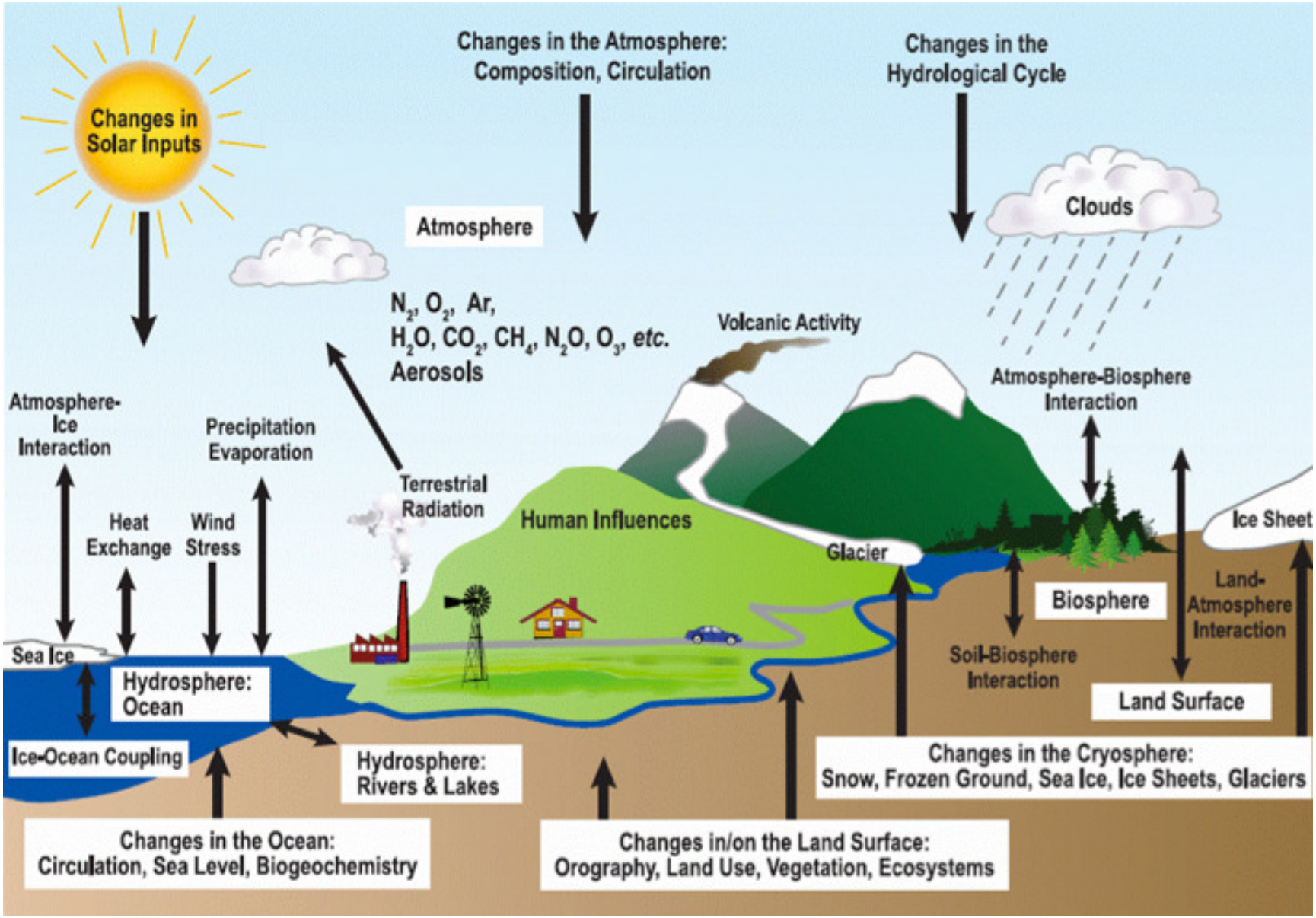
Az éghajlat állapota

IPCC Report 2021

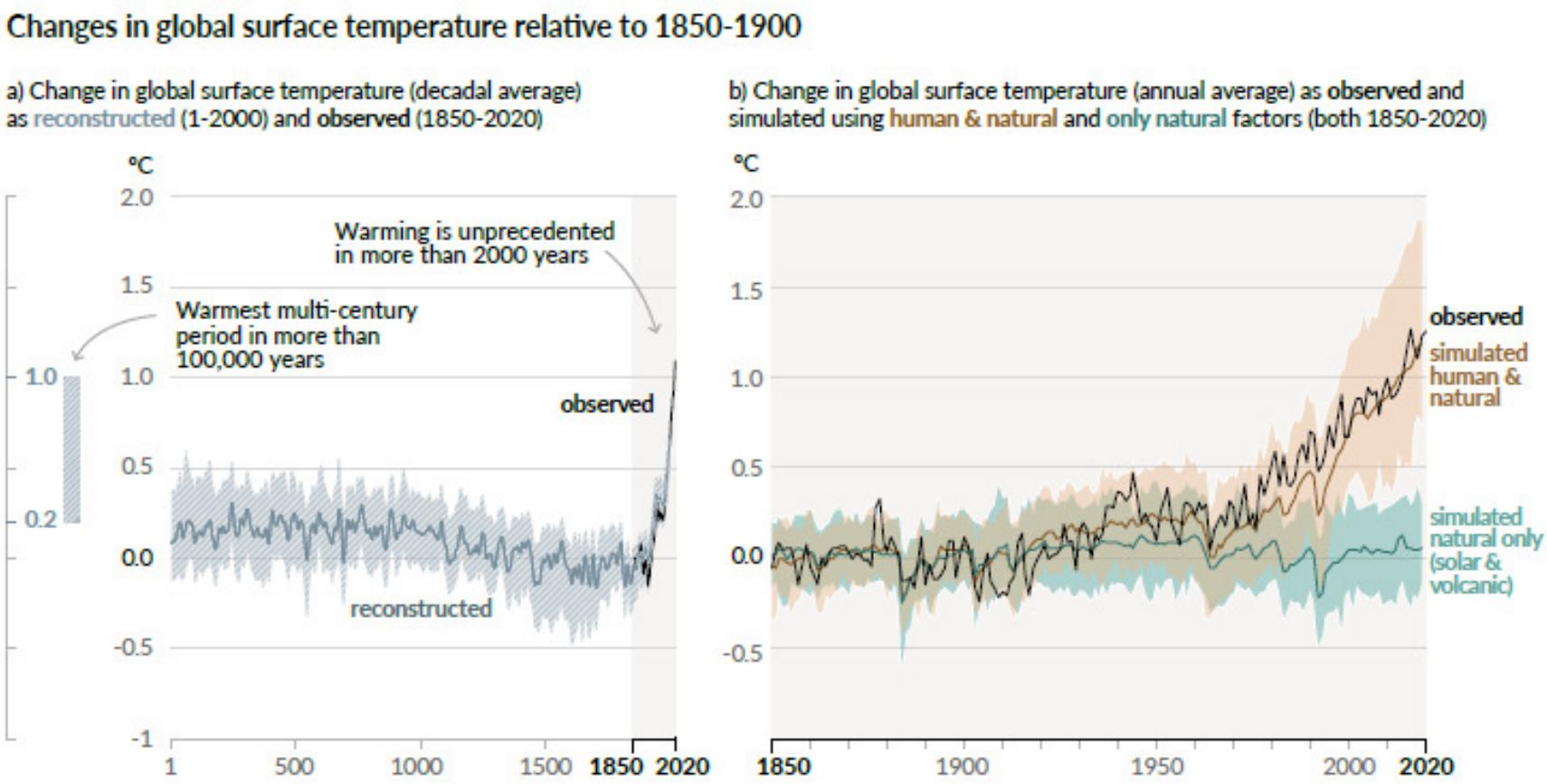
Bozó László
egyetemi tanár

Országos Meteorológiai Szolgálat

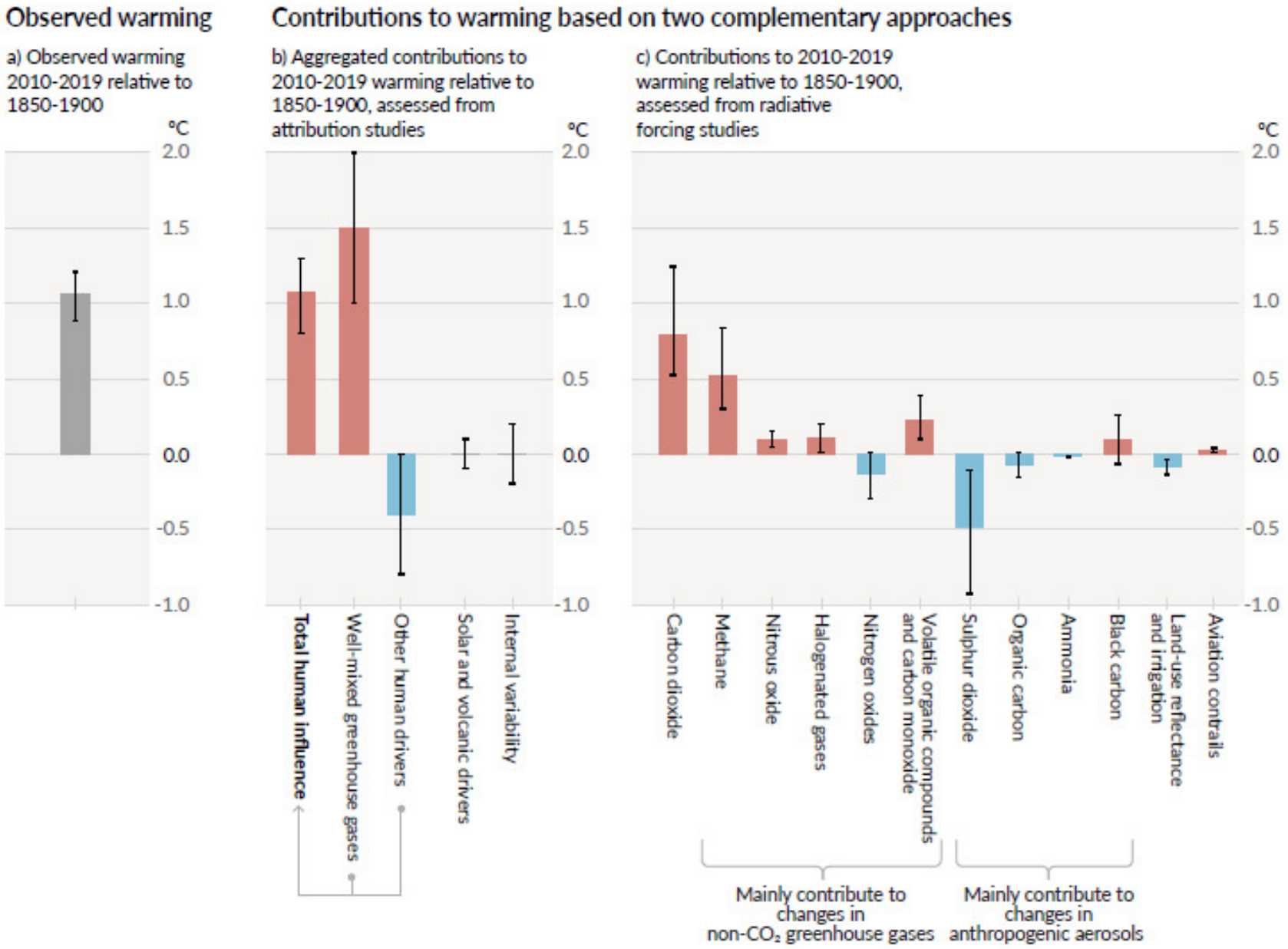
Kölcsönhatások a Föld-rendszerben



