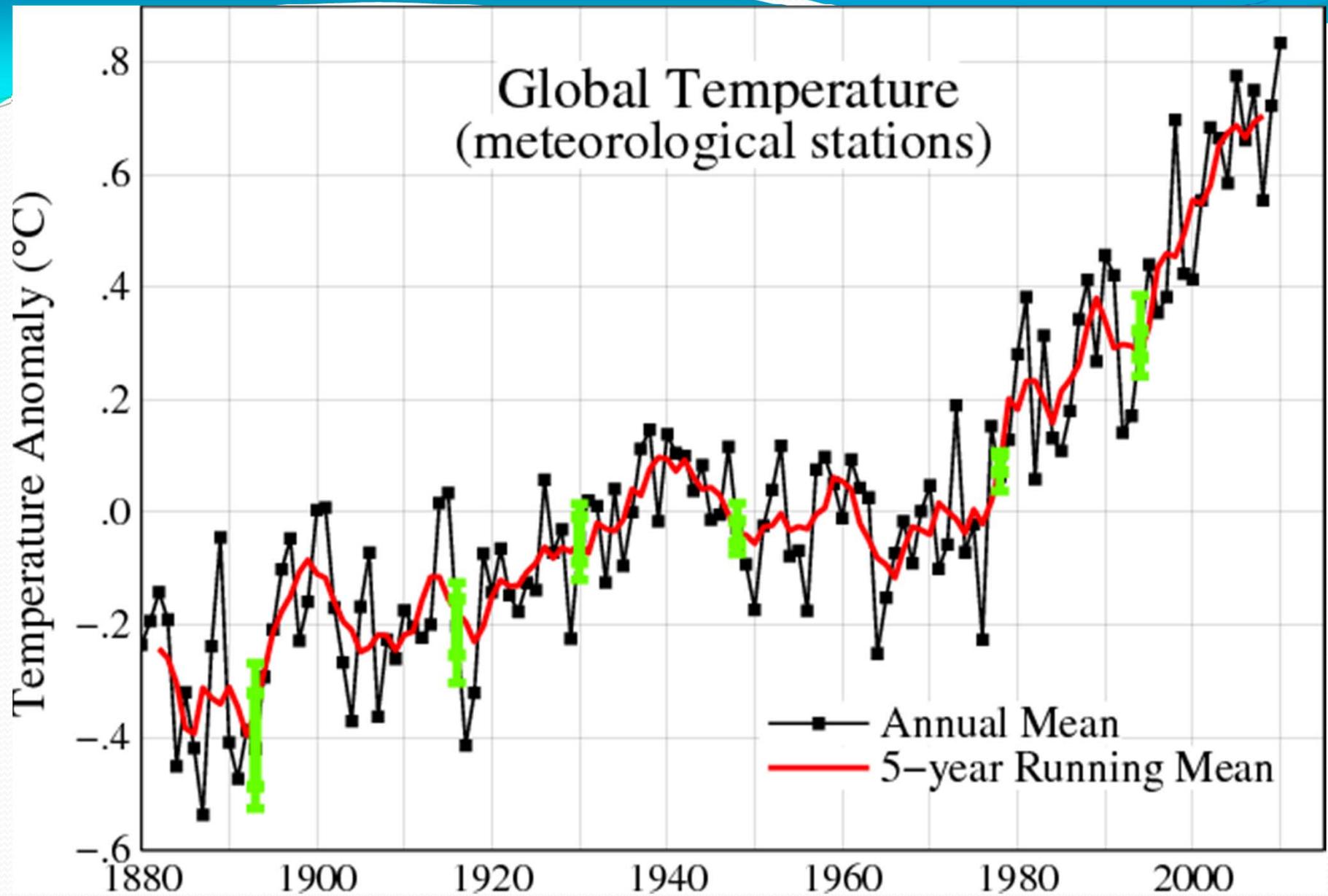
- Alterações climáticas irão agravar-se ao longo do século XXI;
- Um dos sectores mais vulneráveis às alterações climáticas nos países do sul da Europa é o dos recursos hídricos;



- É prudente planear e implementar estratégias de adaptação às alterações climáticas em Portugal que minimizem os impactos adversos, especialmente no sector dos recursos hídricos.



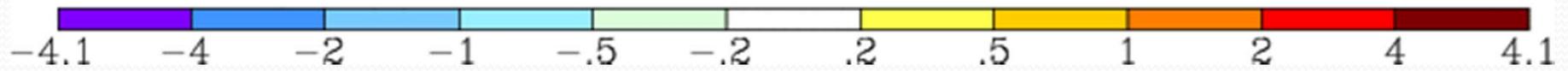
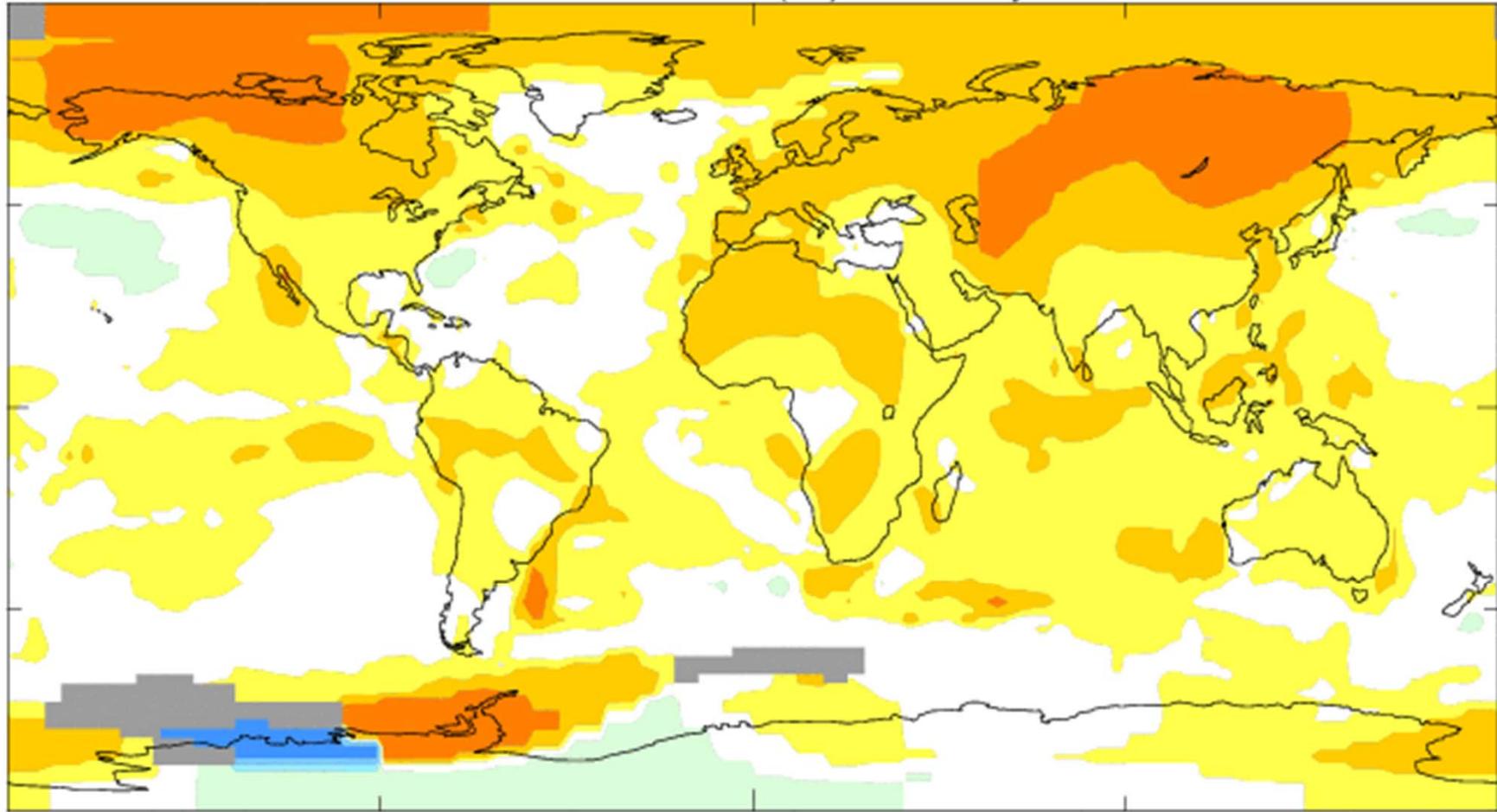
- O **ADAPTACLIMA-EPAL** visa dotar a EPAL de uma estratégia de adaptação a médio e longo prazo cuja implementação permita diminuir as vulnerabilidades das suas actividades às alterações climáticas.



Annual J-D 1980-2010

L-OTI(°C) Anomaly vs 1951-1980

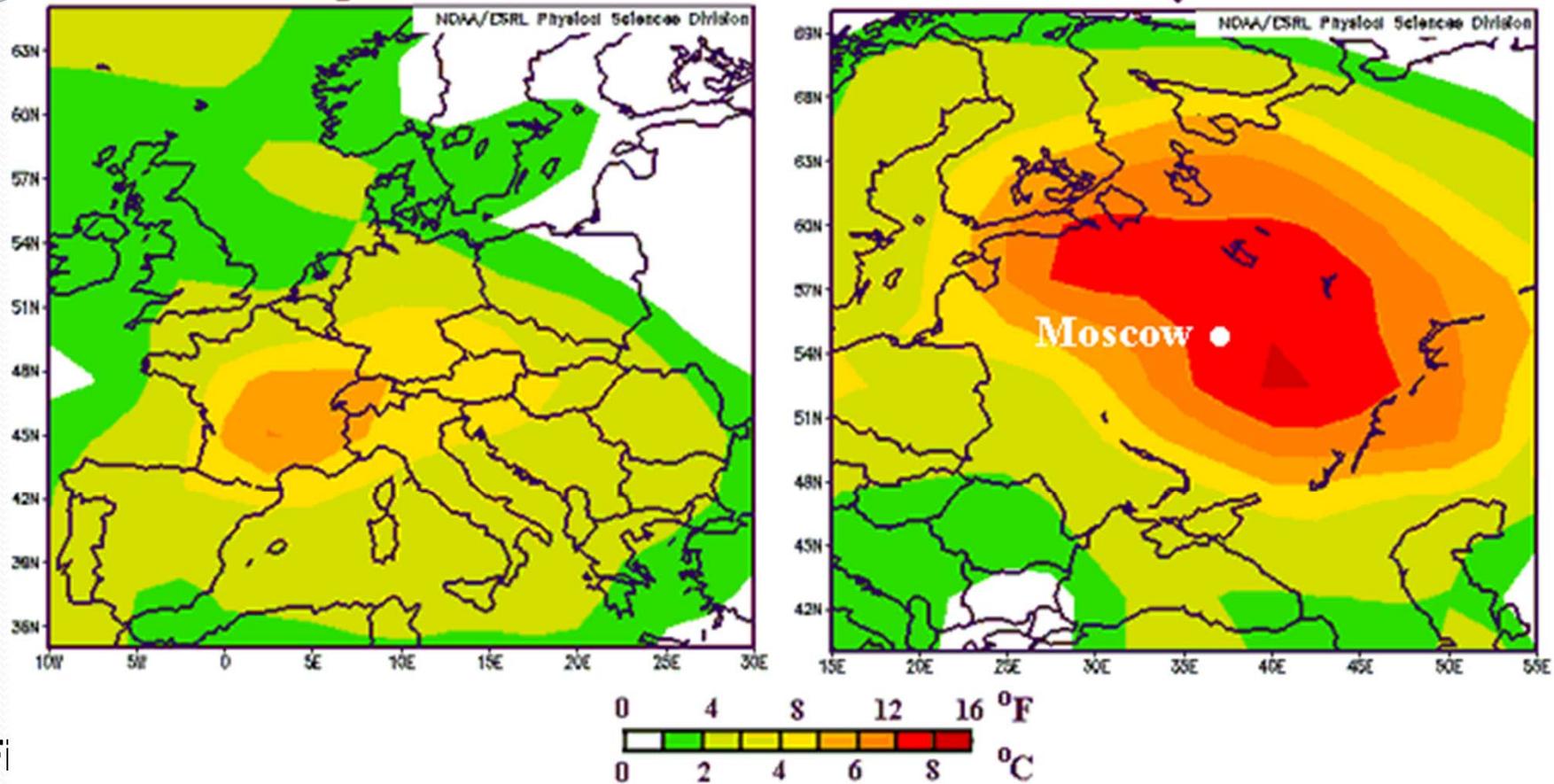
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Departure of Temperature from Average for Two Great Heat Waves

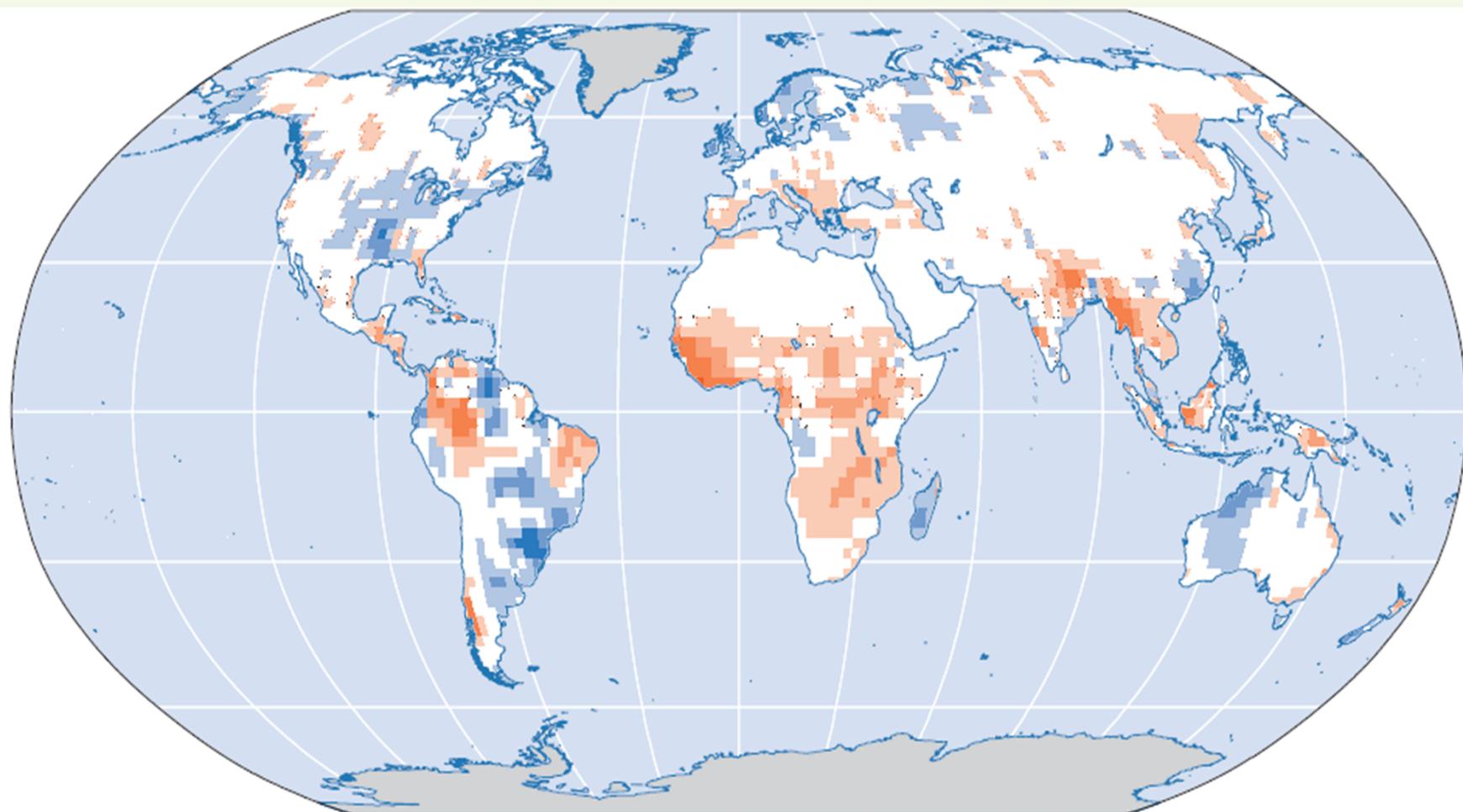
August 2003

July 2010

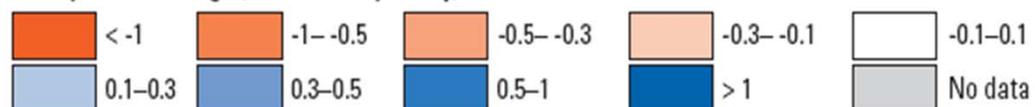


F European heat wave of 2003 (left) with July temperatures from the Great Russian Heat Wave of 2010 (right) reveals that this year's heat wave is more intense and covers a wider area of Europe.

