



Why the 2022, 2023, 2024, ... Italian snow drought(s) matters to you

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Vienna, April 2024

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CIMA Research Foundation

28

YEARS OF INTERNATIONAL RESEARCH FROM 1995 TO 2023

133

HUMAN RESOURCES COMING FROM DIFFERENT COUNTRIES

7

STRATEGIC PROGRAMMES

116

ACTIVE PROJECTS IN 2022

85

INSTITUTIONS WITH WHICH WE WORK

24/7

ACTIVITIES SITUATION ROOM 365 DAYS A YEAR

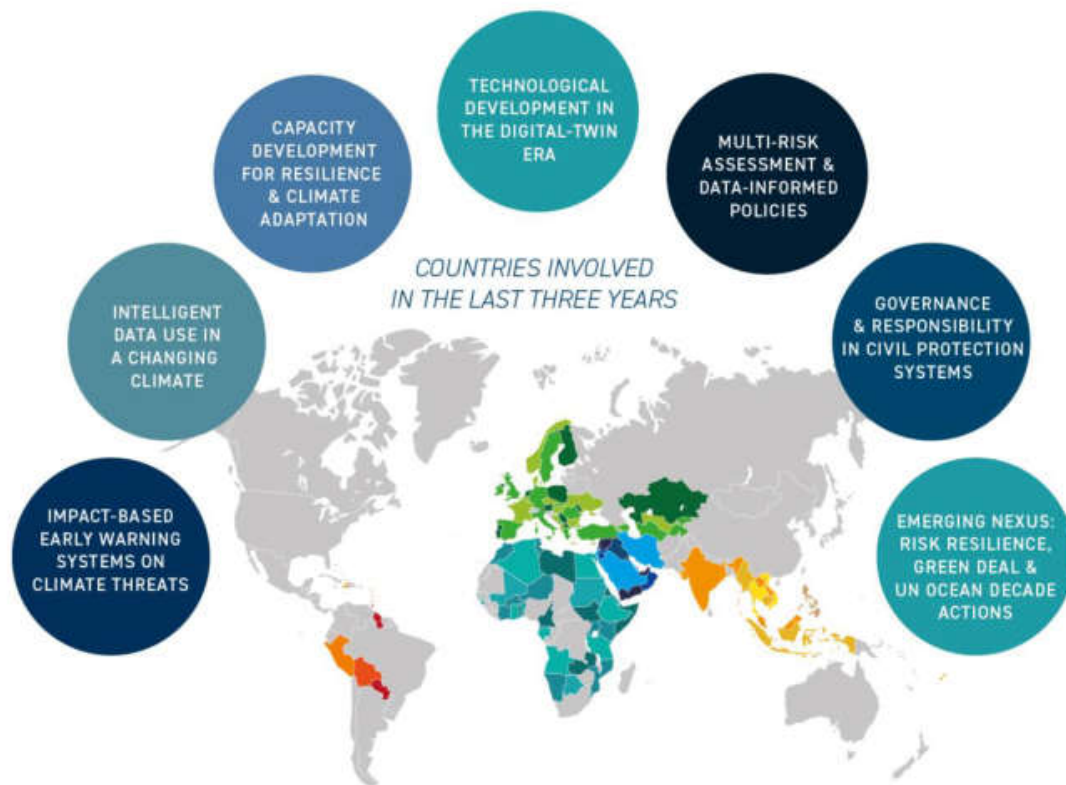
OUR MISSION

CIMA Research Foundation - International Centre on Environmental Monitoring is a non-profit research organization active in the fields of **Civil Protection, Early Warning Systems, Disaster Risk Reduction and Management, Innovation Technology, Climate Change Adaptation and Biodiversity Conservation.**



Headquartered in Savona (Italy)

OUR STRATEGIC PROGRAMMES



WHAT WE ARE

- Competence Center of the Italian Civil Protection System
- Member of PhD programmes on Risk, Climate Change and Sustainable Development (University of Genoa)
- Supporting Centre for the Italian Weather Service (ItaliaMeteo)
- Key actor of the European Civil Protection and Humanitarian Aid Operations - DG ECHO
- Scientific Partner of UNDRR, WMO, UNDP, WFP, FAO, UNICEF, UNOPS, UNEP and WORLD BANK



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OUR FOUNDERS

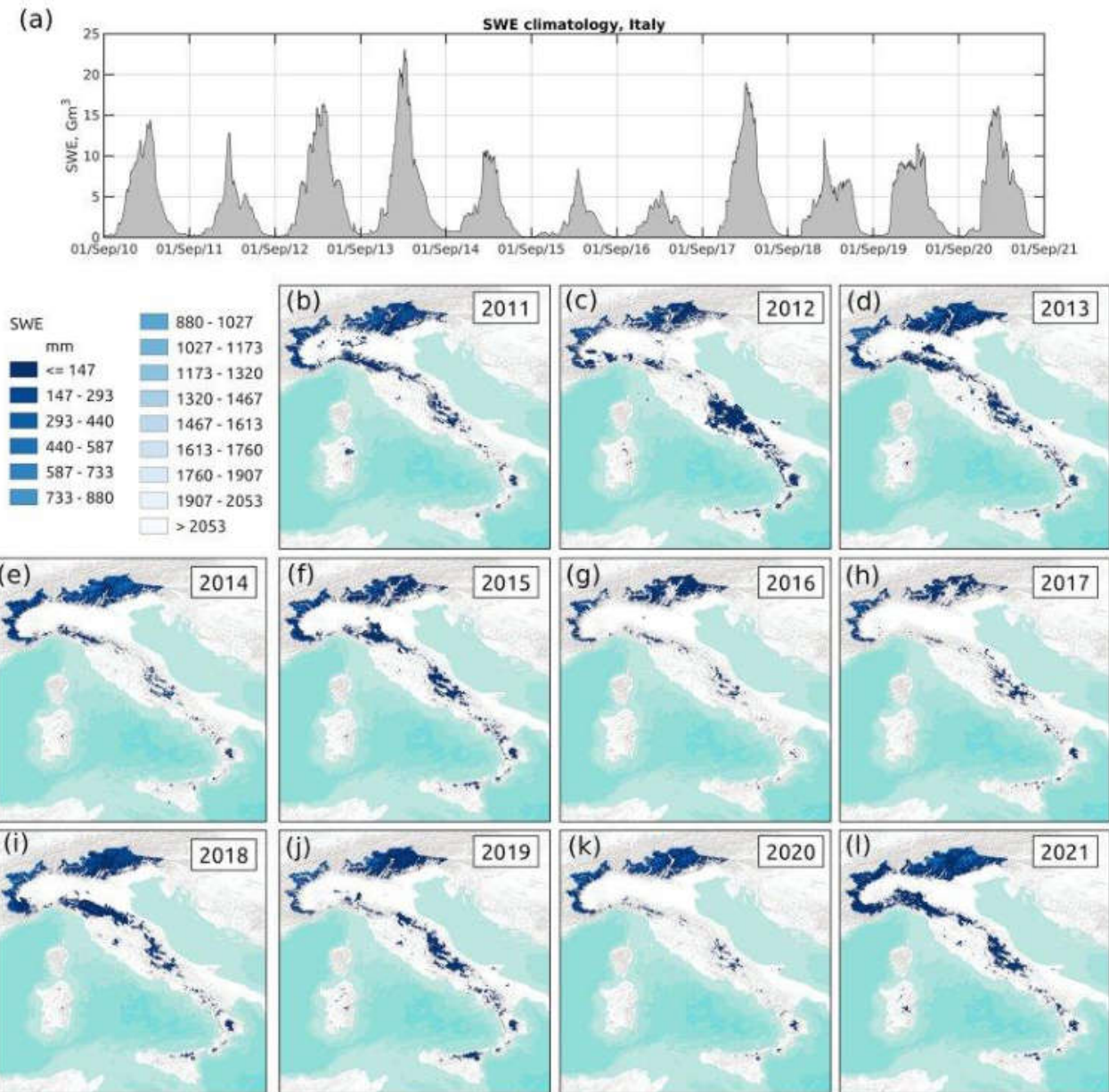
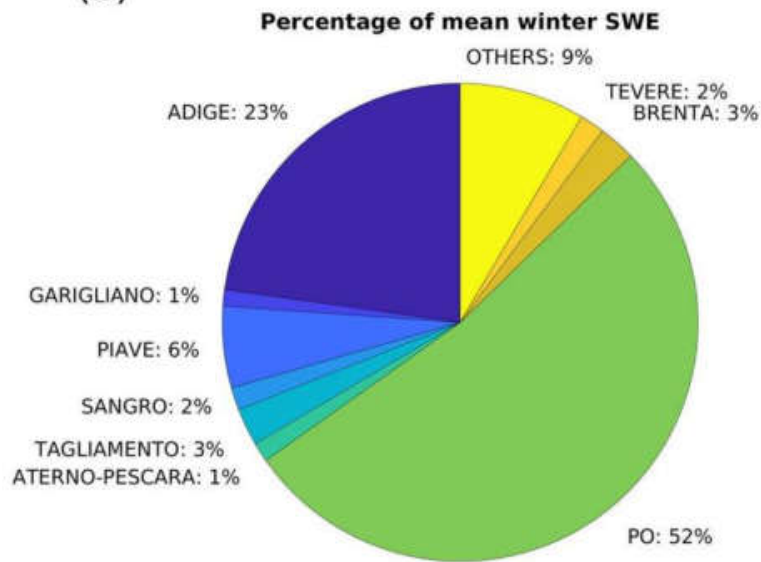




SO WHY SNOW?

