

# Precipitation isotope ( $\delta^{18}\text{O}$ , $\delta^2\text{H}$ , d-excess) seasonality across the Pan-Arctic during MOSAiC

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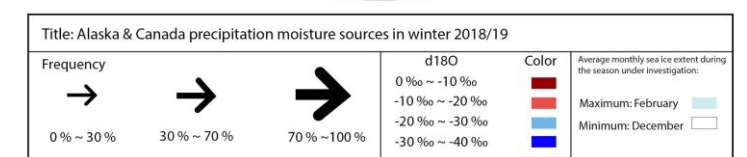
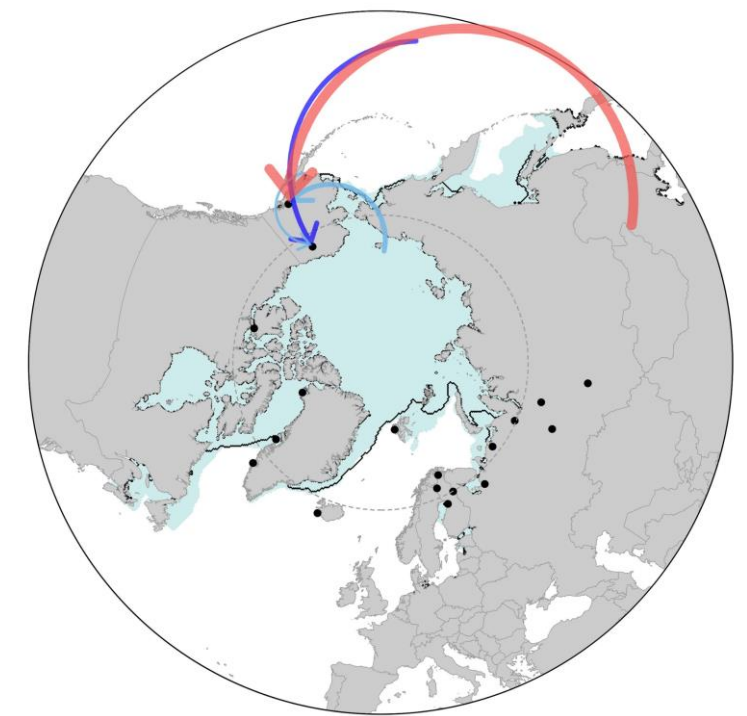
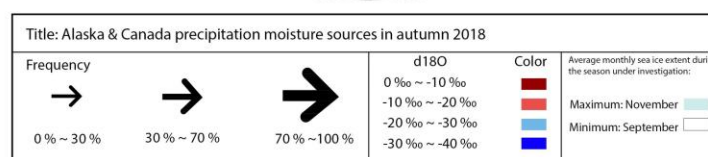
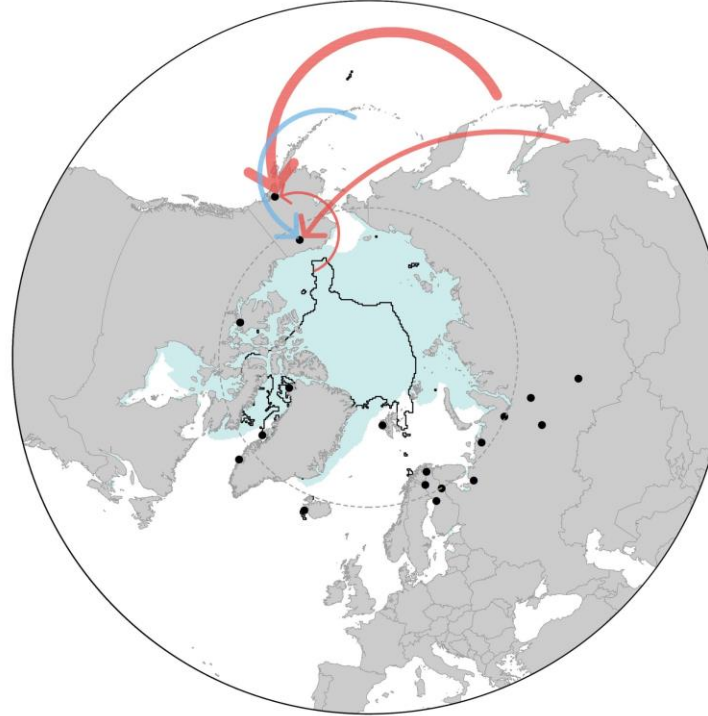
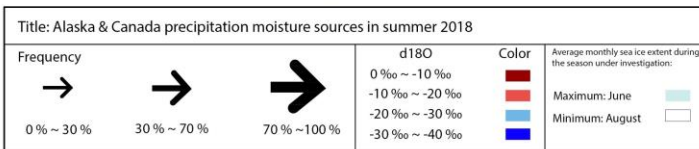
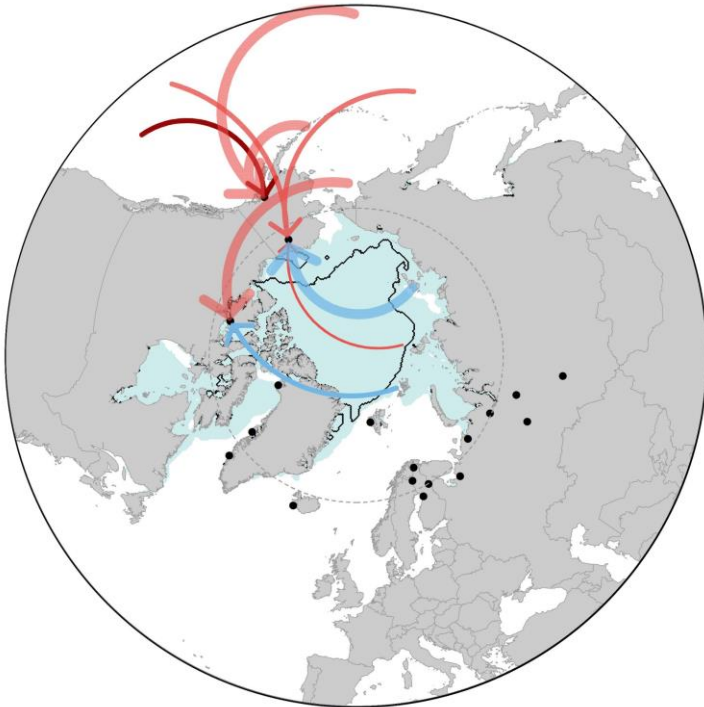


