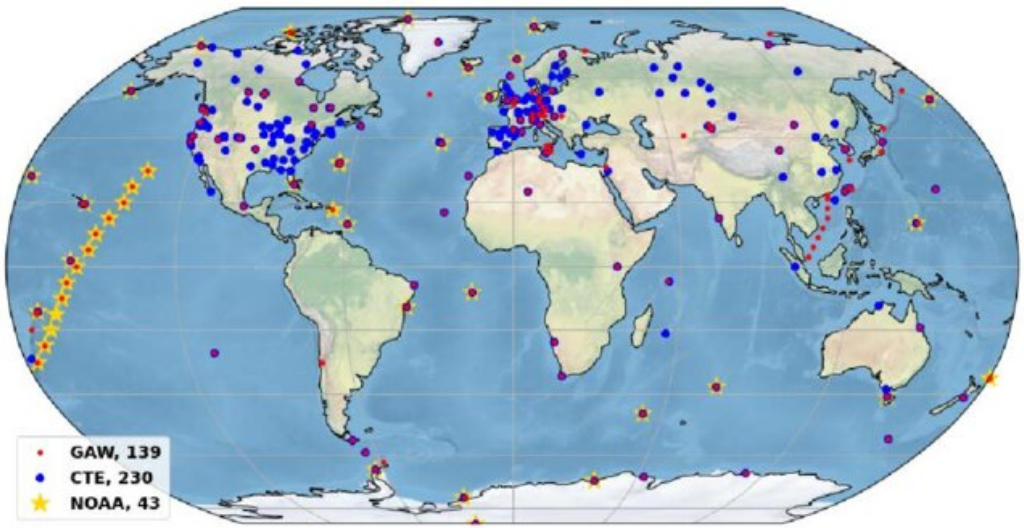
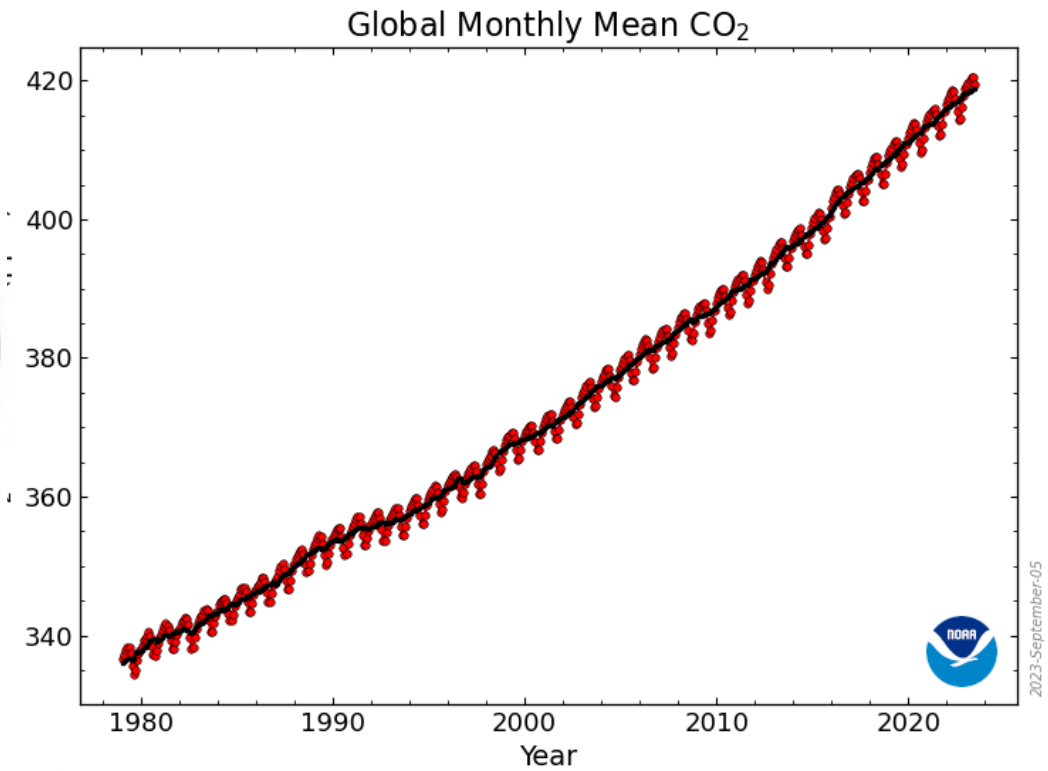
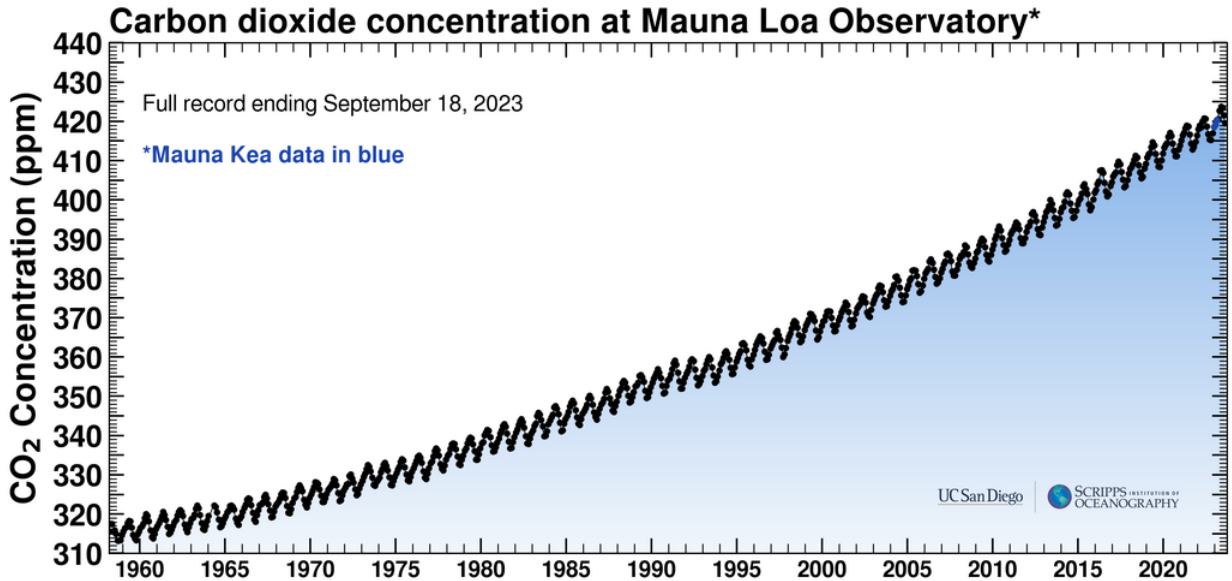
Il clima delle montagne: sempre più caldo, sempre più instabile

Antonello Provenzale
Istituto di Geoscienze e Georisorse
Consiglio Nazionale delle Ricerche

