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Monthly isotopic signal of the precipitated water in the Alps: lagrangian analysis and discussion of measurements

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The present work has been performed in the framework of the project AQUAPAST. The main focus of AQUAPAST is the reconstruction of past changes in the atmospheric circulation and in particular in the water vapour transport mechanism over the Mediterranean area starting from the analysis of the isotopic content of cave speleothems in the North-East of Italy. The calibration of the proxy-data with the present-day isotopic composition of the waters has been carried out by analysing the oxygen isotopic values of monthly water samples from meteorological stations in key localities at different elevation and characterised by different annual rainfall rate. The data from this network of stations are the baseline both for the interpretation of past hydrological changes and for the possible shifts through time in moisture provenance. It is well known that one of the most important controls on isotopic composition of precipitations is the provenance of the moisture, especially for the events that considerably recharge the aquifers. Thus, part of the calibration included a Lagrangian methodology for the reconstruction and analysis of the airstreams governing the transport of water vapour as shown in recent events. The average monthly isotopic signal of the precipitated water sampled in the Province of Trento is here used as a suitable tracer to check the origin of the precipitating water and to verify the reliability of the Lagrangian analysis. In the present work a comparison between the isotopic signal of November 2002 and November 2003 is performed, as November is the most rainy month of the year over the Eastern Alps. The contribution of local evaporation and of evaporation over the Mediterranean Sea and over the Atlantic Ocean to the final precipitation over the Alps is estimated in the both cases. Hypotheses are proposed about the meteorological factors (e.g. monthly averaged sea surface temperature, atmospheric circulation, etc.) determining different isotopic signals in the two years.