

A Ground-based Perspective of Rain-On-Snow Events in Northern Alaska

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How does rainfall affect surface snow cover in a warming climate?



Objectives: (1) Determine the effect of rain-on-snow events on surface snow reflectivity; (2) Investigate the environment conditions and moisture sources

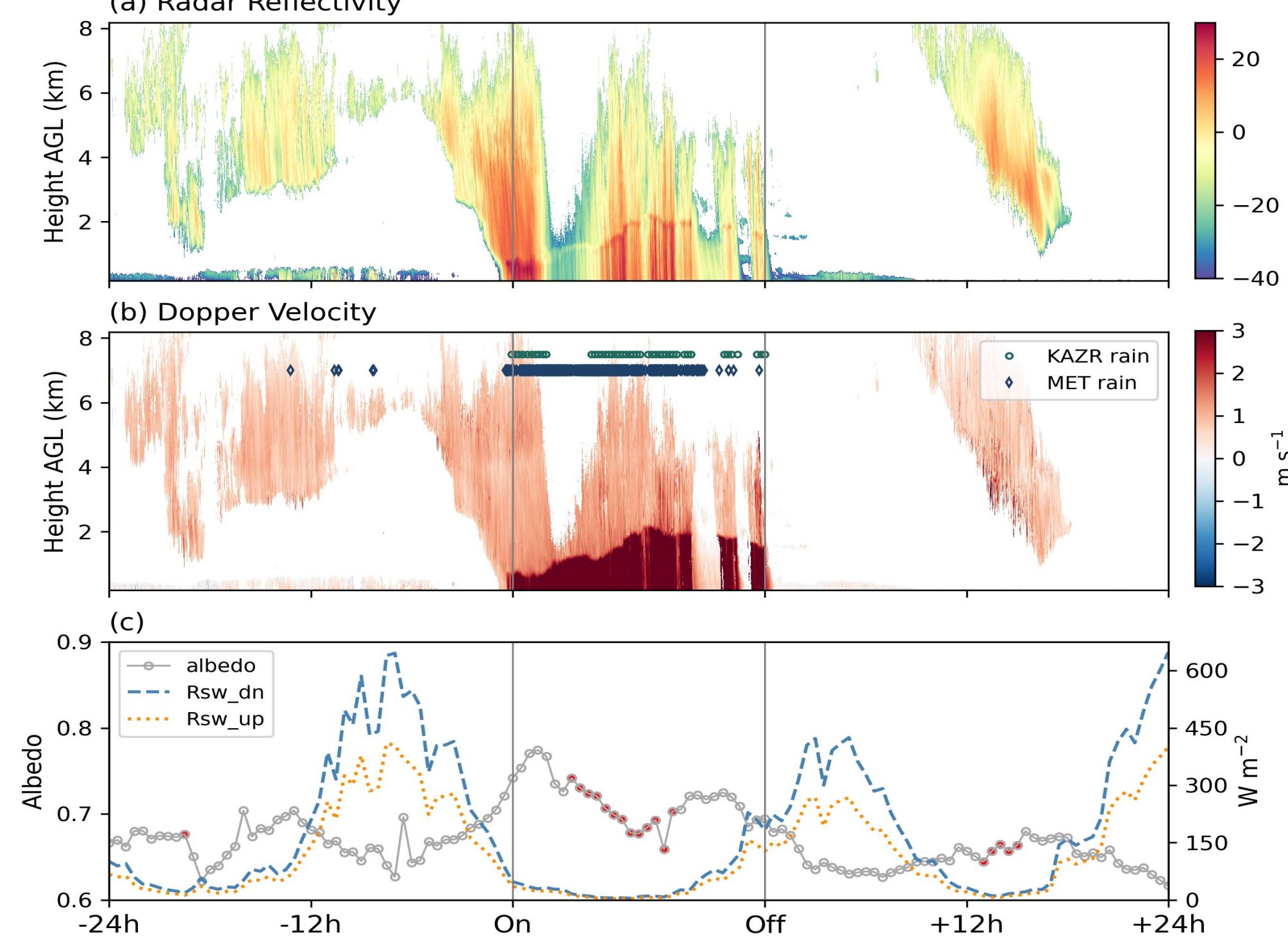
Data and Method

➤ Detect and evaluate rain-on-snow events