La rete globale di osservazioni della CO_2

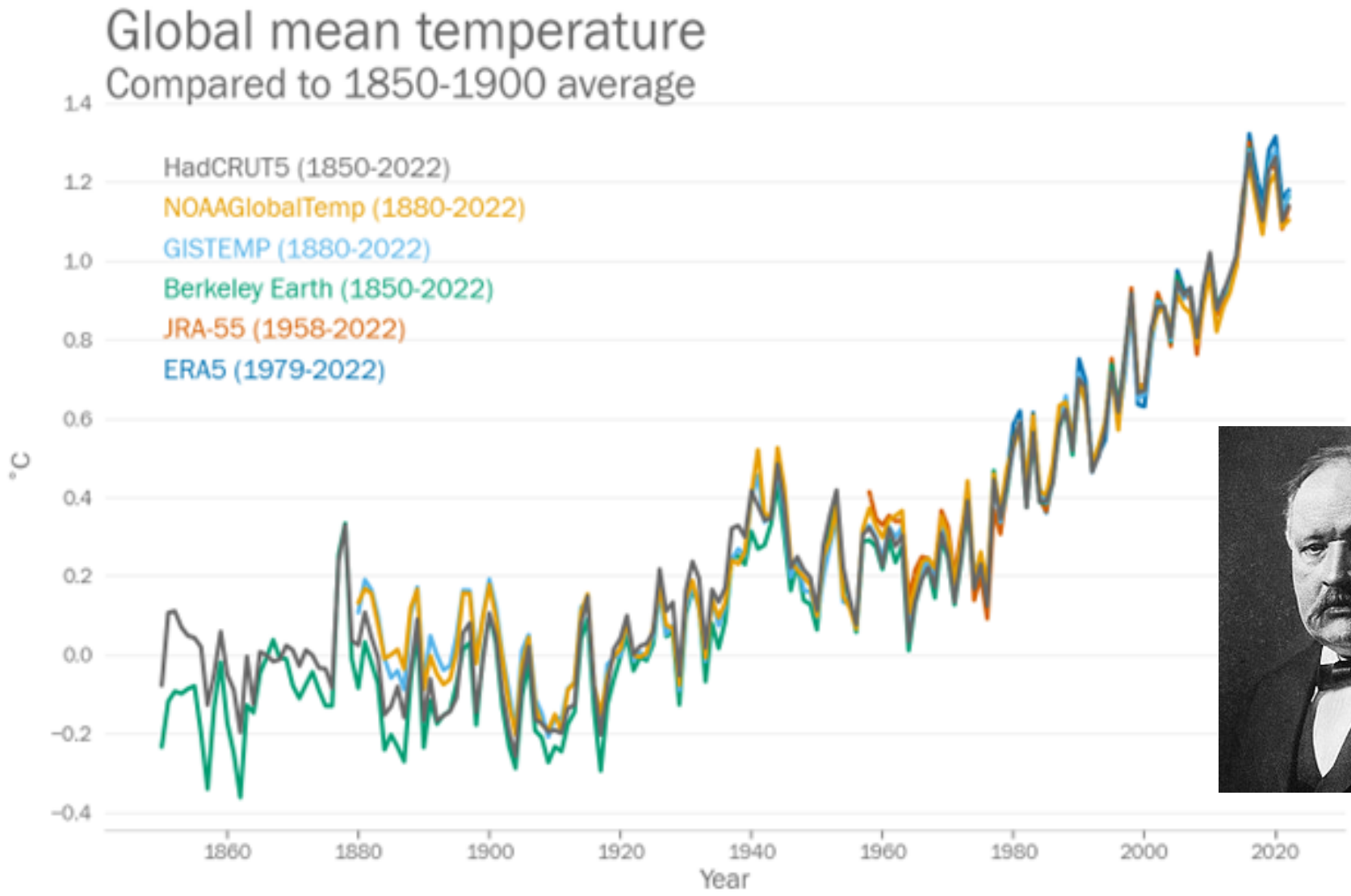






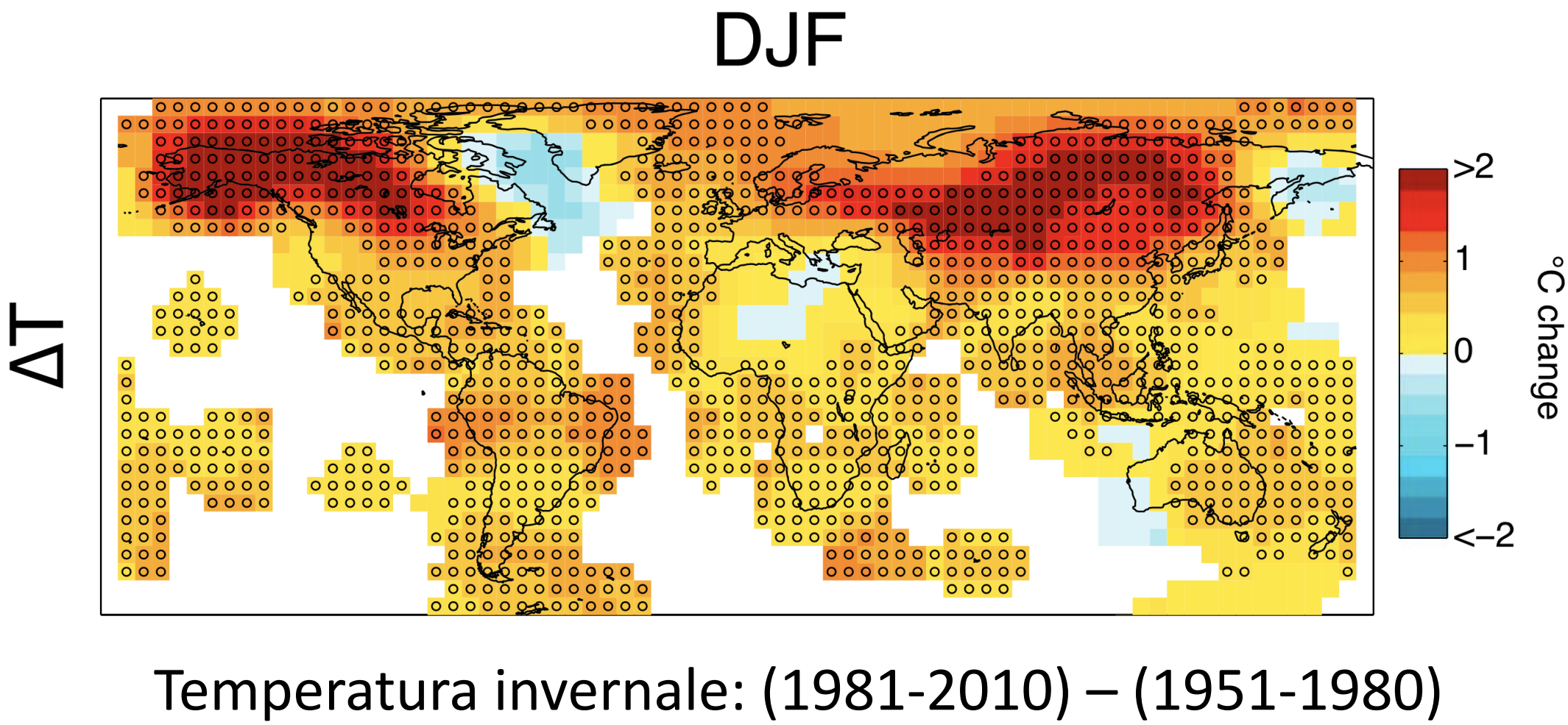
Iniziata da
Charles Keeling
a fine anni ‘50

Conseguenza della crescita della concentrazione di CO_2: aumento globale delle temperature



WMO, https://public.wmo.int/en/media/press-release/eight-warmest-years-record-witness-upsurge-climate-change-impacts

