Stable isotopes composition of river water across peninsular Spain

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This work presents the first results of the analyses of the Spanish Network for Isotopes in Rivers (Red Española de Isótopos en Ríos, REVIR). Created in 2008, the REVIR consists of 80 sampling stations distributed along the major River Basin Districts in peninsular Spain, where quarterly (seasonally) water samples are taken for $\delta^{18}O$ and $\delta^{2}H$ analysis. REVIR makes use of the Radiological Environmental Monitoring Network that operates since the 1970s.

After two water years (2008-09 to 2009-2010), 579 stable isotope analyses have been produced. Some general observations can be made about the different behaviour of these isotopes in the different basins: 1) In Northern basins, river waters and precipitation have similar values of D-excess, 13.6‰, that match with that of precipitation of Western Mediterranean Sea, even though the area is influenced by the Atlantic Ocean and the Biscay Bay rainfall; 2) In most of the basins, isotope values for surface waters lie along evaporation lines with slopes between 4.9 and 5.7, due to the effect of regulation trough dams and longer residence times in a semiarid climate; 3) More negative values for $\delta^{18}O$ and $\delta^{2}H$ are concentrated in the basins where the higher mountainous chains exist, influenced by seasonal processes of snow accumulation and melting, such as the Ebro basin, which drains the Southern Pyrenees; 4) The differences in the spatial variability of the isotope composition of surface waters are influenced by the size and topography of the basins and the spatial distribution of sampling stations.

The information supplied by REVIR is useful for the characterization of surface waters and their spatial and temporal variability and will allow: 1) the study of the processes modifying the isotope signals observed in river waters from the isotope input of precipitation (i.e. evaporation, interaction with ground water,...); 2) the calibration of the models presently running that simulate the spatial distribution of isotopes in precipitation; 3) the study of the evolution of these isotope signals in relation with changes in climate factors; 4) the study of the effect of evaporation from surface water bodies (lakes and dams) in water resources; and will facilitate the application of the European Union Water Framework Directive by a better knowledge of the origin and evolution of surface waters through the study of their characteristic isotope signal.

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