Mapping groundwater recharge using the relationship between the IDPR and baseflow indexes

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KEYWORDS: groundwater recharge, mapping, IDPR, BFI, infiltration, uncertainty

Quantifying the renewable groundwater resource is a key point for water managers that have to organize the water supply for the present and the future in the context of climate change. Our work aims to estimate and to map groundwater recharge by precipitation with a resolution adapted to water management needs.

A gridded water budget model was developed to compute the groundwater recharge with a resolution of 8 km and a daily time step. Three different water budget methods were included to assess the uncertainty associated to the effective rainfall parameterization method. We then proposed a global solution to split the effective rainfall between runoff and infiltration, relying on a GIS built parameter called IDPR. This distributed parameter is related to the drainage density and hydrological connectivity. The IDPR index is available over the all France area with at least a 50 m spatial resolution. The river baseflow index (BFI) was calculated with the Wallingford method over more than sixty french instrumented watersheds. It is assumed that the BFI is representative of the average infiltration coefficient of the hydrogeological basin. A linear relationship between the BFI and the spatial average IDPR index was proved for the sedimentary basins. It thus allowed calibrating the IDPR index in terms of infiltration capacity. Finally, groundwater direct recharge could be calculated and annual average recharge maps were generated.

This methodology will be applied to produce recharge maps over all France, as well as future recharge maps under different climate scenarios.