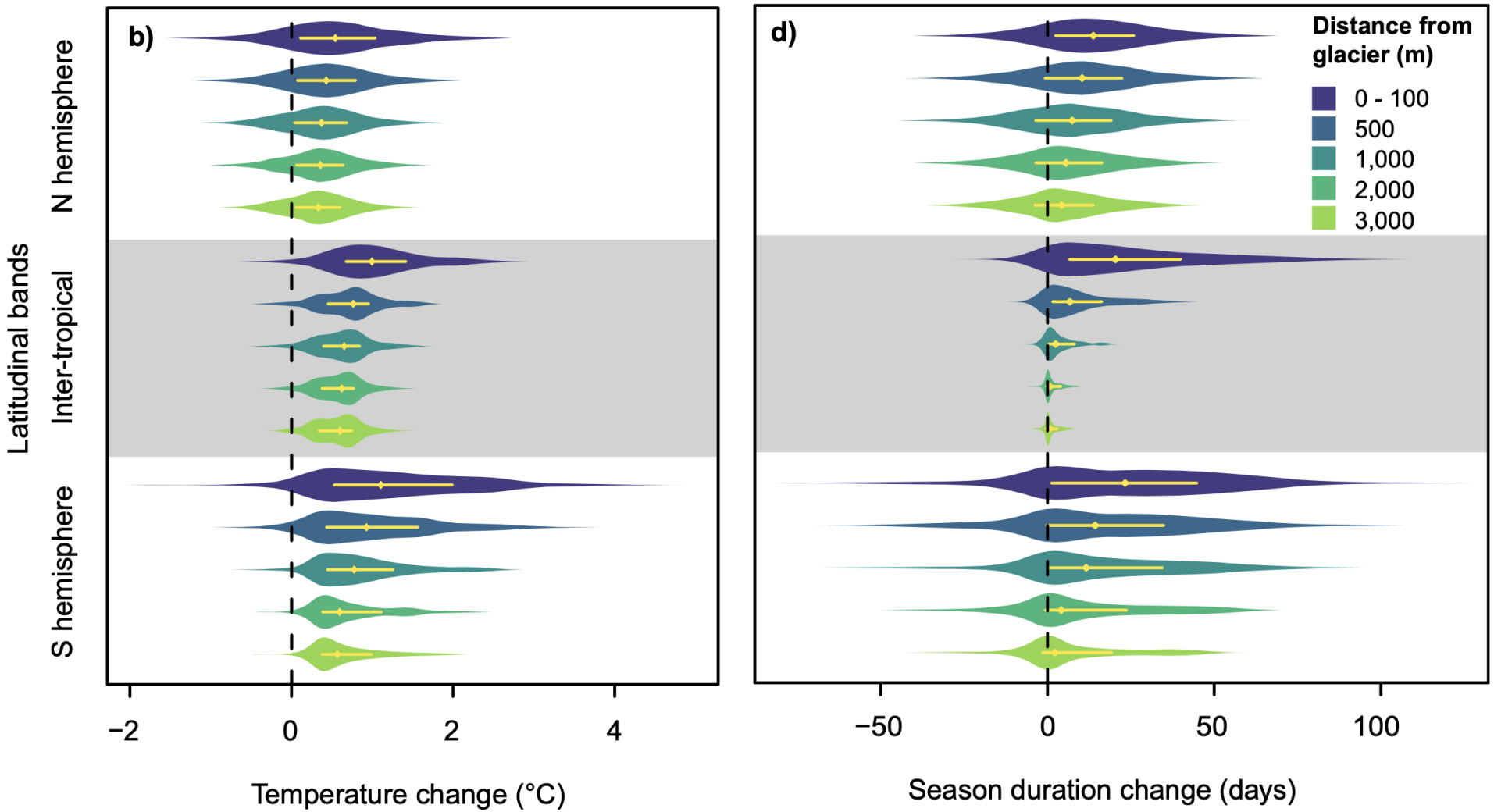
Aumento globale delle temperature: forte disomogeneità spaziale



Temperatura invernale: (1981-2010) – (1951-1980)

Turco et al. 2015

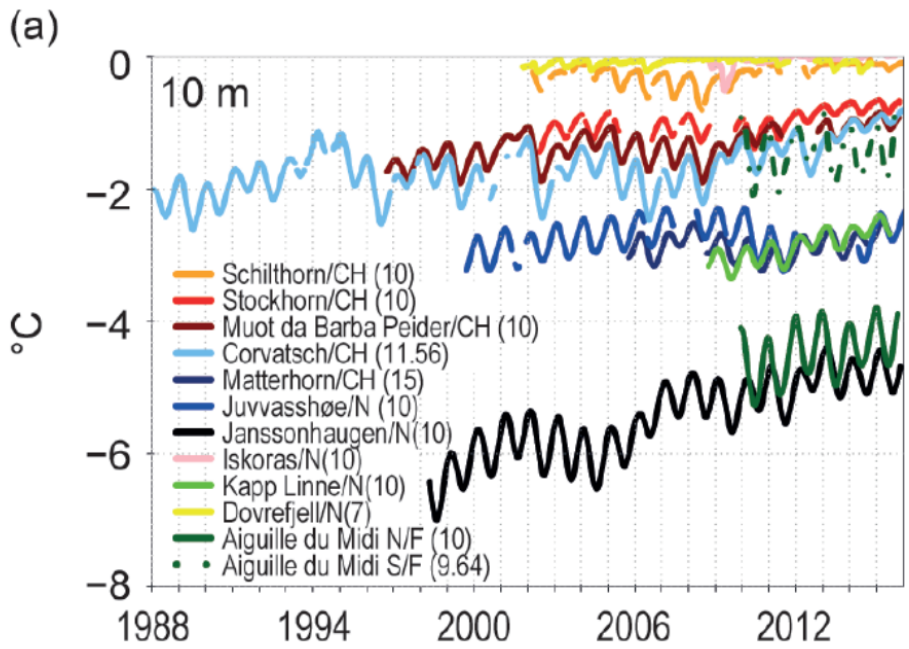
Amplificazione montana (2016-2020 vs 2001-2005)

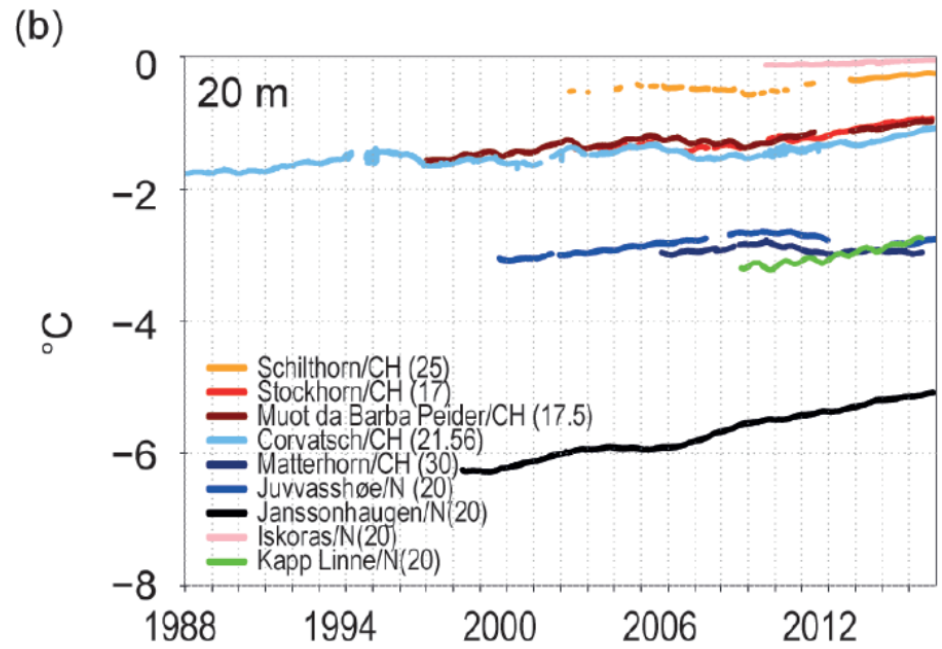


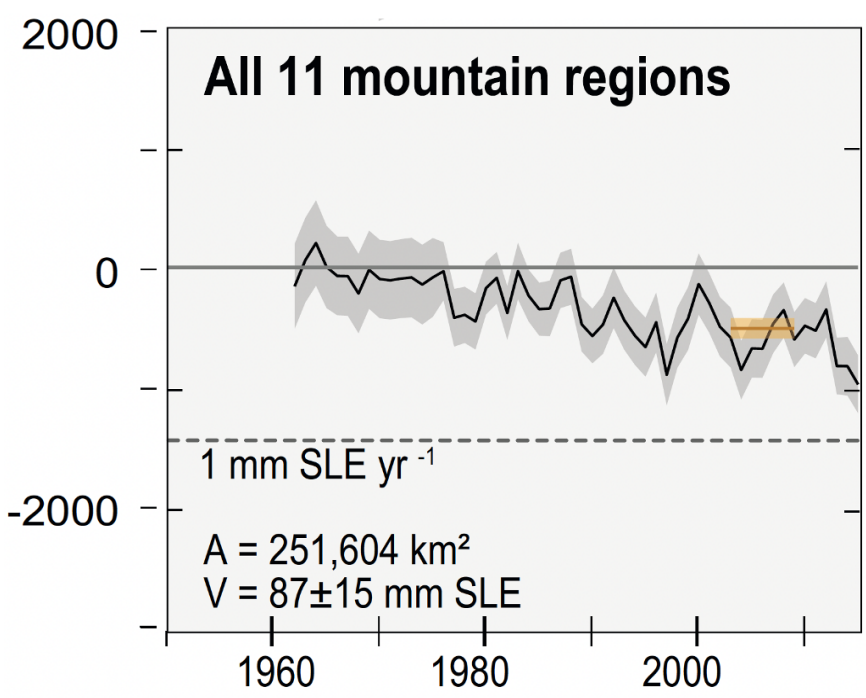
Marta et al. *Nature Communications* 2023

