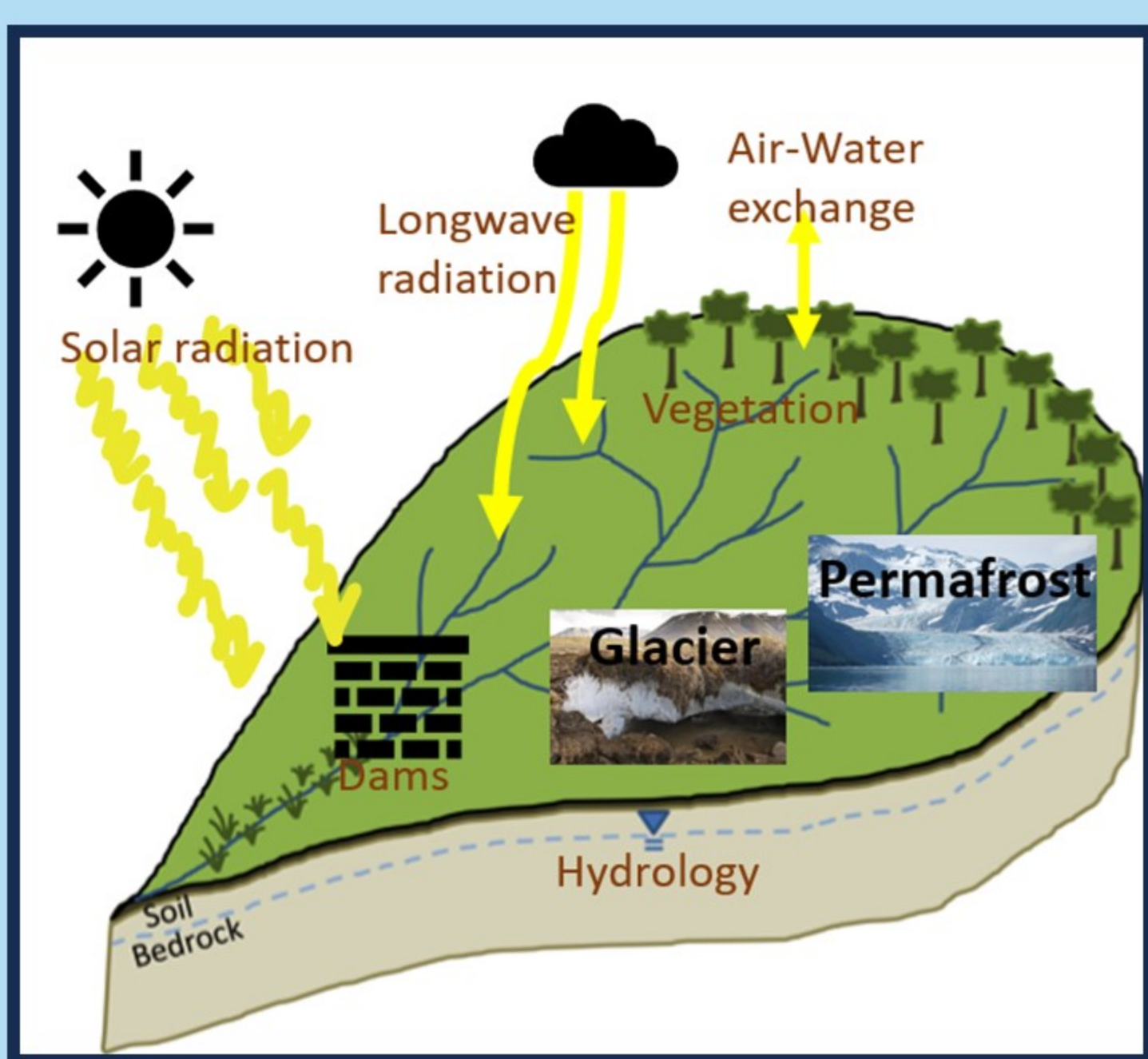
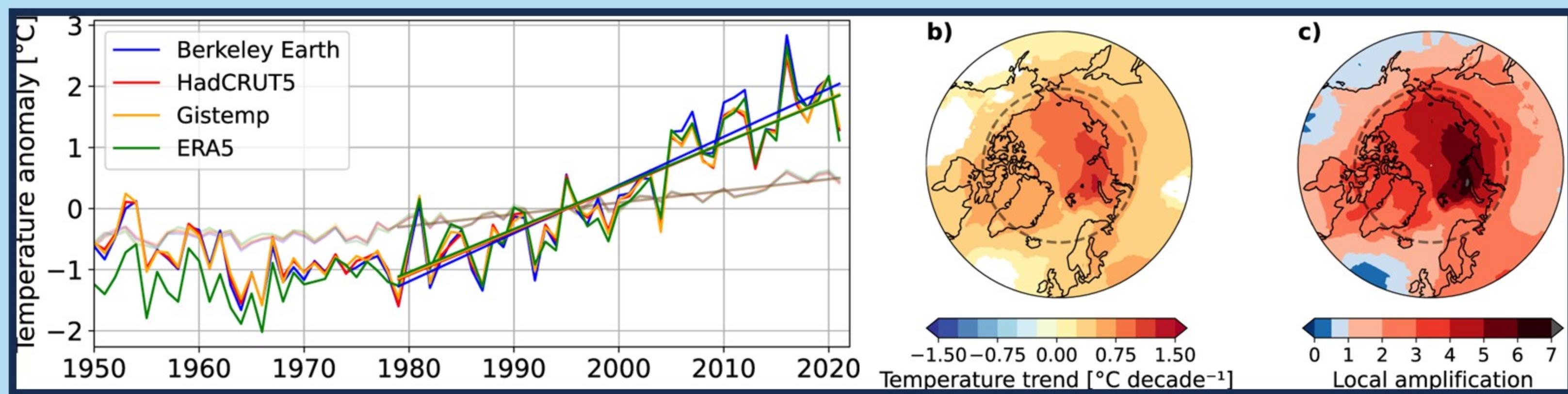