b. Precipitation



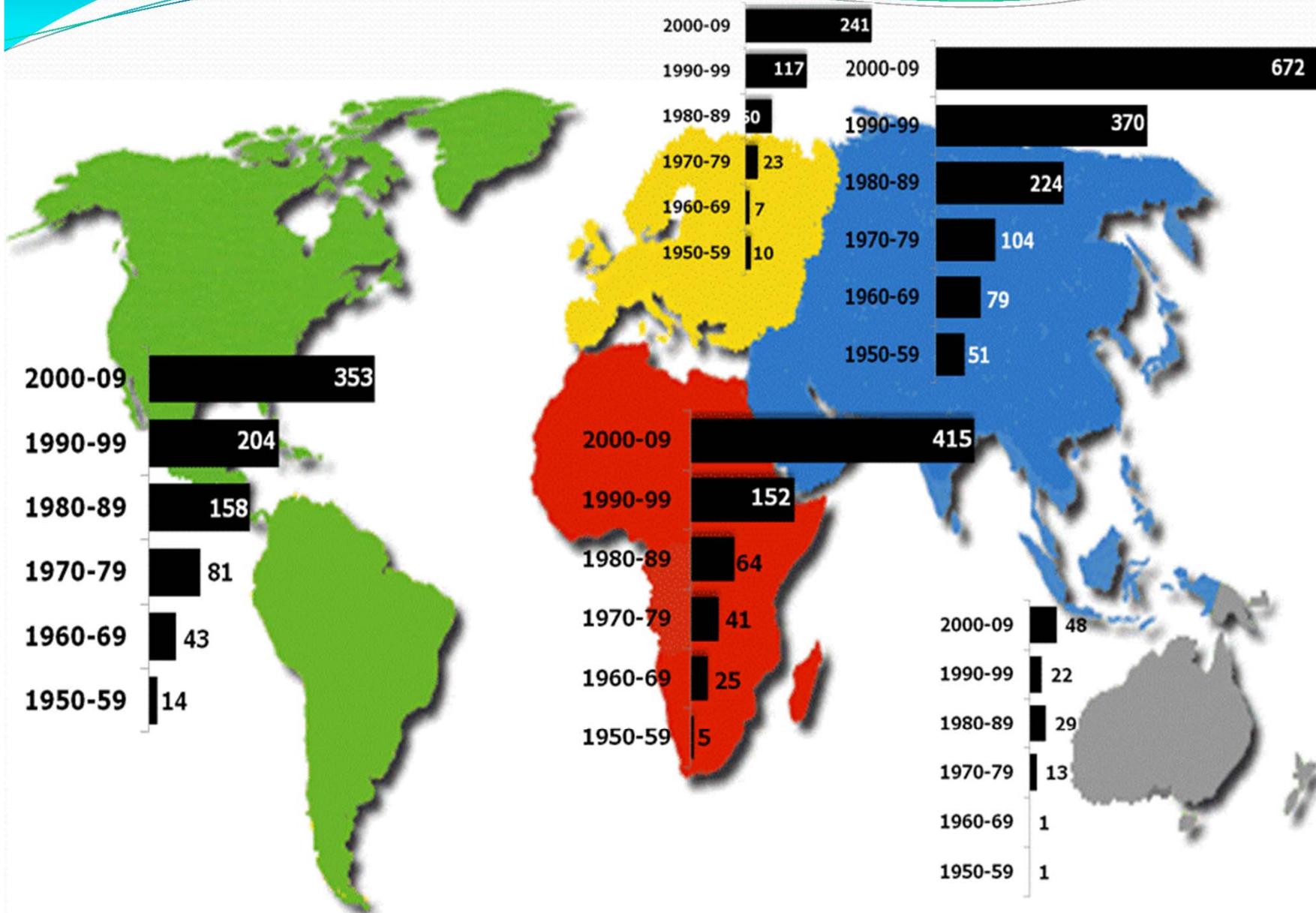
Precipitation change (millimeters per day)



Source: Goddard Institute for Space Studies, http://data.giss.nasa.gov/cgi-bin/precipcru/do_PRCmap.py?type=1&mean_gen=0112&year1=1980&year2=2000&base1=1951&base2=1980 (accessed May 2009).

Note: Yellow denotes increased in precipitation in millimeters a day; blue denotes decreases from 1980 to present compared with the previous three decades. Drying has been greatest in continental interiors, while rainfall has become more intense in many coastal areas. The changing geographic distribution of rainfall has serious implications for agriculture.

Inundaciones 1950-2009



Fuente: The international disaster data base, Center for Research on Epidemiology of Disasters. 2010.

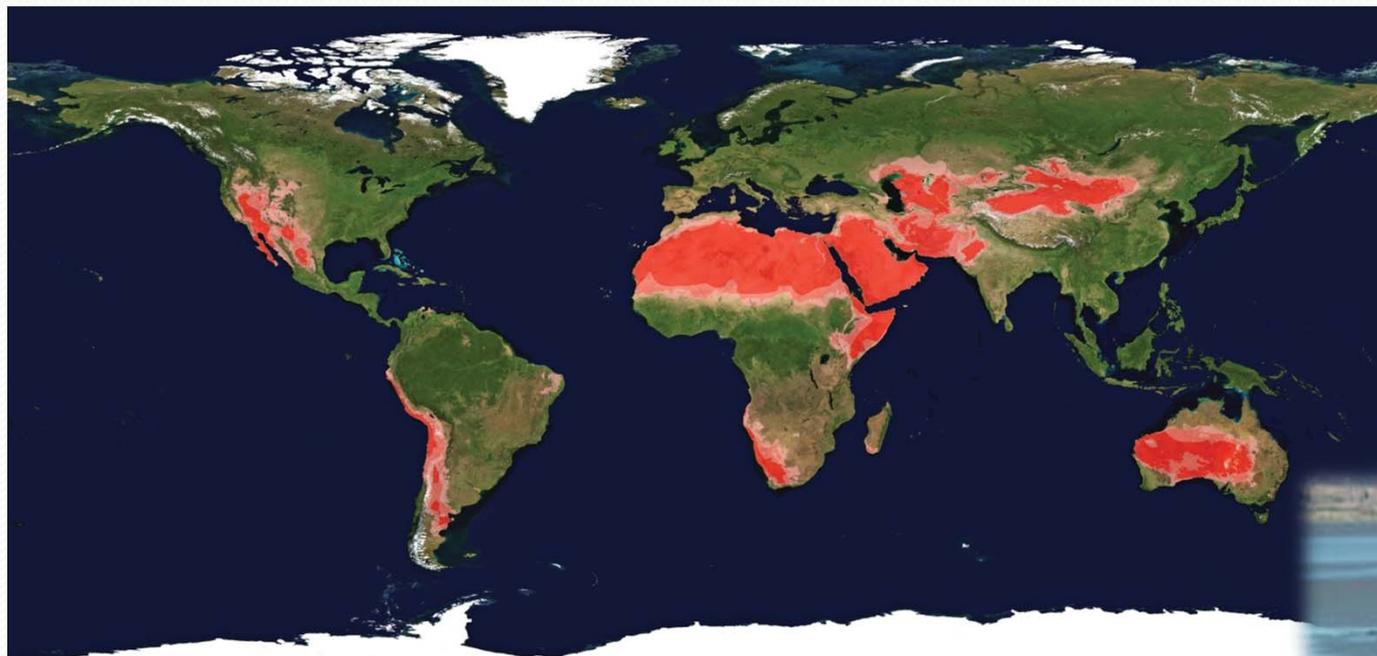
Secas

Cerca de **400,000,000** pessoas vivem em condições de seca extrema

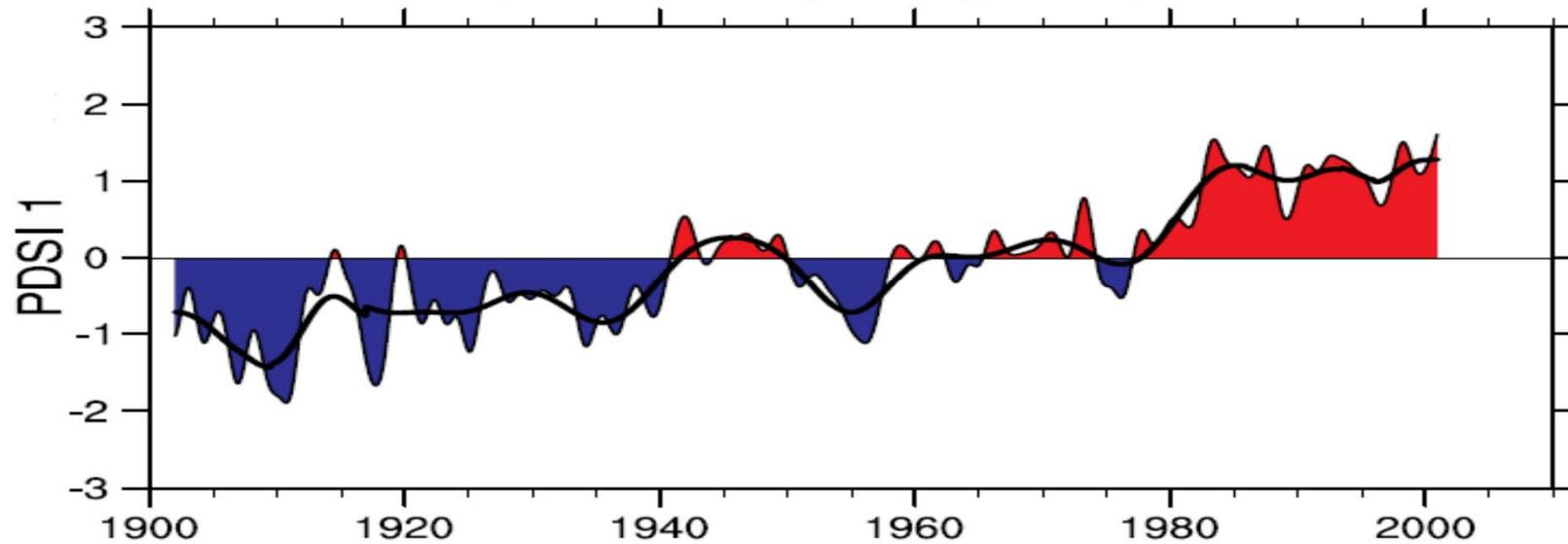
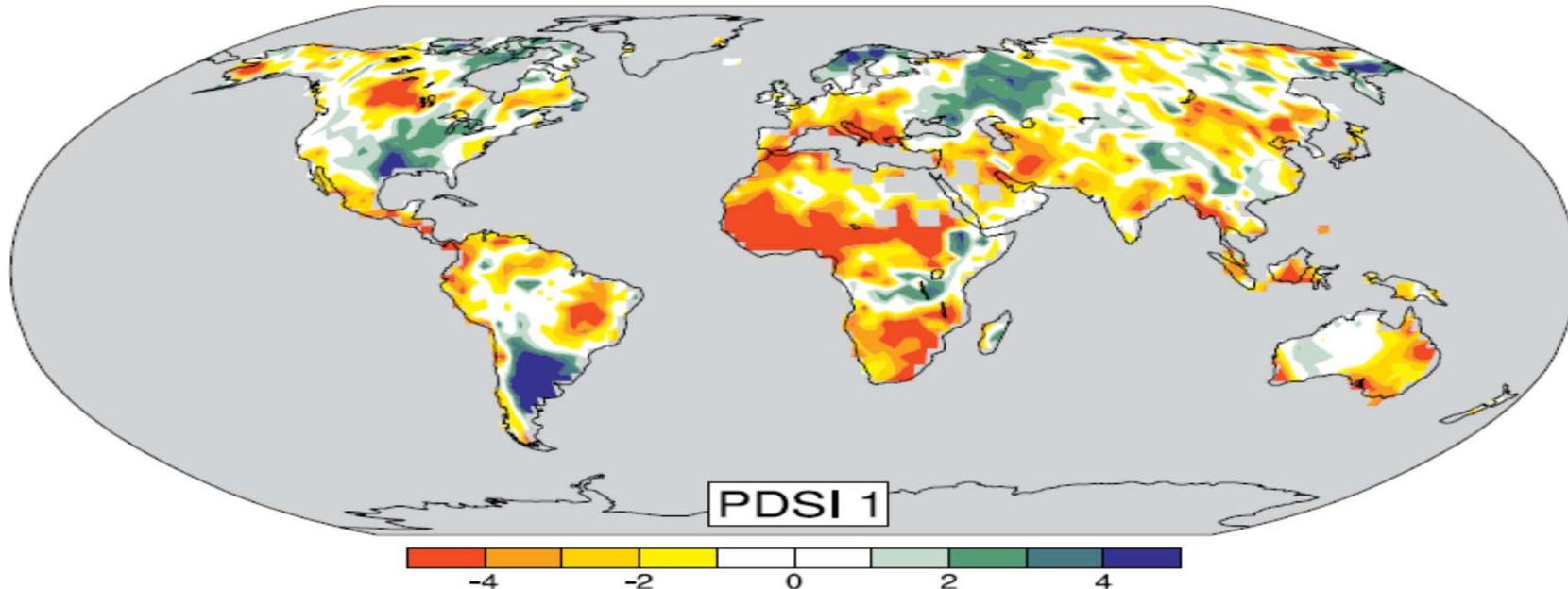
Terra considerada “Muito Seca” a nível mundial:

