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# Climate change impacts on agriculture, forestry, ecosystems and water resources



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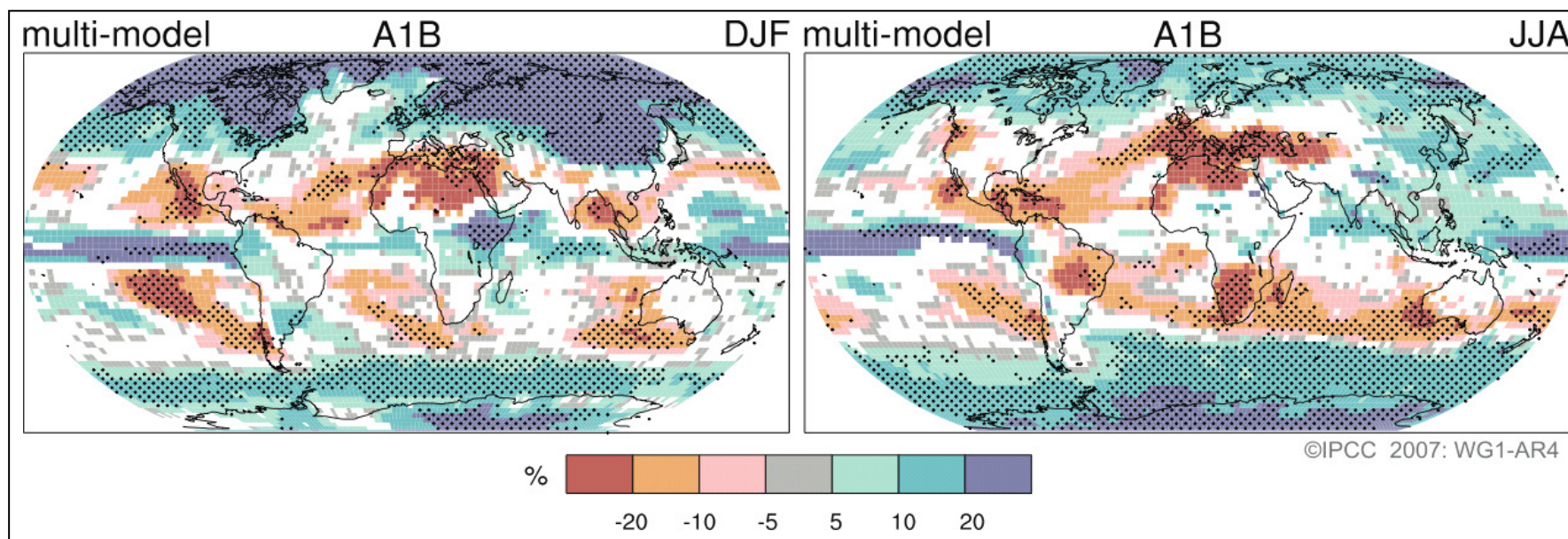
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# Changes in climate

## Temperature change:

Last 100 years + 0.74 °C globally

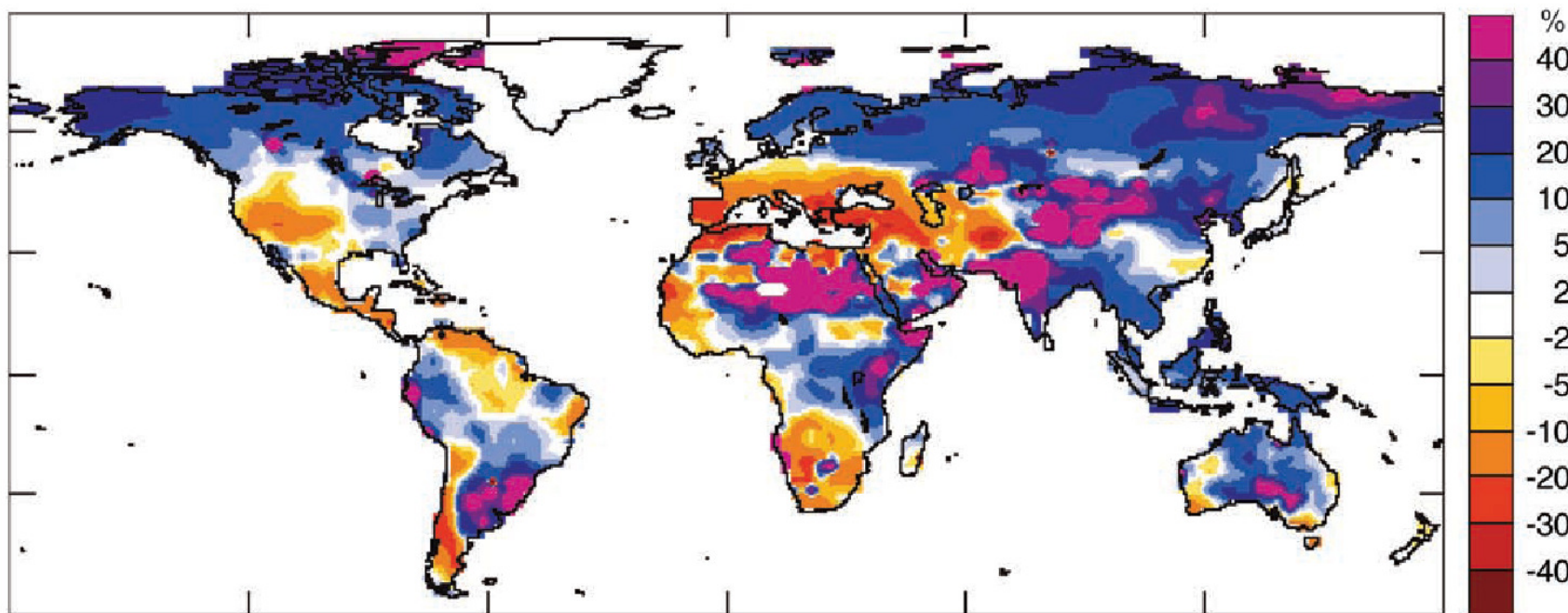
21<sup>st</sup> century 1.1 -6.4 °C globally