Participating stations in the PAPIN project. The stations that have sent samples to us and the stations agreed to send samples in the future are represented on the map by orange and green points, respectively.

- The Pan-Arctic Precipitation Isotopes Network (PAPIN) project utilizes a new coordinated network of 24 stations to collect samples, analyze and synthesize how precipitation isotope geochemistry varies in space and time in the north; with a focus on the mechanisms controlling precipitation isotopes.
- Arctic precipitation isotope data, collected with coordinated and synchronous event-based sampling across the Pan Arctic, will provide transformative insight as to the contemporary Arctic water cycle and future environmental changes.
- This information has many applications, though is especially applicable to understanding how connections between sea ice, atmospheric dynamics, and precipitation influence the distribution of freshwater across the Arctic.
- Our observed Arctic mean summer  $-$ latitude slope of  $-0.3\text{‰}/\text{degree}$  of latitude is 50% smaller than the annual latitude effect in the midlatitudes ( $-0.6\text{‰}/\text{degree}$ ). This rate decreases to  $-0.1\text{‰}/\text{degree}$  of latitude in Finland and Russia, while in Alaska and northern Canadian a  $-0.7\text{‰}/\text{degree}$  latitudinal rate is observed.
- We attribute these nuances to divergent moisture sources and transport pathways into, within, and out of the Arctic, and demonstrate how atmospheric circulation processes drive changes in isotope geochemistry and climate that are linked to sea ice concentration.