Why snow?

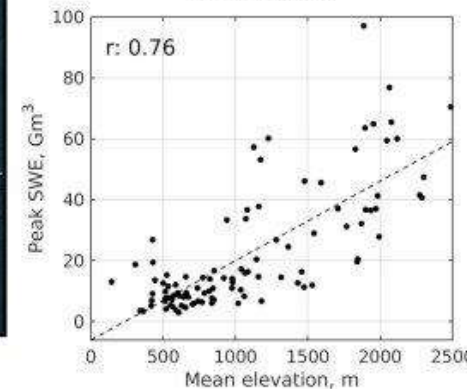
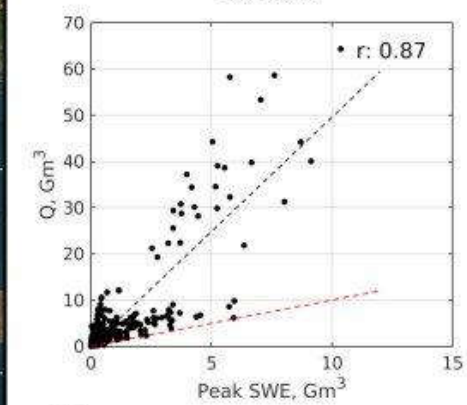
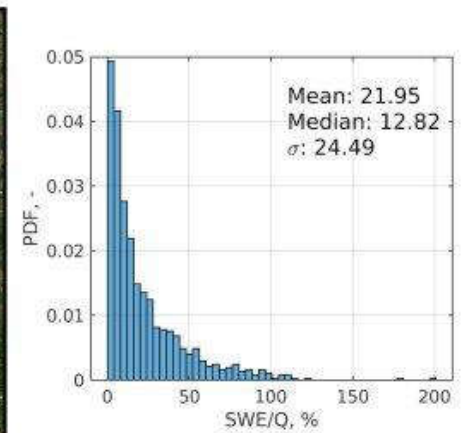
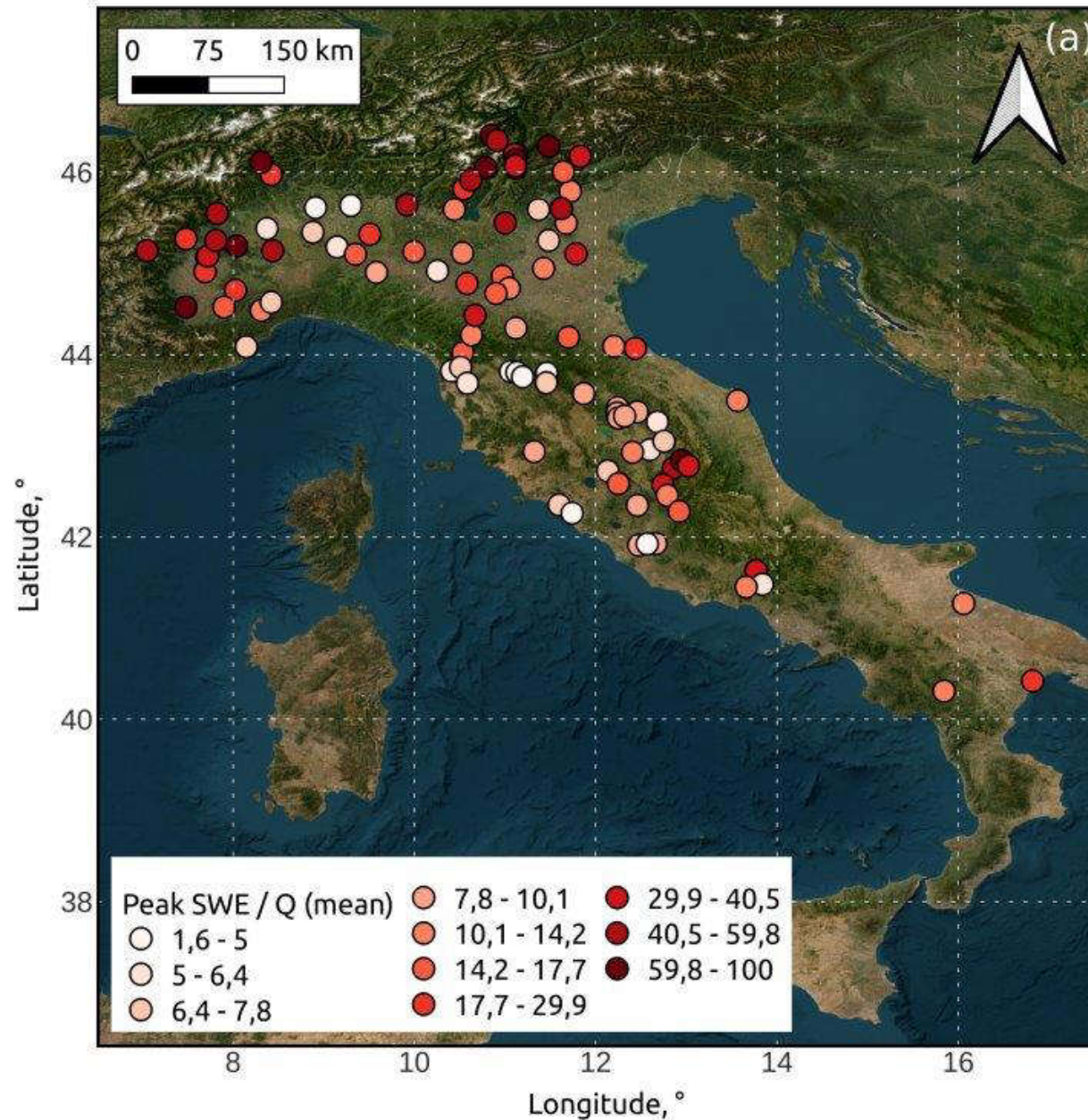
Italy hosts on average 13.70 ± 4.9 Gm³ of snow water equivalent (2011-2021), with a concentration in the southern Alps and the central Apennines.



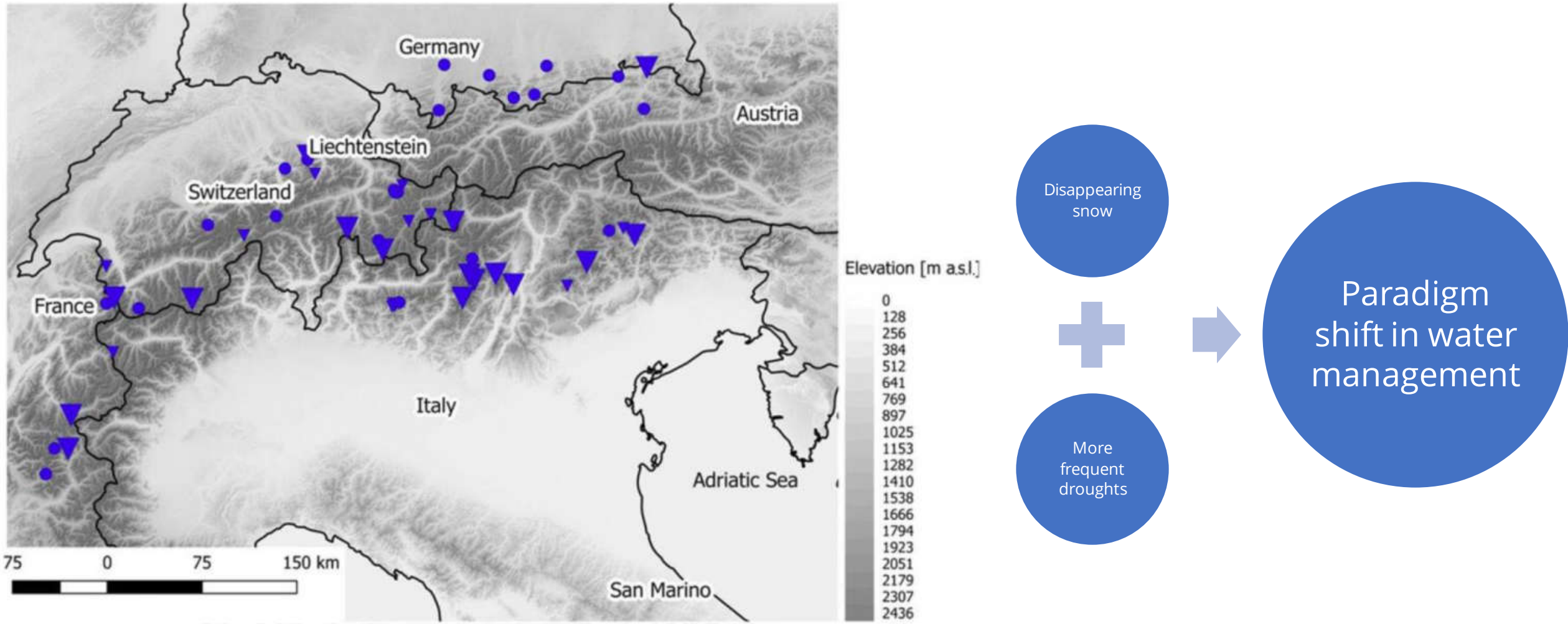
Why snow?