15% em 1970

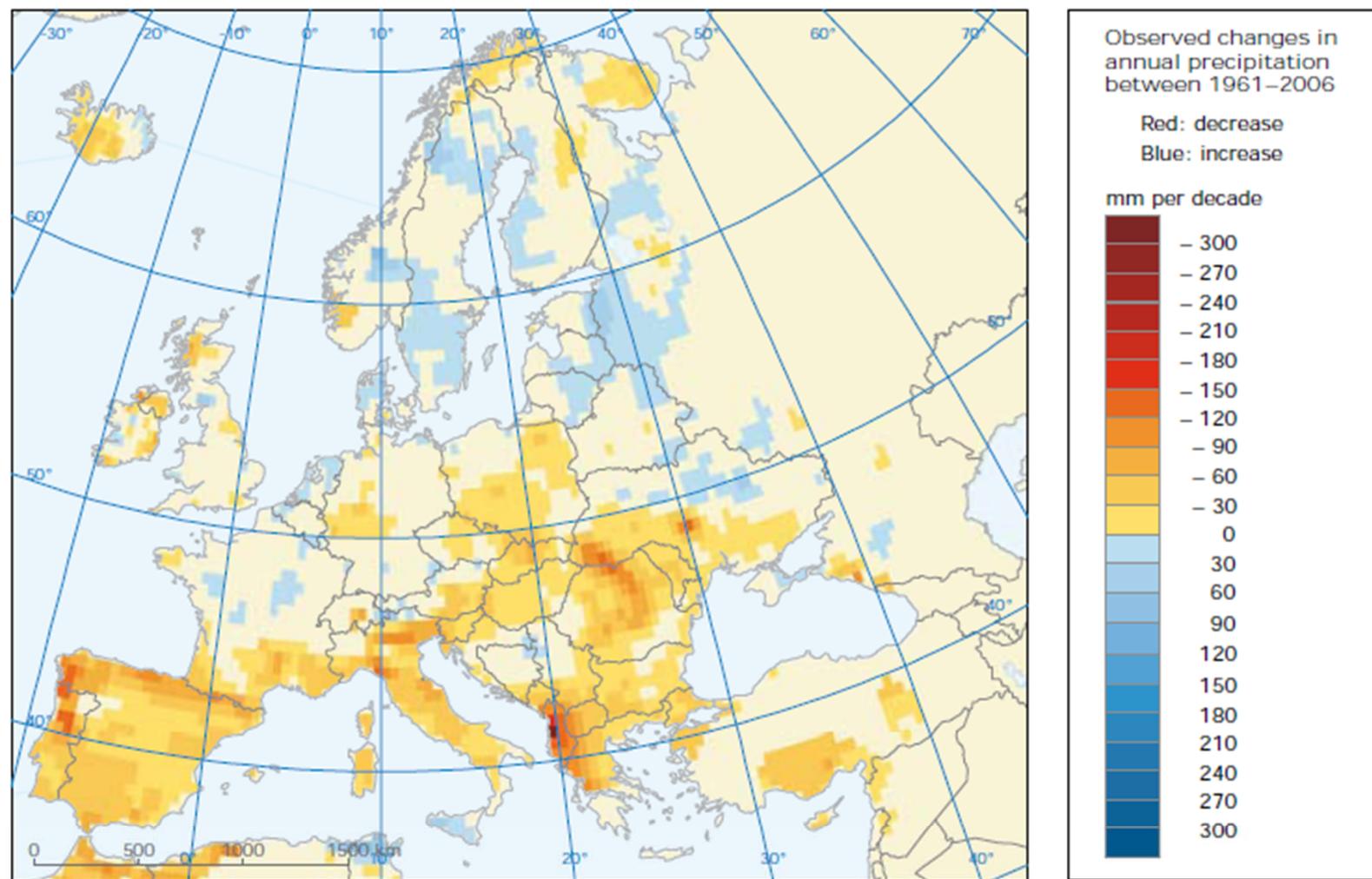
38% em 2010



Drought severity index is increasing



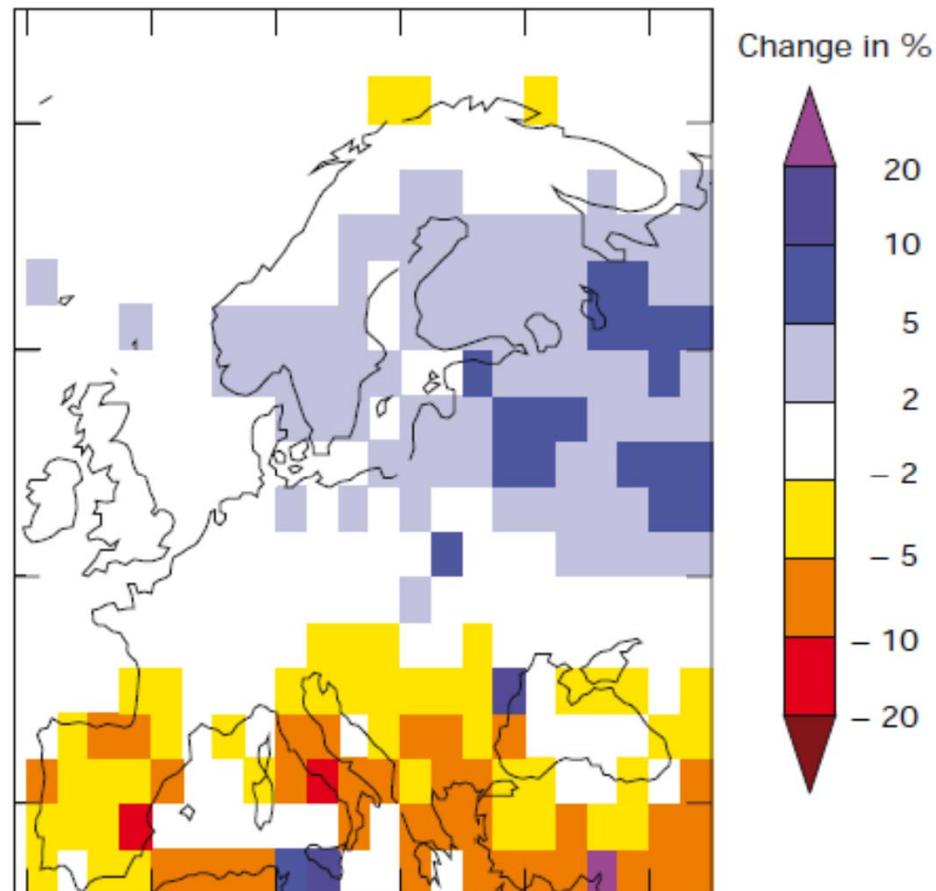
Map 5.4 Observed changes in annual precipitation 1961–2006



Note: Data are in mm per decade, blue means an increase, red a decrease. The observations indicate that large decadal scale variability in precipitation amount is superposed on the long time scale trends described above. This variability is partly related to the decadal scale variability in atmospheric circulation anomalies (see Box 5.1). Calculating trends over shorter time periods may therefore lead to different results.

Source: The climate dataset is from the EU-FP6 project ENSEMBLES (<http://www.ensembles-eu.org>) and the data providers in the ECA&D project (<http://eca.knmi.nl>).

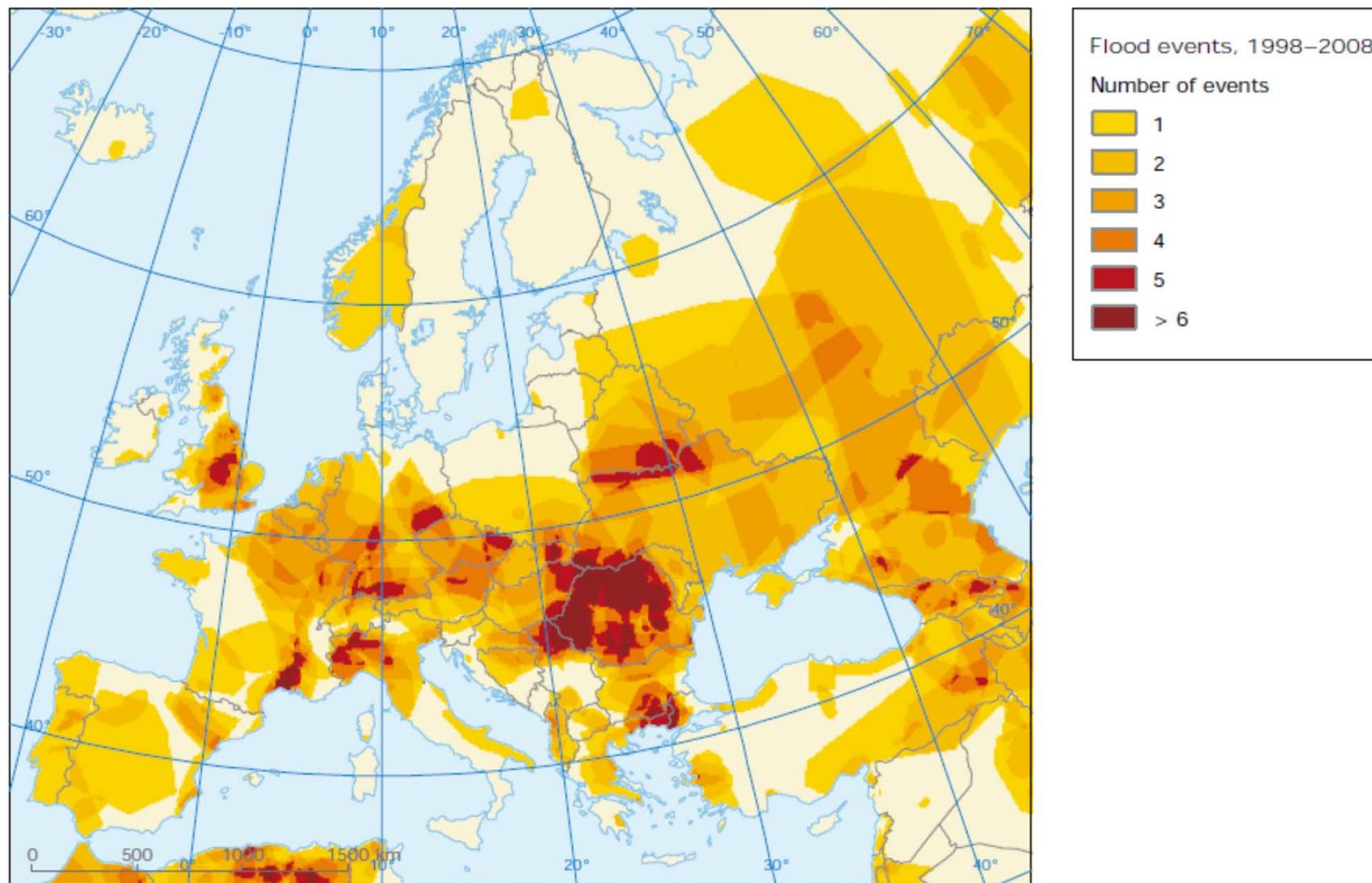
Map 5.22 Modelled change in annual river flow between 1971–1998 and 1900–1970



Note: The map is based on an ensemble of 12 climate models and validated against observed river flows.

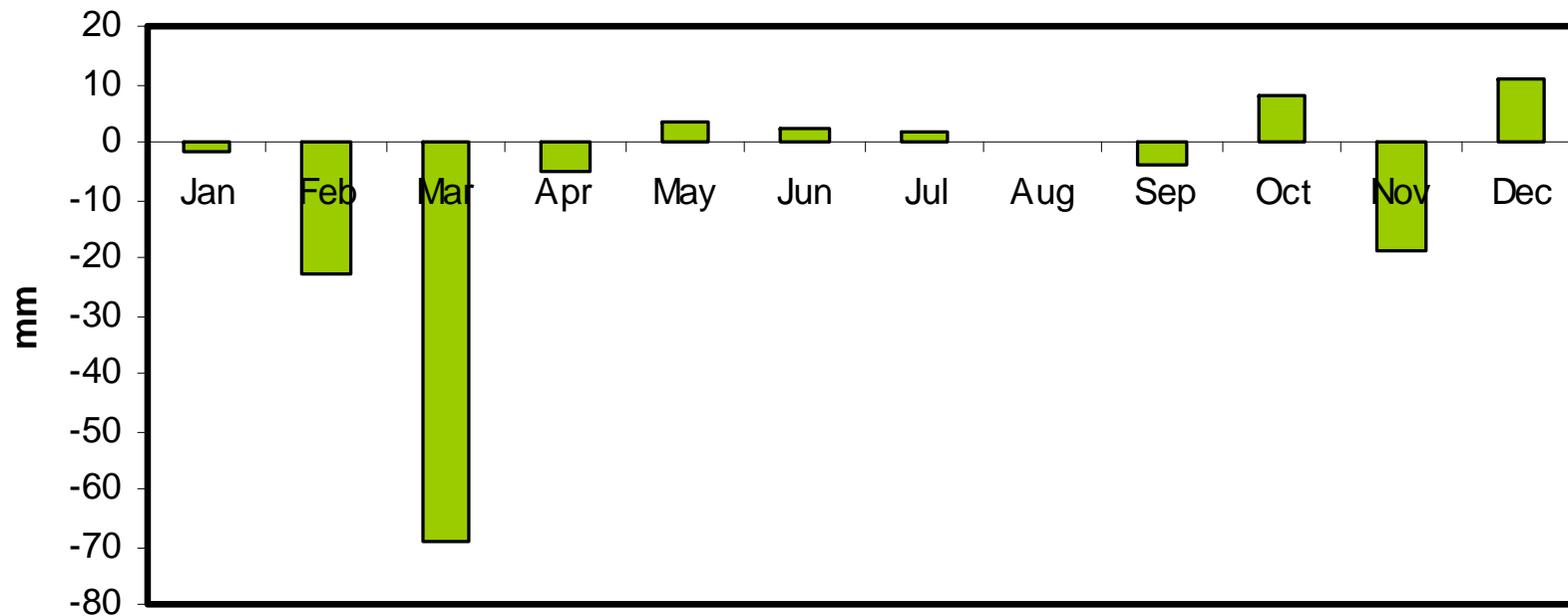
Source: Milly *et al.*, 2005.

Map 5.24 Occurrence of flood events in Europe 1998–2008



Source: Based on data from Dartmouth Flood Observatory (<http://www.dartmouth.edu/~floods/>).