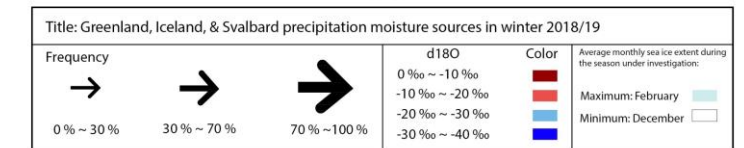
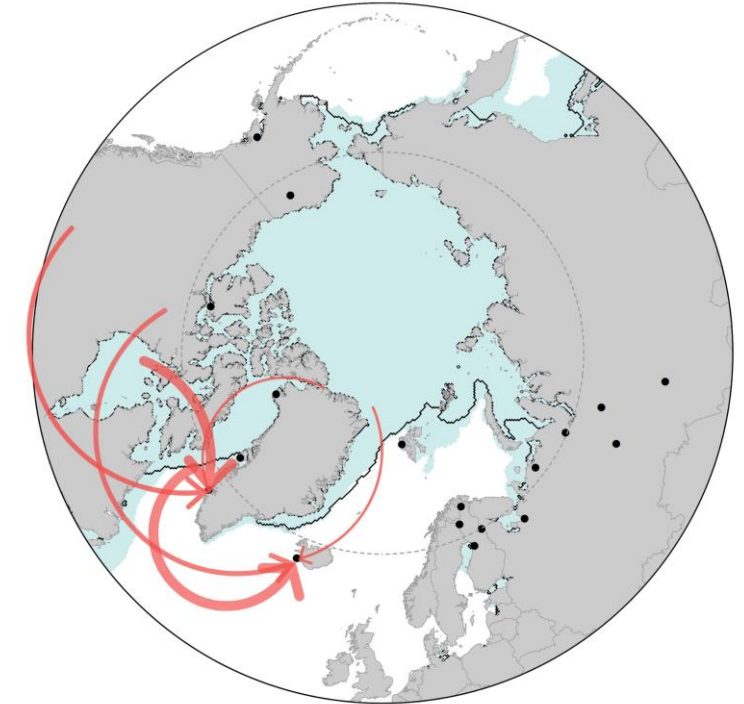
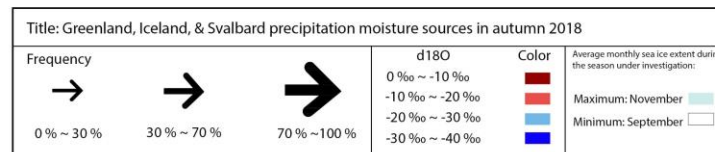
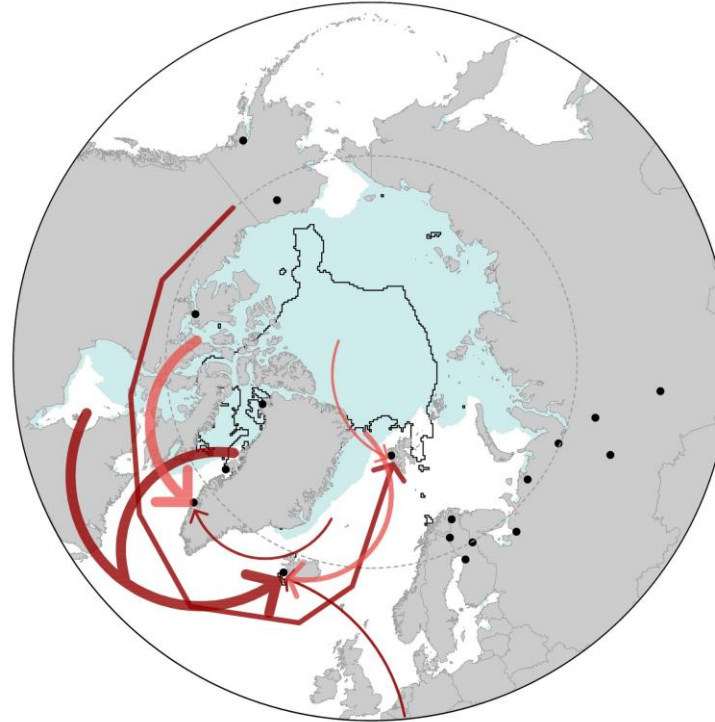
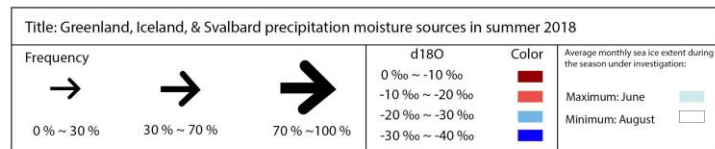
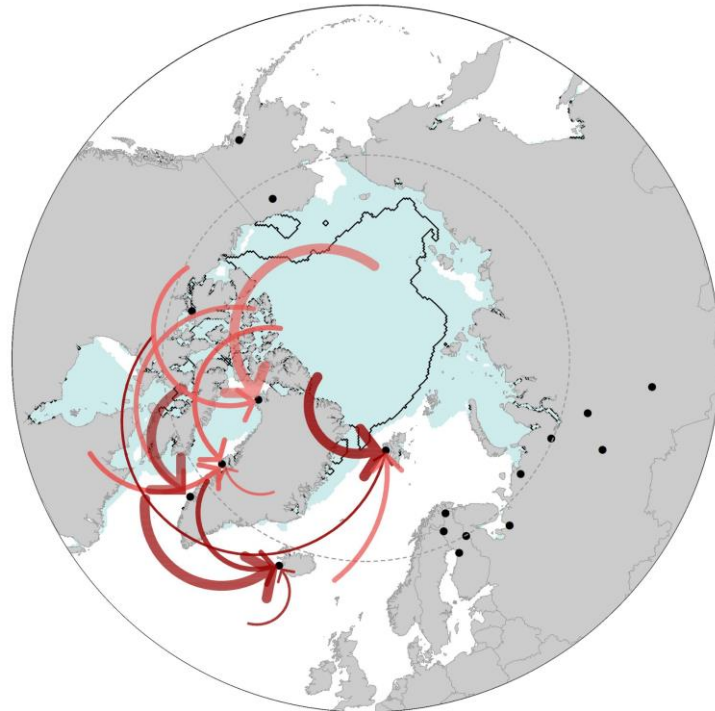