Owing to our heavily seasonal precip regime, peak SWE can be up to 60% or more than annual streamflow.

In Italy, today's snow is tomorrow's water.

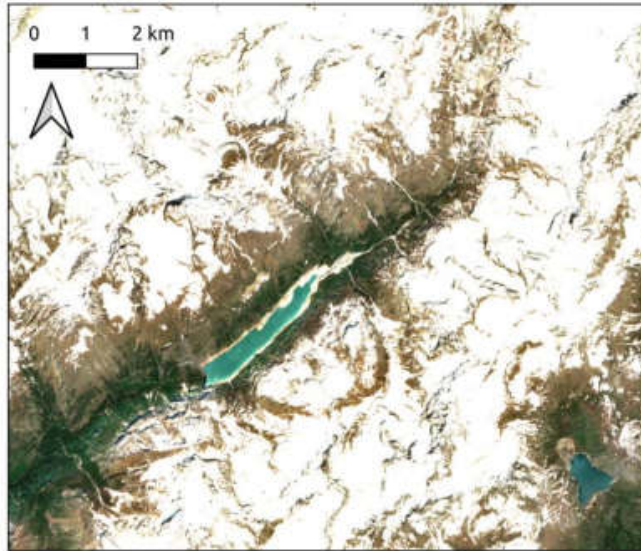


So what's the problem?



Marty et al., 2017

Learning from past events: the 2022 snow drought



Place Moulin, June 2021 (left) vs. June 2022 (right) (c) ESA Copernicus

Is there a characteristic signature of snowmelt deficit in escalating societal impacts downstream?

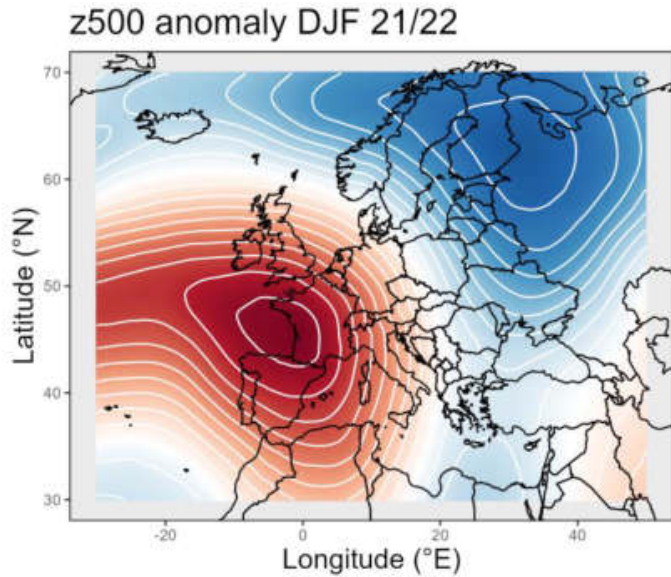


OLXnews.travel NEWS DESTINATIONS EXPERIENCES STAYS PEOPLE SERIES
'The water wasn't there': Lake Garda tourists shocked by how much hotspot has shrunk

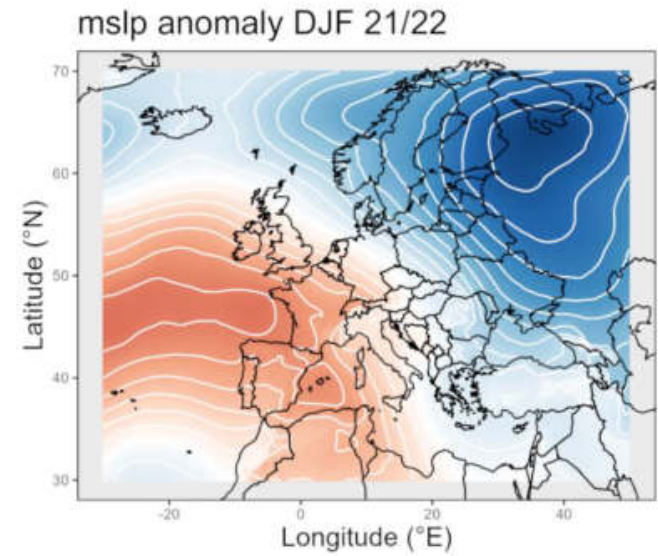
'We worry about it disappearing': alarm grows over Italy's drought-hit Po River
Drought blighting country's longest waterway continues as economic hub battles climate crisis

Snow prelude (?)

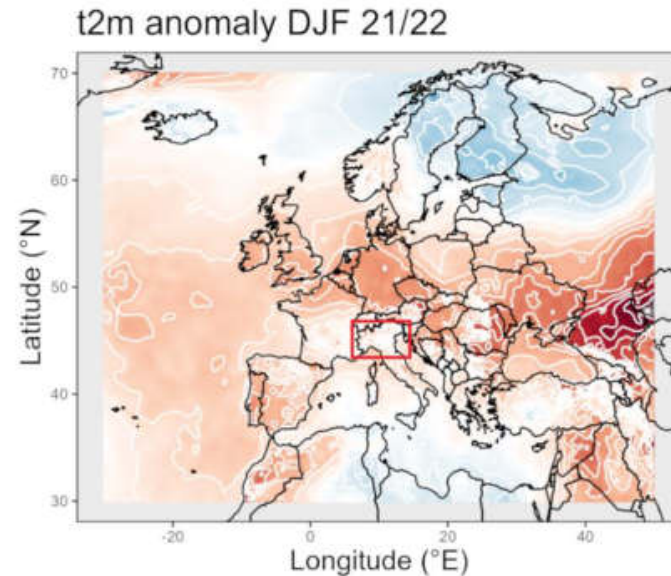
Persistent **high pressure ridge** across the W. Med.
= Positive **temperature anomaly** & Significant **precipitation deficit** (up to -70%)



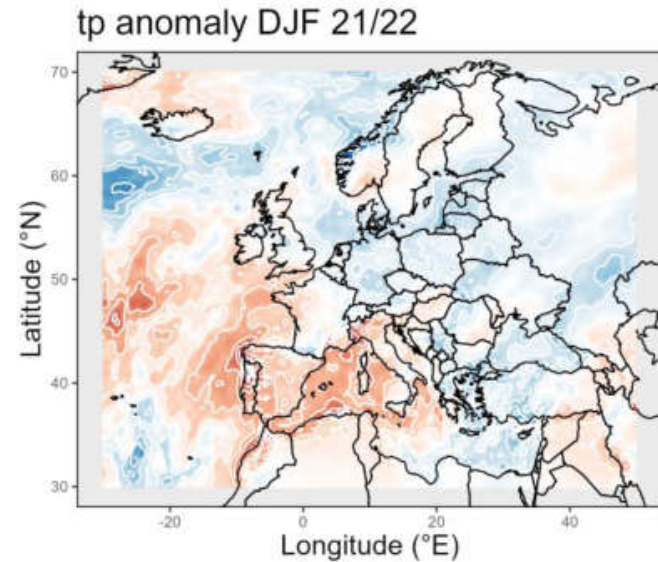
(a)



(b)



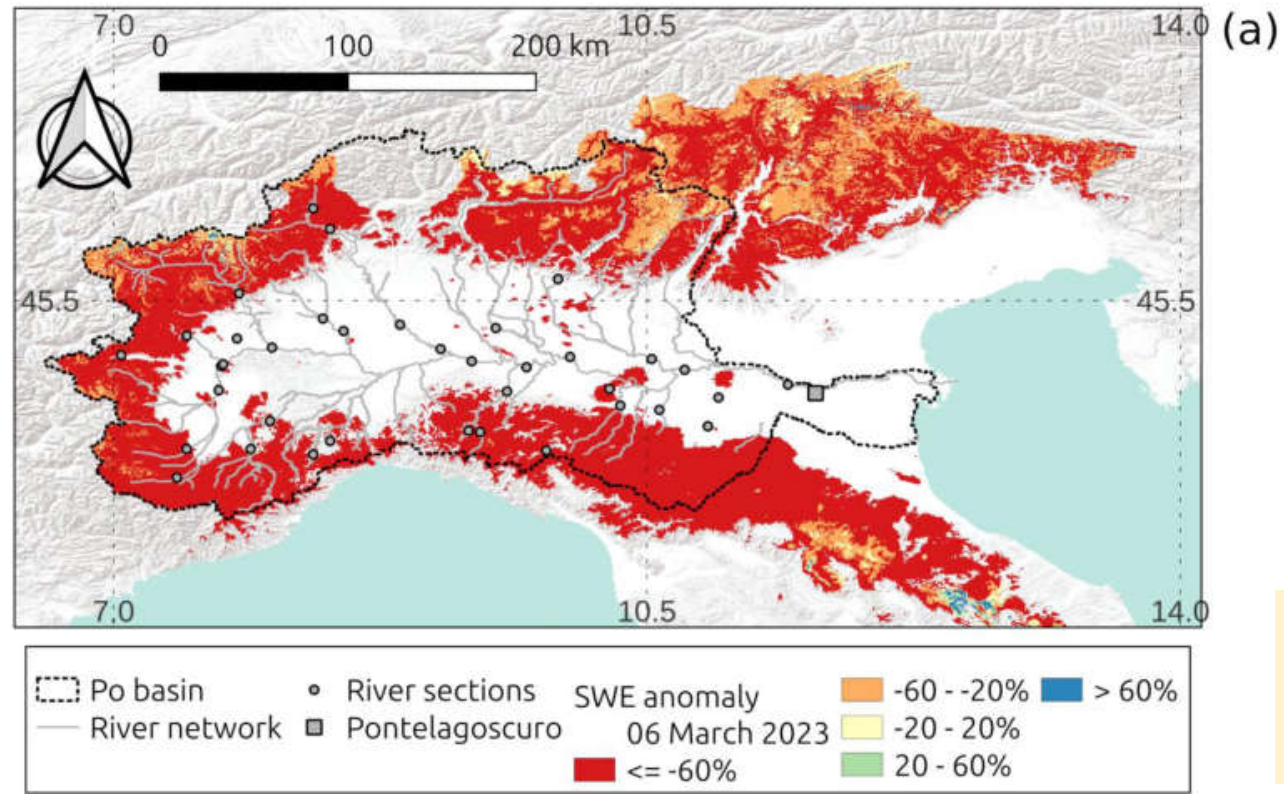
(c)