A felszínközeli hőmérséklet változása



Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling



Változások az extrém meleg időszakok előfordulásában

Climate change is already affecting every inhabited region across the globe with human influence contributing to many observed changes in weather and climate extremes

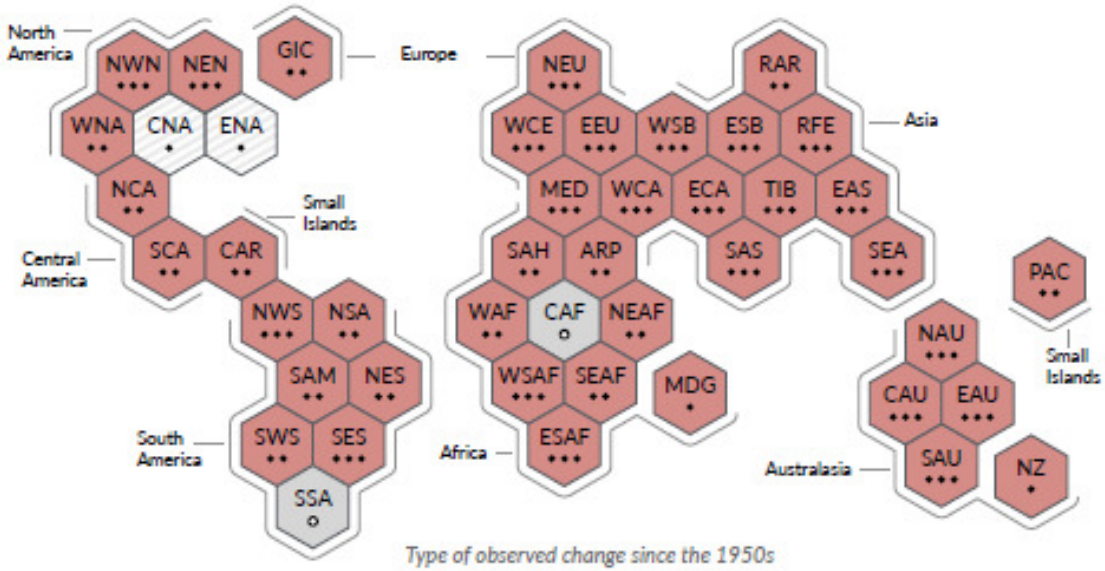
a) Synthesis of assessment of observed change in **hot extremes** and confidence in human contribution to the observed changes in the world's regions