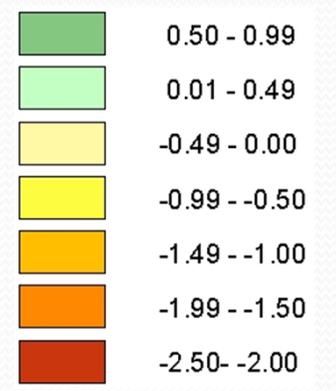
Annual cycle of the difference between monthly mean precipitation in the 1940-69 and the 1970-99 climate normals



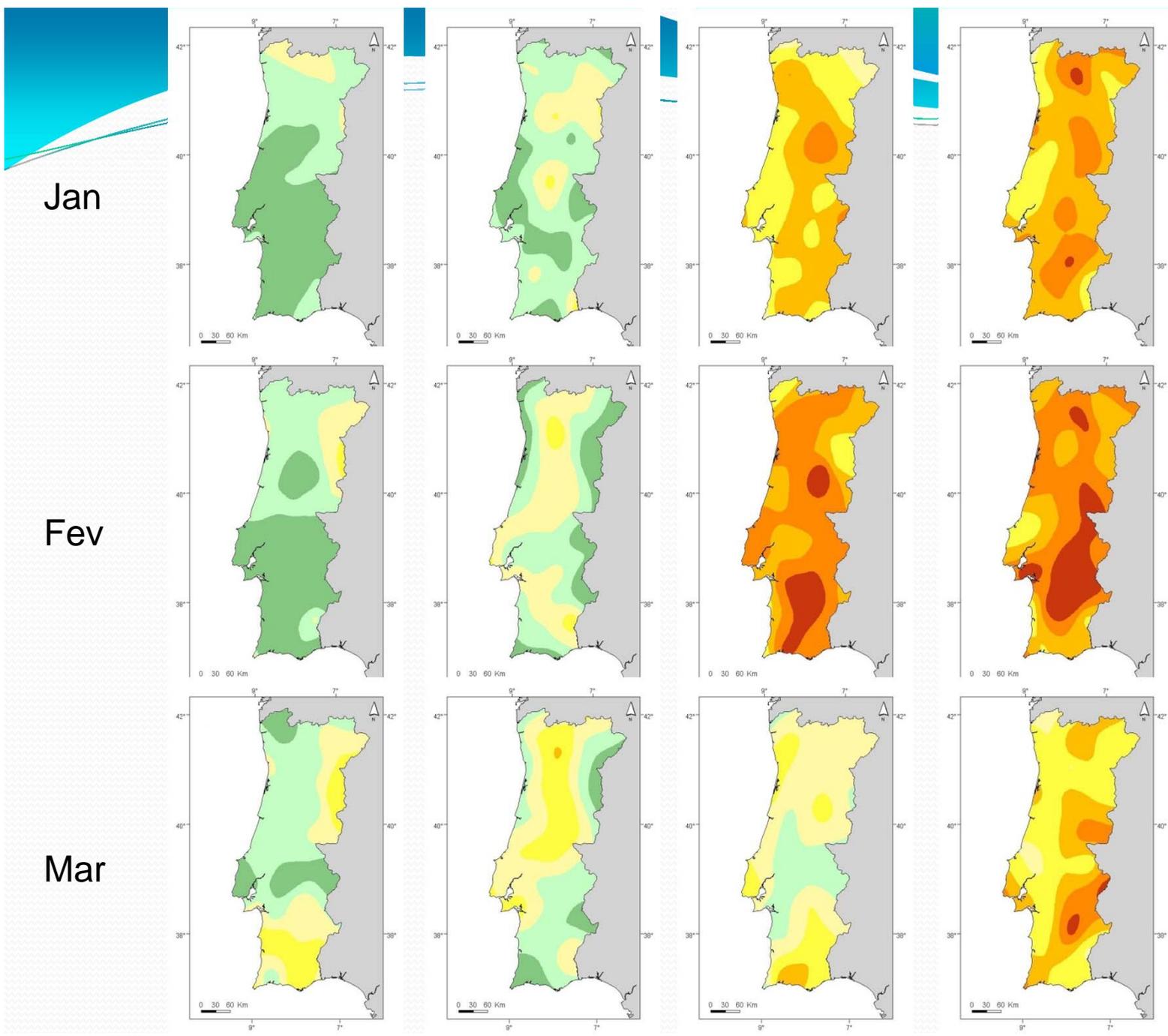
Fonte, SIAM

Indice
PDSI
Seca

Chuva ligeira



Seca moderada



1961-70

1971-80

1981-90

1991-00

Terceiro relatório de acompanhamento relativo à Comunicação sobre a escassez de água e as secas na União Europeia, COM(2007) 414 final SEC(2011) 338 final

[1] O questionário para o relatório anual (enviado aos 27 Estados-Membros e à Noruega e à Suíça) foi respondido por 21 países (AT, BE, BG, CH, CY, CZ, DK, EE, ES, FR, HU, IE, IT, LU, MT, NL, PT, RO, SE, SK e UK).

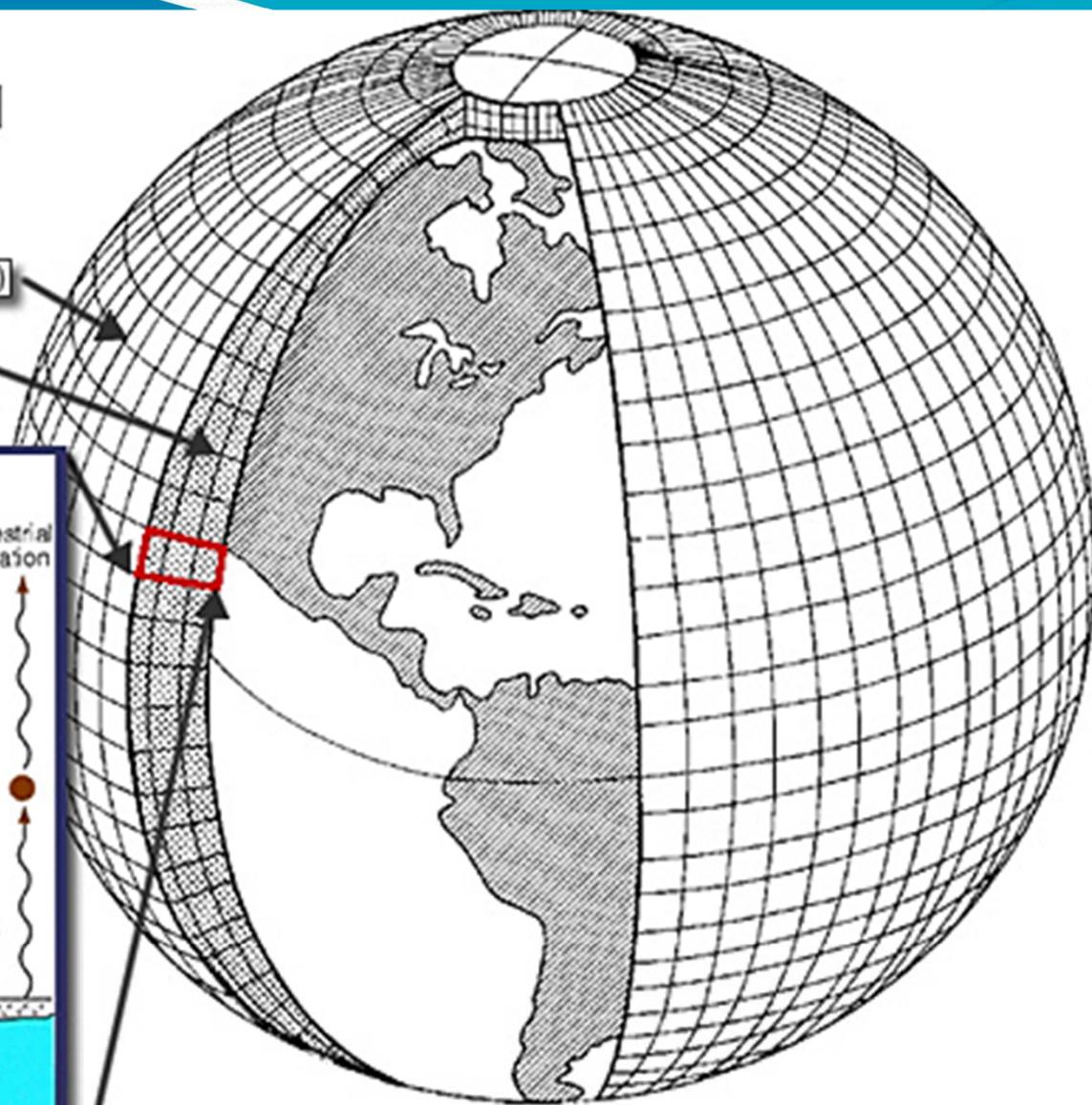
O presente relatório abrange o período de Maio de 2009 a Maio de 2010 e baseia-se nas respostas de 21 países ao questionário anual da Comissão [1]. A situação de escassez de água era a seguinte:

- três Estados-Membros comunicaram que a escassez de água nos seus territórios era contínua (CZ, CY, MT);
- cinco Estados-Membros comunicaram a ocorrência de secas ou de níveis de precipitação inferiores às médias a longo prazo (FR, PT, HU, ES, UK);
- quatro Estados-Membros registaram a ocorrência de fenómenos limitados de escassez de água a nível local (FR, NL, RO e SE).

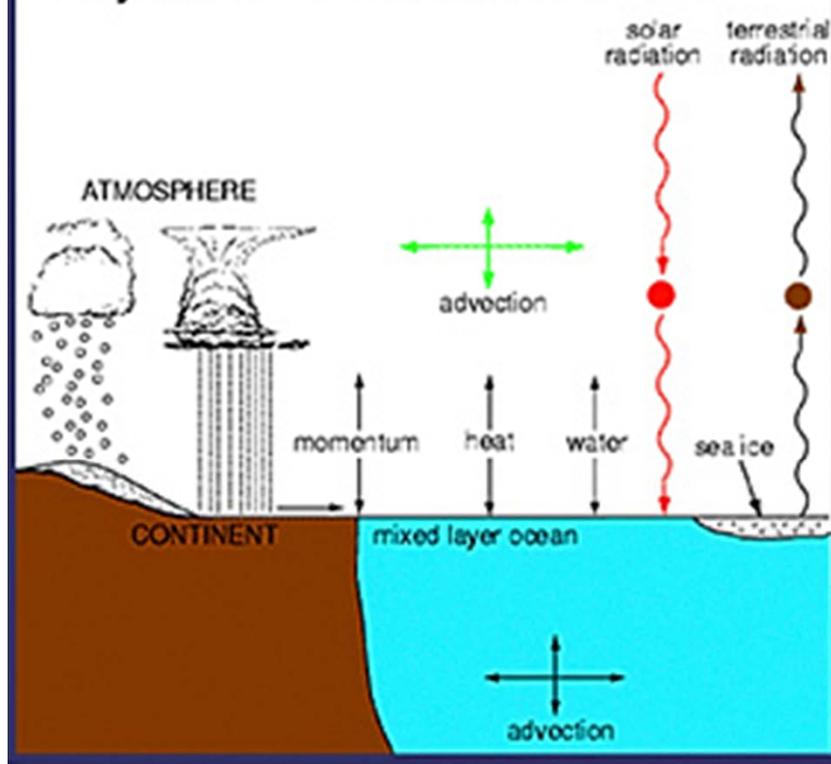
Schematic for Global Atmospheric Model

Horizontal Grid (latitude - longitude)

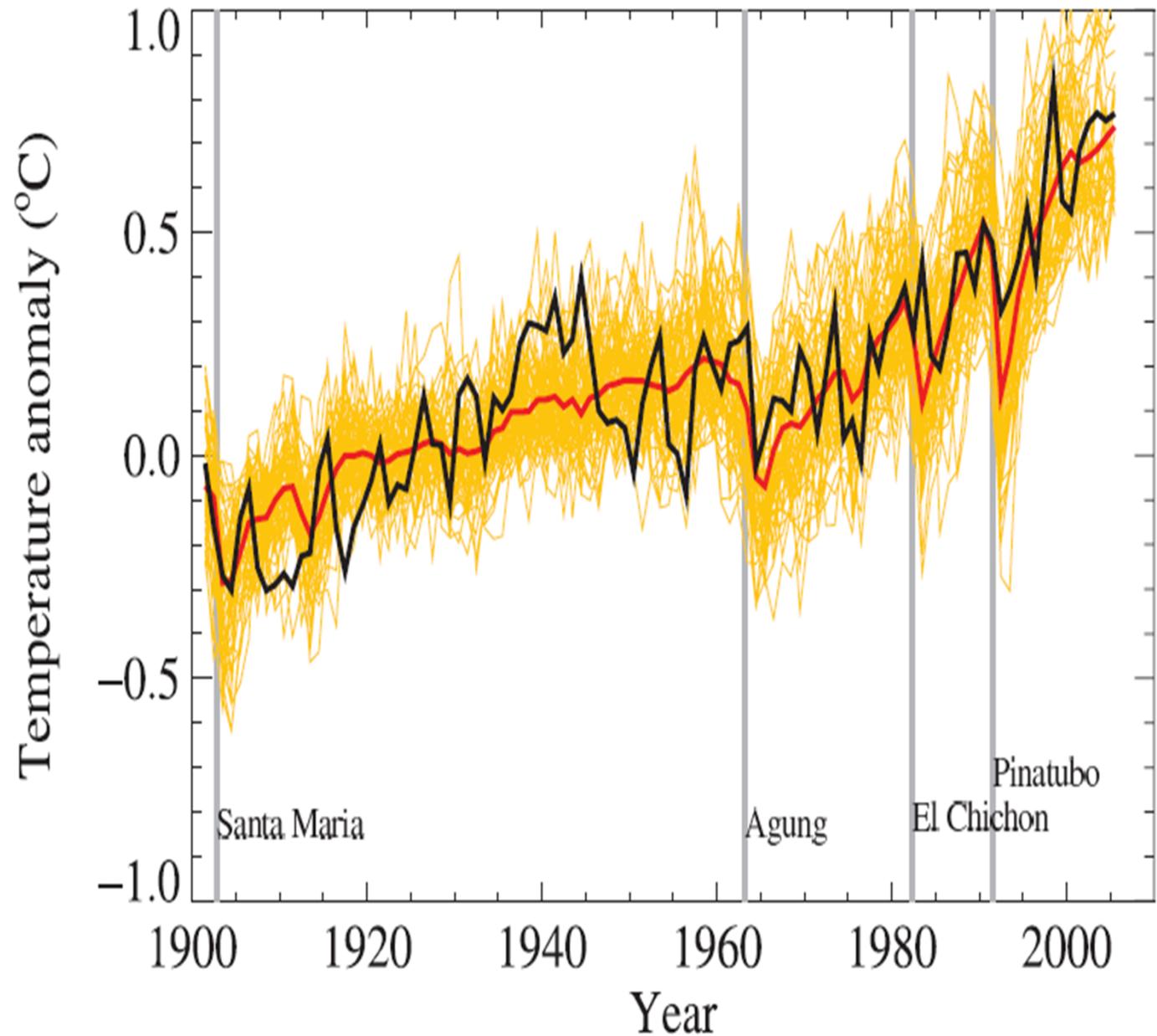
Vertical Grid (height or pressure)

