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TITLE: Spatio-temporal distribution of stream-aquifer water exchanges along a multi-layer aquifer system

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ABSTRACT BODY: The aim of this work is to understand the spatial and temporal variability of stream-aquifer water exchanges along a 6 km-stream network in a multi-layer aquifer system. With an area of 104 km2, the Orgeval experimental basin is located 70 km east from Paris. It drains a multi-layer aquifer system, which is composed of two main geological formations: the Oligocene (upper aquifer unit) and the Eocene (lower aquifer unit). These two aquifer units are separated by a clayey aquitard.
Five MOLONARI stations (MOnitoring LOcal des échanges NAppe-RIvière) have been deployed along the stream-network to monitor stream-aquifer exchanges over years, based on continuous pressure and temperature measurements (15 min-time step). The five MOLONARI stations are distributed in two upstream, two intermediate, and one downstream site. The two upstream sites are connected to the upper aquifer unit, and the downstream one is connected to the lower aquifer unit. One year (april2012-july 2013) of hydrological data are hereafter analyzed.
We first focus on the spatial distribution of the stream-aquifer exchanges along the multi-layer aquifer system during the low flow period. Results display an upstream-downstream functional gradient, with upstream gaining stream and downstream losing stream. This spatial distribution is due to the multi-layer nature of the aquifer system, whose lower aquifer unit is depleted.
Then it appears that the downstream losing streams temporally switch into gaining ones during extreme hydrological events (December 2012 and January 2013), while the upstream streams remain gaining streams even during the flood peak when overflow drastically reduces the water exchanges. To illustrate the spatial distribution of the stream-aquifer exchanges' temporal variability three extreme hydrological events of various intensity are analyzed.

KEYWORDS: 1830 HYDROLOGY Groundwater/surface water interaction, 1847 HYDROLOGY Modeling, 1895 HYDROLOGY Instruments and techniques: monitoring.

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