Type of observed change
in hot extremes

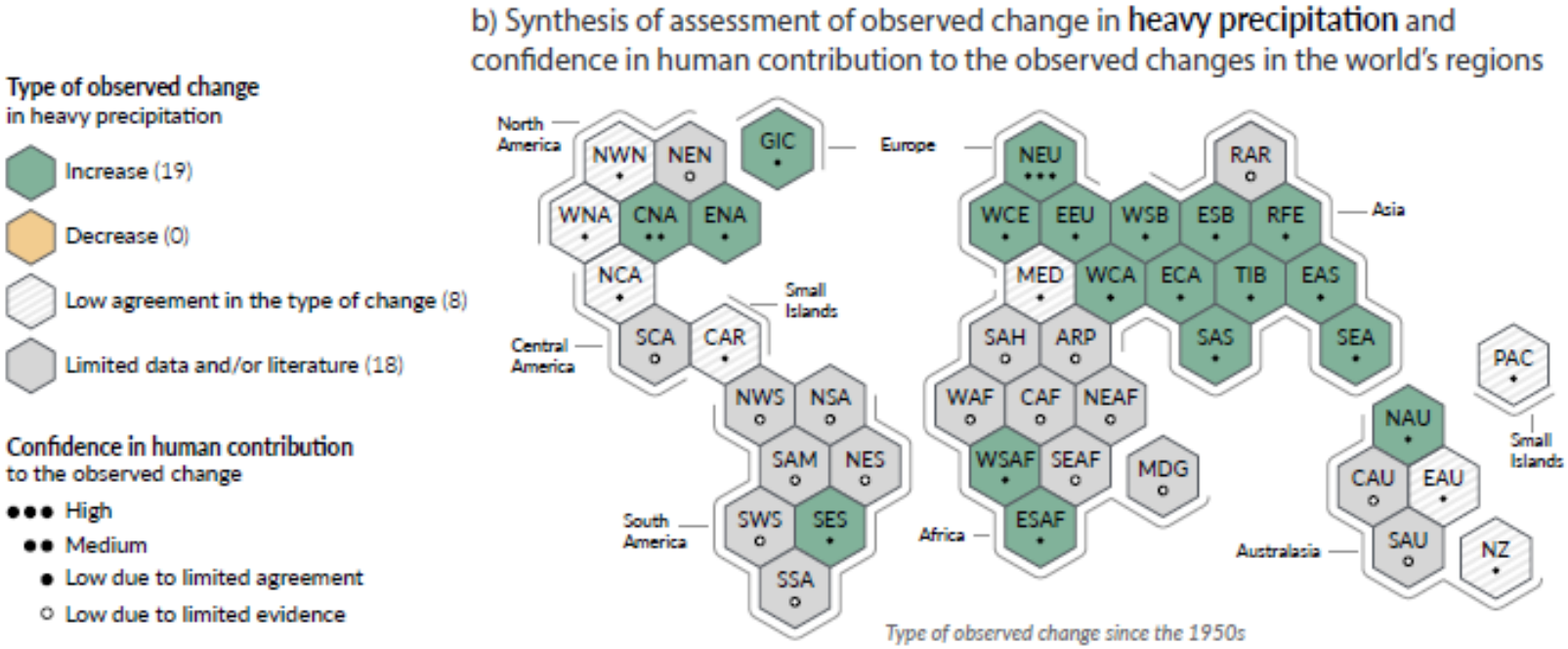
- Increase (41)
- Decrease (0)
- Low agreement in the type of change (2)
- Limited data and/or literature (2)

Confidence in human contribution
to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence



Változások a jelentős csapadékos időszakok előfordulásában



Változások az aszályos időszakok előfordulásában

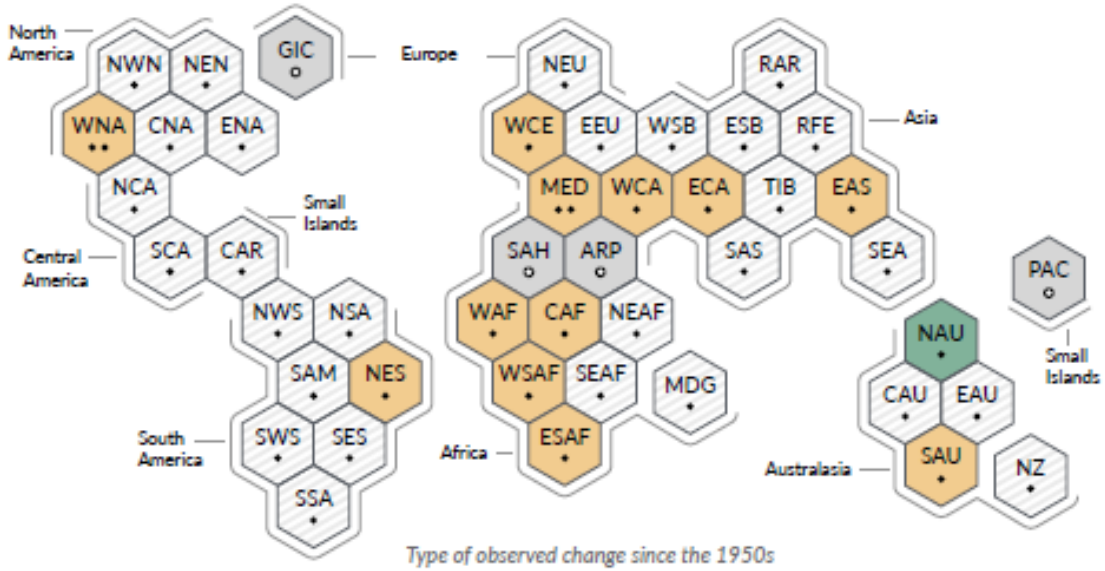
c) Synthesis of assessment of observed change in **agricultural and ecological drought** and confidence in human contribution to the observed changes in the world's regions

Type of observed change
in agricultural and ecological drought

- Increase (12)
- Decrease (1)
- Low agreement in the type of change (28)
- Limited data and/or literature (4)

Confidence in human contribution
to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence



Type of observed change since the 1950s

Each hexagon corresponds to one of the IPCC AR6 WGI reference regions

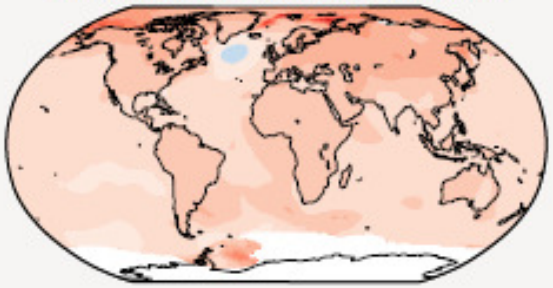
NWN *North-Western North America*

IPCC AR6 WGI reference regions: **North America**: ***NWN*** *(North-Western North America)*, ***NEN*** *(North-Eastern North America)*, ***WNA*** *(Western North America)*, ***CNA*** *(Central North America)*, ***ENA*** *(Eastern North America)*, **Central America**: ***NCA*** *(Northern Central America)*, ***SCA*** *(Southern Central America)*, ***CAR*** *(Caribbean)*, **South America**: ***NWS*** *(North-Western South America)*, ***NSA*** *(Northern South America)*, ***NES*** *(North-Eastern South America)*, ***SAM*** *(South American Monsoon)*, ***SWS*** *(South-Western South America)*, ***SES*** *(South-Eastern South America)*, ***SSA*** *(Southern South America)*, **Europe**: ***GIC*** *(Greenland/Iceland)*, ***NEU*** *(Northern Europe)*, ***WCE*** *(Western and Central Europe)*, ***EEU*** *(Eastern Europe)*, ***MED*** *(Mediterranean)*, **Africa**: ***MED*** *(Mediterranean)*, ***SAH*** *(Sahara)*, ***WAF*** *(Western Africa)*, ***CAF*** *(Central Africa)*, ***NEAF*** *(North Eastern Africa)*, ***SEAF*** *(South Eastern Africa)*, ***WSAF*** *(West Southern Africa)*, ***ESAF*** *(East Southern Africa)*, ***MDG*** *(Madagascar)*, **Asia**: ***RAR*** *(Russian Arctic)*, ***WSB*** *(West Siberia)*, ***ESB*** *(East Siberia)*, ***RFE*** *(Russian Far East)*, ***WCA*** *(West Central Asia)*, ***ECA*** *(East Central Asia)*, ***TIB*** *(Tibetan Plateau)*, ***EAS*** *(East Asia)*, ***ARP*** *(Arabian Peninsula)*, ***SAS*** *(South Asia)*, ***SEA*** *(South East Asia)*, **Australasia**: ***NAU*** *(Northern Australia)*, ***CAU*** *(Central Australia)*, ***EAU*** *(Eastern Australia)*, ***SAU*** *(Southern Australia)*, ***NZ*** *(New Zealand)*, **Small Islands**: ***CAR*** *(Caribbean)*, ***PAC*** *(Pacific Small Islands)*

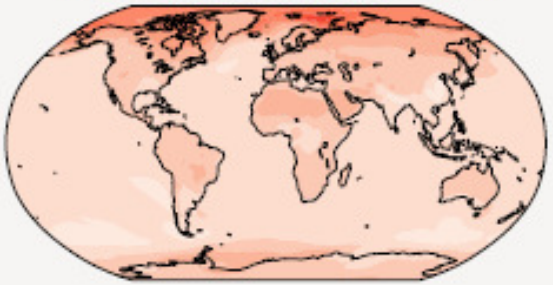
a) Annual mean temperature change (°C) at 1 °C global warming

Warming at 1 °C affects all continents and is generally larger over land than over the oceans in both observations and models. Across most regions, observed and simulated patterns are consistent.

Observed change per **1** °C global warming



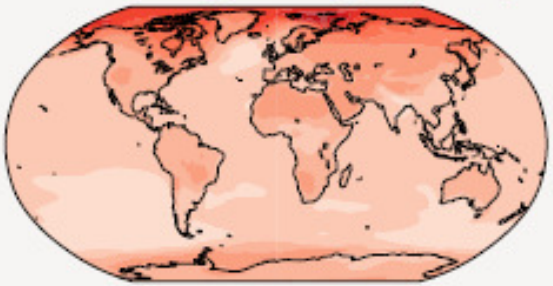
Simulated change at **1** °C global warming



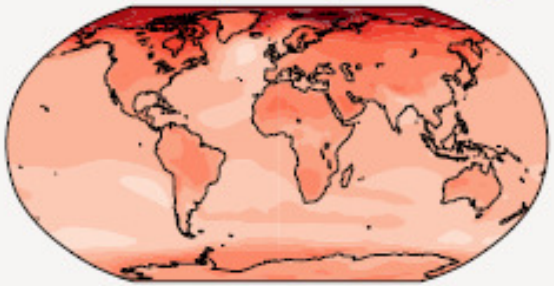
b) Annual mean temperature change (°C) relative to 1850-1900

Across warming levels, land areas warm more than oceans, and the Arctic and Antarctica warm more than the tropics.