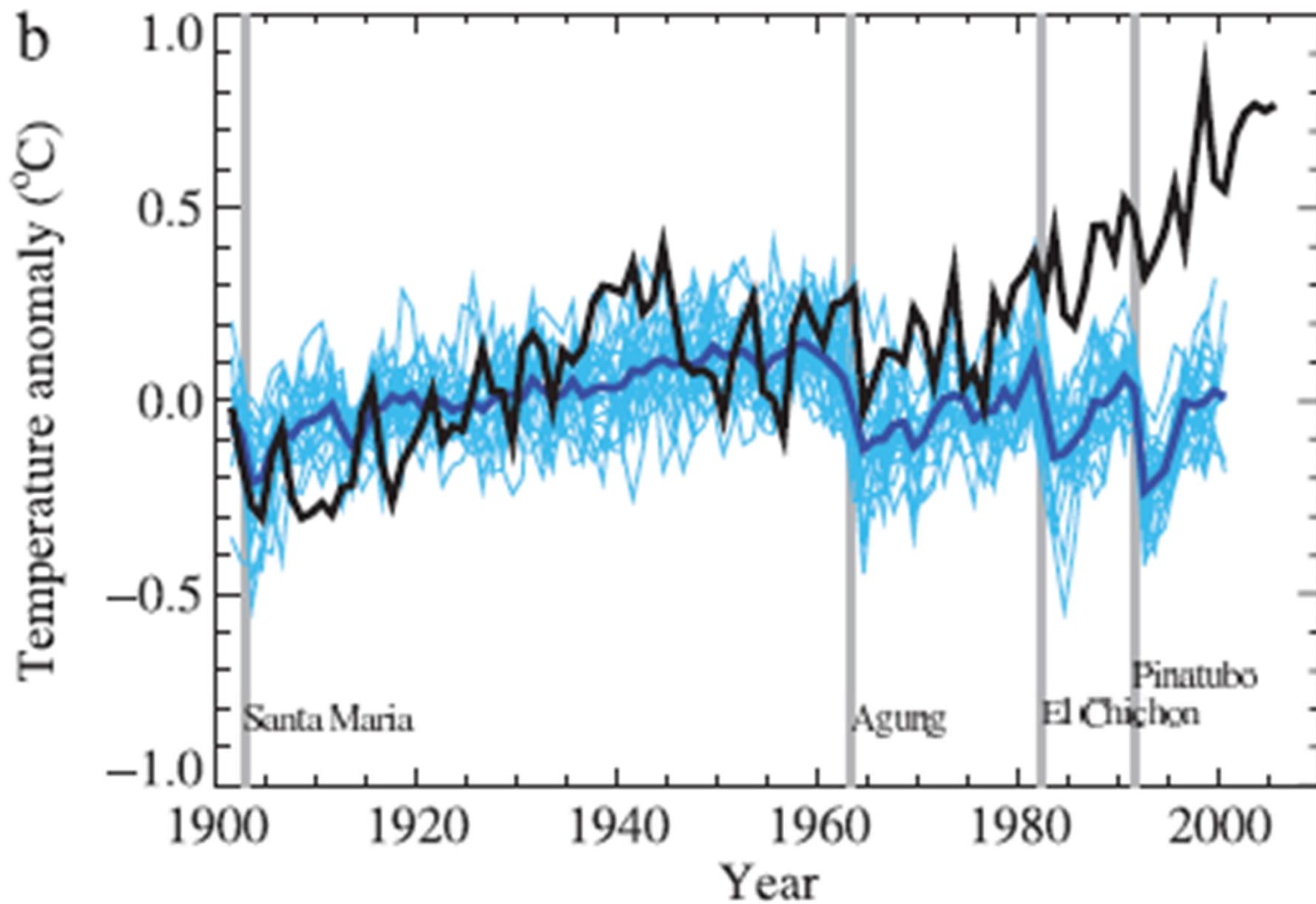


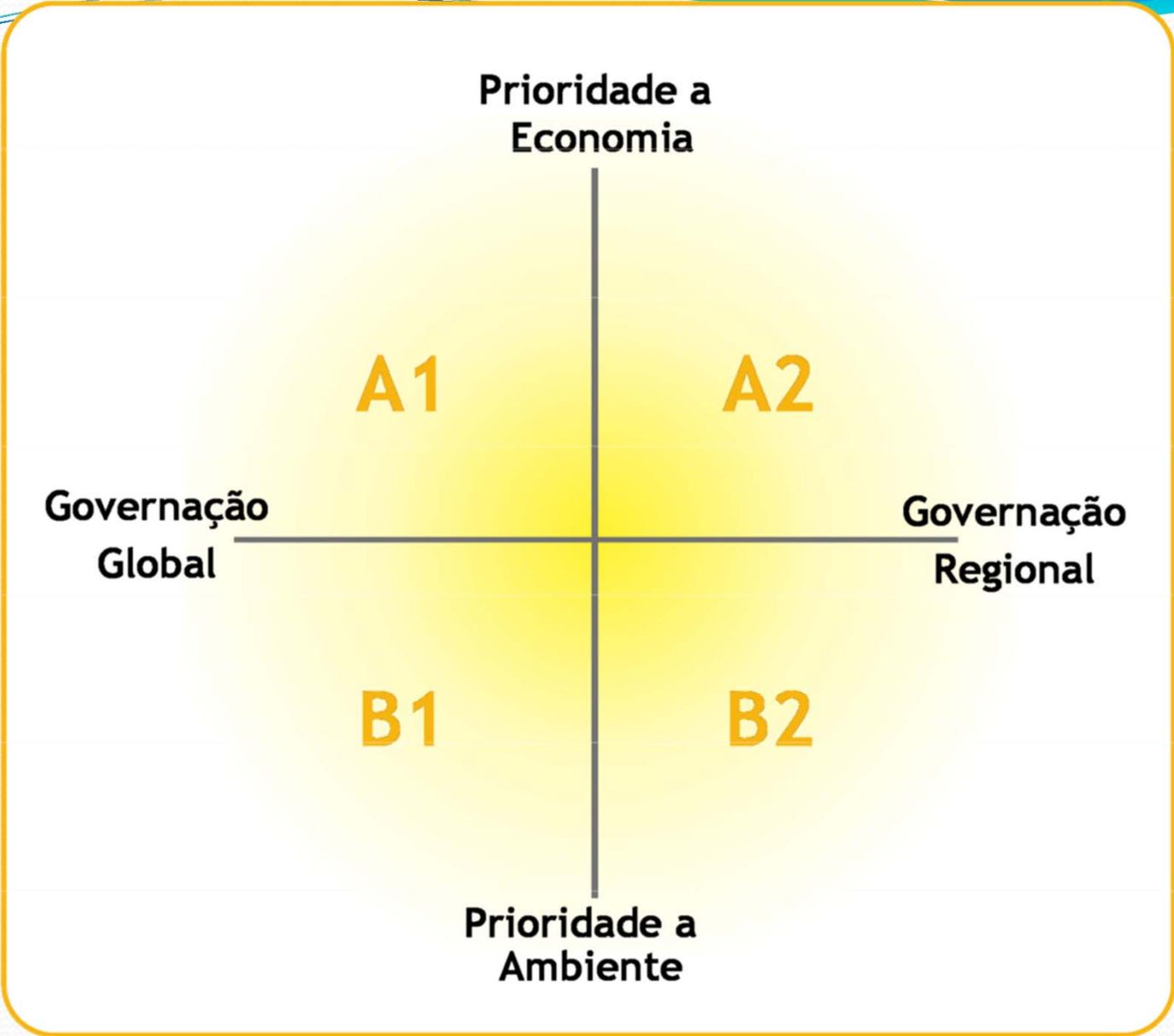
Physical Processes in a Model



FAQ 8.1, Figure 1. *Global mean near-surface temperatures over the 20th century from observations (black) and as obtained from 58 simulations produced by 14 different climate models driven by both natural and human-caused factors that influence climate (yellow). The mean of all these runs is also shown (thick red line). Temperature anomalies are shown relative to the 1901 to 1950 mean. Vertical grey lines indicate the timing of major volcanic eruptions. (Figure adapted from Chapter 9, Figure 9.5. Refer to corresponding caption for further details.)*



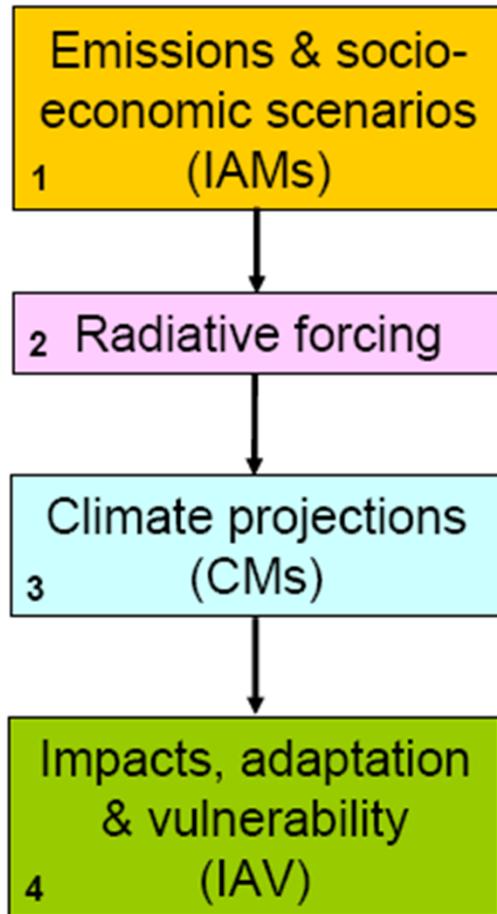




	População	Economia	Ambiente	Equidade	Tecnologia	Globalização	Emissões
A1·FI							
A2							
B1							
B2							

Fonte, SIAM

(a) Sequential approach



(b) Parallel approach

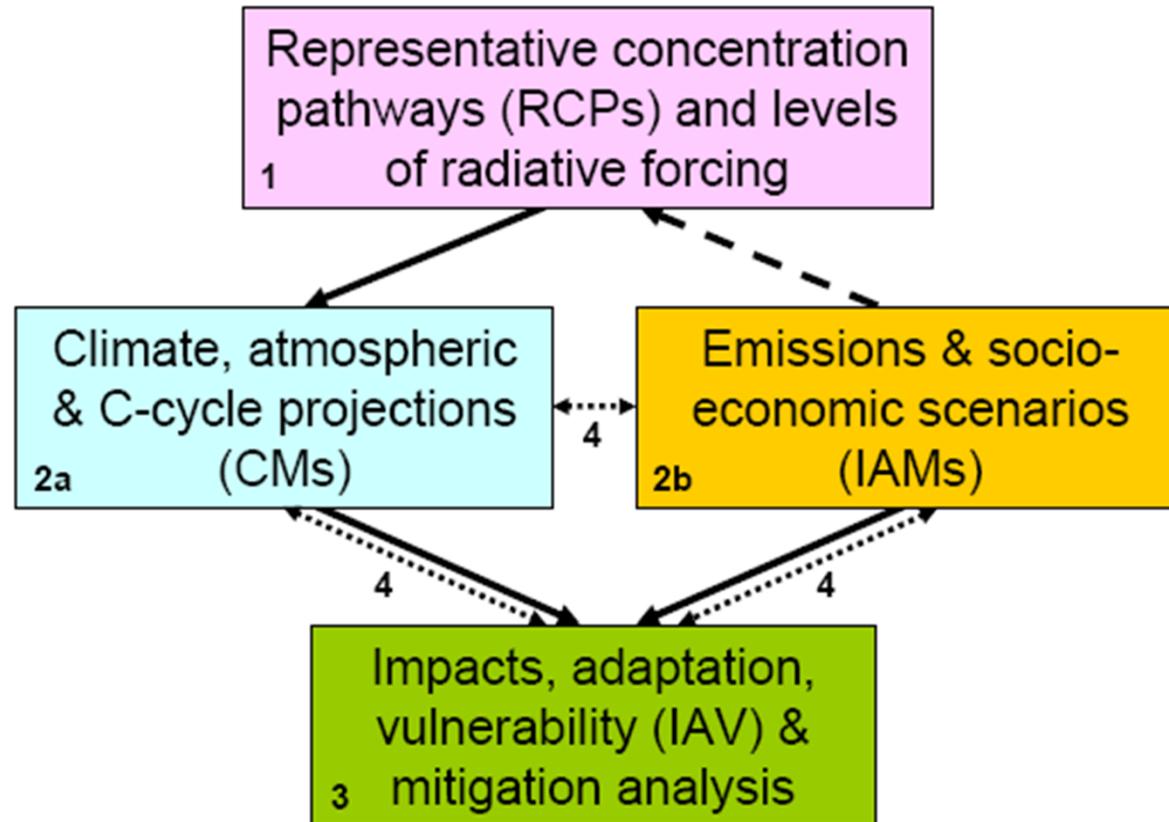
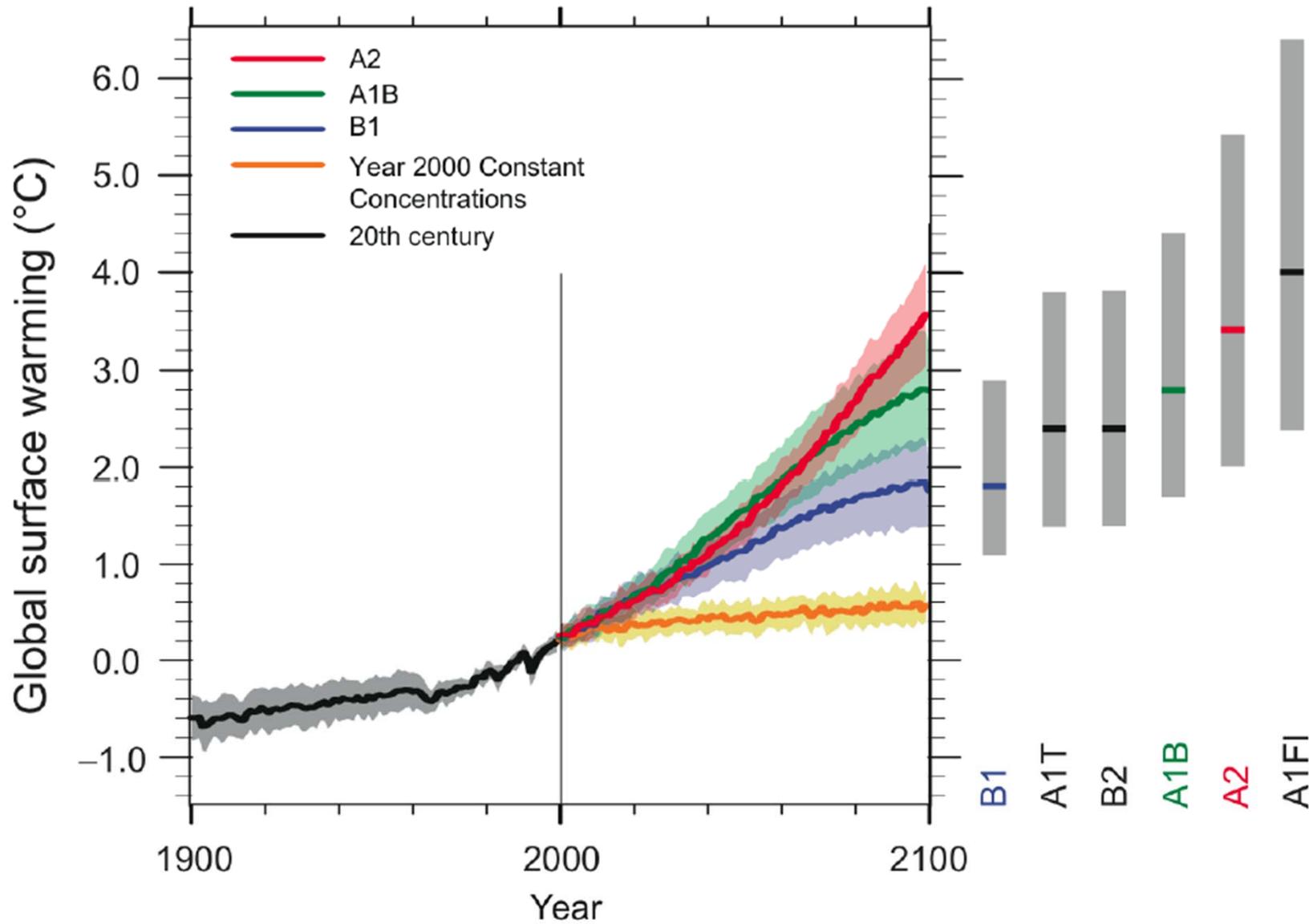


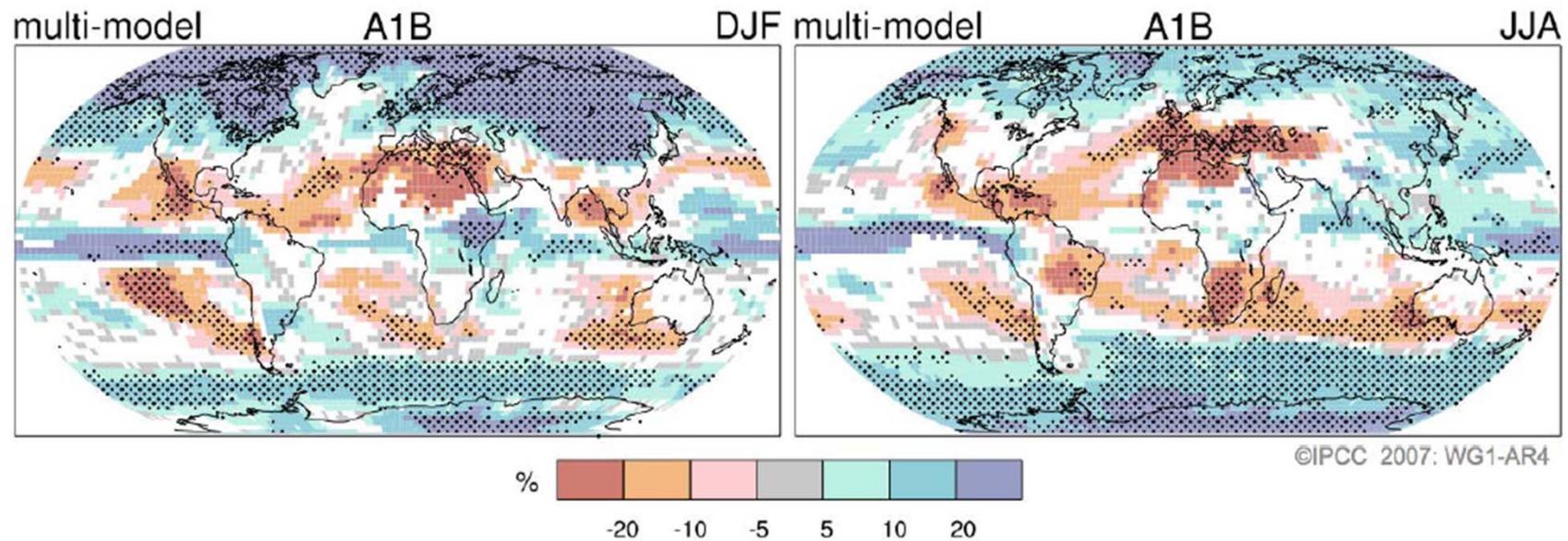
Figure 1. Approaches to the development of global scenarios: (a) previous *sequential* approach; (b) proposed *parallel* approach. Numbers indicate analytical steps (2a and 2b proceed concurrently). Arrows indicate transfers of information (solid), selection of RCPs (dashed), and integration of information and feedbacks (dotted).