(d)

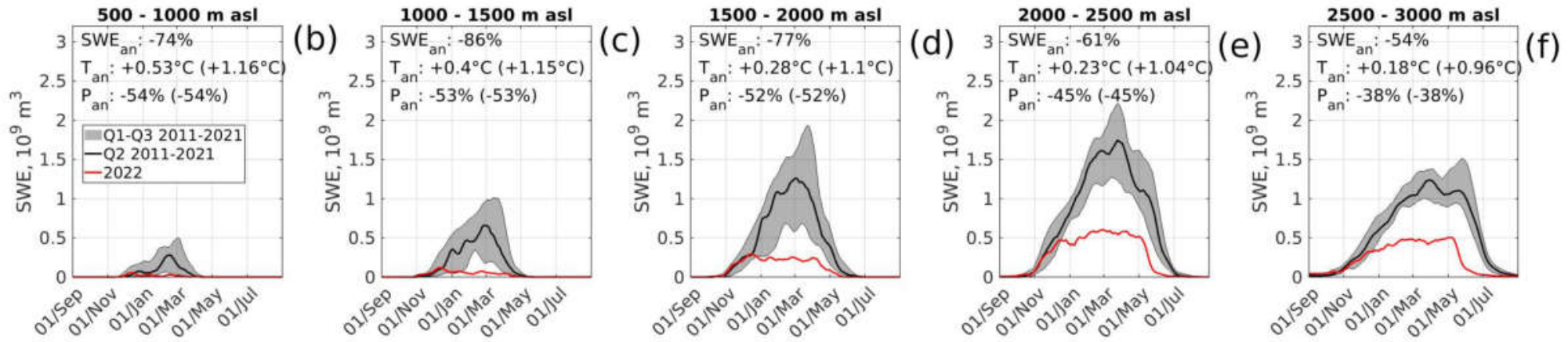
The snow drought

Homogeneous spatial anomaly in SWE

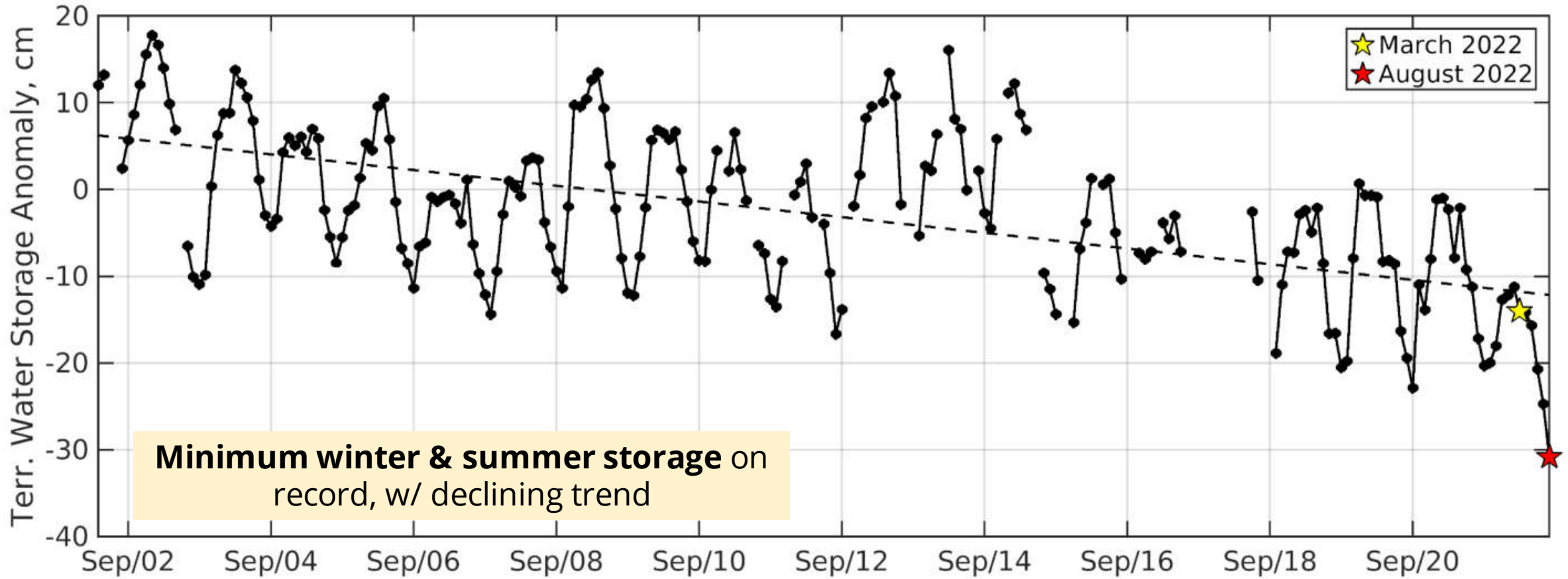


Earlier-than-usual end of the snow season

Quasi-stationary SWE during mid-winter & no snow below 1500 m asl

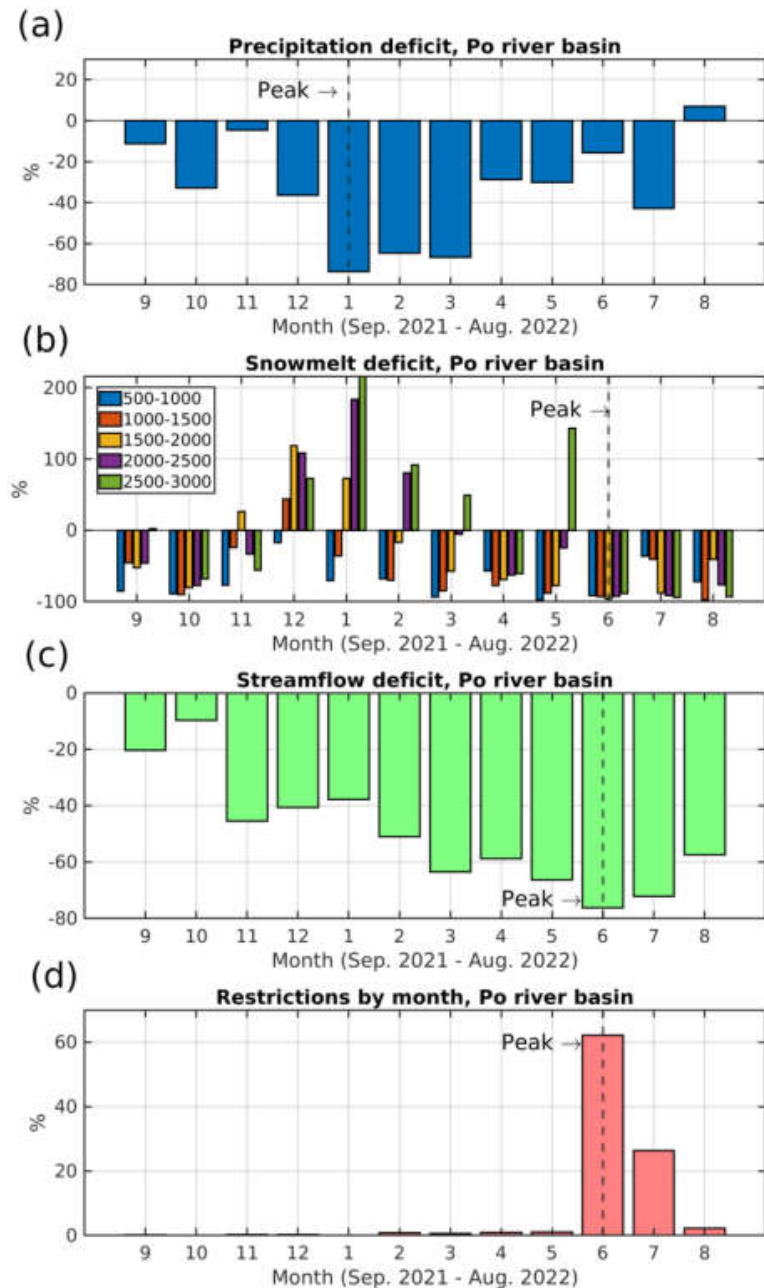


Hydrologic impacts



Minimum winter & summer storage on record, w/ declining trend