# Northern America (NA); Anchorage, Toolik Lake, Cambridge Bay



- Summer: **enriched** moisture arriving from North Pacific Ocean (NPO) into the Arctic, **depleted** moisture arriving from Arctic Ocean (AO) out of the Arctic.
- Autumn: **enriched** moisture arriving from NPO & Sea of Okhotsk into the Arctic, **depleted** moisture arriving from Bering Sea into the Arctic.
- Winter: **enriched** moisture arriving from NPO & Sea of Okhotsk into the Arctic, **depleted** moisture arriving from Bering Sea & Chukchi Sea within the Arctic.

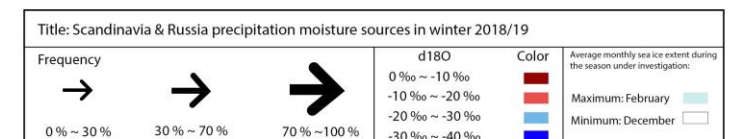
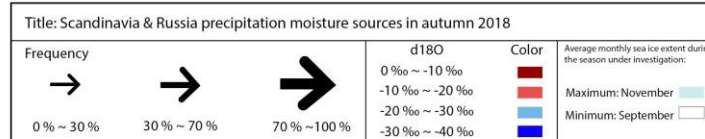
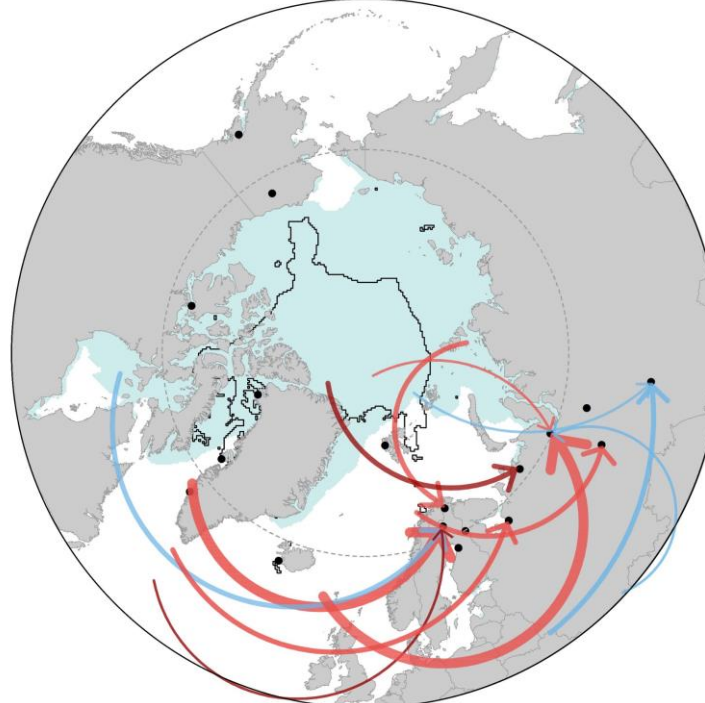
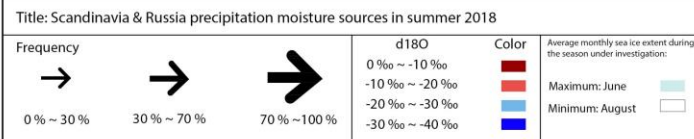
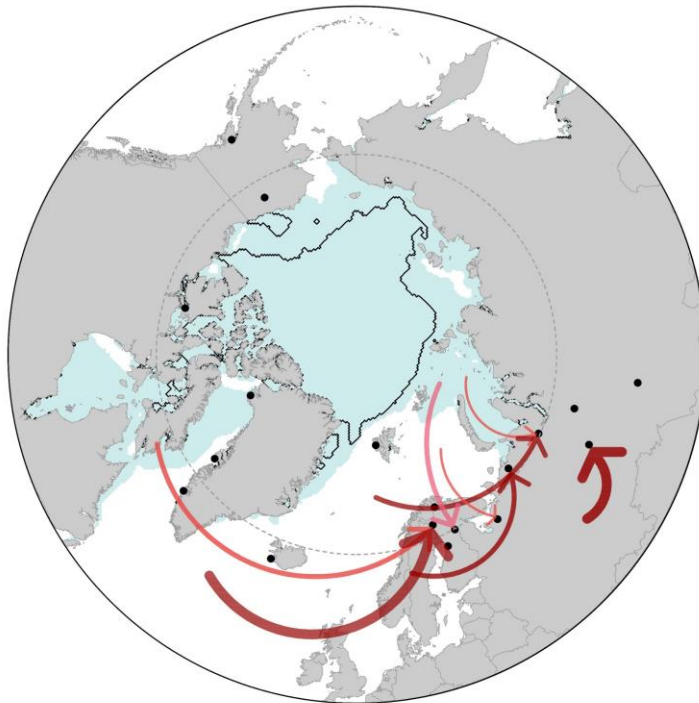
# Greenland, Iceland, Svalbard (GIS); Thule, Disko Island, Nuuk, Sudurnes, Ny-Ålesund