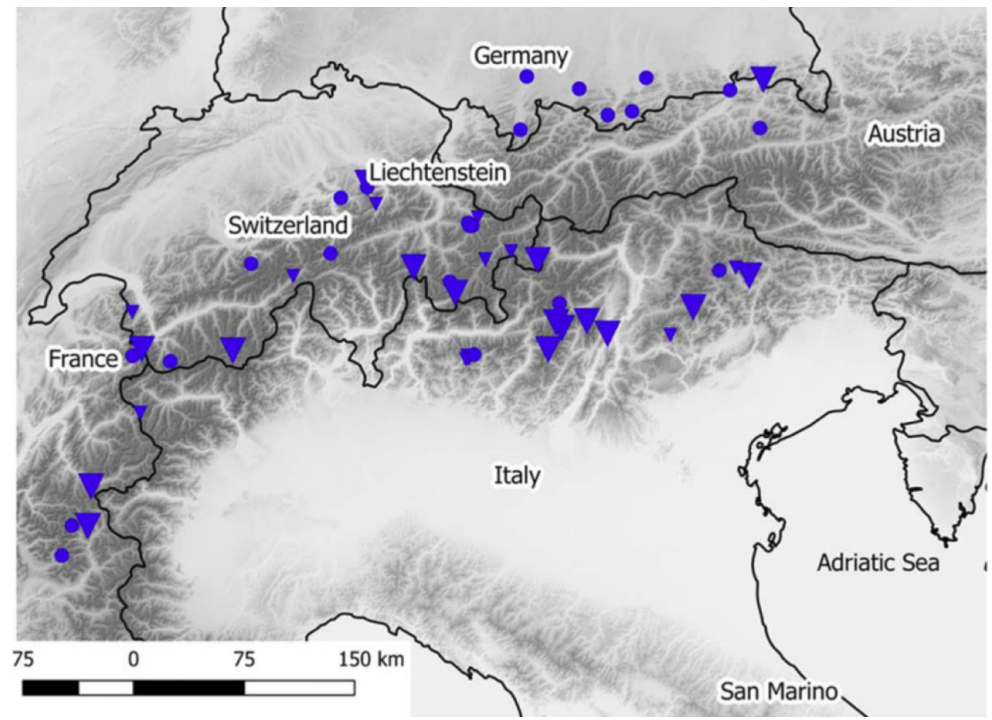
Il riscaldamento in montagna

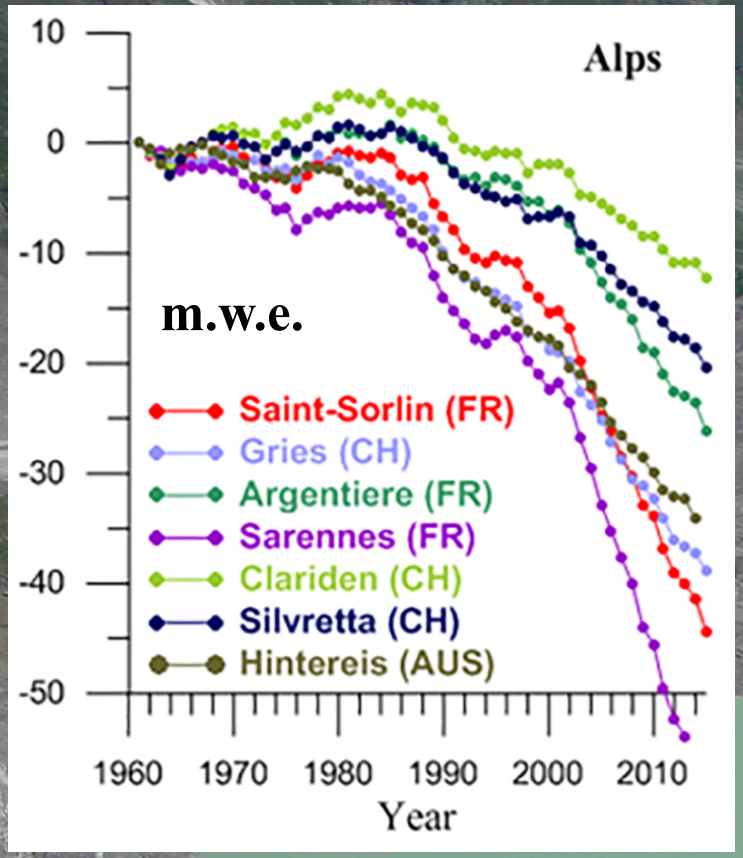
Beniston et al, The Cryosphere, 2018
IPCC, SROCC, 2019