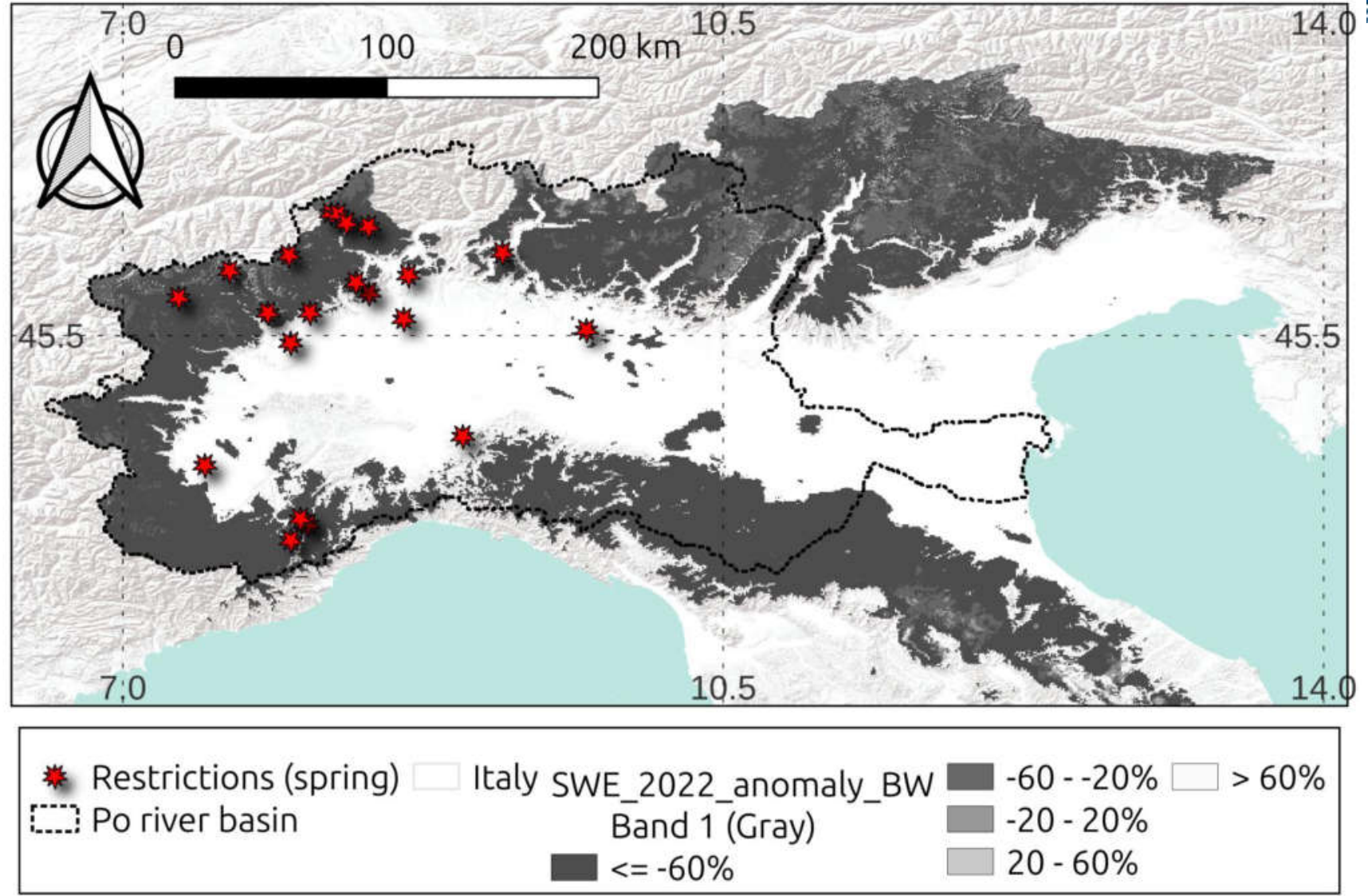
Peaks in Q anomaly and water-use restrictions were simultaneous to the peak in snowmelt anomaly



Positive anomalies in snowmelt during winter mitigated the drought

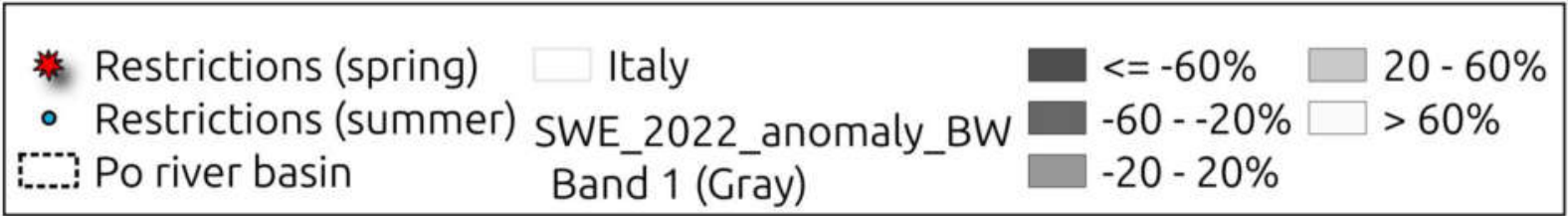
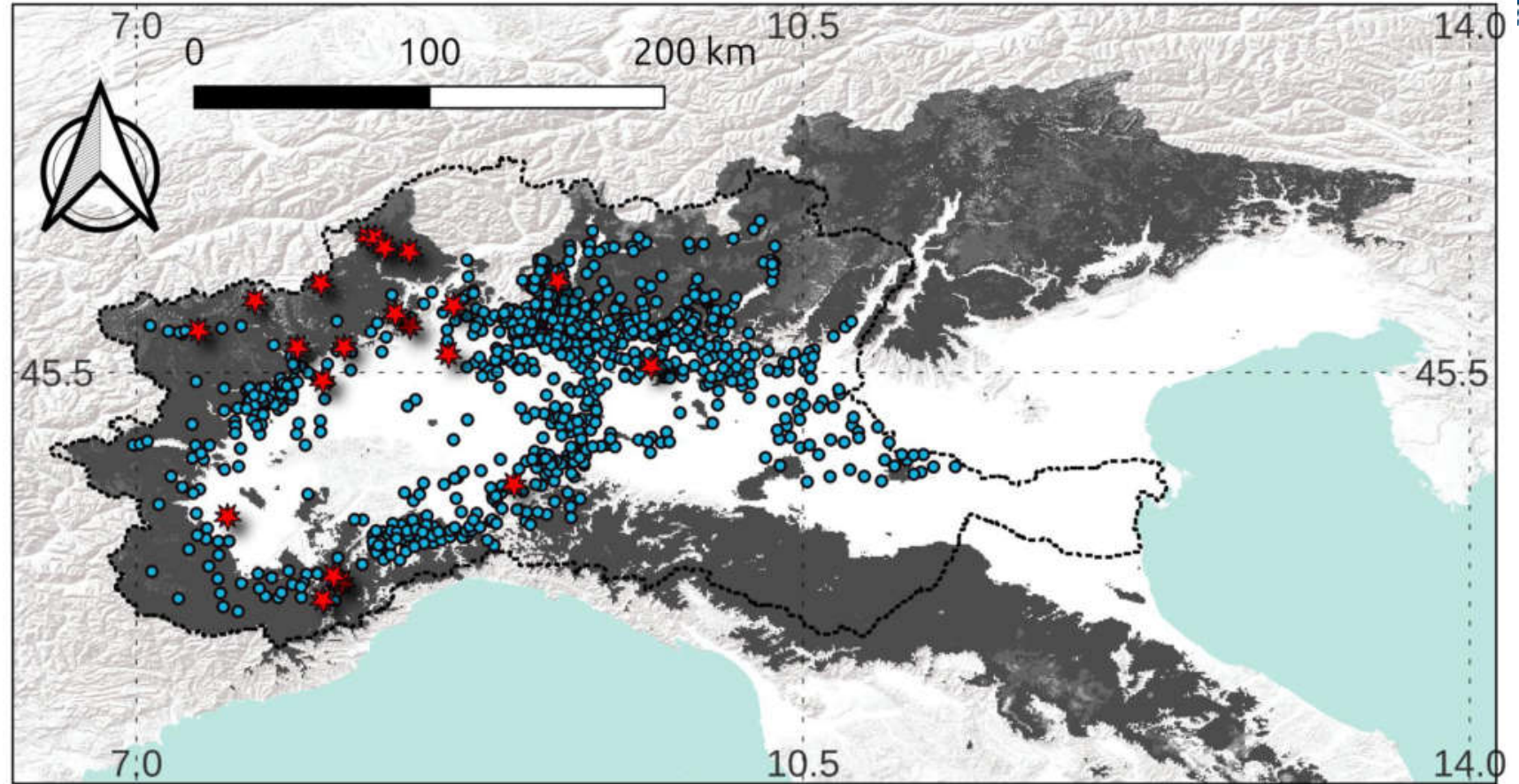
Socio-hydrologic impacts

March to May 2022:
scattered restrictions in
headwater regions.