Multi-model Averages and Assessed Ranges for Surface Warming



Source, IPCC

Projected Patterns of Precipitation Changes



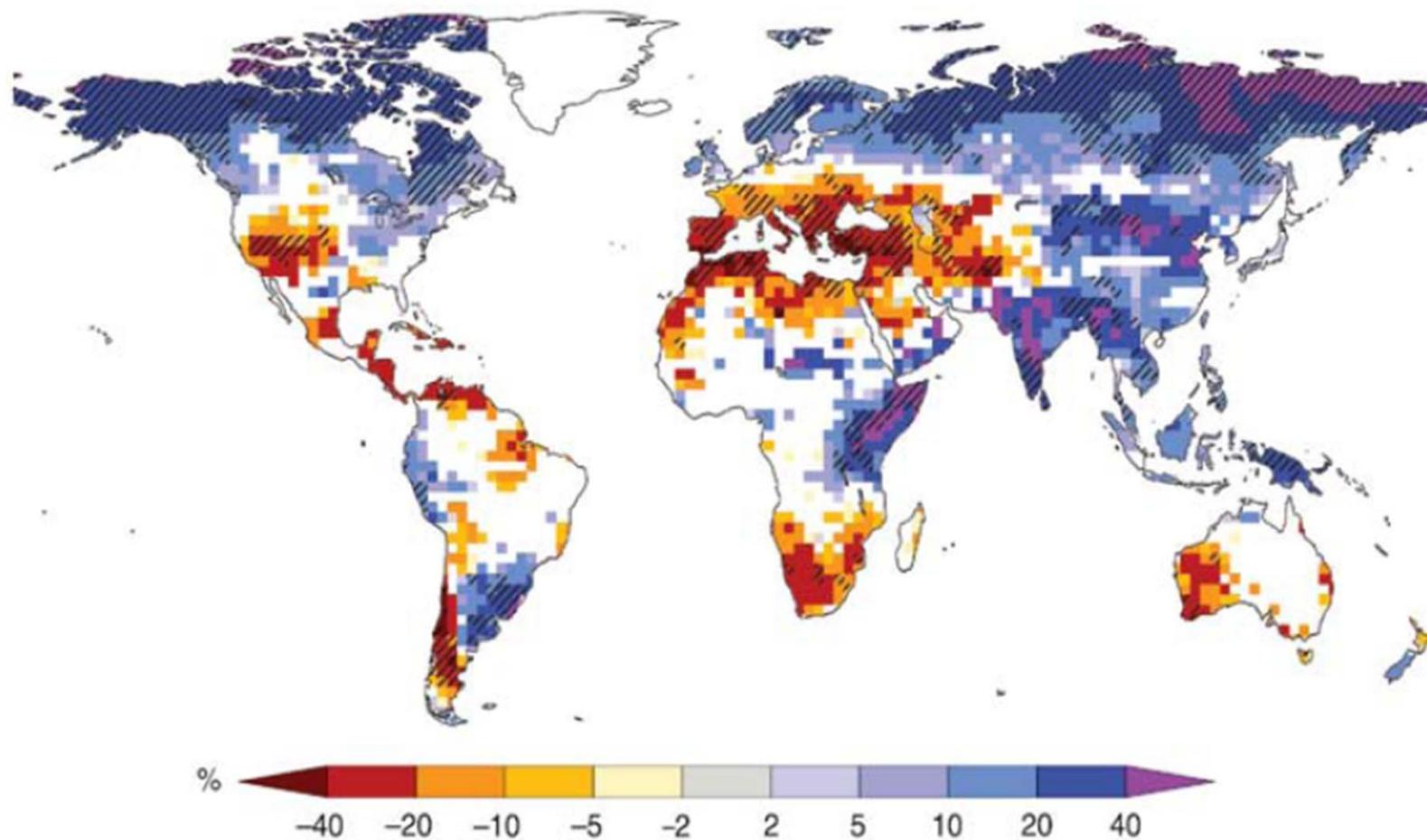


Figure 2.10: Large-scale relative changes in annual runoff for the period 2090–2099, relative to 1980–1999. White areas are where less than 66% of the ensemble of 12 models agree on the sign of change, and hatched areas are where more than 90% of models agree on the sign of change (Milly et al., 2005). [Based on SYR Figure 3.5 and WGII Figure 3.4]

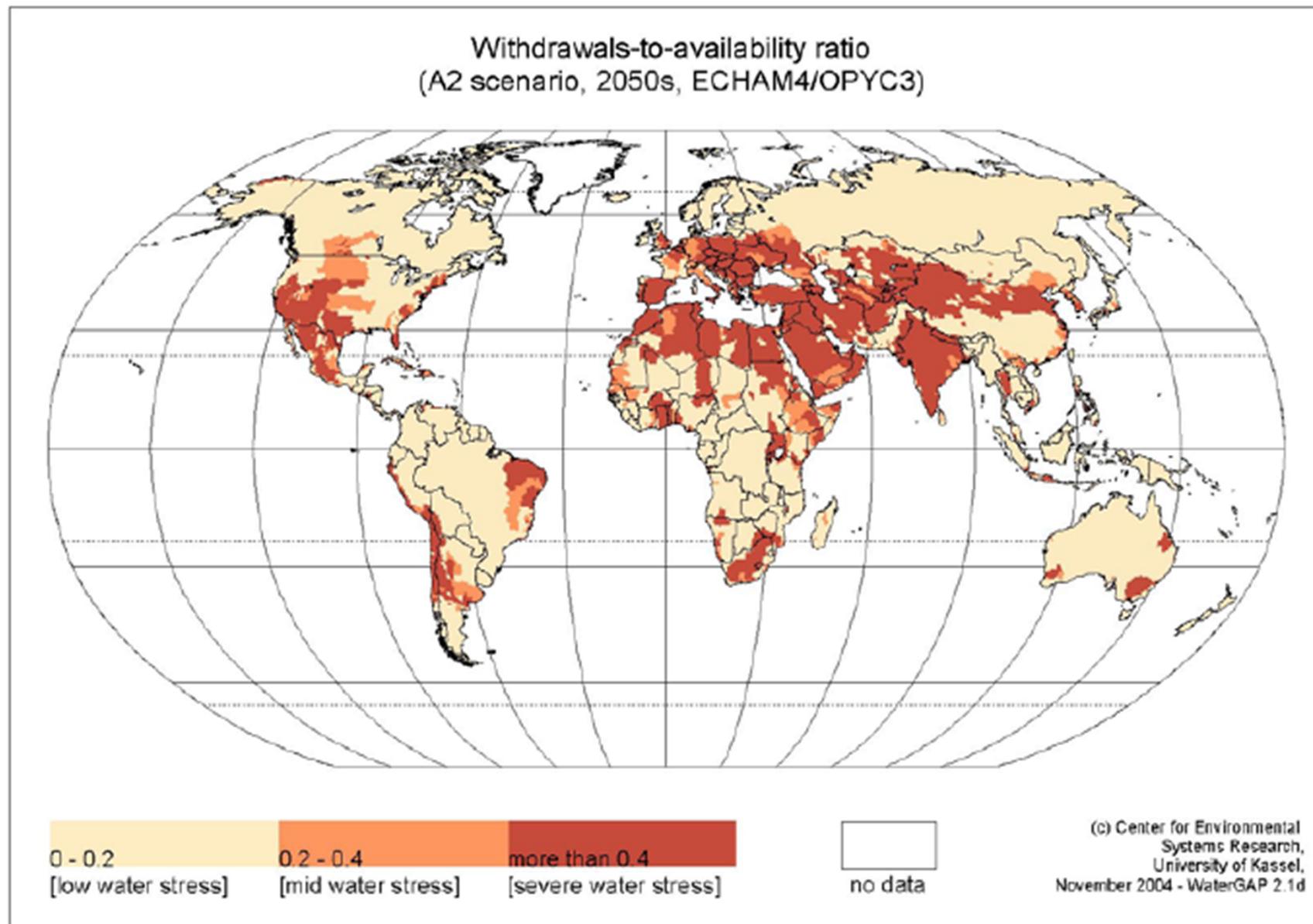


Figure 10. Water stress expressed by the w.t.a ratio in the 2050s for the A2 scenario (climate change input from the ECHAM4 model and simulations with WaterGAP)

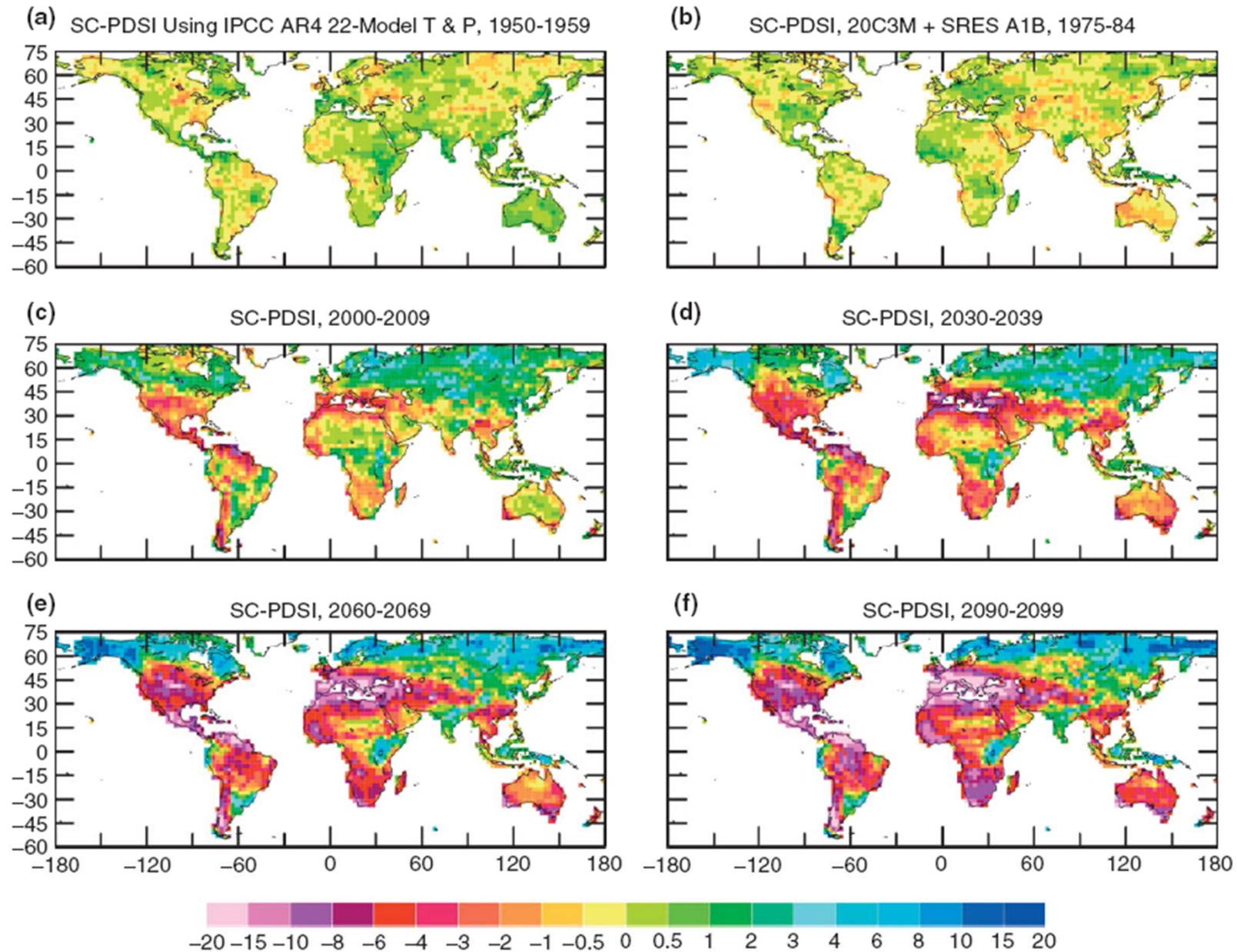
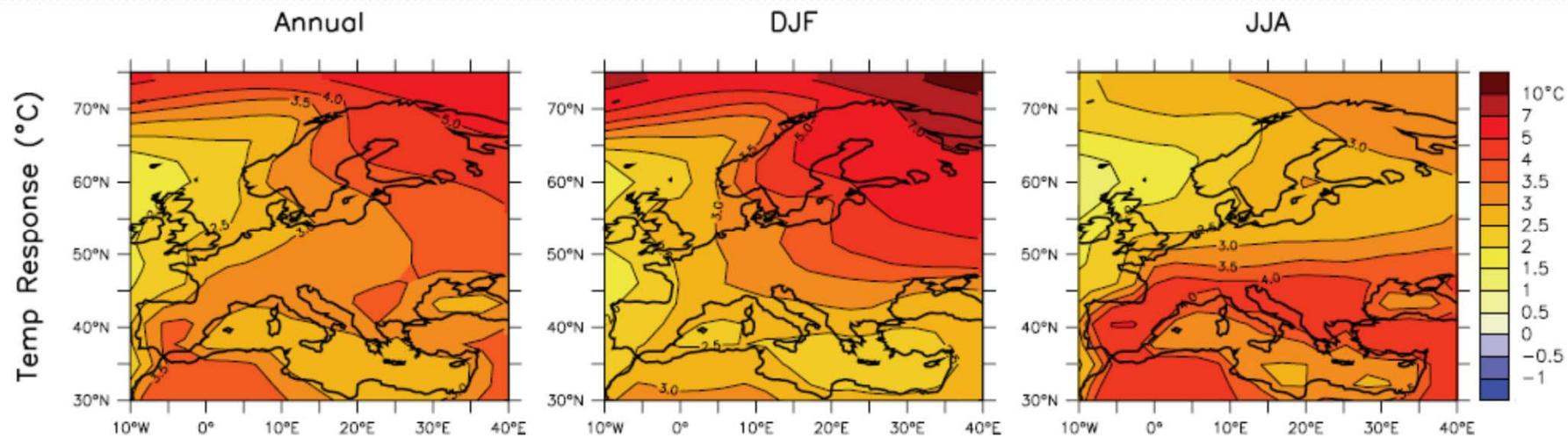


FIGURE 11 | Mean annual sc-PDSI_{pm} for years (a) 1950–1959, (b) 1975–1984, (c) 2000–2009, (d) 2030–2039, (e) 2060–2069, and (f) 2090–2099 calculated using the 22-model ensemble-mean surface air temperature, precipitation, humidity, net radiation, and wind speed used in the IPCC AR4 from the 20th century and SRES A1B 21st century simulations.¹²⁸ Red to pink areas are extremely dry (severe drought) conditions while blue colors indicate wet areas relative to the 1950–1979 mean.

