



Combining stable isotopes and hydrometric data to investigate the stormflow response of a Mediterranean mountain catchment (Vallcebre Research Catchments, Spain)

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The hydrological behaviour of Mediterranean mountain catchments has been investigated in the last two decades in the Vallcebre Research Catchments (NE Spain, 42° 12'N, 1° 49'E) using a twofold approach based on hydrometric measurements and modelling. Results obtained have shown the complexity of the rainfall-runoff relationship as well as the strong non-linearity of the catchment's hydrological response. The hydrological behaviour of the catchments is broadly similar to that observed in more humid regions during wet periods. On the contrary, during dry periods or during wetting up transitions, some runoff generation processes characteristic of humid conditions are temporarily absent, activating a different combination of hydrological processes.

Water stable isotopes have been used in the last 3 years for determining the relative contribution of event and pre-event water in the stormflow response, with the aim of improving the understanding of the hydrological behaviour of these catchments. Even if the use of stable isotopes in seasonal Mediterranean catchments has been relatively limited so far compared to humid temperate catchments, results obtained in the Vallcebre Research Catchments showed that the information they provide was very helpful, when used in combination with detailed hydrometric data.

Results obtained using stable isotopes were generally in line with previous finding in these catchments, even if the contribution of pre-event water was higher than expected in some conditions. Using a set of 10 stormflow events with different characteristics (antecedent conditions, rainfall depth and intensity, stormflow coefficient), two components hydrograph separations indicated that pre-event water accounted for 30% to almost 100% of the total runoff. The contribution of pre-event water depended more on rainfall characteristics than on antecedent wetness conditions. Moreover, a strong relationship was observed between the new water contribution and the suspended sediment response of the catchment, showing the larger mobilization of new (event) water by infiltration excess runoff during summer intense rainstorms. During low intensity rainfall events, old water contribution dominated suggesting the predominance of subsurface and groundwater contributions.