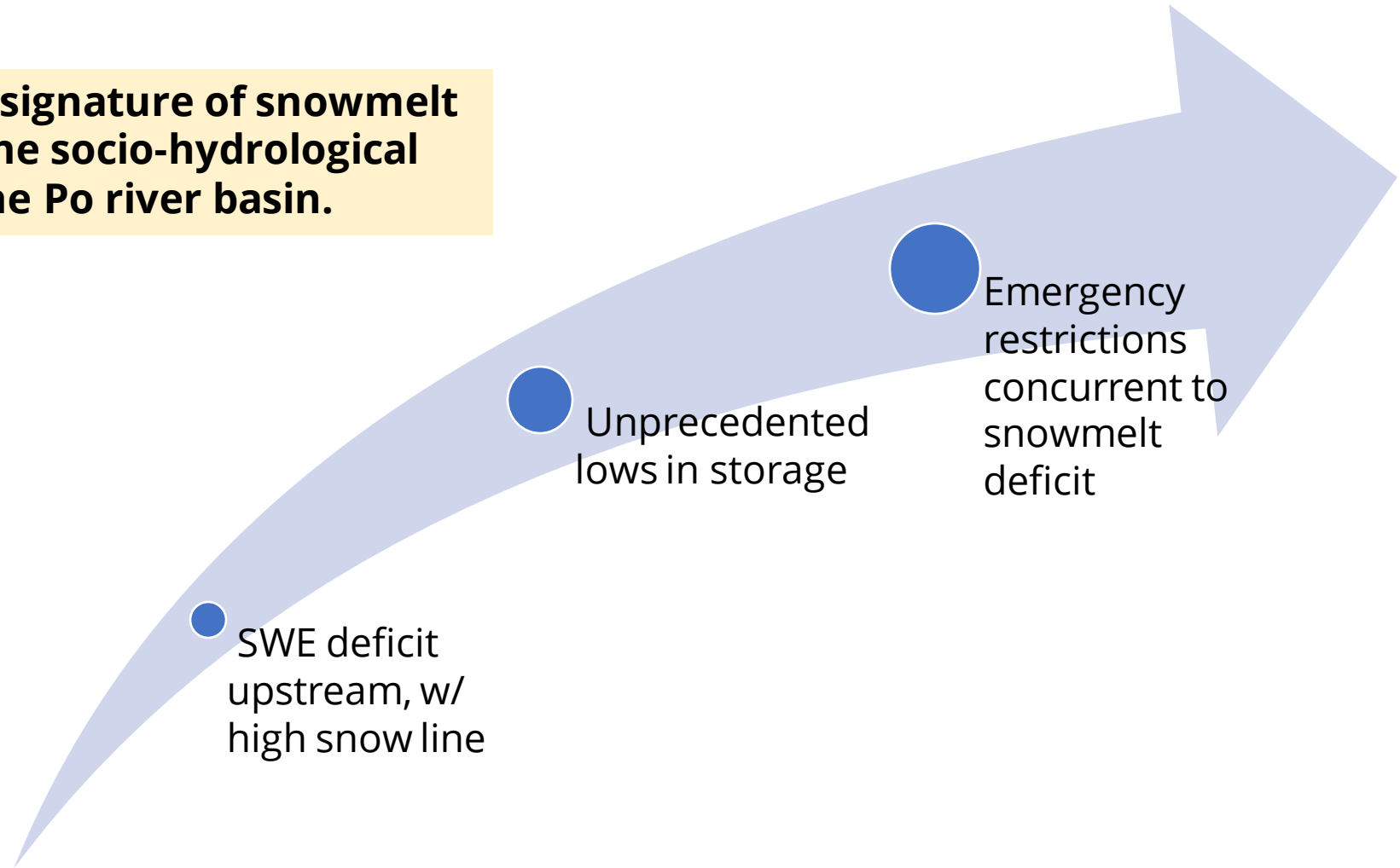
Socio-hydrologic impacts

March to May 2022: scattered restrictions in headwater regions.
June - July 2022: peak in lowland areas (missed freshet).

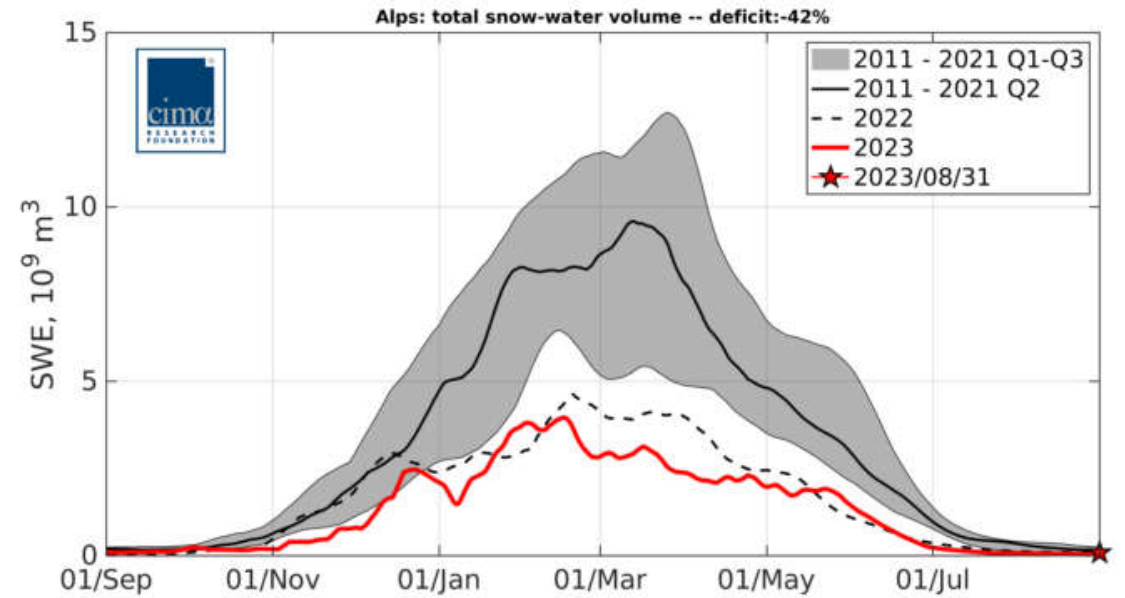
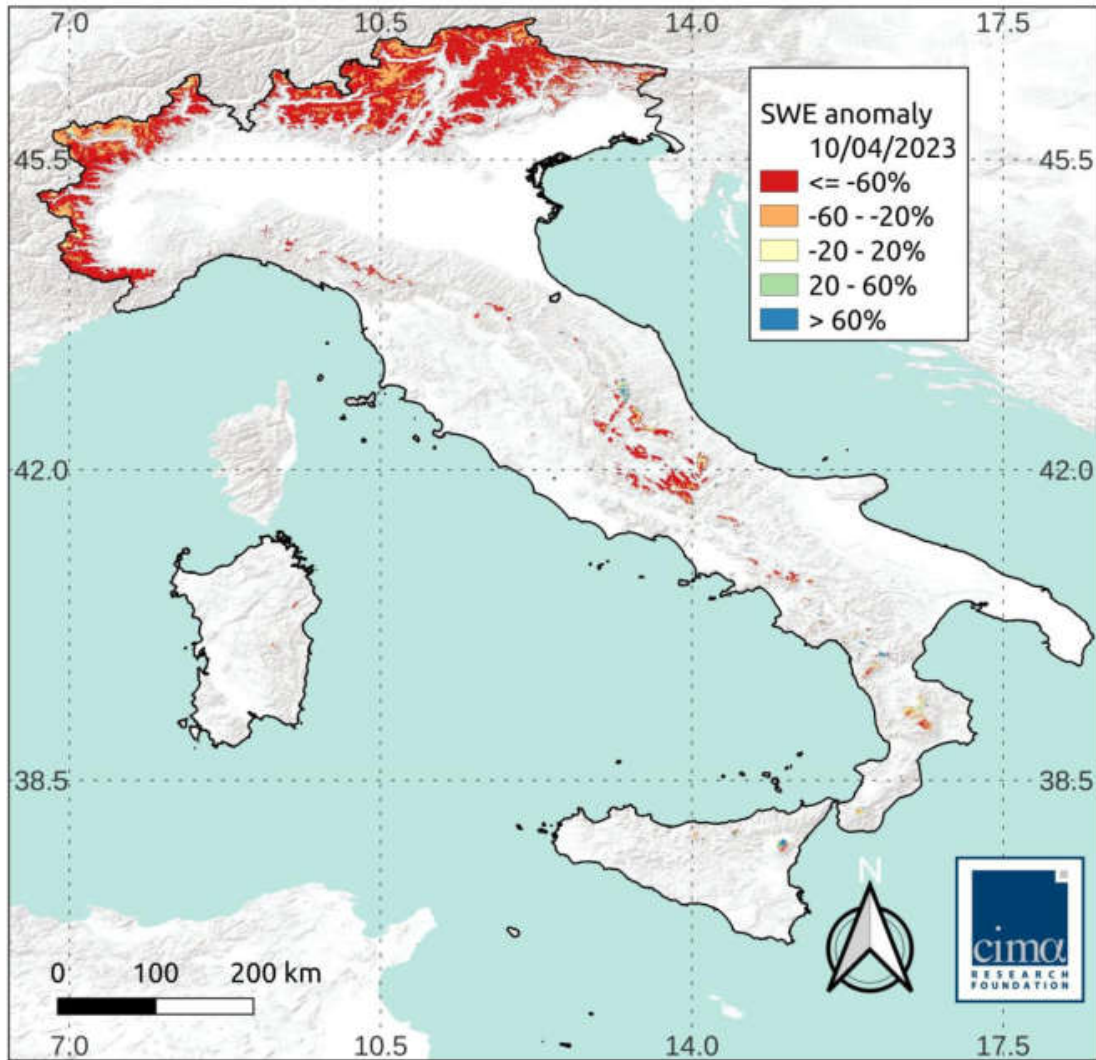


We learned it the hard way

In 2022, we saw a clear signature of snowmelt deficit in escalating the socio-hydrological drought across the Po river basin.