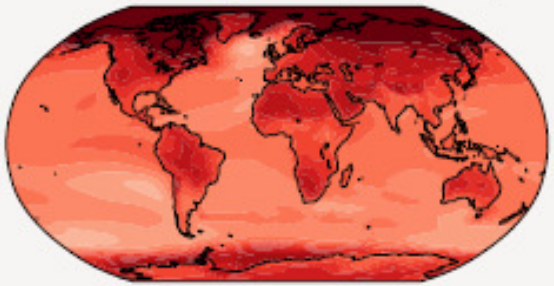
Simulated change at **1.5** °C global warming

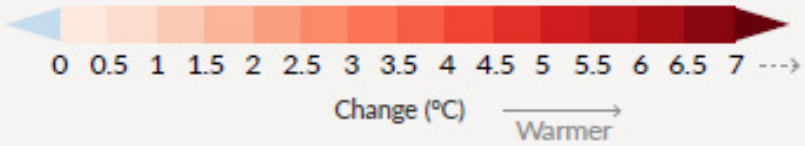


Simulated change at **2** °C global warming



Simulated change at **4** °C global warming

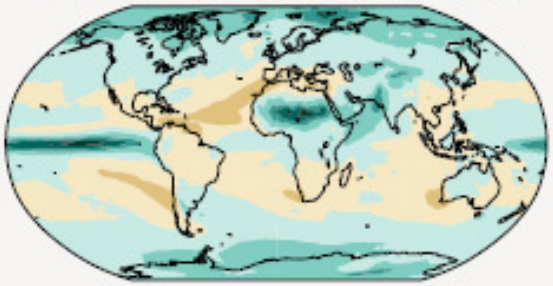




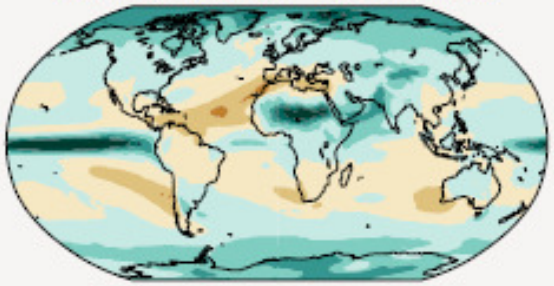
c) Annual mean precipitation change (%) relative to 1850-1900

Precipitation is projected to increase over high latitudes, the equatorial Pacific and parts of the monsoon regions, but decrease over parts of the subtropics and in limited areas of the tropics.

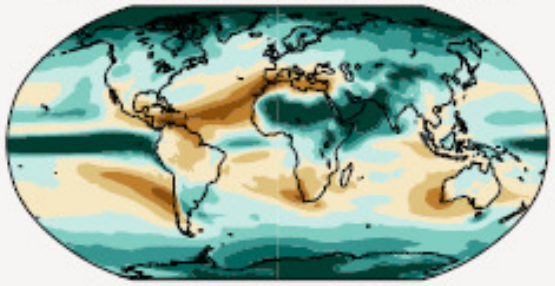
Simulated change at **1.5 °C** global warming



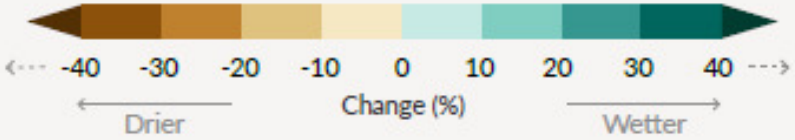
Simulated change at **2 °C** global warming



Simulated change at **4 °C** global warming



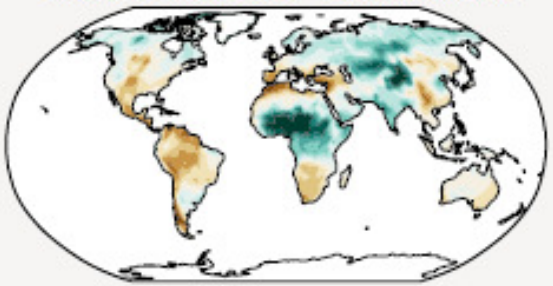
Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions



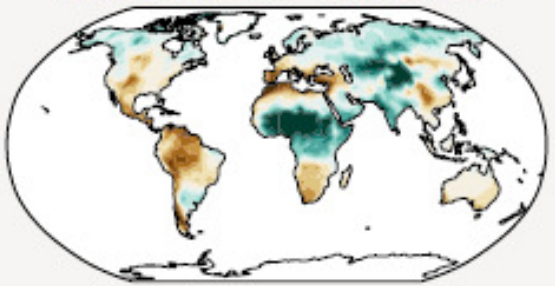
d) Annual mean total column soil moisture change (standard deviation)

Across warming levels, changes in soil moisture largely follow changes in precipitation but also show some differences due to the influence of evapotranspiration.

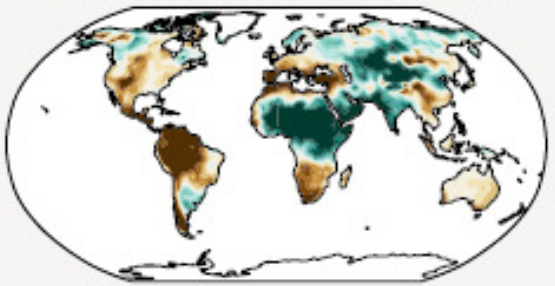
Simulated change at **1.5 °C** global warming