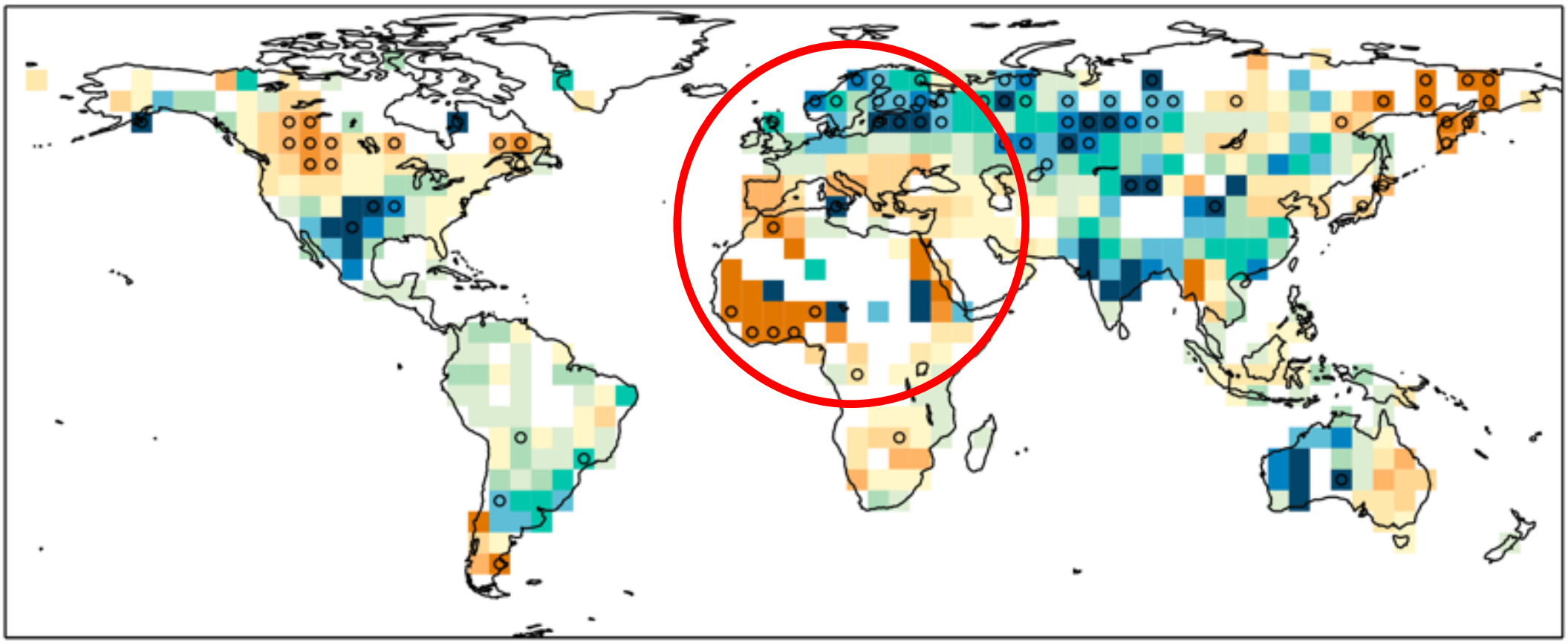


Formazione di laghi effimeri

Effetti del riscaldamento : conseguenze sul ciclo dell'acqua

ga.water.usgs.gov

Cambiamenti nella distribuzione spaziale e temporale della precipitazione



Precipitazione invernale: (1981-2010) – (1951-1980)

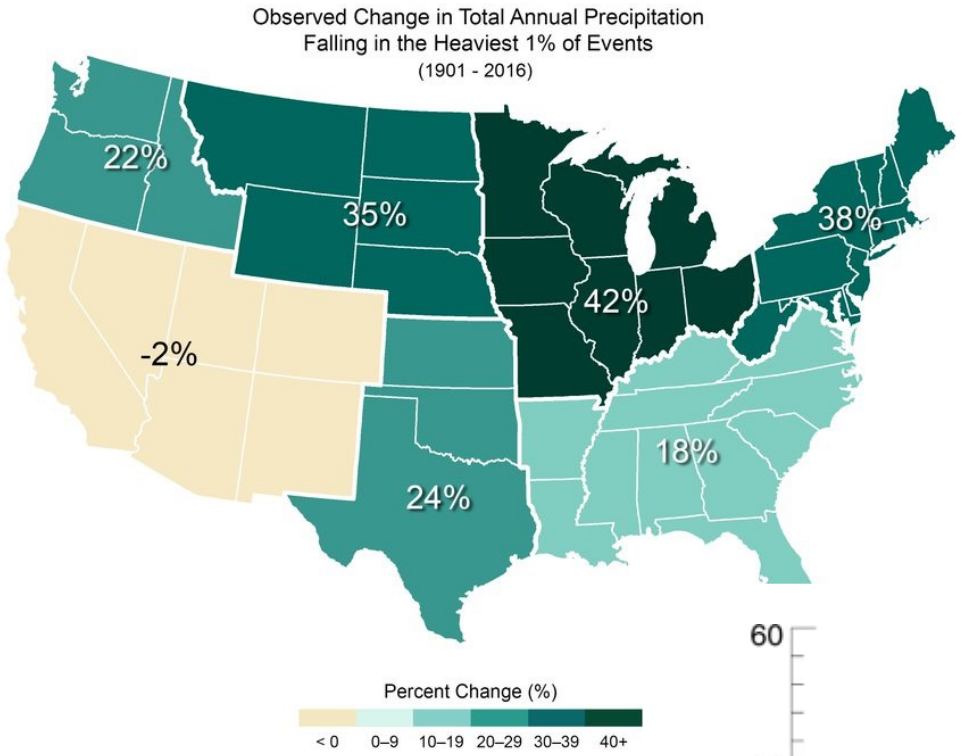
Turco et al, GRL 2015

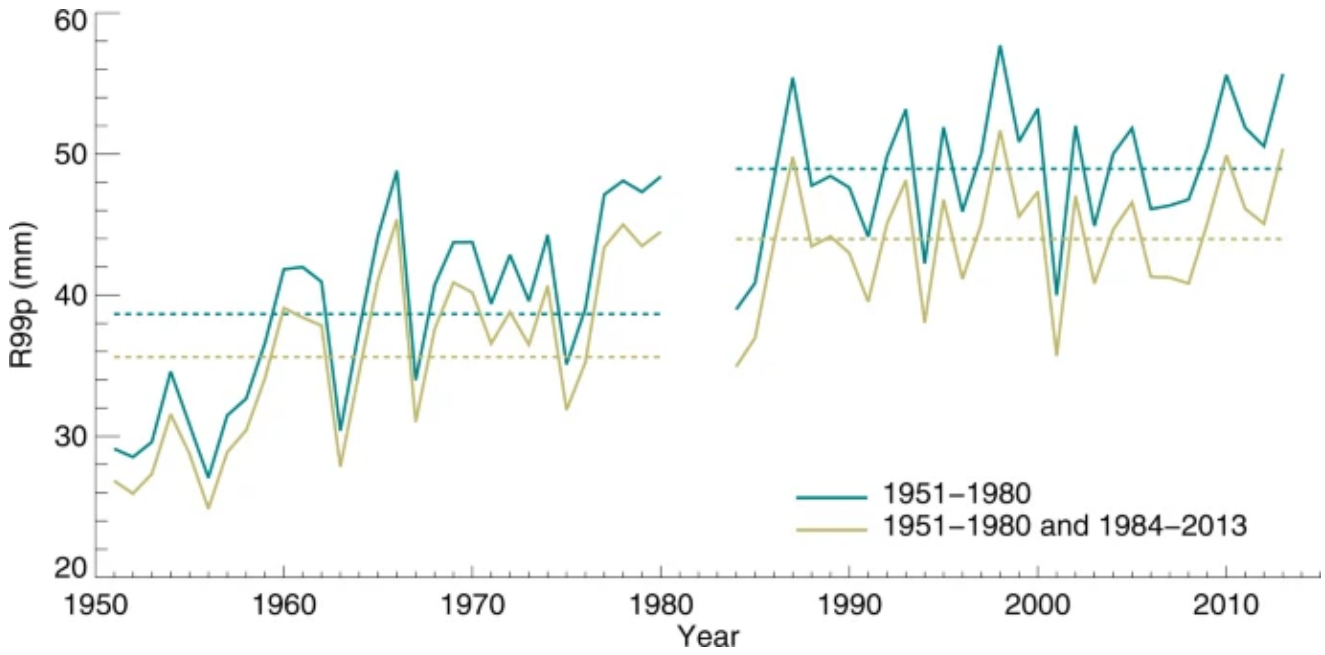
Eventi estremi: alluvioni, siccità, incendi

