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Spatio-temporal variability of water table response in an abandoned farmland catchment in the Spanish Pyrenees

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In this study the temporal and spatial dynamics of the water table was investigated in a small sub-Mediterranean mountain catchment formerly cultivated and subjected to abandonment and subsequent plant re-colonization. The analysis of the water table fluctuations at 5 locations over a 6-year period indicated that groundwater followed a marked seasonal evolution with i) a drying-down period of the water table from the end of spring (associated with increasing evapotranspiration demand), ii) a wetting up period commencing with the first autumn rainfalls, and iii) a wet period during winter and spring. We observed a high spatial variability in the water table response, especially during the wetting up period. We identified saturation excess runoff areas scattered throughout the catchment, suggesting the influence of factors (e.g., soils, vegetation) others than topography controlling the soil saturation patterns. The extent of these areas was dynamic, revealing that increasing wetness conditions favored hydrological connectivity. For selected flood events, the spatial variability and the timing of the water table response was also analyzed and related to stream flow response. Results suggested a tendency to higher spatio-temporal variability during recharge of the groundwater. They also suggested the occurrence of runoff generation processes others than saturation as a consequence of a rise in the water table. Our results illustrates the complexity of catchment hydrology in Mediterranean mountain environments, characterized by a marked climatic seasonality, but also by an heterogeneous landscape in terms of topography, soils and vegetation (most of the times inherited of past human practices).