**Seasonal precipitation change: up to +/- 30% by the end of 21<sup>st</sup> century**

# Changes in water availability

Relative change % !



Change in annual runoff by 2041-60 relative to 1900-70 under SRES A1B scenario

## Phenomena: Changes in

- mean climate
- frequency and intensity of extreme events
- sea level rise

## Impacts

- Biophysical
- Socio-economic

# Impacts on agriculture, forestry, ecosystems, water resources



## Shifts in mean temp./precipitation

Yields: ↓ in warm, ↑ in cold regions if ↑Temp <3°C  
Shifts in species distribution – biodiversity loss, pests and diseases  
Shift in the suitability of land for crops and pasture  
Modest increase in global wood production, but ↑wildfires and ↓forest health  
Snow melt related water resources  
↑water demand



## ↑Droughts

↑ water stress (+ 0.4 to 3.4 Bio people by 2050)  
↑global water demand for irrigation +5-20% by 2080s  
Negative effects on crops, livestock, freshwater fish  
Land degradation, more wildfires



# Impacts on agriculture, forestry, ecosystems, water resources



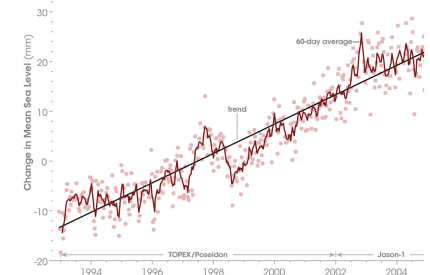
## ↑ Floods, storm surges, cyclones

Damage to crops, trees and coral reefs  
Waterlogging of arable land  
Soil erosion → lower water quality  
→ human health (diarrhoe, cholera etc.)



## Sea level rise

Inundation of low-lying areas  
Salinisation of irrigation water and coastal ecosystems  
↓ freshwater availability, loss of land



## Socioeconomic impacts:

production decline, effects on markets and food prices, trade regimes,  
food insecurity, migration, conflicts