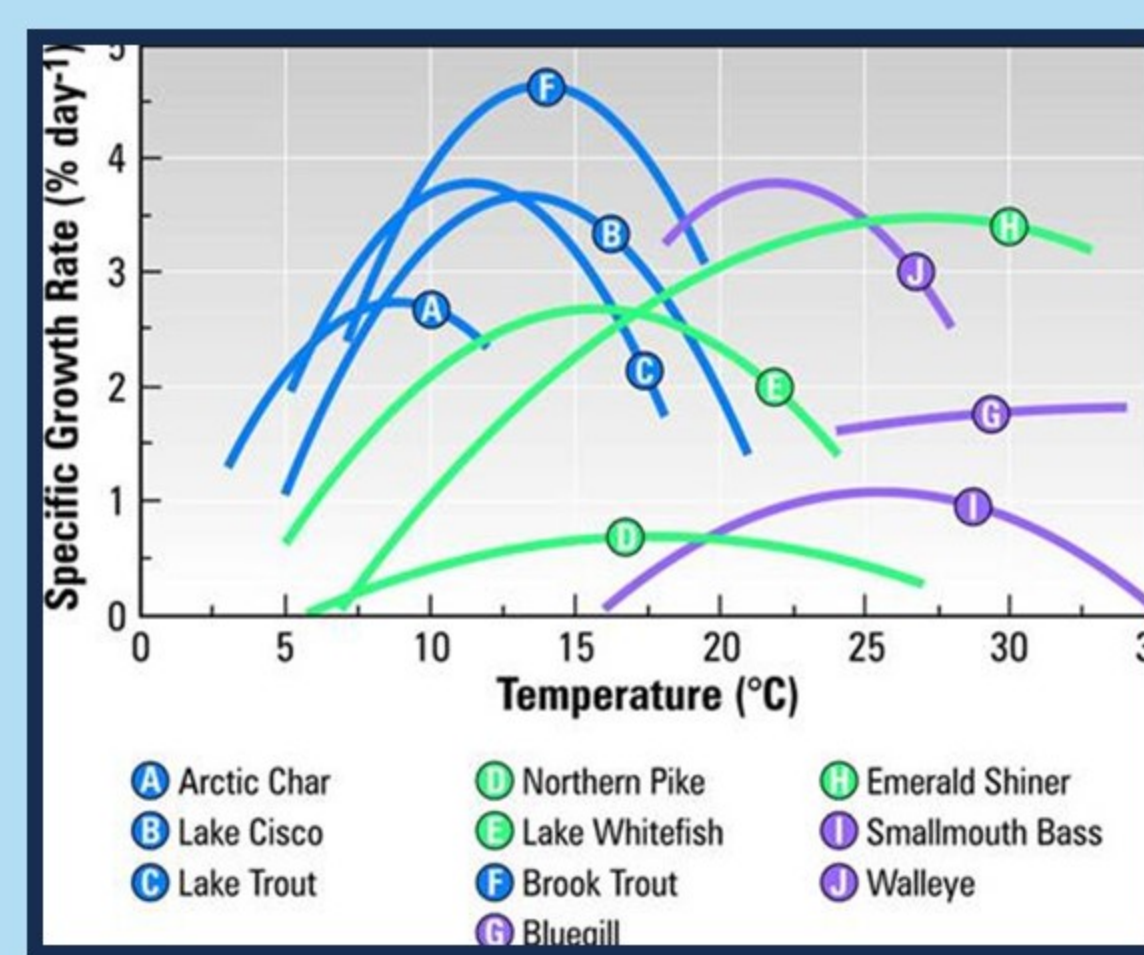