Was this over?



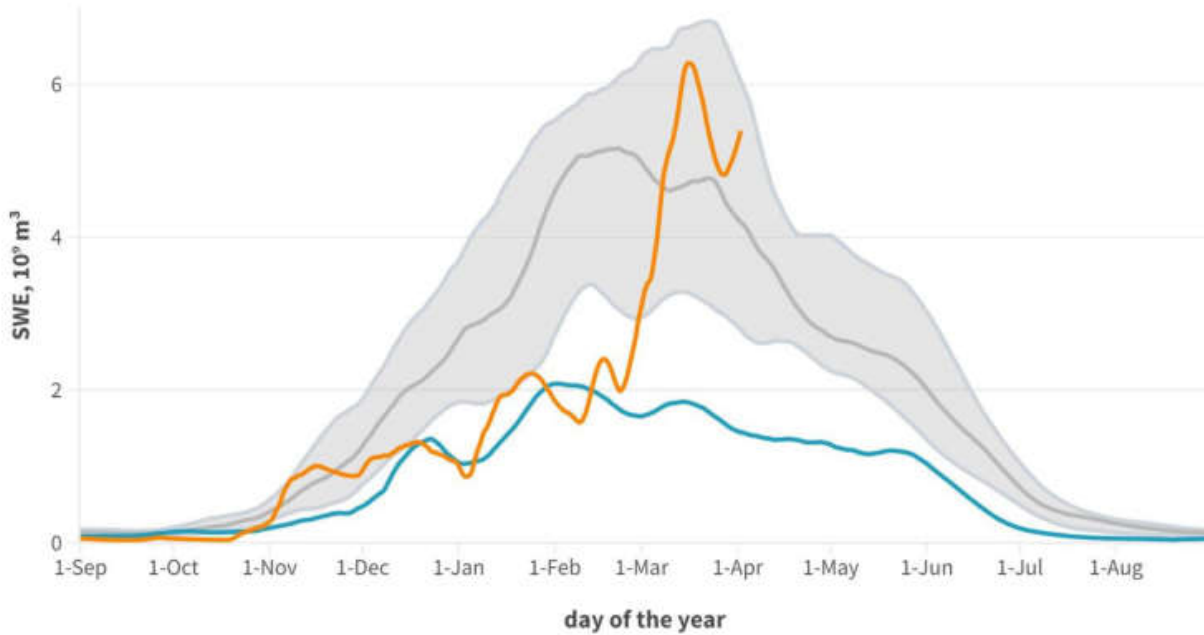
Winter 2022/2023 saw **peaks in SWE that were comparable to 2021/2022** all across the Alps, while the Apennines saw more snow

What about 2024?



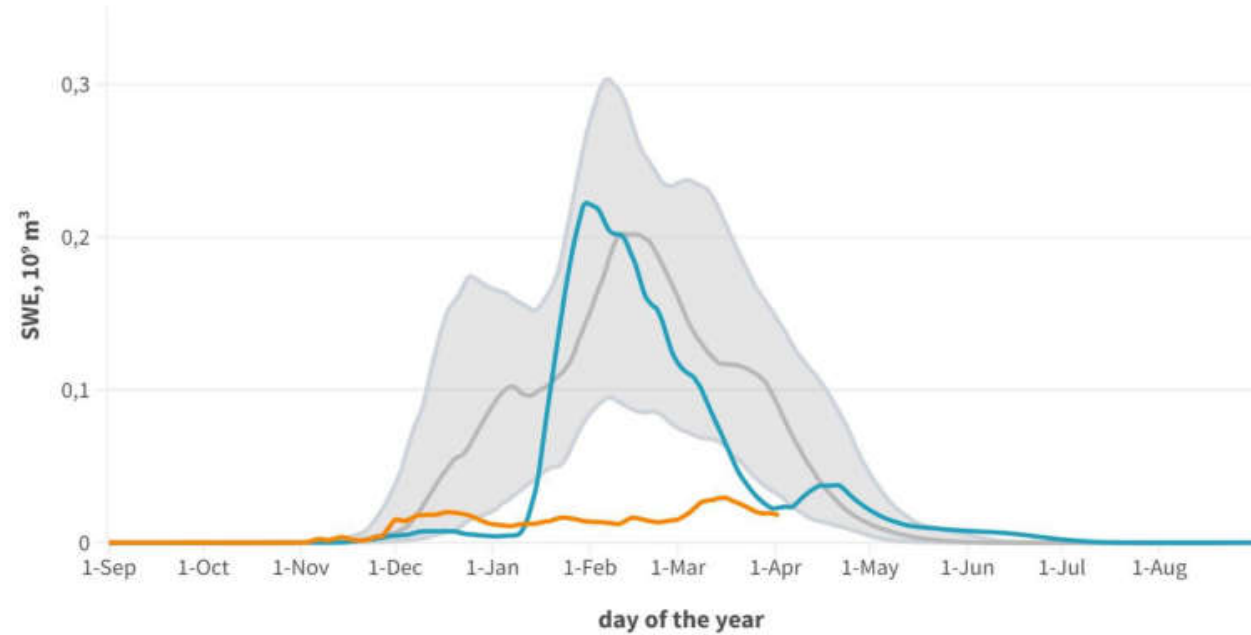
Total snow water volume
PO | anomaly 29%

■ First quartile ■ Third quartile ■ 2011-22 median ■ 2023 ■ 2024



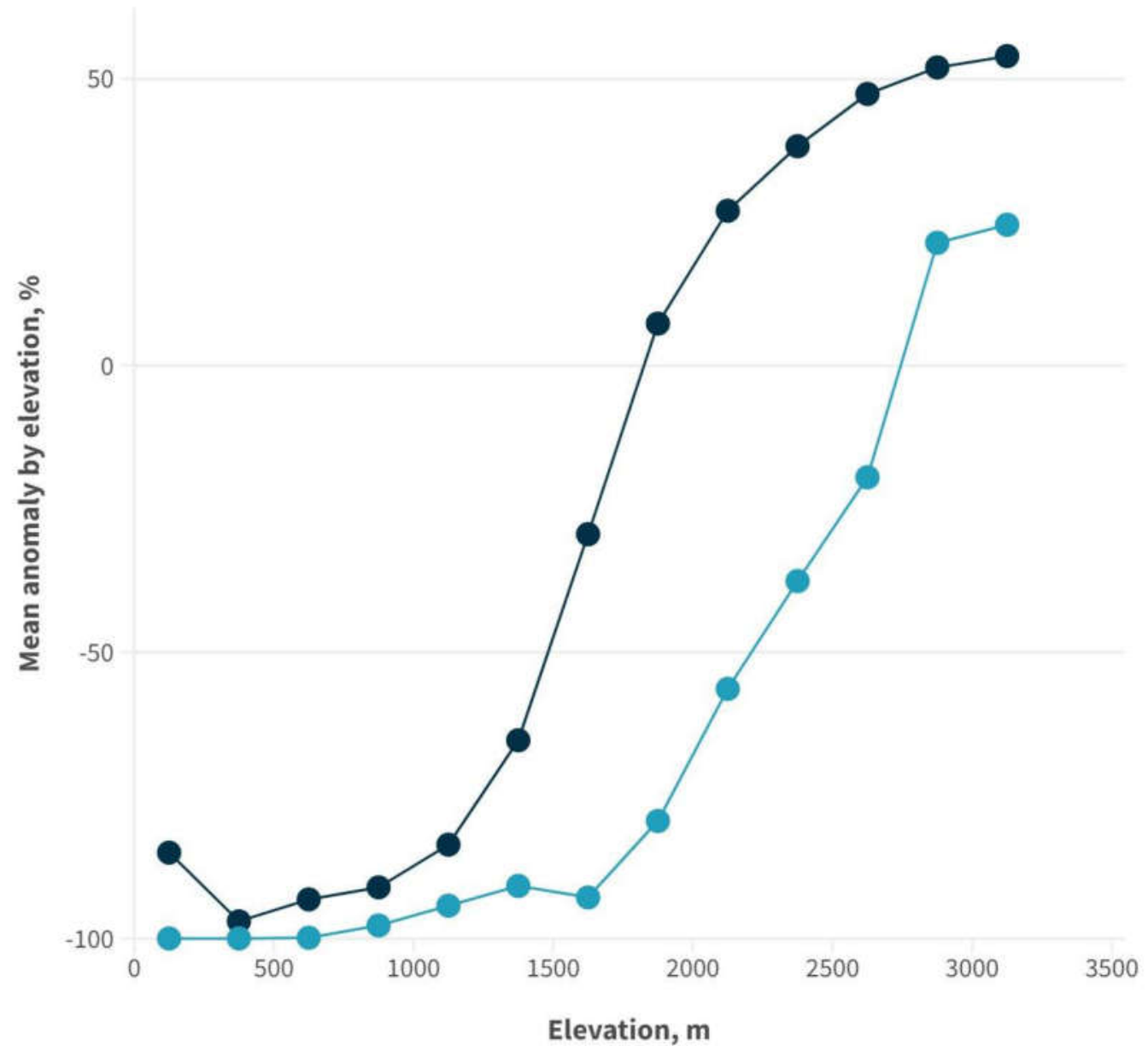
Total snow water volume
TEVERE | deficit -80%

■ First quartile ■ Third quartile ■ 2011-22 median ■ 2023 ■ 2024



What about 2024?

