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Rainfall typology for recharge of a karstic aquifer in the western Mediterranean, a case study from the Sierra de Gador-Campo de Dalias (South-east Spain).

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Isotope signatures in precipitation from the Global Network for Isotopes in precipitation (GNIP) around the Mediterranean basin and literature data are compared to isotopic data from a large karstic aquifer in Southeast Spain to explain the typology of the precipitation events dominating recharge. Analysis of the deuterium excess (d) at the scale of the Mediterranean basin and at the regional scale allows us to understand the isotopic context of the study area: Campo de Dalias and the Sierra de Gador (Almería province). The origin of precipitation can be determined from its d-value. The d-value changes in function of the initial evaporation condition, its depends of the relative humidity and temperature during the evaporation producing the water vapour of the clouds. The water vapour which dominate the study area is generated in two areas, the Atlantic Ocean (d = 10‰) and Western Mediterranean basin (d= 15‰). With increasing precipitation volume the western Mediterranean character dominates. These heavier storms contribute mainly to recharge, as illustrated by the d-value of 13.6‰ in deep groundwater of the Campo de Dalias. Weighted d-values increase with the volume of precipitation giving a significant relationship for the southern and eastern coast of the Iberian Peninsula. This selectivity of deuterium excess (d) to monthly precipitation was used to estimate the return period of precipitation leading to aquifer recharge at 4.9 years. Still rainfall with lower return periods represents c. 90% of the total precipitation. One of the challenges to meet ever-growing water demands is to increase recharge from events with a low return period yielding intermediate quantities per event, but forming the bulk of the annual precipitation.