A. Day, 2010



Fonte: IPCC, 2007

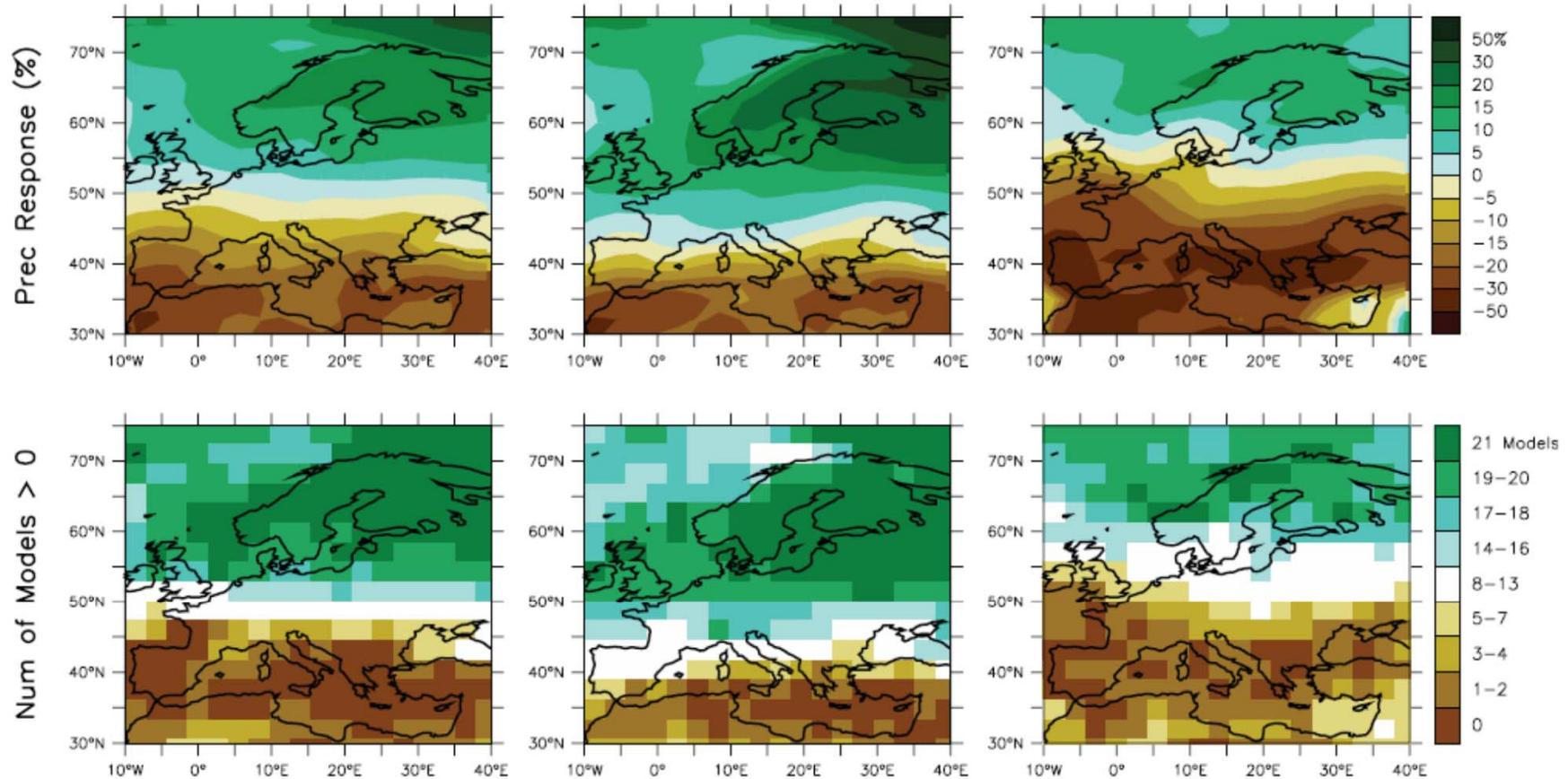
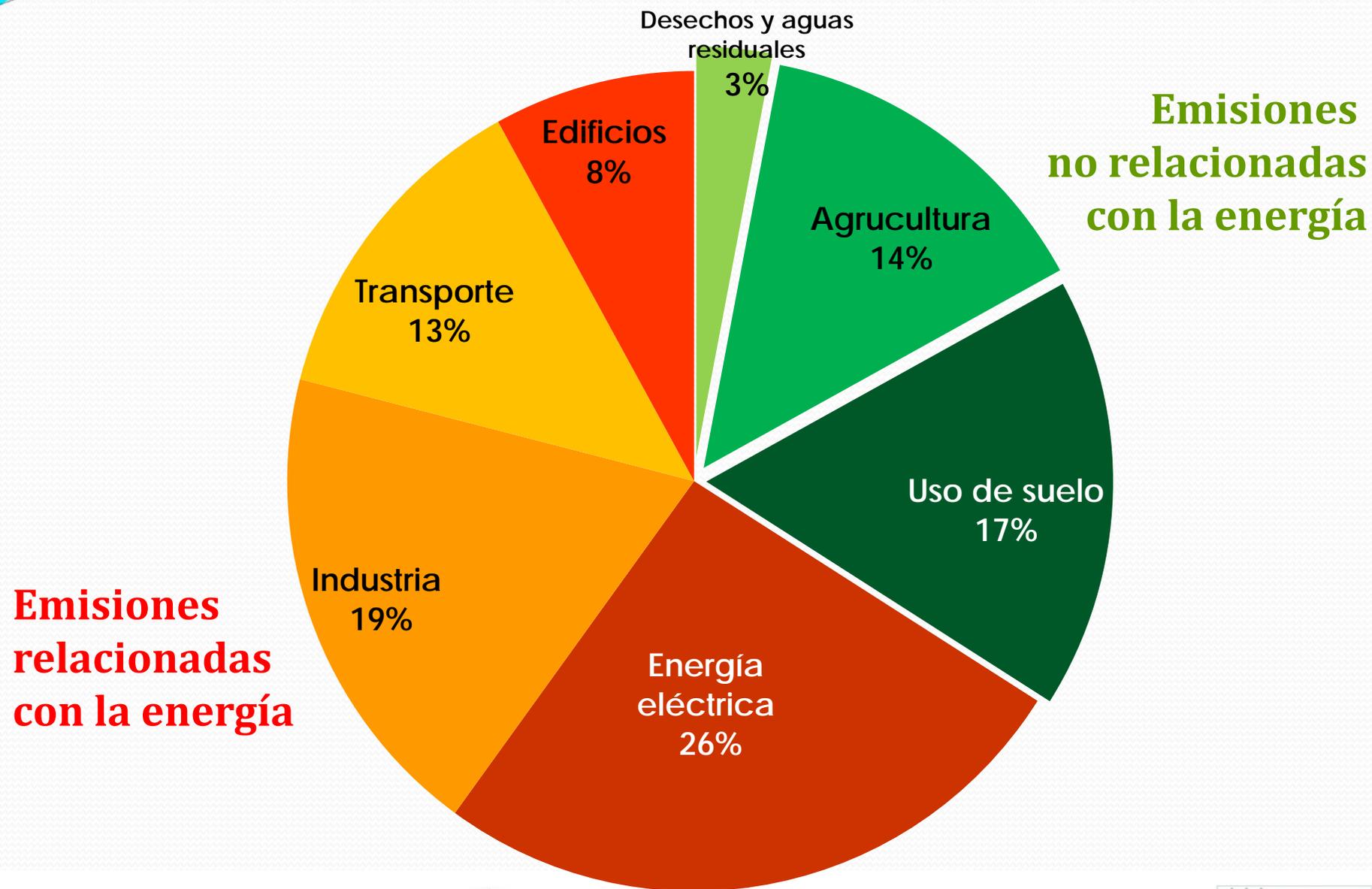


Figure 11.5. Temperature and precipitation changes over Europe from the MMD-A1B simulations. Top row: Annual mean, DJF and JJA temperature change between 1980 to 1999 and 2080 to 2099, averaged over 21 models. Middle row: same as top, but for fractional change in precipitation. Bottom row: number of models out of 21 that project increases in precipitation.

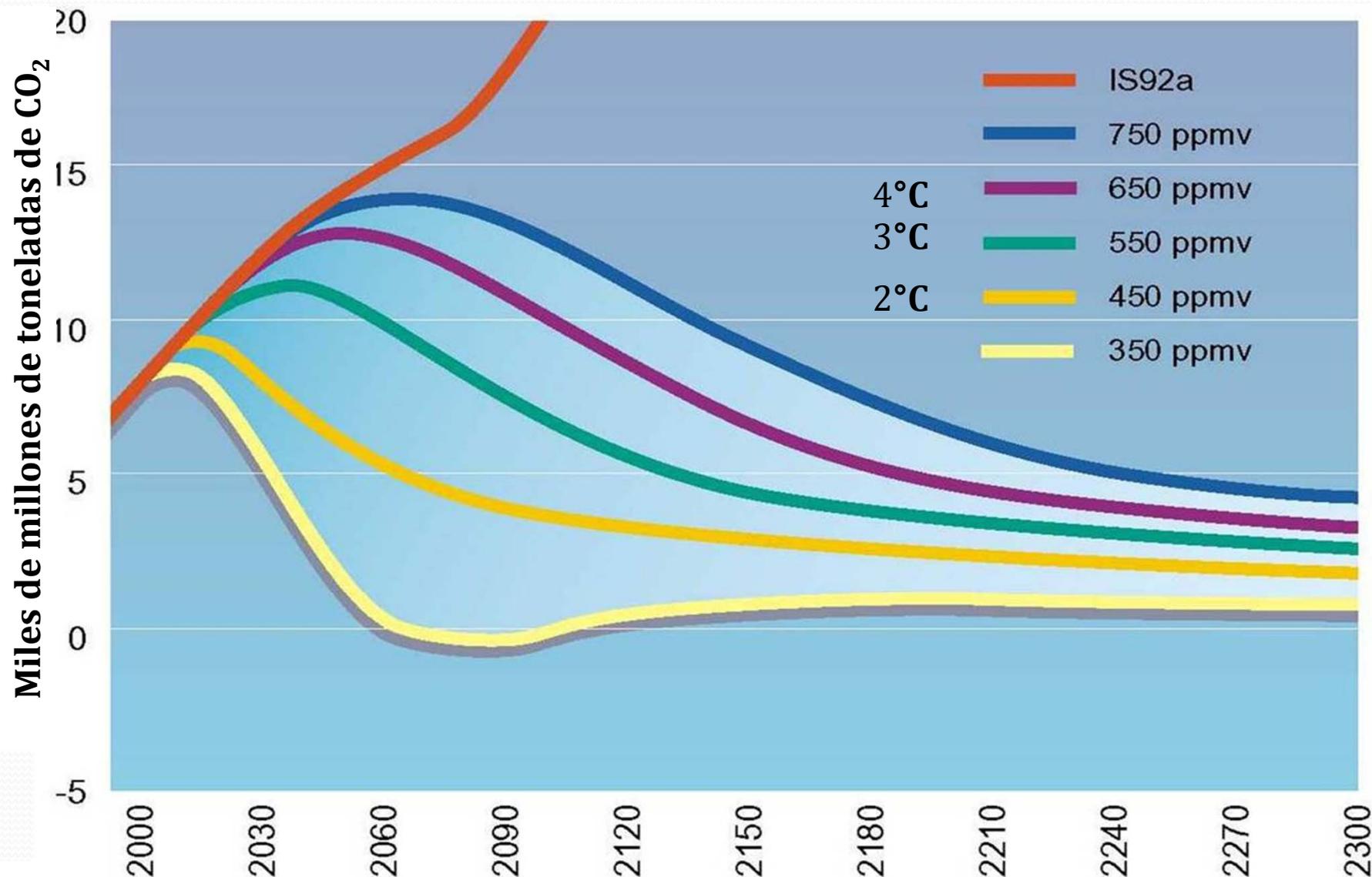
Fonte: IPCC, 2007

Emissões de GEE por sector 2007



Trajectórias das emissões de CO₂e

(2005 = 380 ppmv)



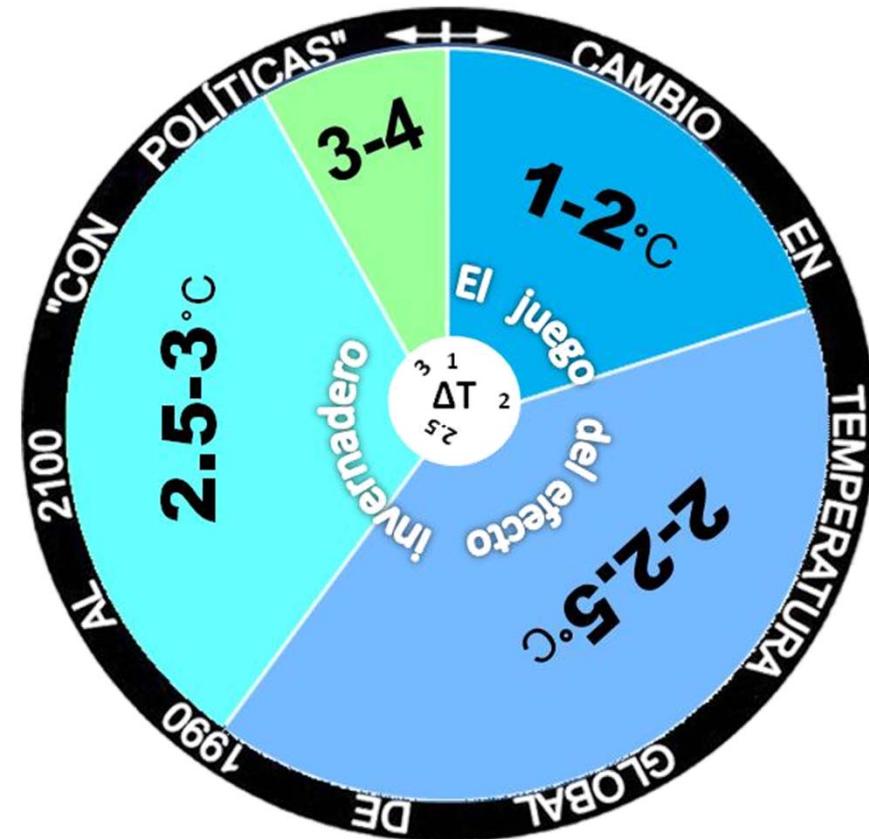
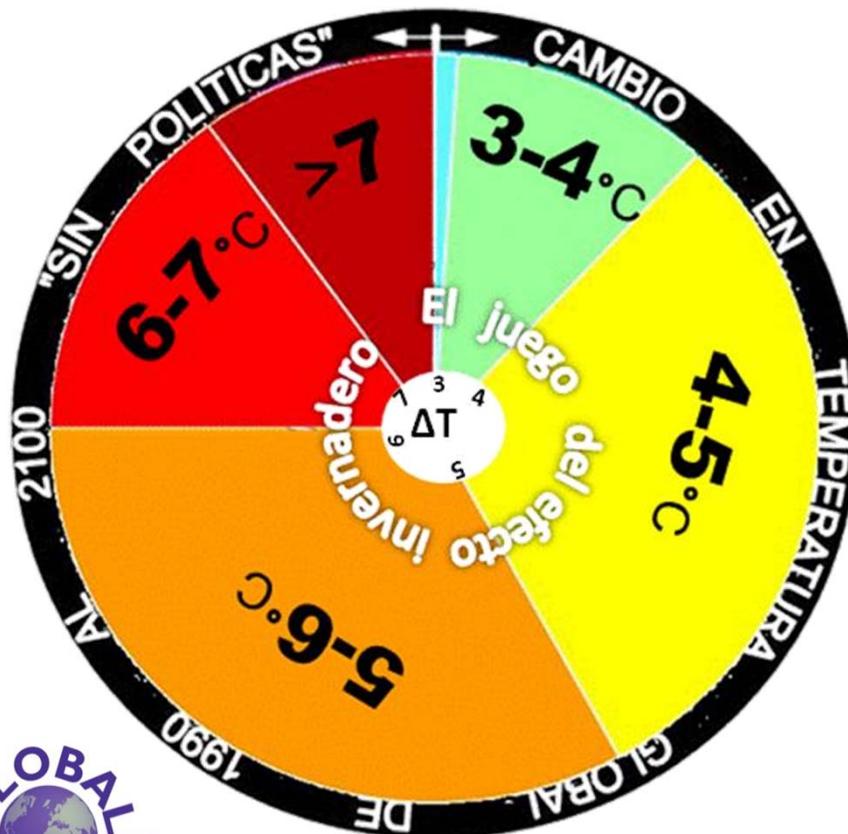
Fuente: Stern Review; World Resources Institute