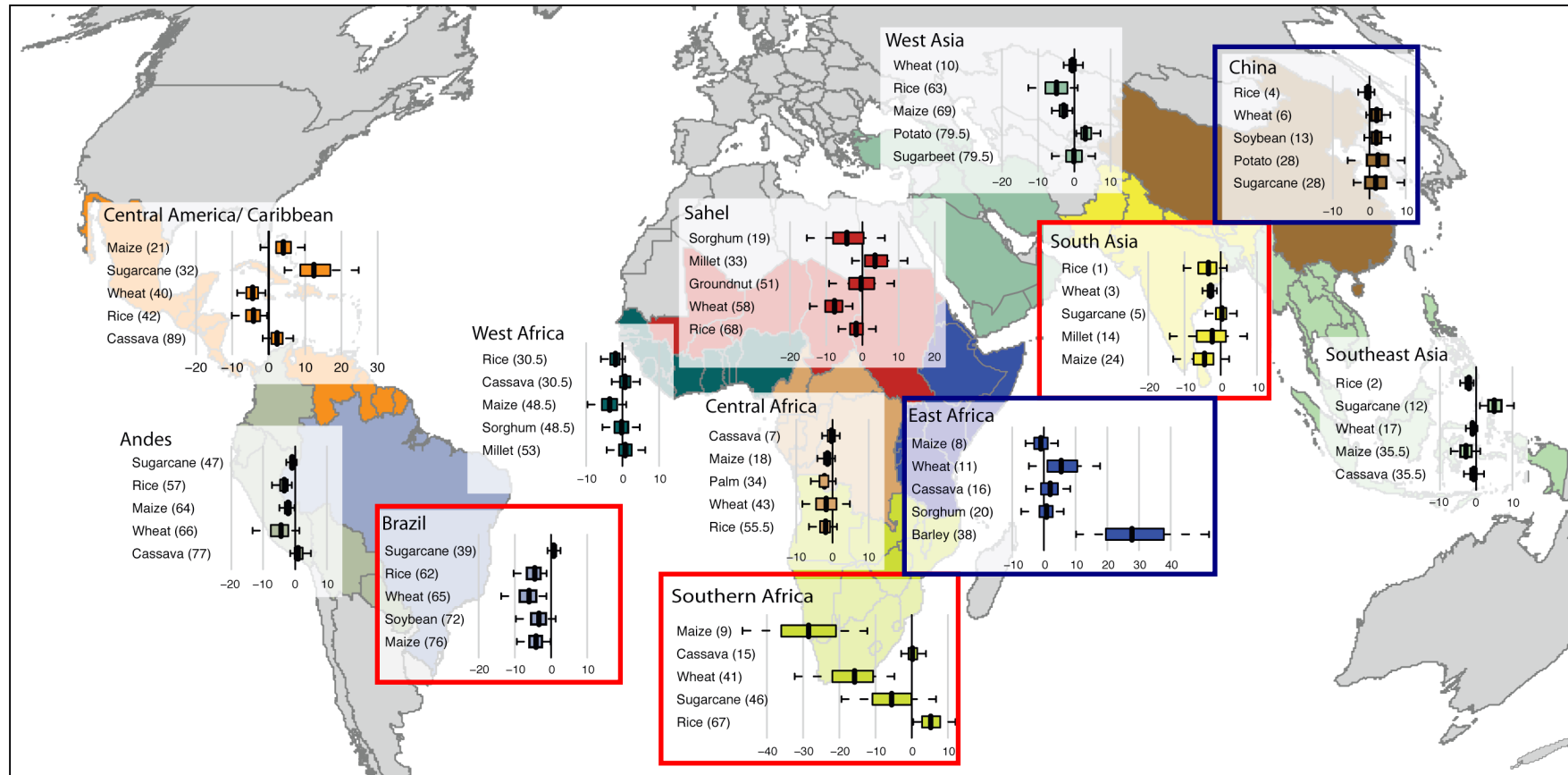
**Interactions complex and location specific, Severity = f(warming, mitigation, adaptation)**

## Who will be most affected?

- Already vulnerable in developing & developed countries
- Producers: Small-holder farmers (600 mio people), pastoralists, forest-dependent people, inland and coastal fishers and aquaculture communities (200-300 mio people)
- Consumers: Urban poor, particularly in coastal cities and floodplains settlements 300-400 mio people
- Among these already discriminated people (women, children, ill ..)



# CC Impacts on crop yields by 2030



- Additional 5-170 Mio people at risk of hunger by 2080
- depending on socio-economic development

# Food security – Impacts on food systems



Climate change affects all 4 dimensions of food security

- Availability
  - Loss in food production
  - Indirect environmental feedbacks
- Access
  - Infrastructure damage, asset losses
  - Loss of income and employment opportunities
- Stability
  - Increased livelihood risks, pressure on food prices
  - Higher dependency on food imports and food aid
- Utilization
  - Human health risks, nutrition



# Key impacts – by region

## Latin America

Productivity decline in semiarid areas

Biodiversity loss in Amazonas



## Africa

Productivity decline, food insecurity

Biodiversity loss in E/S-Africa

Malaria in highlands of E-Africa



## Asia

↓ freshwater availability,

↓ crop yields Central/S-Asia by 2050s, higher in E/SE-Asia

Flooding of megadeltas (Mekong, Ganges/Brahmaputra)

Glacier melting



## Small islands

Degradation of coastal ecosystems

Decreased water availability, damaged infrastructure



# Take home messages



- **Climate change**
  - has the potential to undermine advances in poverty reduction and sustainable development
  - will greatly affect the health and productivity of crops, livestock, fish and forests
  - will worsen the living conditions of hundred millions of farmers, pastoralists, fishers and forest-dependent people as well as the urban poor
  - will increase hunger and malnutrition in many countries, in particular in Southern Africa and South Asia
- **Uncertainties about local impacts will remain** – adaptation as socio-institutional learning process
- **Farmers have to play a central role** in adaptation/mitigation but need support of consumers and the whole society