

Classification reveals varying drivers of severe and moderate hydrological droughts in Europe

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EGU Vienna, 27.05.2022



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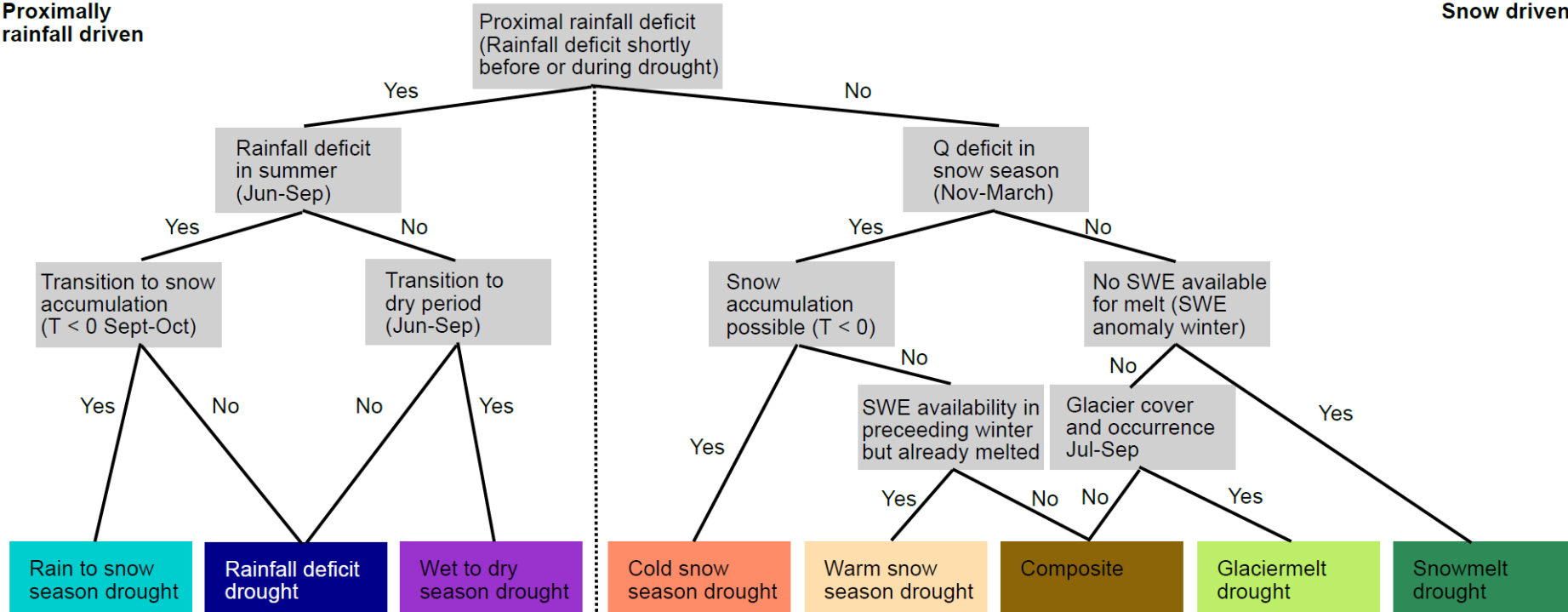
What drives moderate and severe droughts?