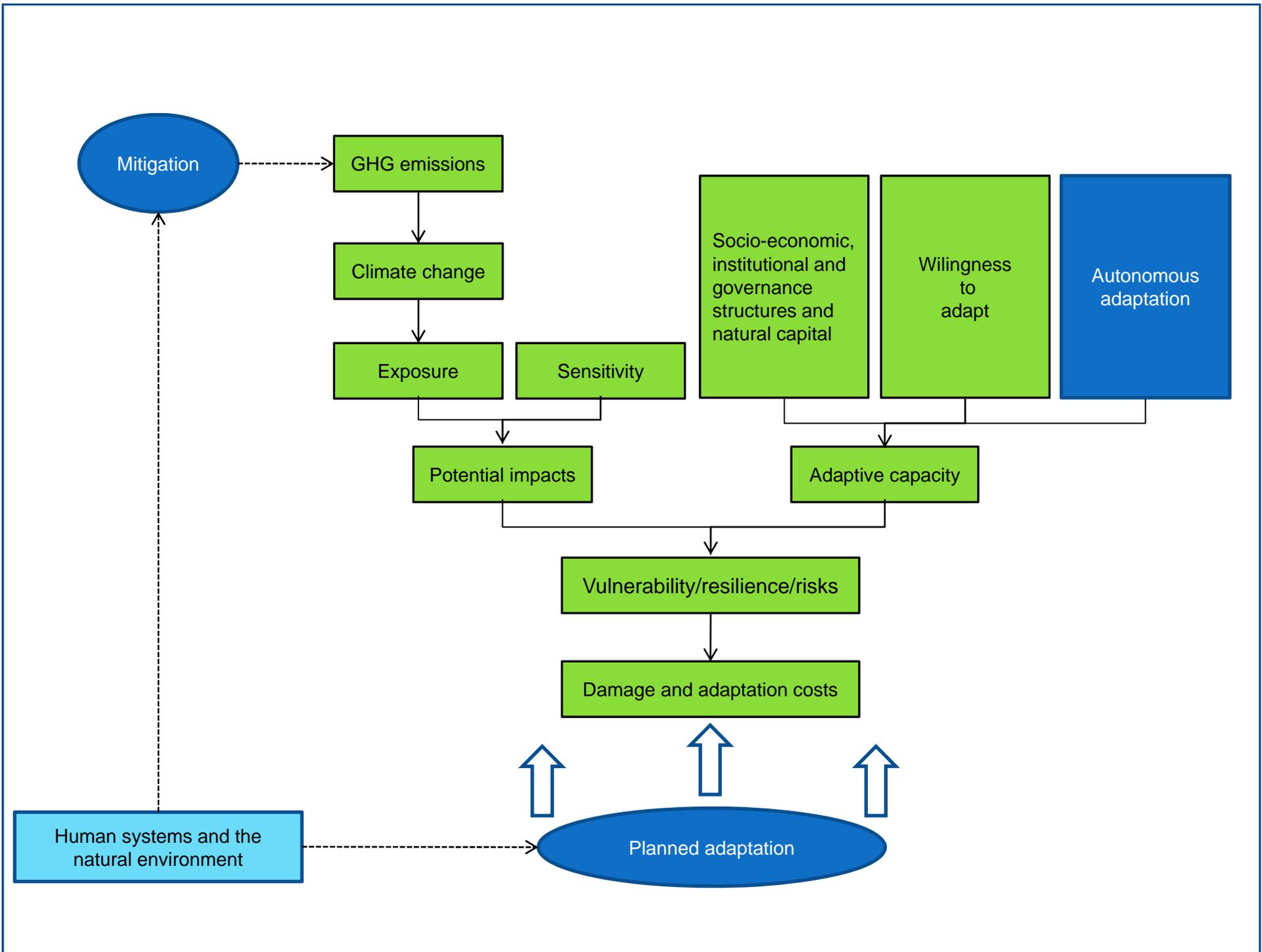
Lidar com a incerteza em políticas climáticas

Sem Políticas climáticas

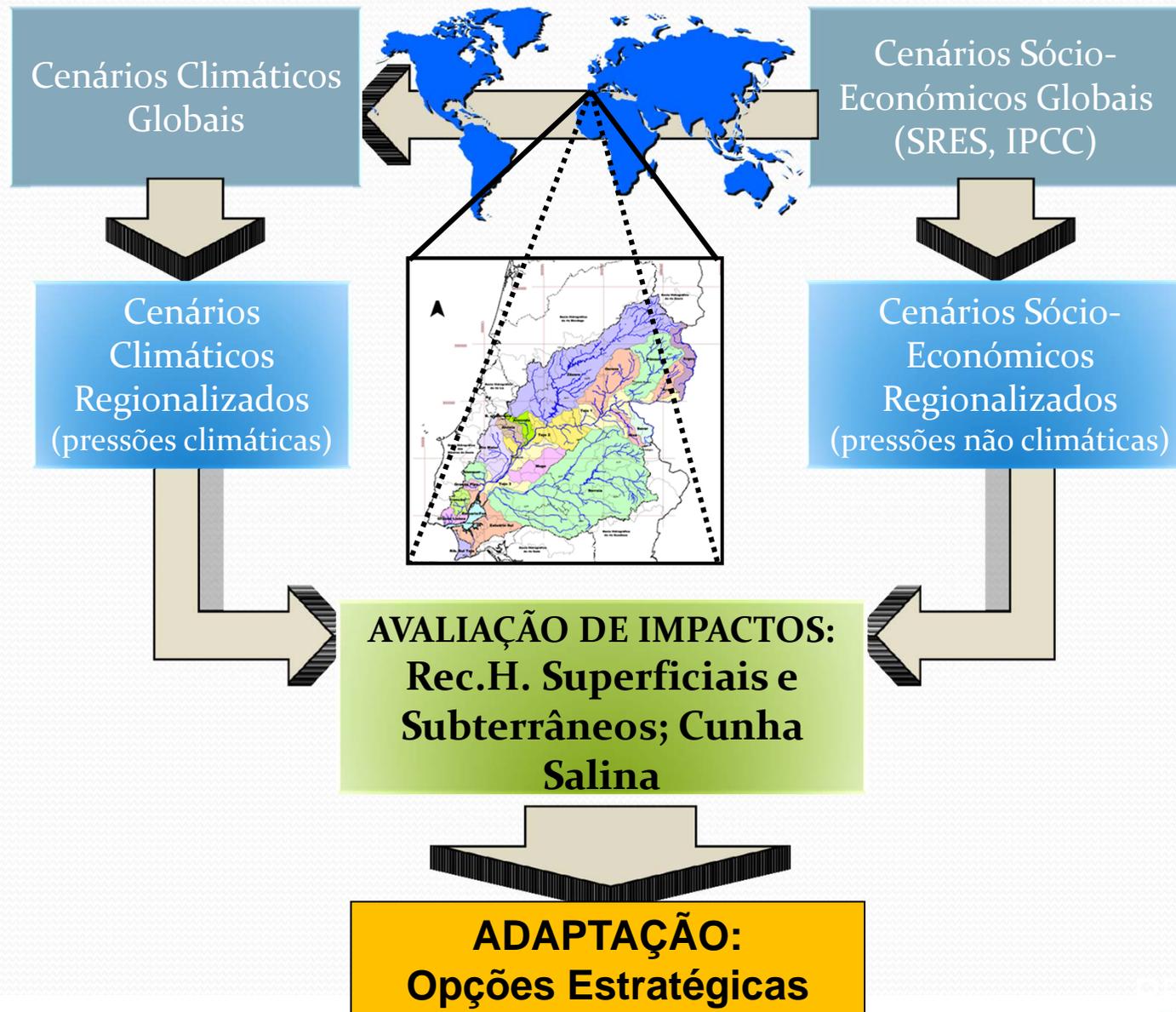
Estabilização do CO₂ em 550ppm:

Uma nova roda com políticas

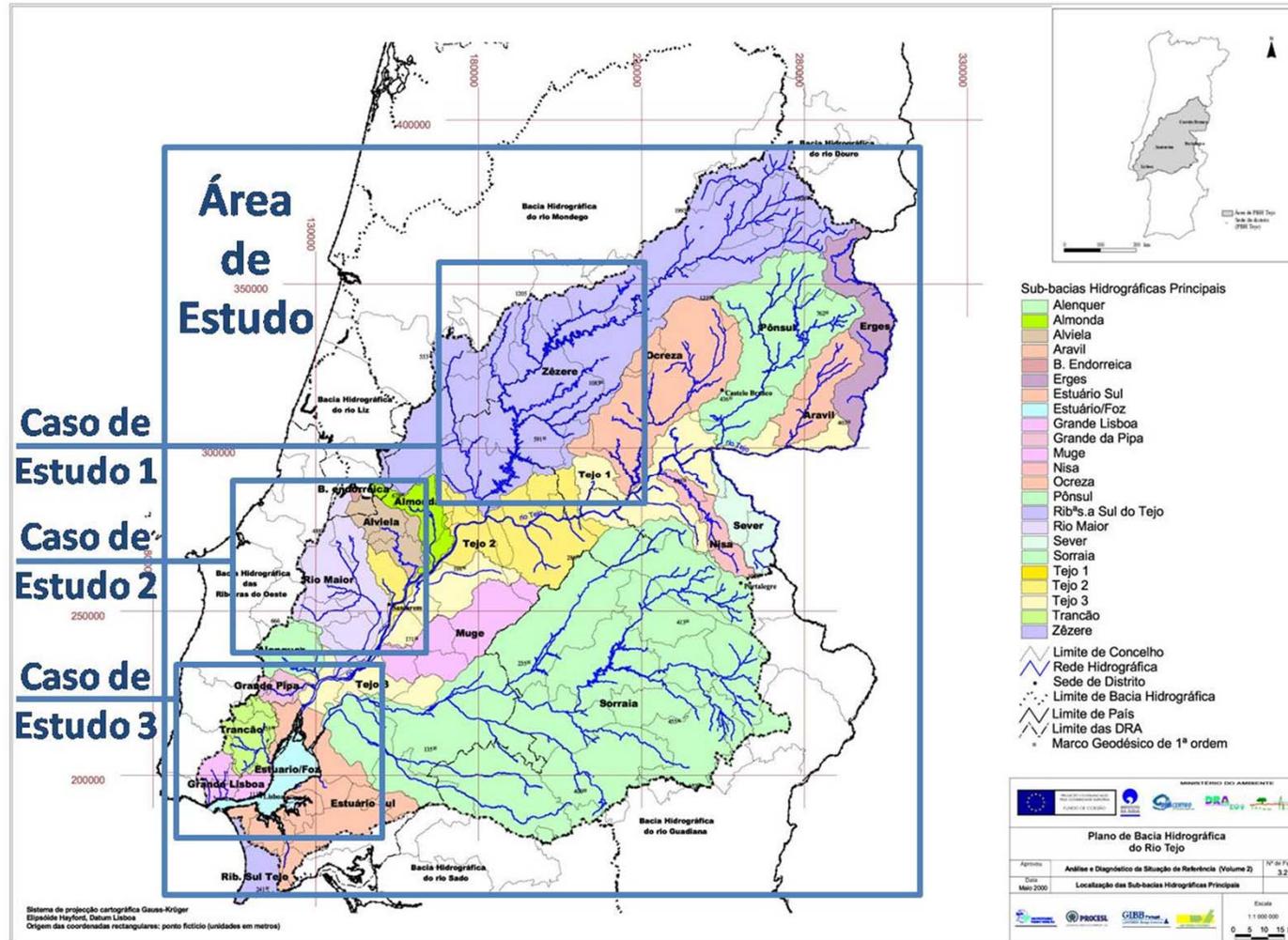




Metodologia



Áreas de estudo



Porquê Adaptar? Factores Relevantes

1. Efeitos de mudanças/alterações (CLIMÁTICAS, outras ...);
2. Evolução da regulação (ambiental, qualidade de serviço, económica);
3. Interacções água/energia/emissões GEE;
4. Incorporação da participação pública (tomada de decisão, transparência, responsabilidade social);
5. Flexibilidade, resiliência, adaptabilidade e controlo risco.

Estreita colaboração do Projecto ADAPTACLIMA – EPAL com:

IM, INAG, ARH Tejo, ERSAR, Águas de Portugal,
Incluindo SANEST, Águas do Centro,
Águas do Oeste , SIMTEJO,
entre outras

Pretende-se estabelecer um diálogo, sob a égide da EPAL , com todas as referidas organizações, relativo aos resultados e aos dados obtidos sobre precipitação, escoamento, recarga de aquíferos, intrusão salina, qualidade das águas, impactos e medidas de adaptação, incluindo as respectivas incertezas

Adaptação? Exemplos

Anglian Water Services' 25 year Water Resource Plan (WRP)



Robust adaptation decisions amid climate change uncertainties

Dessai, S. (2005)

Figure 8: Causes of Anglian Water's vulnerability to climate change



Source: Anglian Water.

Adaptação? Exemplos

Fresh and salt water in the estuaries of the rivers Rhine, Meuse and Scheldt - the Netherlands



Krammer Locks in the Philips Dam. The locks enable navigation between Rhine and Scheldt and are constructed to keep the sweet water of the Volkerak (above) separated from the salt water of the Eastern Scheldt.

Fonte: Climate Research Netherlands – Research Highlights. (2009)

Obrigado pela vossa atenção

6 Julho 2011