Foto: NASA

Eventi di precipitazione estrema

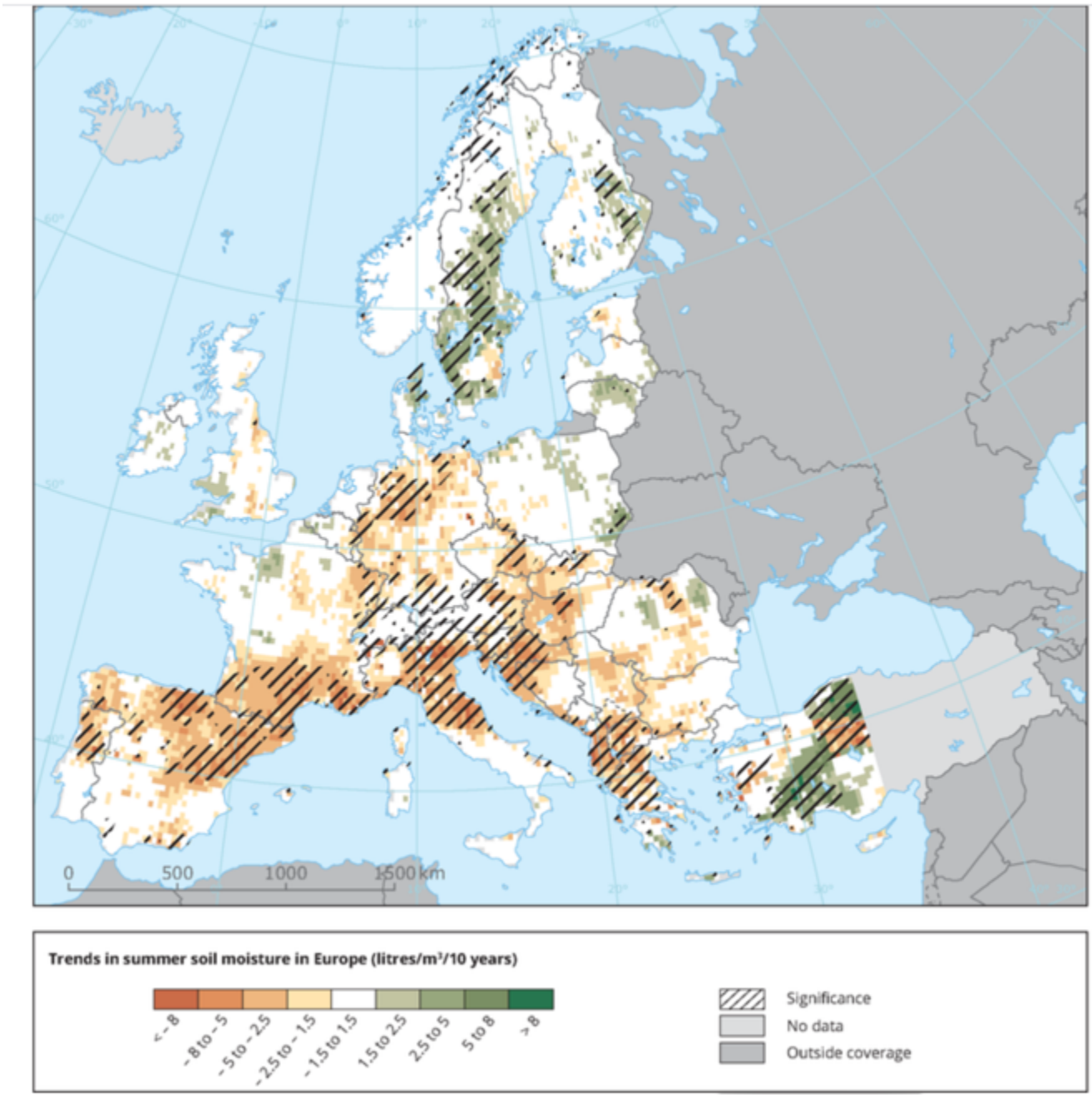
https://www.globalchange.gov/browse/indicators/heavy-precipitation





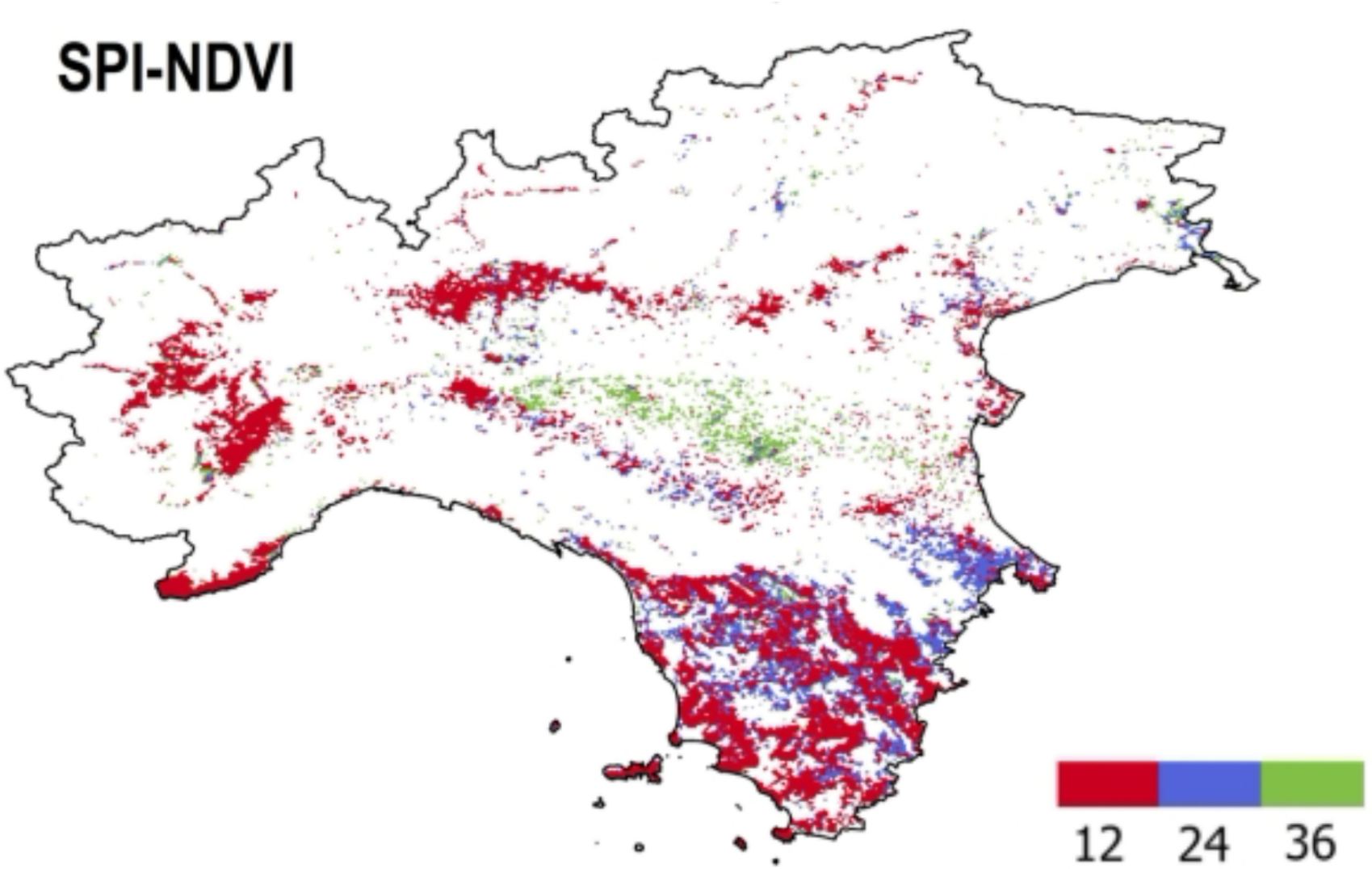
R99p over **Europe** from the E-OBS dataset, Myhre et al, Scientific Reports, https://www.nature.com/articles