## Background

**Arctic amplification: The Arctic has warmed nearly 4 times faster than the globe since 1979**



## Impacts of Arctic amplification on fisheries



Water temperature influences chemical, physical, and biological processes

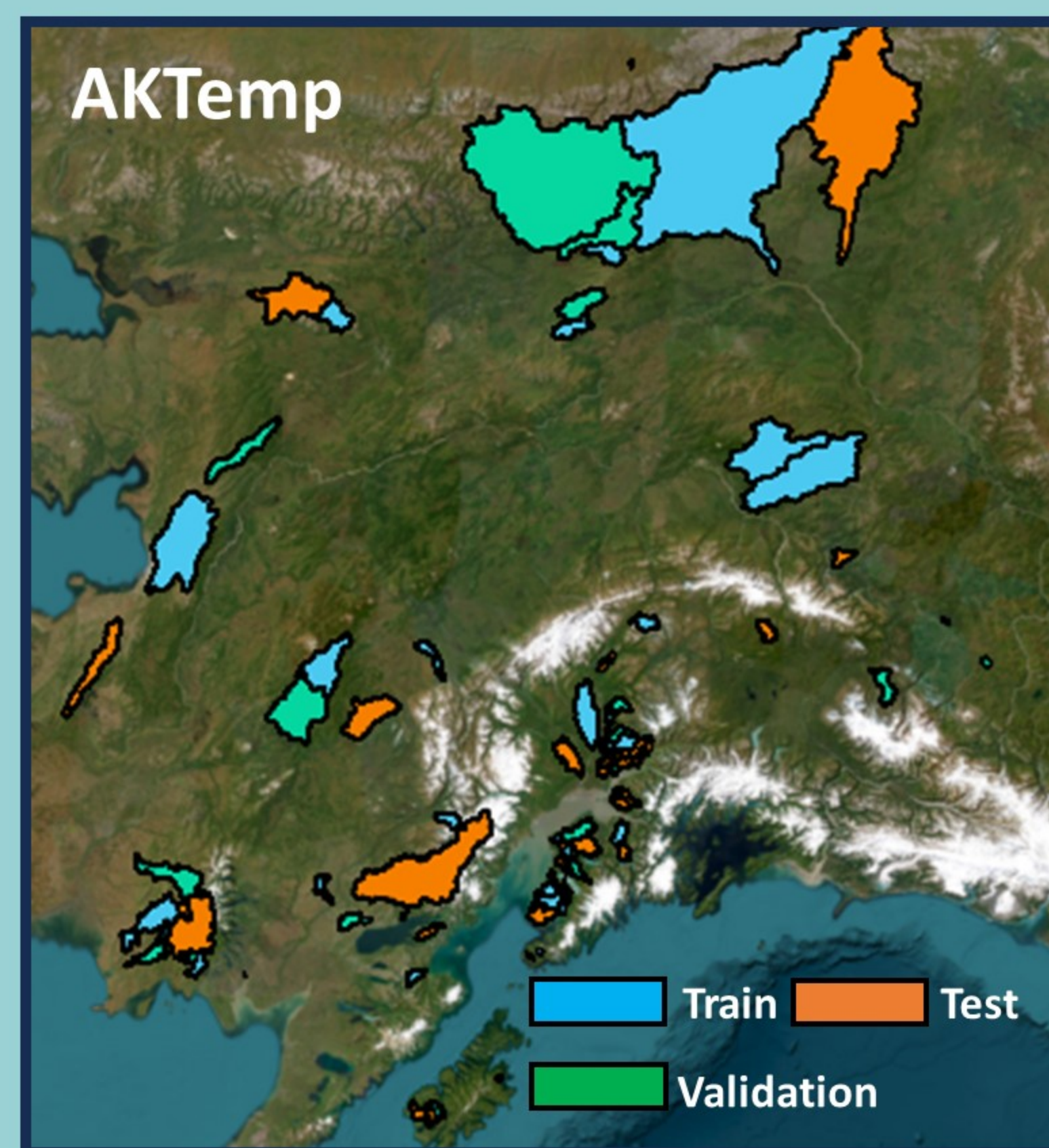
In addition to exhibiting higher growth rates at lower temperatures, arctic fish species also exhibit narrower ranges of temperature preference and tolerance.

