Abstract Preview

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Abstract Title: **Direct single well measurement of groundwater flux in permafrost-impacted aquifers in Nunavik, Canada.**

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Permafrost dynamics in high latitude territories is a complex process resulting from atmospheric, soil, water and vegetation interaction. Advective heat transport by groundwater has been identified as potentially playing a significant role in permafrost dynamics. However, there is a lack of direct measurements of groundwater parameters such as hydraulic head and hydraulic conductivity for determining flow patterns and groundwater fluxes in permafrost environments due to difficulties in accessing these remote territories and associated high costs of field work in such remote areas. Existing monitoring wells are often insufficient to allow the assessment of representative hydraulic gradients and realistic groundwater flow rates.
Here, the Finite Volume Point Dilution Method (FVPDM) is applied to measure in-situ groundwater fluxes in a supra- and sub-permafrost sandy aquifer within a small watershed in Umiujaq, Nunavik, Canada. The advantage of the FVPDM method is to provide direct measurement of groundwater flux using a single well technique. The tests show that this method can be successfully applied in remote conditions and with limited resources. Darcy fluxes derived from the FVPDM tests varied from 0.577 to 0.840 m/d, implying that advective heat transport from groundwater flow could be contributing to permafrost thaw at this site. These data are important since very few estimates of groundwater fluxes are available in the discontinuous permafrost zone and that such a significant groundwater flux can have a major impact on heat exchange between groundwater and permafrost. Moreover, they are essential for building and calibrating realistic groundwater flow and heat transport models required for better understand permafrost dynamics and sustainable groundwater management in cold environments.

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