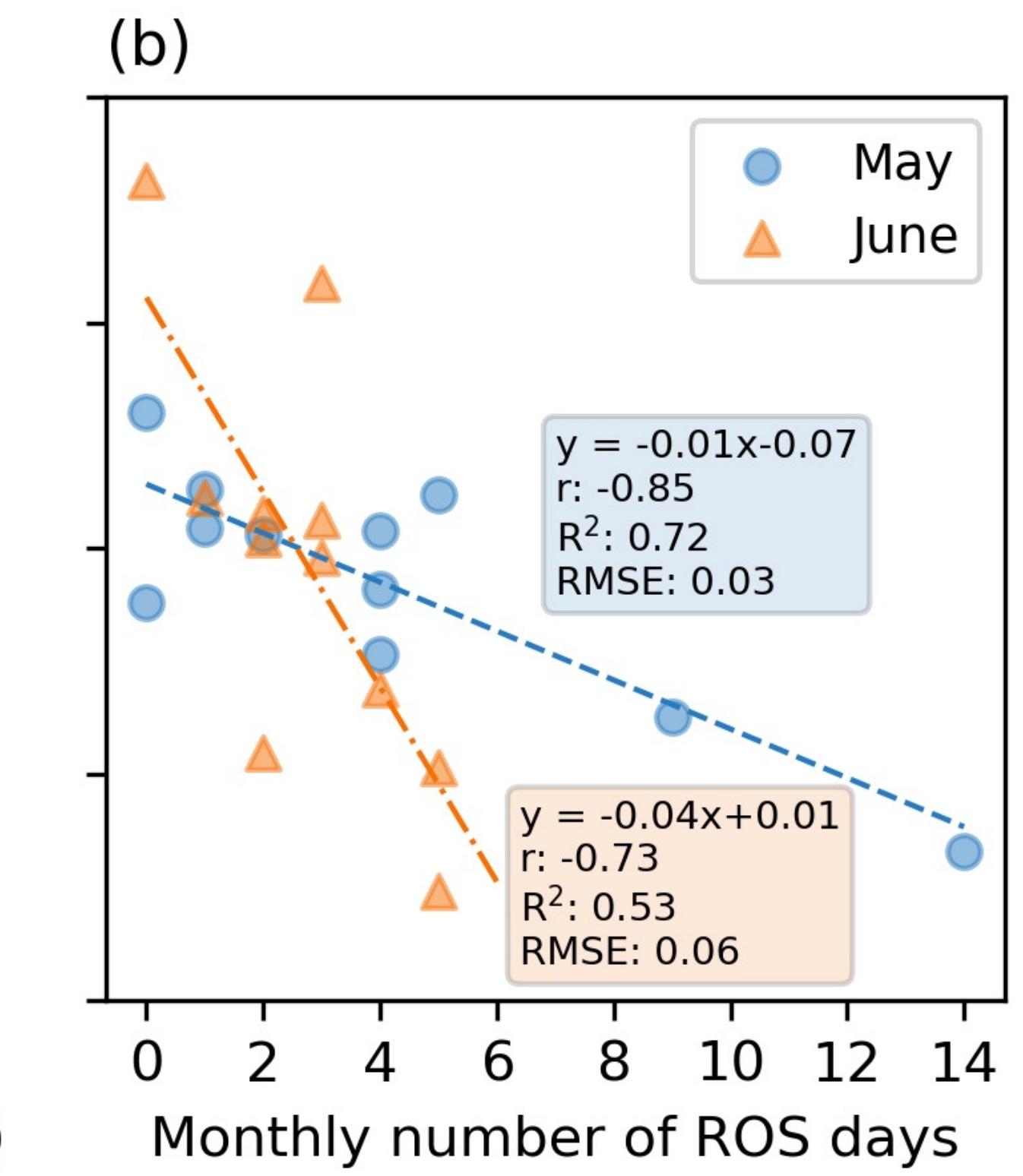
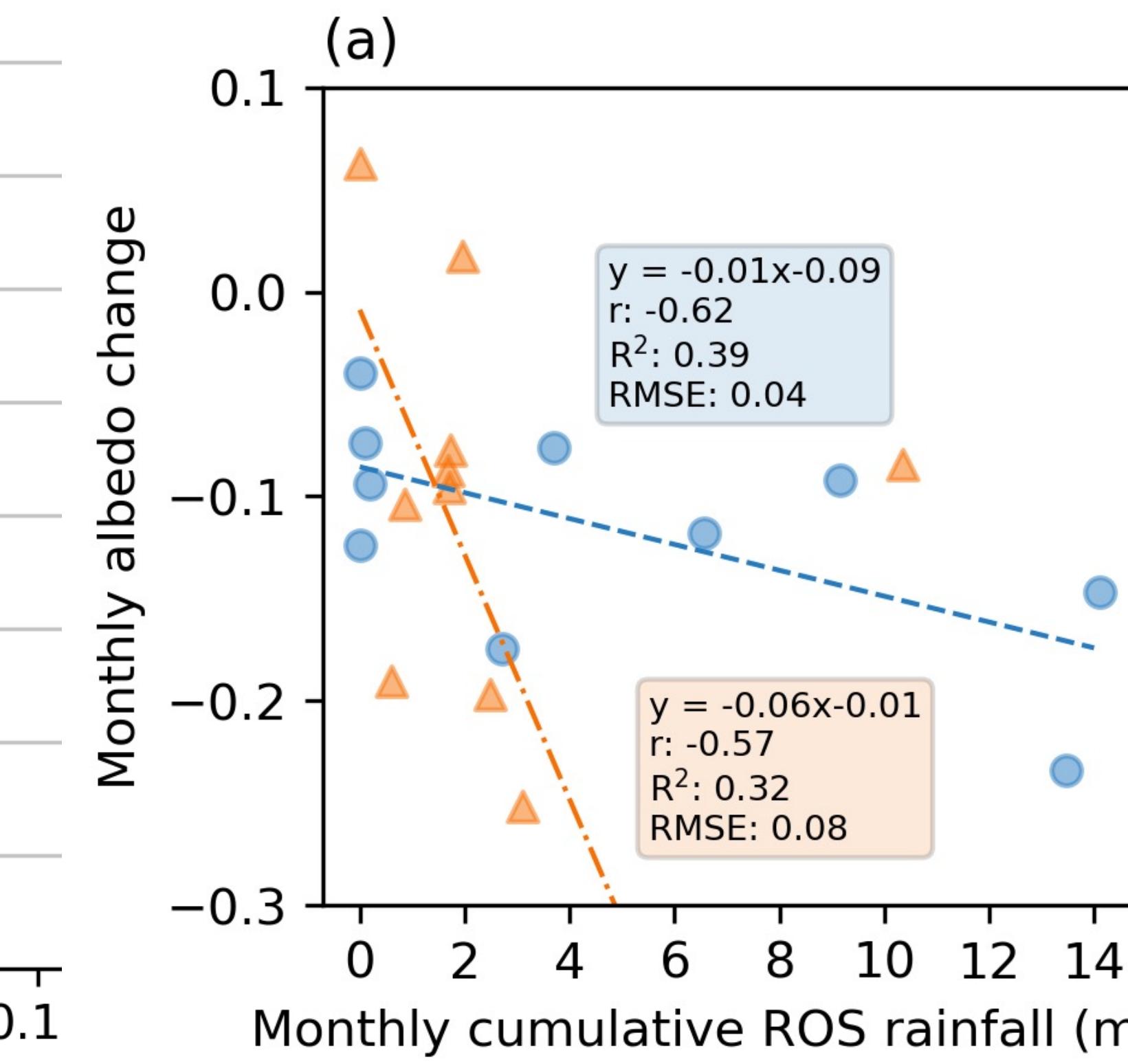
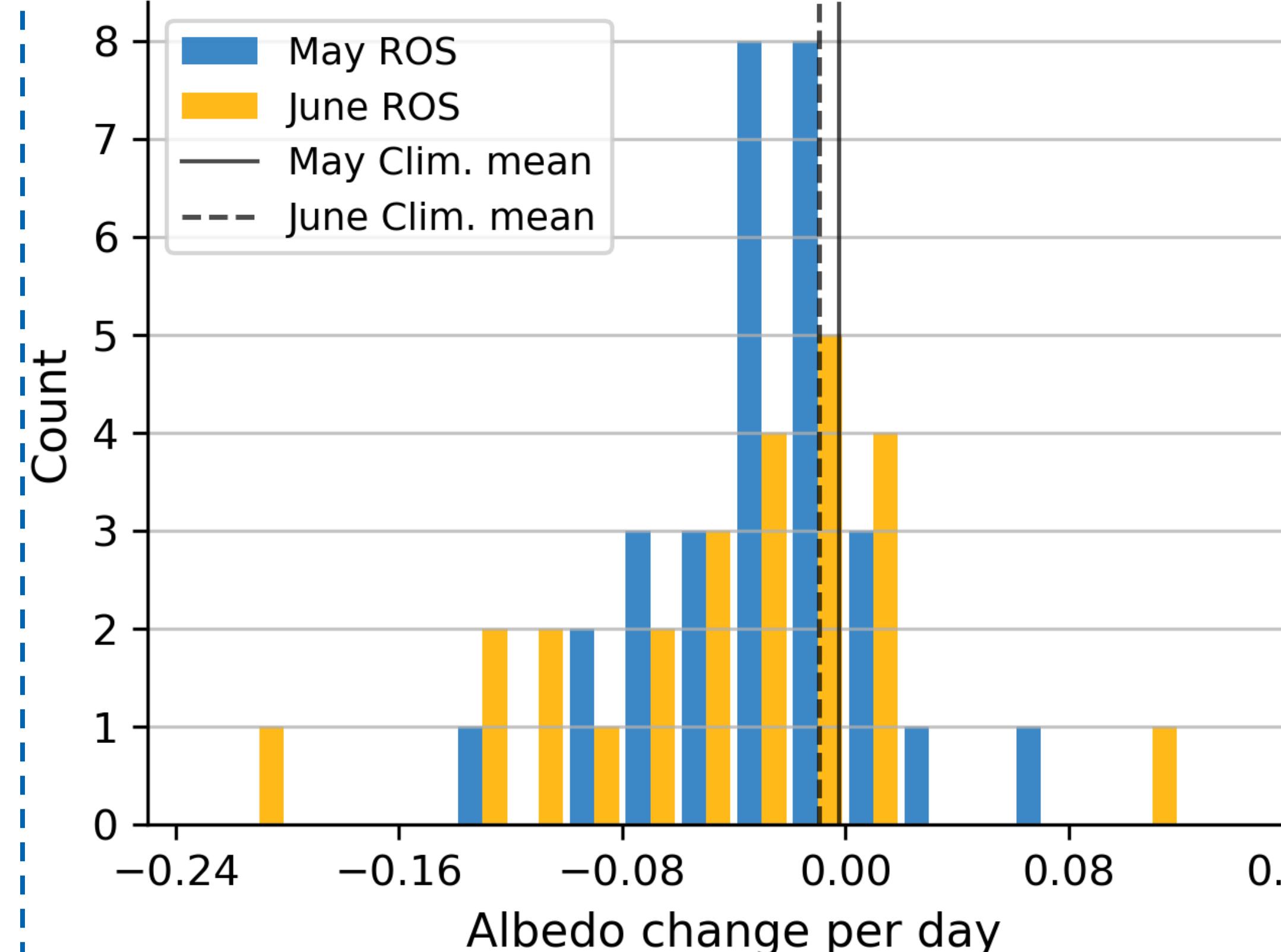
Ground observations by Ka-band Zenith Radar and Surface Energy Balance System are used to detect rain-on-snow events and evaluate the subsequent snow albedo changes in May and June from 2012 to 2022 at two sites in northern Alaska: North Slope of Alaska (NSA) ★ and Oliktok Point (OLI) ●. 56 events have been detected.