Reist, James D., et al 2006  
Rantanen, Mika, et al. 2022

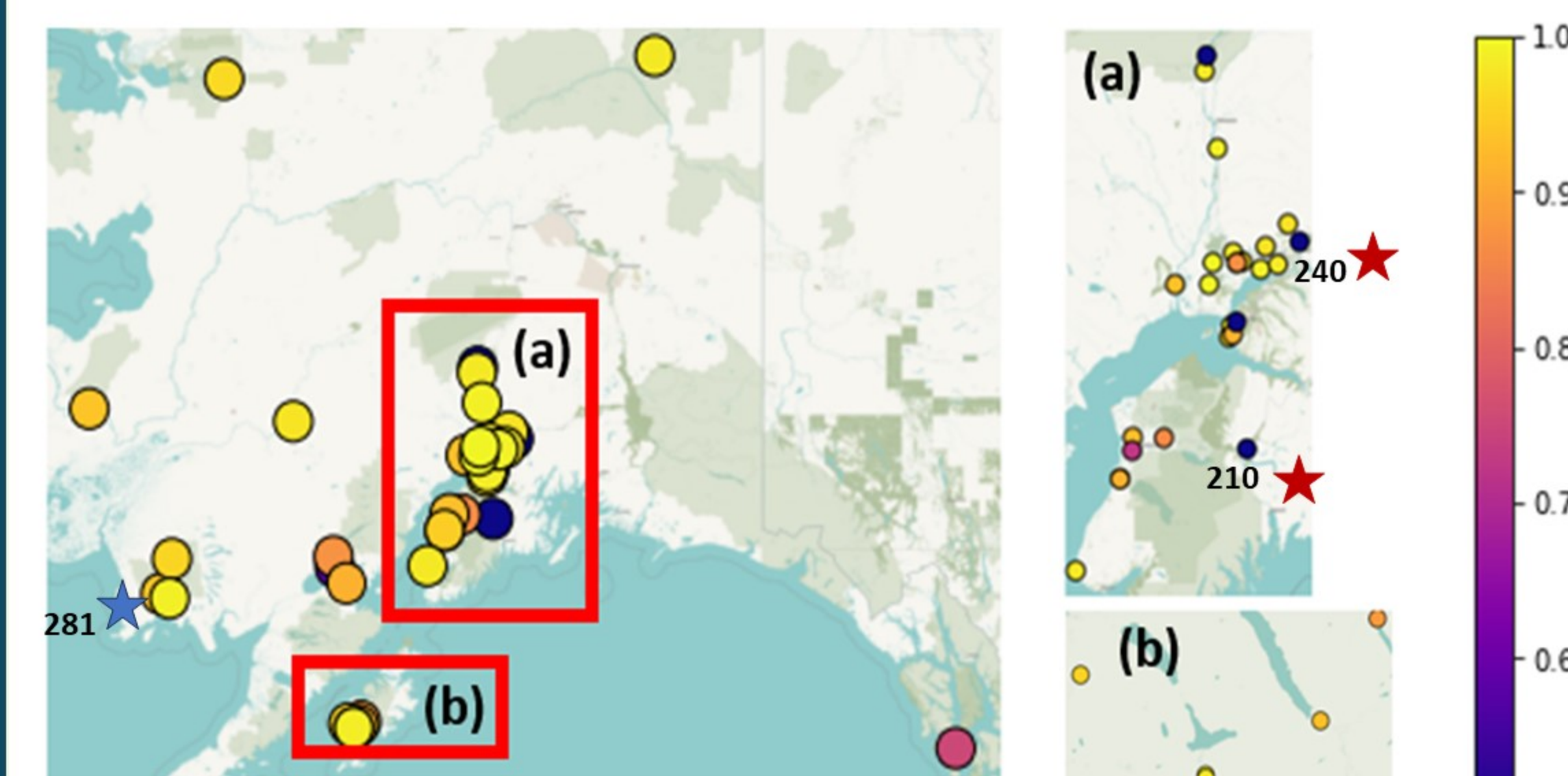
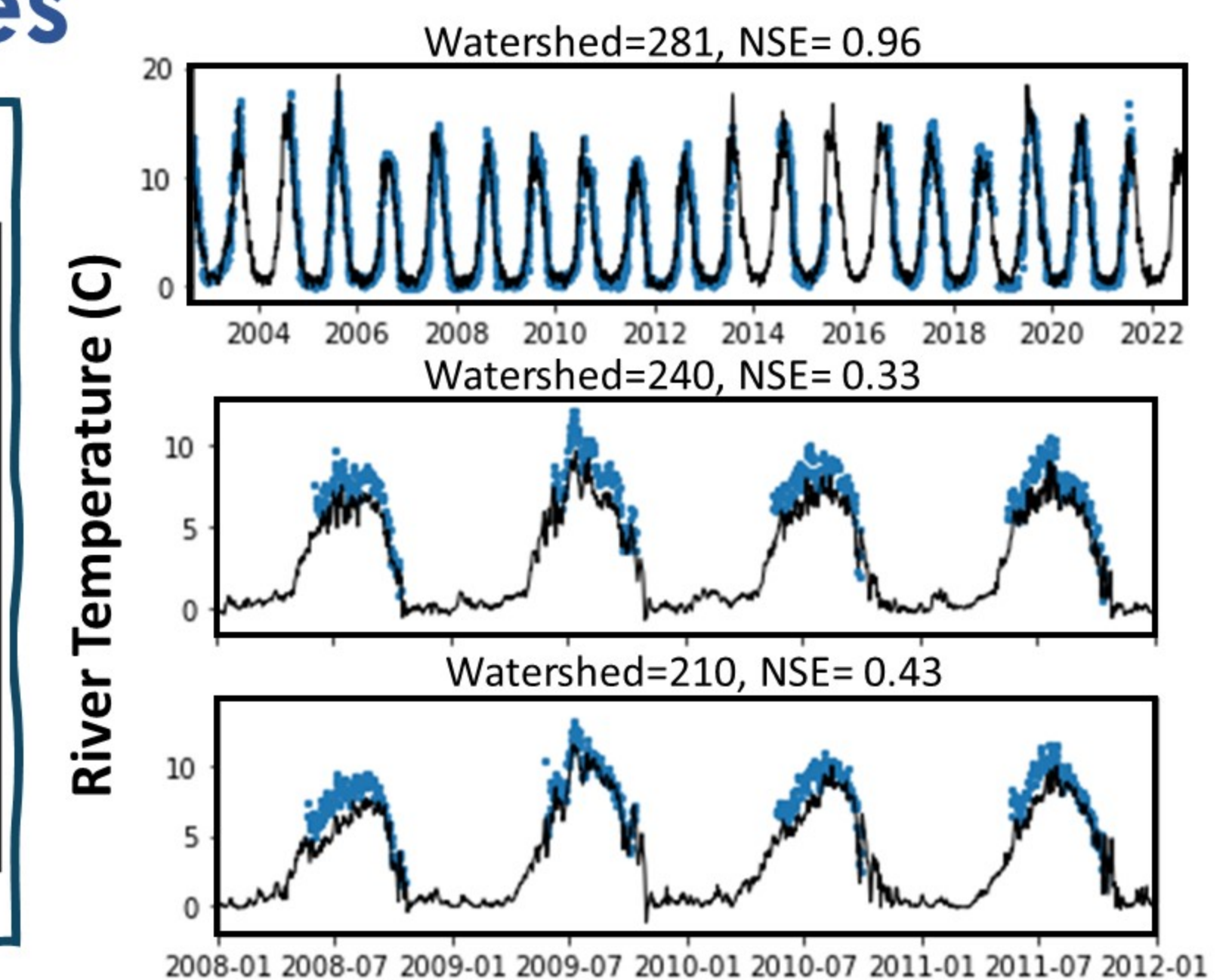
