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Stable isotope gradients in Southern Norway surface waters indicate moisture sources

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The climatological distribution of stable isotopes in precipitation in Southern Norway is largely unknown. We report here the first results from snapshot sampling campaigns conducted along a transect from Bergen to Oslo in Southern Norway during September 2016 and October 2017.

Samples have been collected from lakes, ponds, streams, rivers, fjords and one glacier in 2016, and from small lakes and surface waters in 2017. The collection strategy was to obtain a variety of elevations and water bodies that represent the altitude of the catchments (15 m a.s.l. to 1500 m a.s.l.).

Measurerements of the concentration of δ^{18}O show least depletion at the west coast, which quickly transitions to a high-depletion regime all across the interior elevations. The gradient does not decline with elevation in the transition to the eastern lowlands. This is likely due to the main advection direction being from the west, which leads to isotope fractionation along the western slope, and continuation of the depleted rainfall towards the east. Lower depletion in the easternmost part of Southern Norway indicates the that other water vapour transport pathways also play a role.

The d-excess is markedly different on the eastern and western part of the highland region of Southern Norway. This indicates that the topography does act as a transport barrier to the moisture. According to this interpretation, the d-excess reflects the combination of different moisture origin, below-cloud processes, and surface evaporation effects. Moisture source analysis from backward trajectories confirms clearly different moisture sources for the western and eastern region. Such high-resolution precipitation isotope datasets are highly useful to constraint isotope-enabled regional models.