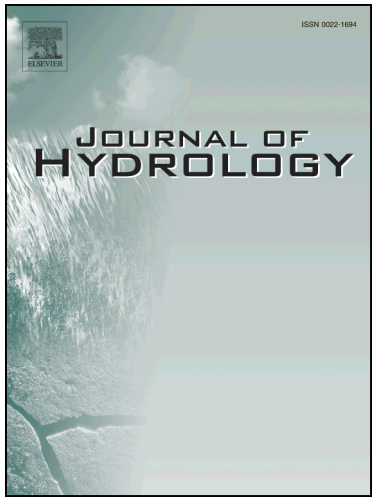

Research papers

Transformation of snow isotopic signature along groundwater recharge pathways in the Canadian Prairies

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Transformation of snow isotopic signature along groundwater recharge pathways in the Canadian Prairies

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Abstract

Application of stable isotope methods to evaluate the contribution of different water sources to groundwater recharge relies on the knowledge about isotopic signatures of these sources. The data collected at study sites in the Canadian Prairies show that snowpack isotopic signatures exhibit a high spatial variability over a small scale (< 100 m) limiting the usefulness of point samples to estimate an average isotopic composition of snow over a large area. Isotopic signatures of snowmelt runoff can be different from those of pre-melt snowpack, further undermining the applicability of snow isotopic signature to characterisation of snowmelt-driven hydrological processes. Accounting for the actual signature of snowmelt runoff has strong effects on its perceived role in recharging groundwater. The data also show that diffuse and depression-focussed components of groundwater recharge have different isotopic signatures, where the latter closely resembles snowmelt runoff.

Keywords: stable isotopes, snow, snowmelt runoff, groundwater recharge, Canadian Prairies

1. Introduction

Snowpack accumulation and depletion are important elements of the hydrologic cycle in many parts of the world (Lehning, 2013; Lundberg et al., 2015; Tetzlaff et al., 2015) and have