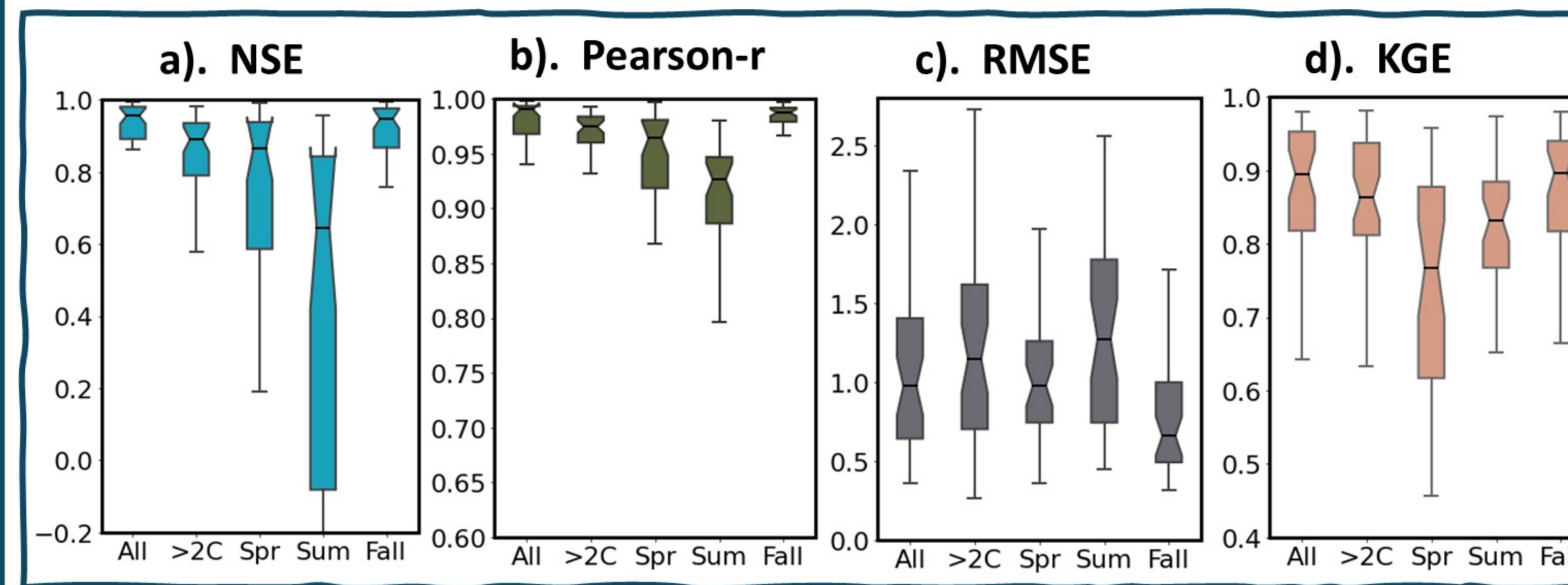
## Research Questions