/s41598-019-52277-4



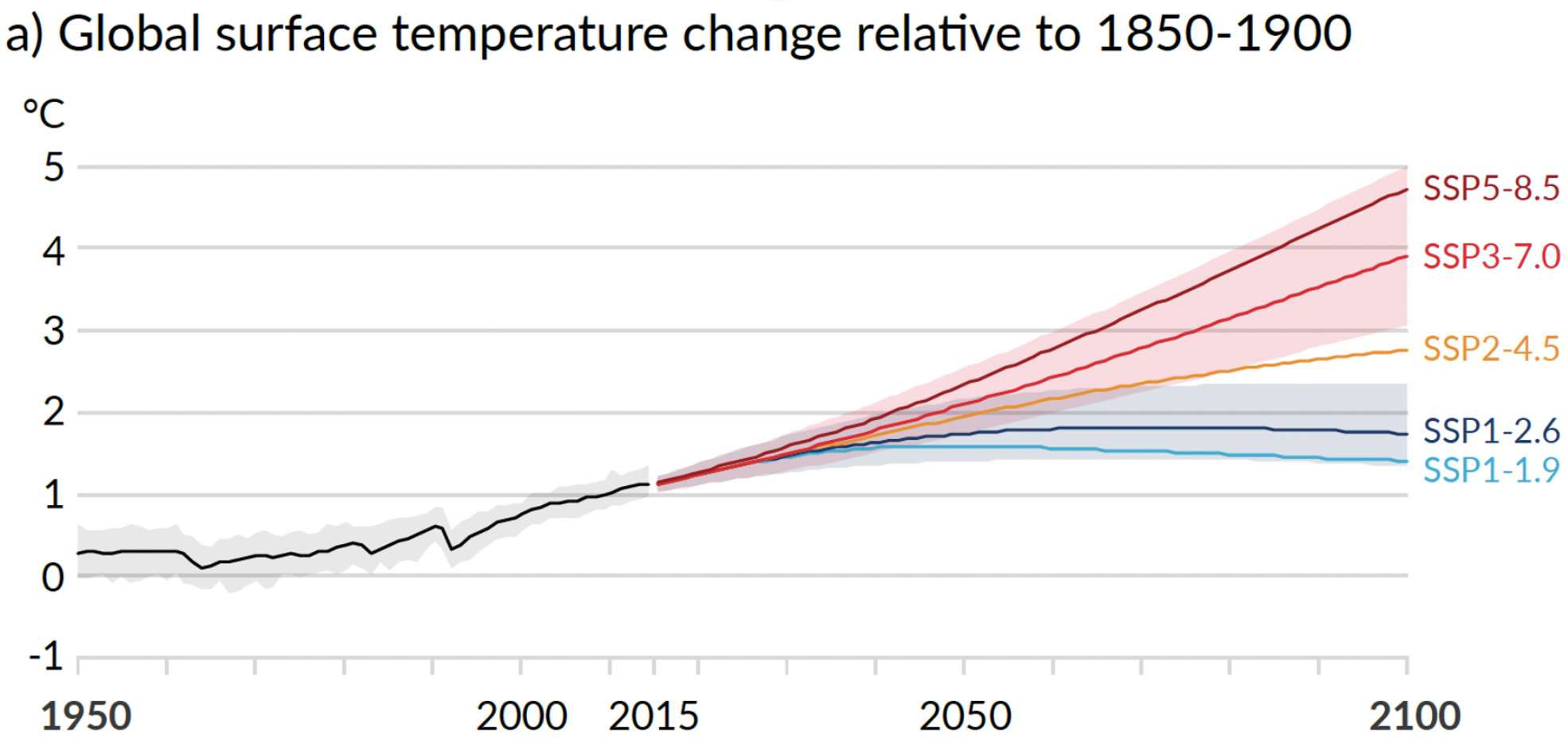
European Environmental Agency,
https://www.eea.europa.eu/data-and-maps/figures/trends-in-summer-soil-moisture-1

Effetti della siccità sulla vegetazione (2000-2020)



Alice Baronetti et al, 2023

Stime della crescita della temperatura nel prossimo futuro



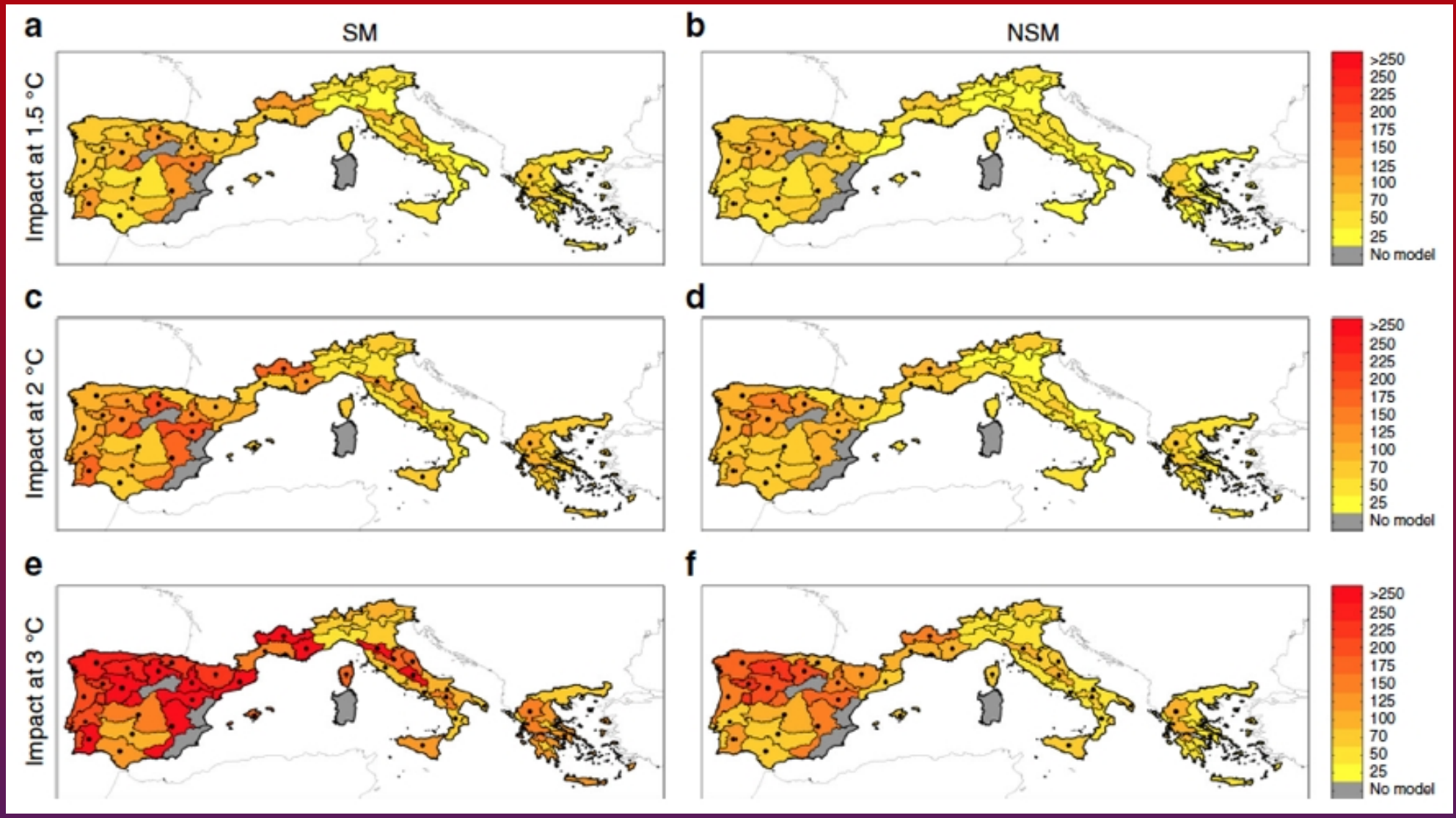
Climatic Change (2022) 172:22
https://doi.org/10.1007/s10584-022-03370-7

Check for updates

Future droughts in northern Italy: high-resolution projections using EURO-CORDEX and MED-CORDEX ensembles

Alice Baronetti[1,3] · Vincent Dubreuil[2] · Antonello Provenzale[3] · Simona Fratianni[1]

Proiezioni per l'area bruciata attesa



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Turco et al. Nature Communications 2018

Come possiamo affrontare i cambiamenti climatici?