Hydrological drought classification

Proximally
rainfall driven

Snow driven



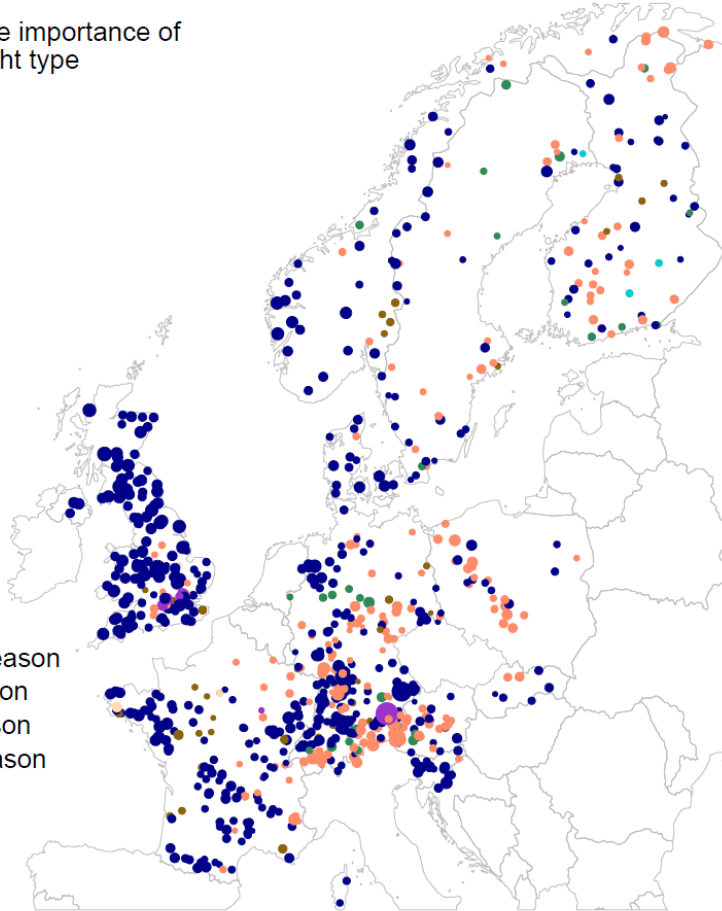
We group drought events into eight drought types using a standardized classification scheme applicable to large samples of catchments.

Dominant drought type

● Dot size: relative importance of dominant drought type



- Rain deficit
- Rain to snow season
- Wet to dry season
- Cold snow season
- Warm snow season
- Snowmelt
- Glacier melt
- Composite

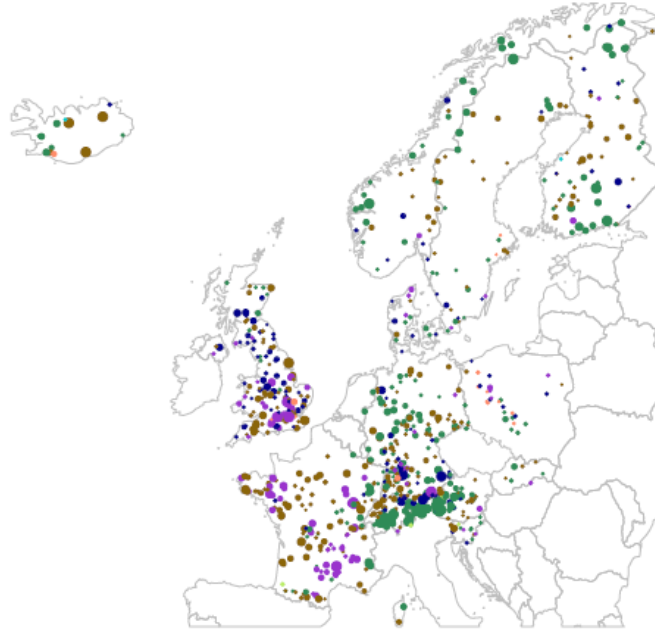
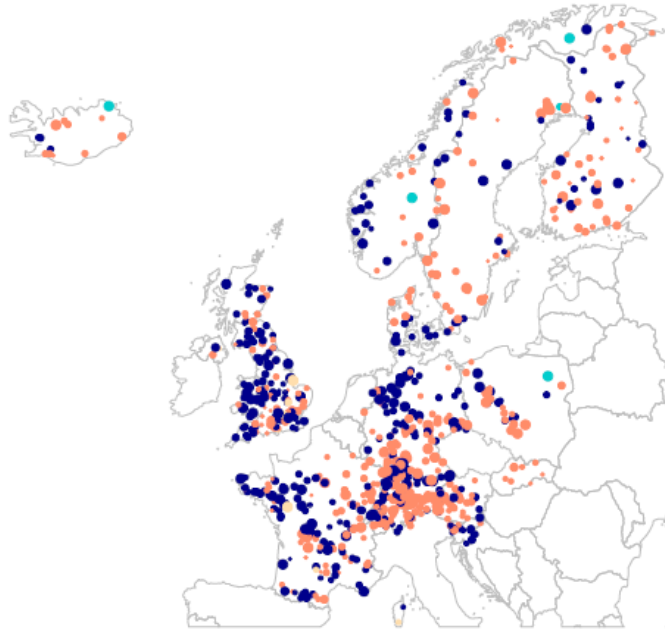