- In a data-scarce high-altitude region, can a parsimonious DL model produce reliable river temperatures?
- What are the important drivers and processes deciding the spatial-temporal trends of Alaskan river temperature?
- How did the Arctic temperature amplification reflect on river temperature regimes?

## Study Area



## Model performances

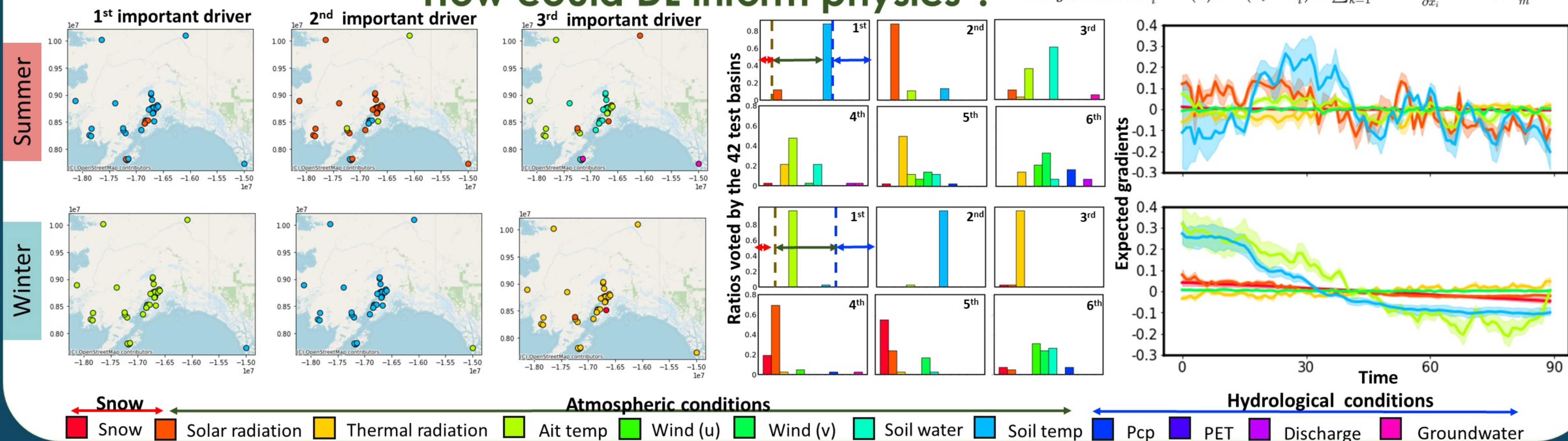


**Conclusions**

- One parsimonious data-driven model would be able to produce reliable river temperature dynamics in ungauged basins in Alaska region
- In high latitude region, river temperature is determined by the 'first-order' climatic processes, and then by the second-order hydrological drivers. Streamflow is not necessarily required for river temperature estimations.

**Future work: How did climate change affect water temperatures in the past 40 years?**

## How could DL inform physics?



## A Long Short-Term Memory Approach: $T^{\circ C} = f(x, A, x^*, A^*)$