Even with an overall surplus in SWE, we are still seeing **strong negative anomalies at low elevations**

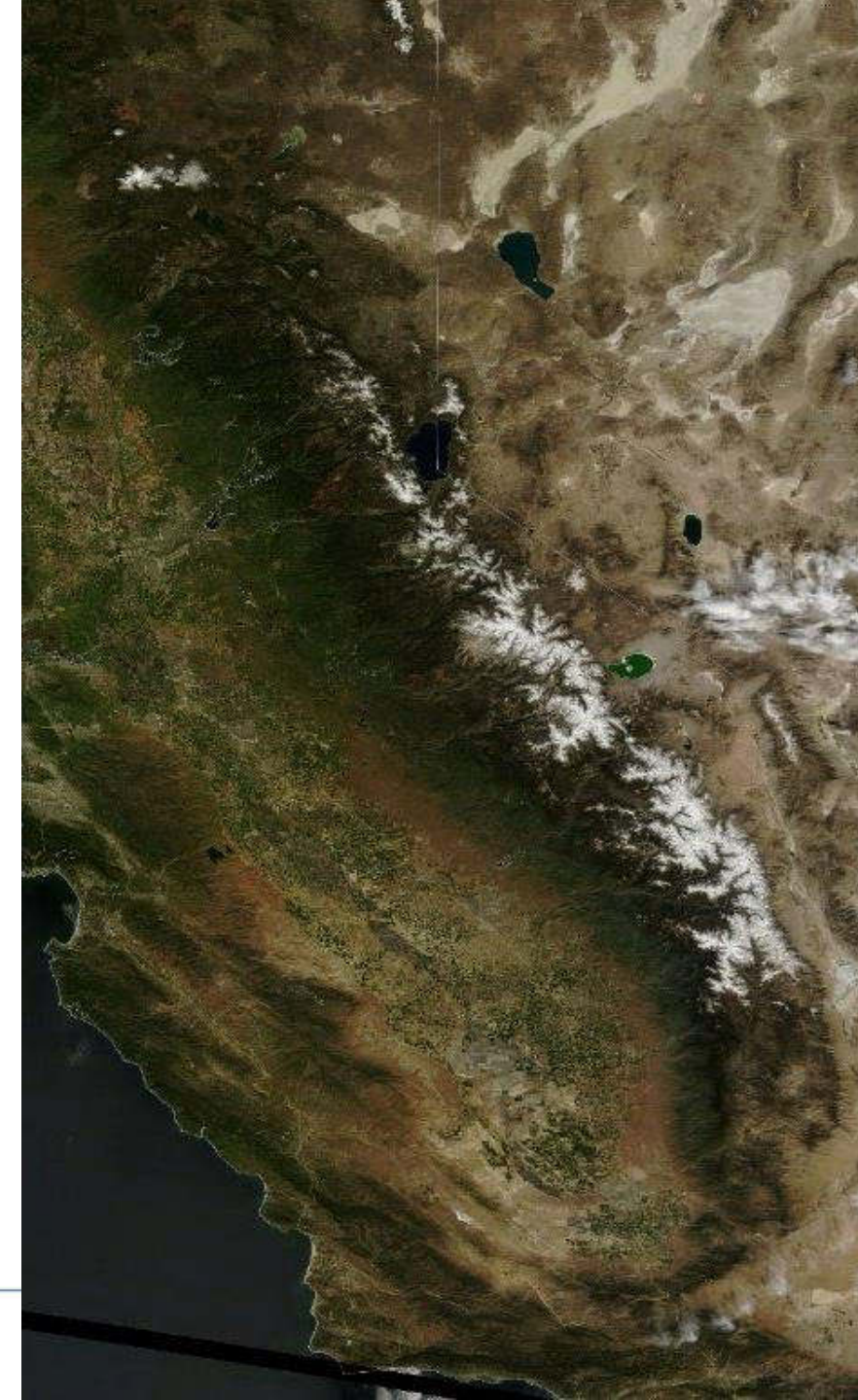
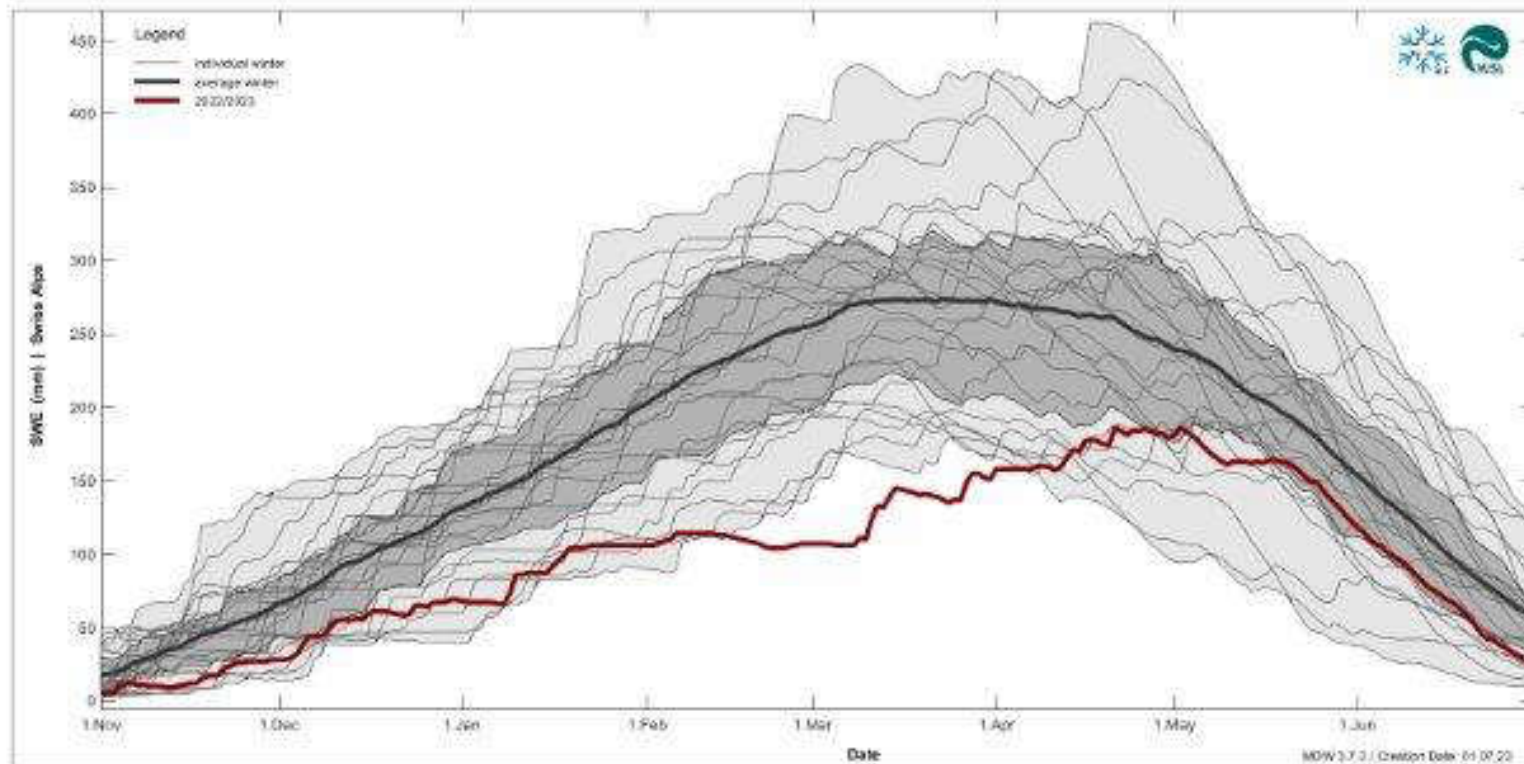


So, why should you care?

A lack of snow today could be a lack of water tomorrow – esp in a warming climate

Snow droughts translate into socio-hydrologic droughts, bc we miss water when we need it the most (spring)

For Alpine regions, this is a paradigm shift wrt how water is delivered, used, and managed.





Thank you!



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