➤ Explore moisture sources

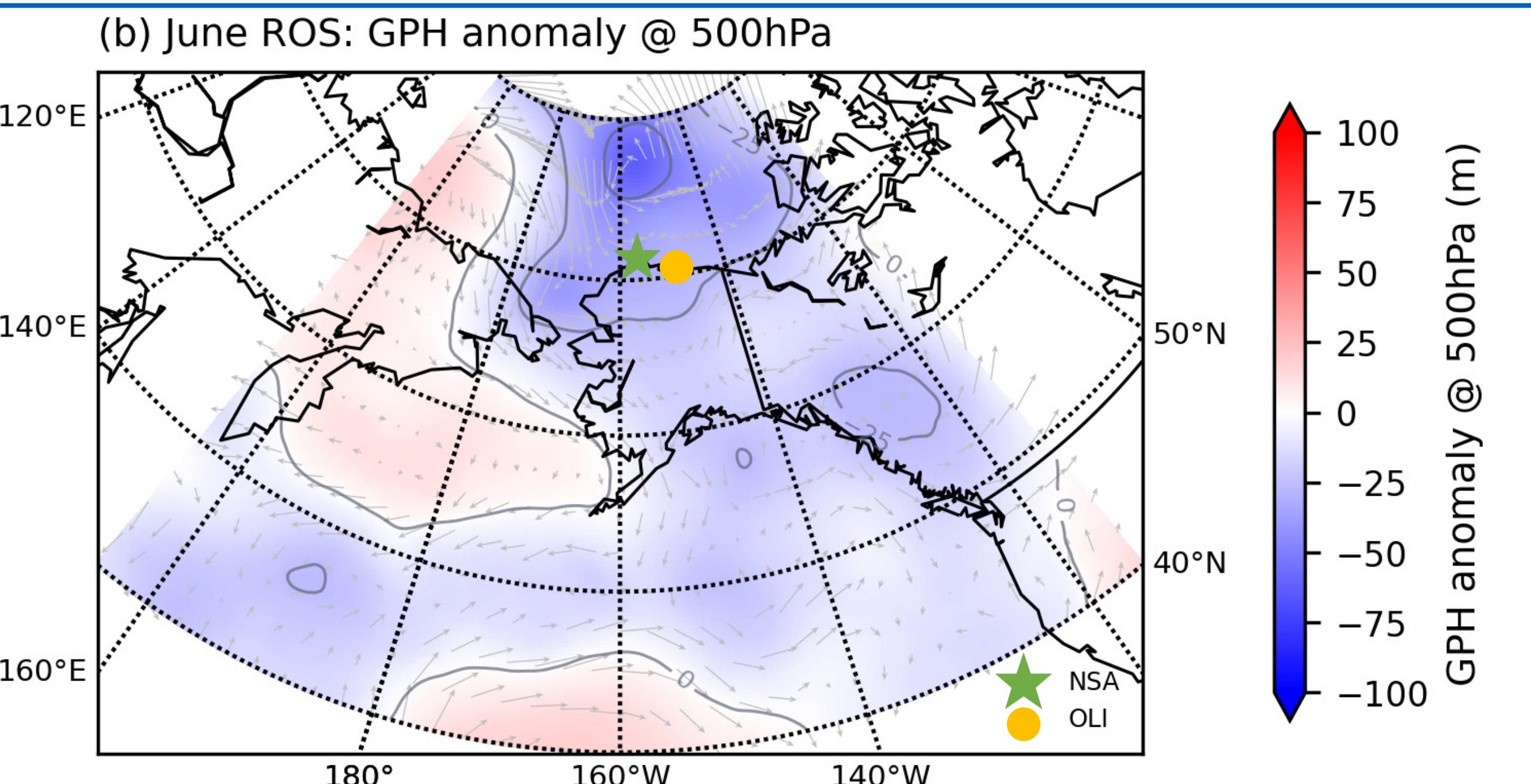
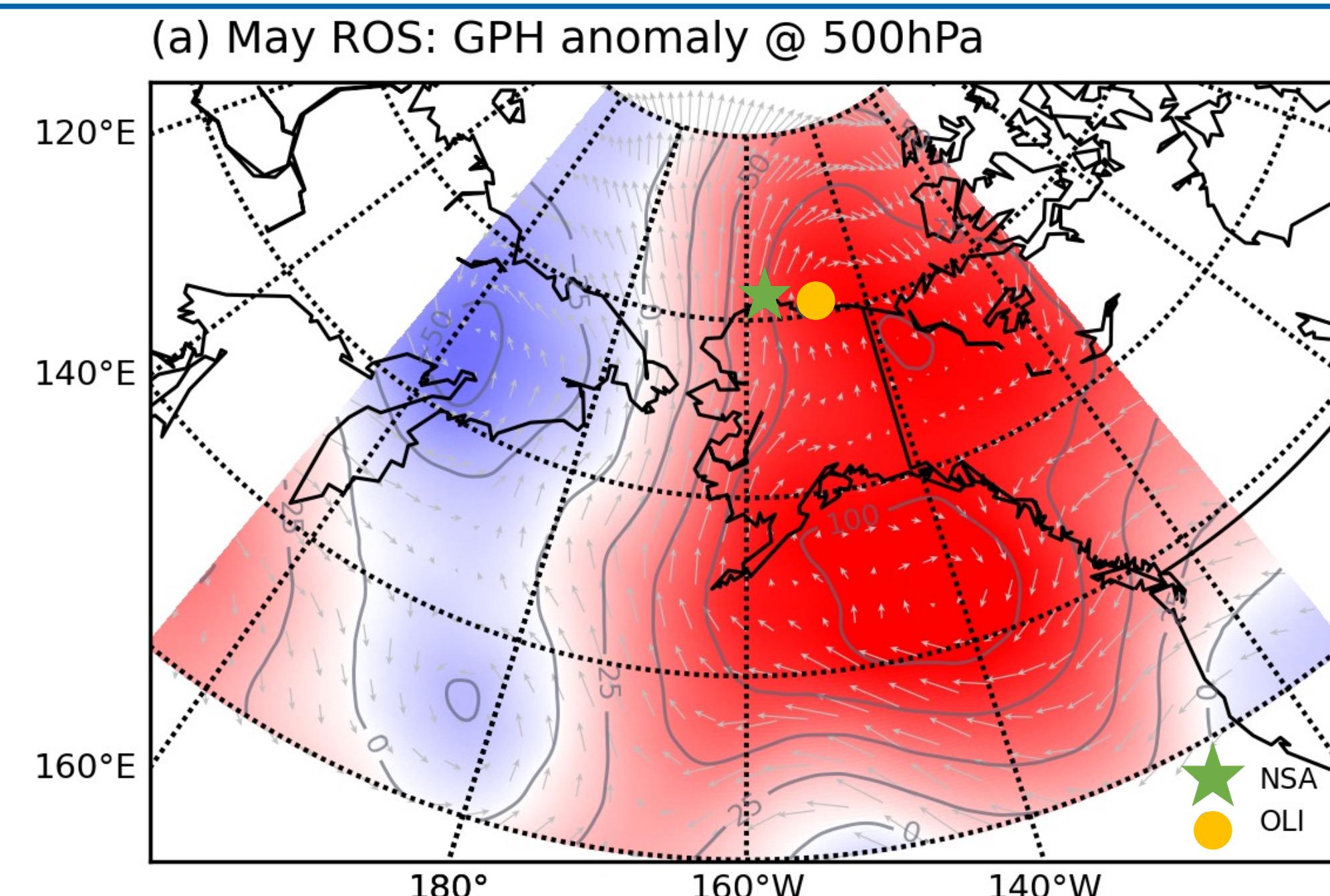
ERA5 reanalysis data of geopotential height (GPH) and integrated water vapor Transport at hourly and monthly time scale are applied to analyze the weather patterns relevant to rain-on-snow events in May and June separately.



Snow albedo changes following rain-on-snow events



Remote v.s. Local: weather conditions reveal different moisture sources



Summary and Conclusion

A long record of ground observations in northern Alaska from 2012 to 2022 have been used to detect rain-on-snow events and evaluate their impacts on the surface snow cover.

Results show that:

- ❖ Rain-on-snow events can cause snow albedo decreases significantly larger than the climatological mean.
- ❖ Rain-on-snow events in May rely on remote transport of moisture from lower latitudes, while those in June are associated with local moisture sources.
- ❖ Our study helps to depict the influence of rain-on-snow events on accelerating surface snow melting at high latitudes in a warming climate.