- Summer: **enriched** moisture arriving from Canadian Archipelago, Baffin Bay, & Labrador Sea within the Arctic and from North Atlantic Ocean (NAO) & Greenland Sea into the Arctic.
- Autumn: **enriched** moisture arriving from Canadian Archipelago, Baffin Bay & Hudson Bay within the Arctic and from NAO & Europe into the Arctic and from AO & Lincoln Sea out of the Arctic.
- Winter: **enriched** moisture arriving from Canada & NAO into the Arctic and and from Baffin Bay, Labrador Sea, & Hudson Bay within the Arctic.



# Scandinavia, Russia (RS); Pallas, Oulanka, Kevo, Oulu, Arkhangelsk, Narian Mar, Labytnangi, Khanymey, Mukhrino, Kajbasovo



- Summer: **enriched** moisture arriving from NAO into the Arctic and from Barents Sea, Scandinavia, and Russia within the Arctic.
- Autumn: **enriched** moisture arriving from NAO into the Arctic and AO out of the Arctic, **depleted** moisture arriving from Russia into the Arctic and AO out of the Arctic.
- Winter: **enriched** moisture arriving from NAO & Russia into the Arctic, **depleted** moisture arriving from AO out of the Arctic.

# Thank you!



**PAPIN team:** Päivi Pietikäinen (The Finnish Forest Administration, Metsähallitus), Riku Paavola (University of Oulu), Otso Suominen & Ilkka Syvänperä (University of Turku), Dmitry Divine & Helge Markussen (Norwegian Polar Institute), Katrine Raundrup (Greenland Institute of Natural Resources), Morten Rasch & Aart Kroon & Martin Nielsen (University of Copenhagen), Hanna Maria Kristjansdottir (Sudurnes Science and Learning Center), Oleg Pokrovsky (Université Paul Sabatier), Sergey Kirpotin (Tomsk State University), Evgeny Zarov & Ilya Filippov (Yugra State University), Aleksandr Sokolov, Konstantin Gribanov (Ural Federal University), Sergey Serikov (Laboratory of Permafrost Geothermics), Brent Else & Samantha Jones (University of Calgary), Donie Bret-Harte (University of Alaska Fairbanks).