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Interannual Variability in Arctic Surface Energy Fluxes and their Drivers

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The Arctic is undergoing amplified climate warming, and temperature and precipitation are predicted to increase even more in the future. Increased climate warming is indicative of changes in the surface energy budget, which lies at the heart of the carbon and water budget. The surface energy budget is an important driver of many earth system processes, and yet has received little attention in the past.

The goal of this study is to further develop our understanding in the spatio-temporal variability of Arctic surface energy fluxes. Specifically, we will investigate the magnitude and dependence on changes in energy flux drivers interannually at different sites across the Arctic. We used *in situ* data from 10 sites gathered from the FLUXNET2015, Arctic Observatory Network, and European Fluxes Database Center repositories. All study sites are of 60° N or higher and spread across the Arctic. The chosen sites include Chokurdakh, Russia (147.5° E, 70.8° N), Cherskiy, Russia (161.3° E, 68.6° N), Kaamanen,, Finland (27.3° E, 69.1° N), Imnavait Creek, USA (-149.3° E, 68.6° N), Zackenberg Heath, Greenland (-20.6° E, 74.5° N), Tiksi, Russia (128.9° E, 71.6° N), Sodankyla, Finland (26.6° E, 67.4° N), Poker Flat, USA (-147.5° E, 65.1° N), Nuuk, Greenland (-51.4° E, 64.1° N), and Samoylov, Russia (126.5° E, 72.4° N). Using these data, we analyzed the interannual variability of surface energy fluxes including net radiation, sensible, latent, and ground heat fluxes, and Bowen ratio including their dependence on potential drivers, such as temperature, wind speed, atmospheric stability, and vapor pressure deficit.

Our results on interannual variability in surface energy fluxes and flux drivers inform long term climate model simulations across the Arctic, which is critical for the improved prediction of the state and development of the surface energy budget and drivers under current and future conditions in this vulnerable, rapidly changing, and understudied region.