Riduzione delle emissioni (CO_2, metano, aerosol carboniosi)

Adattamento e tecniche di gestione (e relative discussioni)

Necessità di pianificazione per l'adattamento ai cambiamenti climatici

Gestione dell'acqua

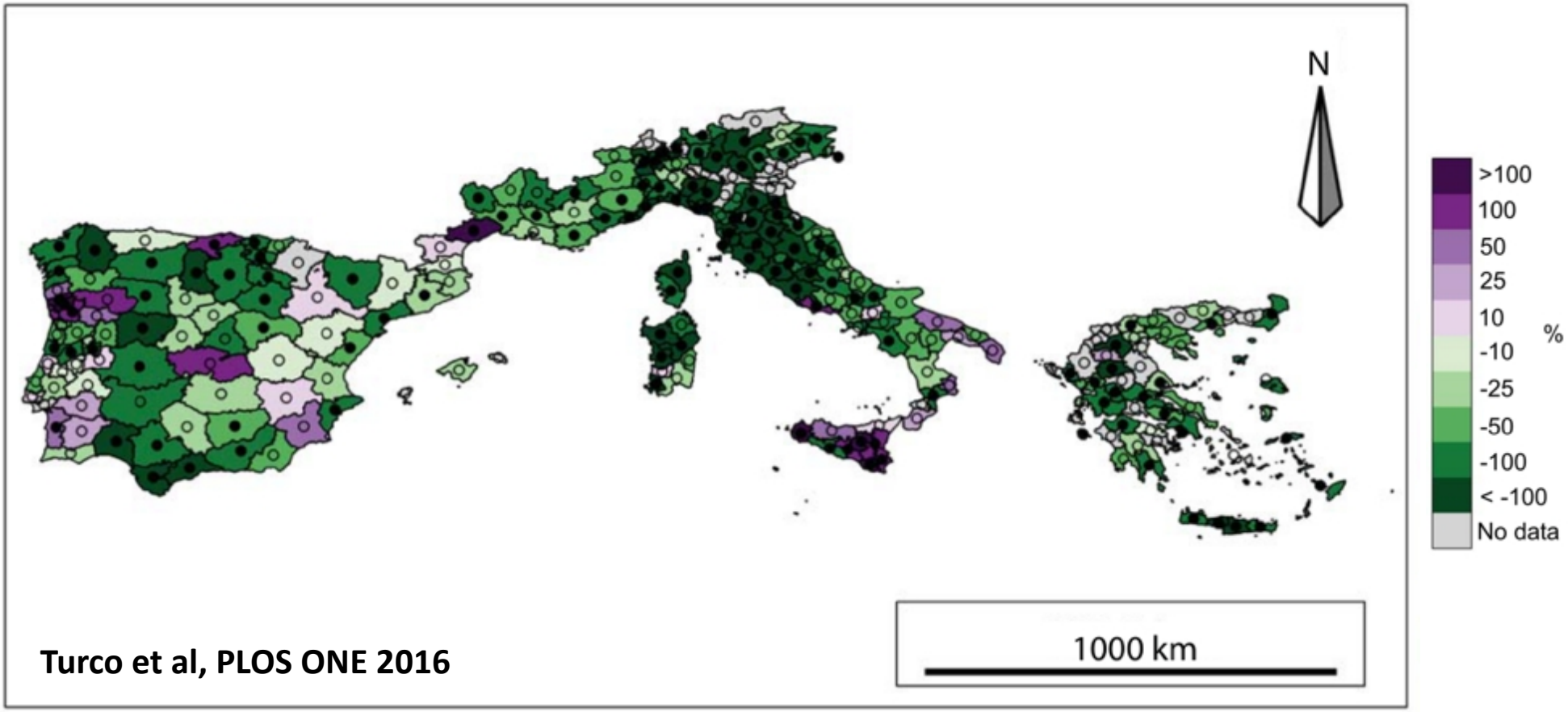
Agricoltura sostenibile

Protezione civile

Attenzione alla geopolitica

Necessità di approcci integrati e multidisciplinari

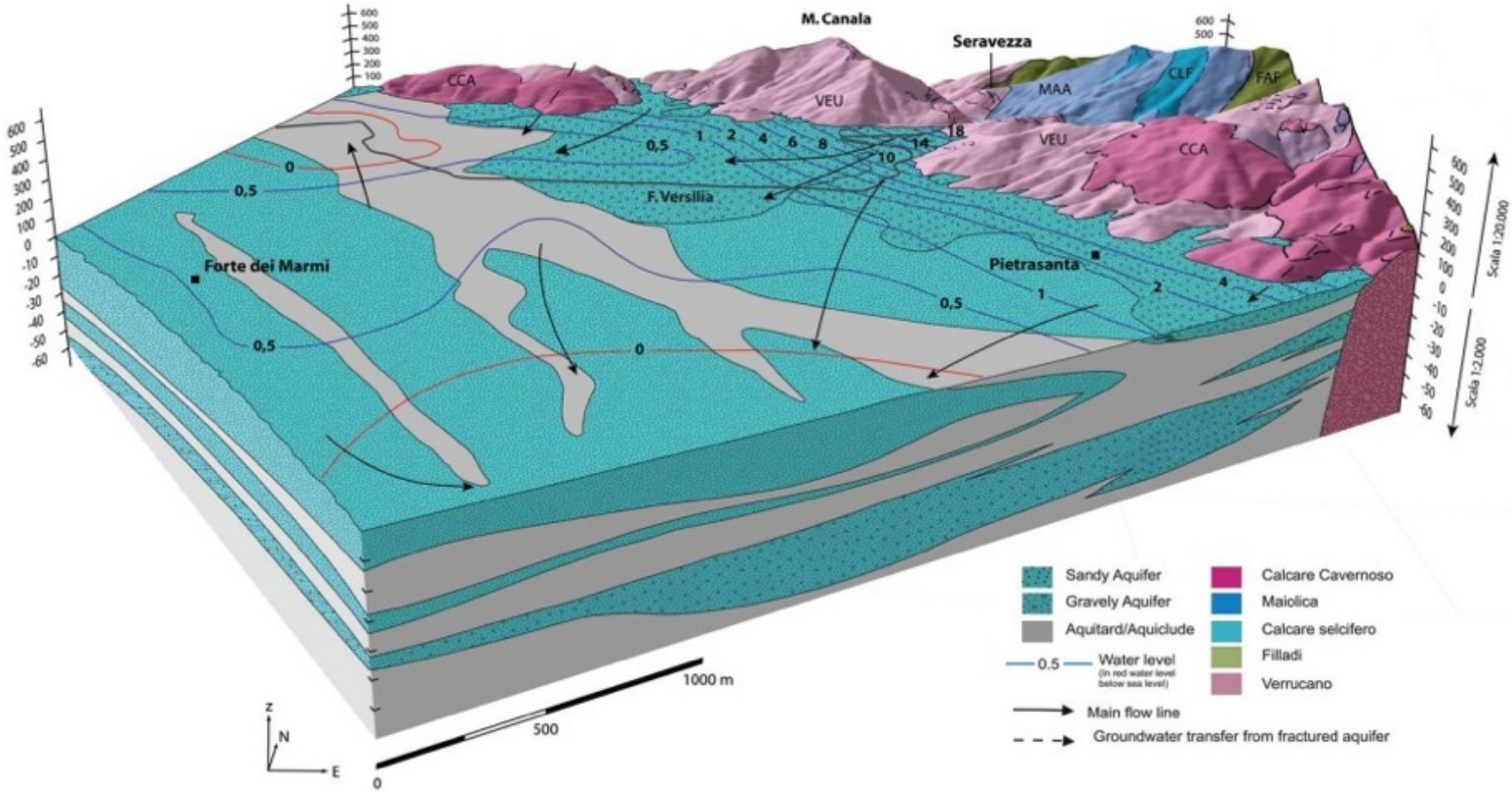
Siccità e incendi estivi in Mediterraneo



Turco et al, PLOS ONE 2016

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Gestione delle risorse idriche
in condizioni di grande variabilità interannuale



G. Masetti et al, IGG CNR

Gestione delle risorse idriche
in condizioni di grande variabilità interannuale

Microvariabilità della temperature: ambienti proglaciali

Silvio Marta et al, *Nature Communications* 2023

Fotosintesi
(assorbimento)

Respirazione
(emissione)

Ruolo degli ecosistemi terrestri e marini nell'assorbimento della CO_2


Necessità di un approccio sistemico
e allo stesso tempo pragmatico