Droughts in Western Europe are mainly driven by rainfall deficits and those in the Alps and Scandinavia by cold snow seasons (i.e. snow accumulation).

Seasonally dominant drought types

Winter

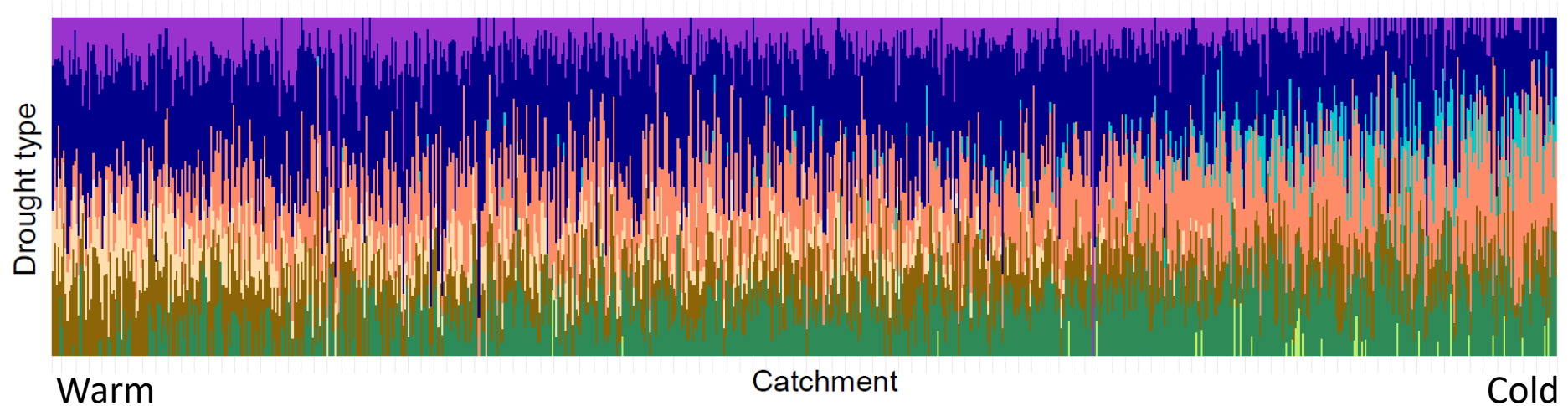
Summer



- Rain deficit
- Rain to snow season
- Wet to dry season
- Cold snow season
- Warm snow season
- Snowmelt
- Glacier melt
- Composite

The dominant drought type varies seasonally. In summer, snowmelt droughts are important in the Alps and Scandinavia.

