

Stable water isotope patterns in a climate change hotspot: The isotope hydrology framework of Corsica (western Mediterranean)

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The Mediterranean is regarded as a region of intense climate change. To better understand future climate change, this area has been the target of several palaeoclimate studies which also studied stable isotope proxies that are directly linked to the stable isotope composition of water, such as tree rings, tooth enamel or speleothems. For such work, it is also essential to establish an isotope hydrology framework of the region of interest. Surface waters from streams and lakes as well as groundwater from springs on the island of Corsica were sampled between 2003 and 2009 for their oxygen and hydrogen isotope compositions. Isotope values from lake waters were enriched in heavier isotopes and define a local evaporation line (LEL). On the other hand, stream and spring waters reflect the isotope composition of local precipitation in the catchment. The intersection of the LEL and the linear fit of the spring and stream waters reflect the mean isotope composition of the annual precipitation (δP) with values of $-8.6(\pm 0.2) \text{‰}$ for $\delta^{18}\text{O}$ and $-58(\pm 2) \text{‰}$ for $\delta^2\text{H}$. This value is also a good indicator of the average isotope composition of the local groundwater in the island. Surface water samples reflect the altitude isotope effect with a value of $-0.17(\pm 0.02) \text{‰}$ per 100 m elevation for oxygen isotopes. At Vizzavona Pass in central Corsica, water samples from two catchments within a lateral distance of only a few hundred metres showed unexpected but systematic differences in their stable isotope composition. At this specific location, the direction of exposure seems to be an important factor. The differences were likely caused by isotopic enrichment during recharge in warm weather conditions in south-exposed valley flanks compared to the opposite, north-exposed valley flanks.

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