Simulated change at **2 °C** global warming

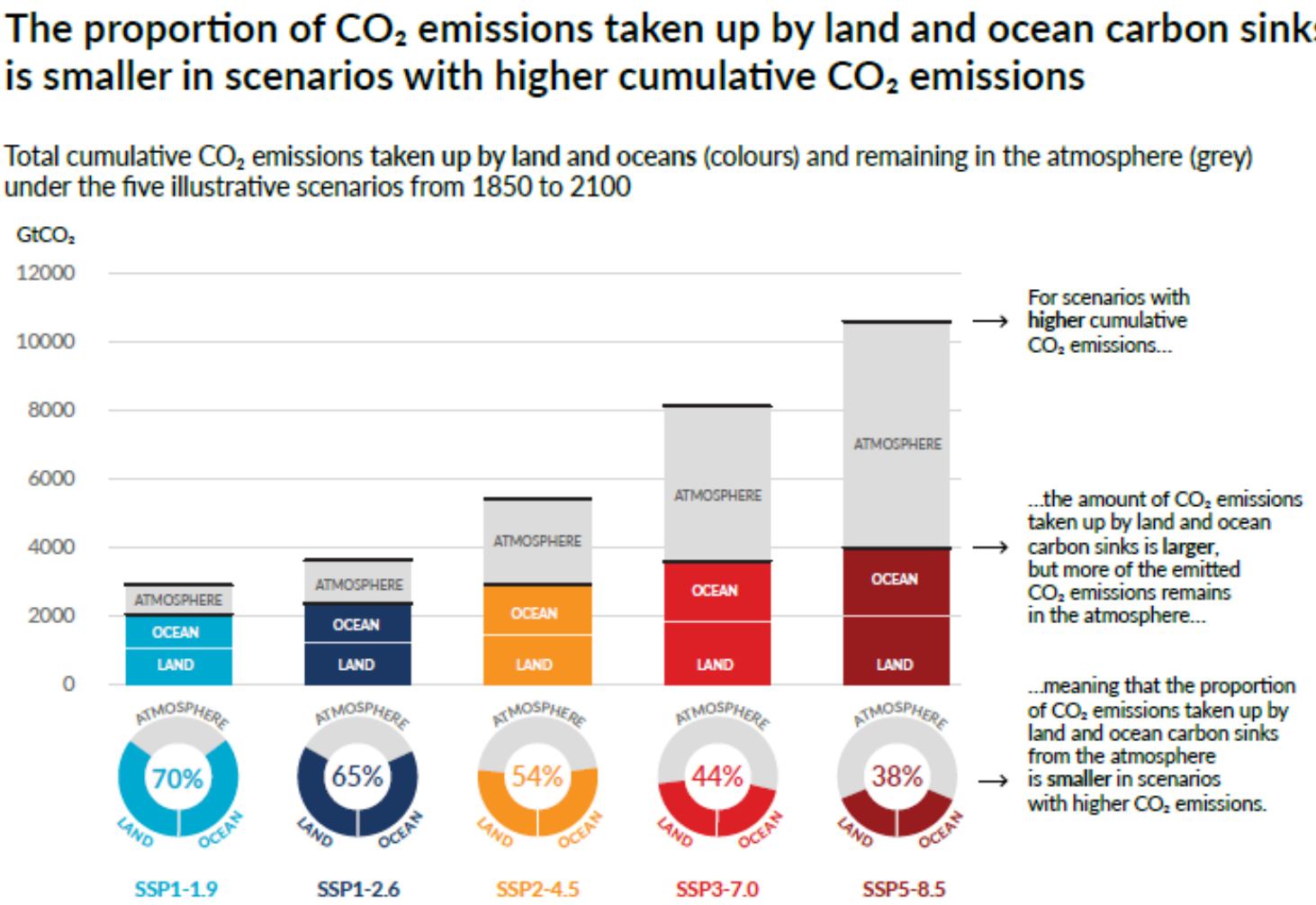


Simulated change at **4 °C** global warming

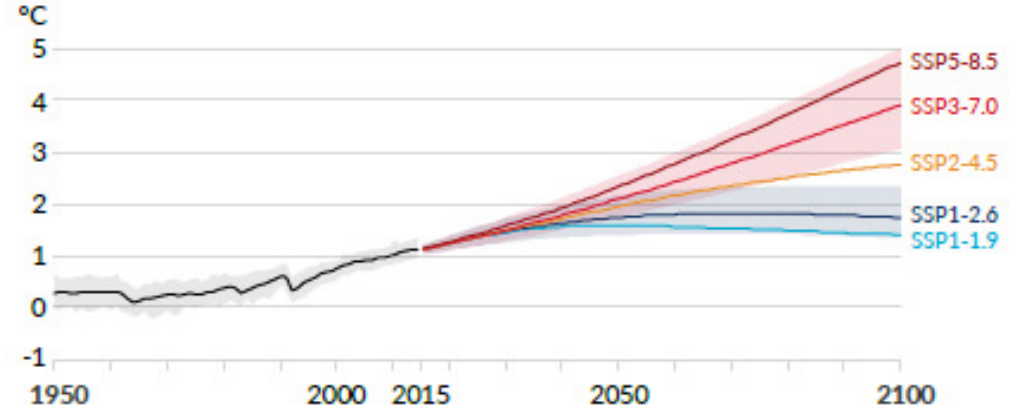


Relatively small absolute changes may appear large when expressed in units of standard deviation in dry regions with little interannual variability in baseline conditions

