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Interactions between surface waters in King George Island, Antarctica – a stable isotope perspective

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In this paper we present a first study of the isotopic composition of surface waters in the southern peninsulas (Barton, Fildes, Weaver and Potter) of King George Island, Antarctica. We have collected > 200 samples of snow and snowmelt, water (lake, river and spring), ice (glacier ice and permafrost) from the four peninsulas in February 2016 and analyzed them for their oxygen and hydrogen stable isotopic composition.
Samples from lake water (50+) indicate a clear west-east depletion trend, suggesting a rain-out process as air masses are moving westward (and are progressively depleted in heavy isotopes) from their origin in the Drake Passage. In both Fildes and Barton Peninsulas, permafrost samples have the heaviest isotopic composition, most probably due to preferential incorporation of heavy isotopes in the ice during freezing (and no fractionation during melting). As permafrost melts, the resulting water mixes with isotopically lighter infiltrated snowmelt, and thus the groundwater has a lower isotopic composition. Further, lake and river (the later fed by lakes) water has the lightest isotopic composition, being derived mostly from the melting of light snow and glacier ice. It seems feasible to separate isotopically water in lakes/rivers (largely fed by melting multi-year glaciers and snow) and water from melting of snow/ground ice
This preliminary study suggests that it is possible to separate various water sources in the southern peninsulas of King George Island, and this separation could be used to study permafrost degradation, as well as feeding and migration patterns in the bird fauna, with implications for protection purposes.

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