Analysis of channel transmission losses in a dryland river reach in Northeast Brazil using multiple type data

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Scarcity of hydrological data, especially streamflow discharge and groundwater level, restricts the understanding of channel transmission losses (TL) in drylands. Furthermore, the lack of information on spatial river dynamics encompasses high uncertainty on TL' analysis in large rivers. The objective of this study was to combine the information from streamflow and groundwater level series with multi-temporal satellite data to derive a hydrological concept of TL for a reach of the Middle Jaguaribe River (MJR) in semiarid Northeast Brazil. TL occur in an alluvium, where river and groundwater can be considered to be hydraulically connected. Most losses certainly infiltrated only through streambed and levees and not through the flood plains, as could be shown by satellite image analysis. TL events, whose input river flows were smaller than a threshold, did not reach the outlet of MJR. TL events, whose input volumes were higher than this threshold, reached the outlet losing on average 30% of their input. During the dry seasons (DS) and at the beginning of rainy seasons (DS/BRS), no river flow is expected for pre-events and events have vertical infiltration into the alluvium. At the middle and the end of the rainy seasons (MRS/ERS), river flow sustained by base flow occurs before/after events and lateral infiltration into the alluvium plays a major role. Thus, the MJR shifts from a losing river at DS/BRS to a losing/gaining (mostly losing) river at MRS/ERS. A model of this system has to include the coupling of river and groundwater flow processes linked by a leakage approach. Based on this analysis, we proposed strategies for its modelling and simulation.