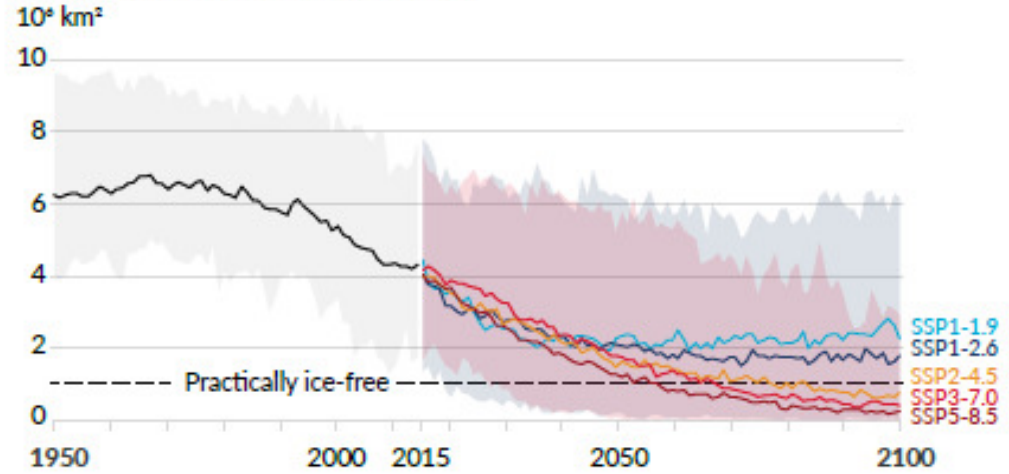
A földfelszín és az óceán által felvehető szén-dioxid mennyiségének várható alakulása



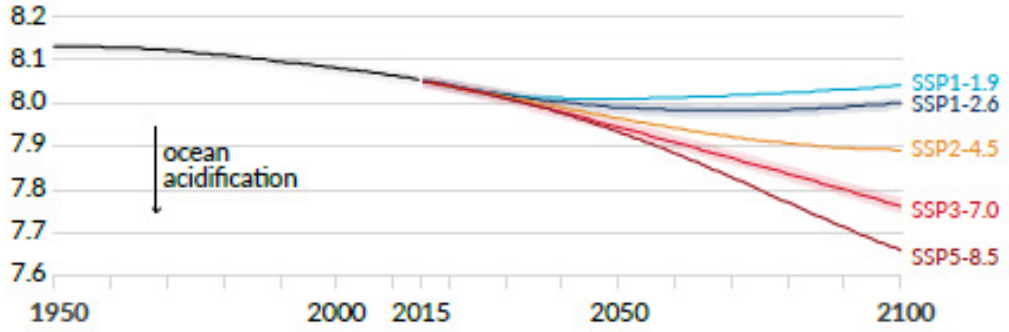
a) Global surface temperature change relative to 1850-1900

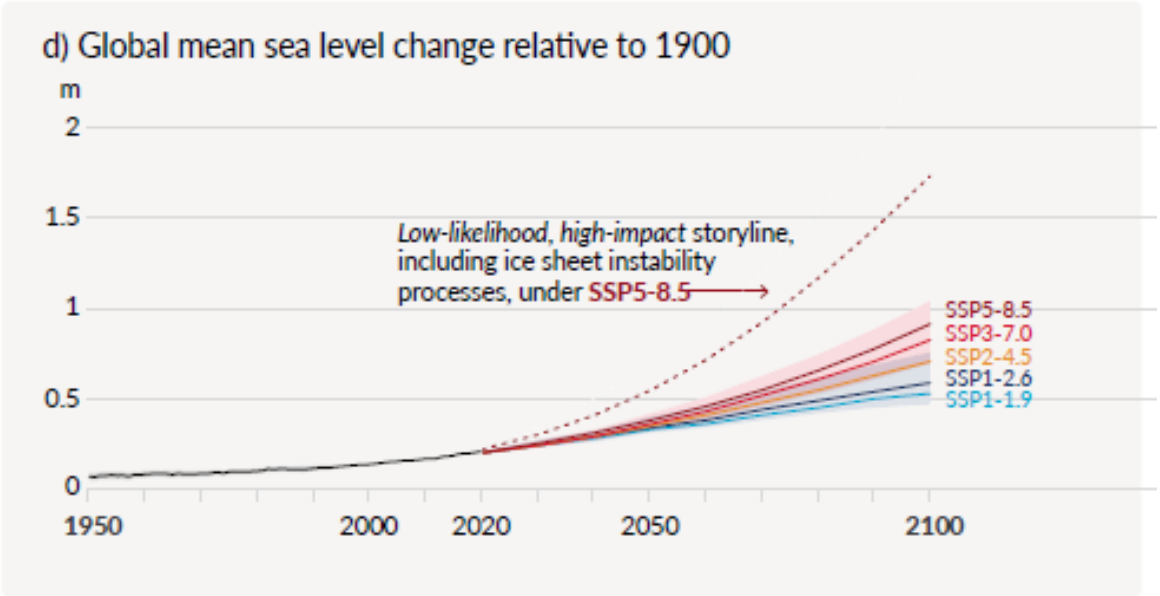


b) September Arctic sea ice area



c) Global ocean surface pH (a measure of acidity)




d) Global mean sea level change relative to 1900
m
2
1.5
1
0.5
0
1950
2000
2020
2050
2100
Low-likelihood, high-impact storyline, including ice sheet instability processes, under SSP5-8.5
SSP5-8.5
SSP3-7.0
SSP2-4.5
SSP1-2.6
SSP1-1.9