Drought type frequency

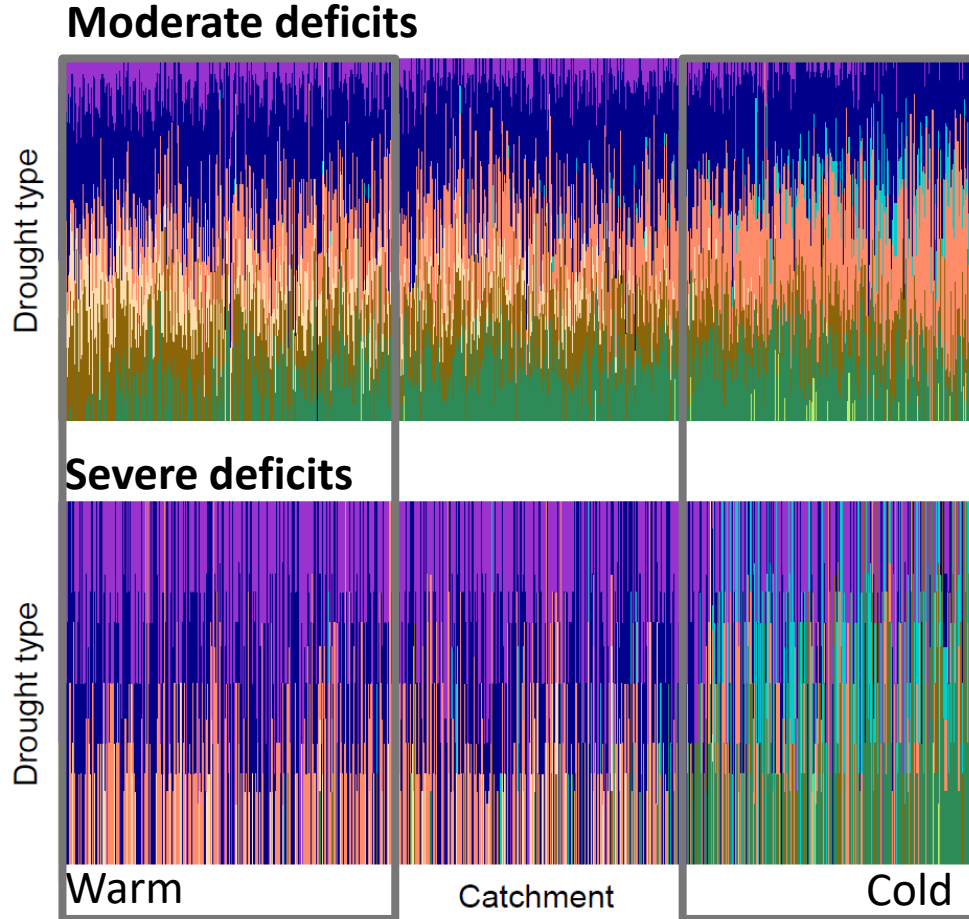


- Rain deficit
- Rain to snow season
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- Snowmelt
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- Composite

Warm and cold regions show a different drought type mix with snow-driven droughts becoming more important in colder catchments.

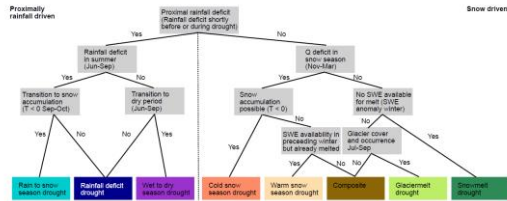
Moderate vs. severe droughts



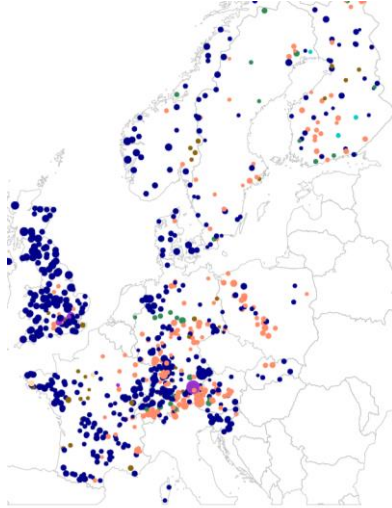
Moderate and severe droughts are driven by different processes. In warm regions, severe droughts are predominantly caused by rainfall deficits prolonging into the dry season and in cold regions by snowmelt deficits.

Conclusions

Standardized classification scheme for streamflow droughts



Dominant drought types in Europe vary regionally and seasonally



Moderate and severe droughts are moderated by different processes

