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SPATIAL AND TEMPORAL VARIABILITIES IN STABLE ISOTOPE COMPOSITIONS OF PRECIPITATION AND AIR MOISTURE SOURCES IN HUNGARY

This study evaluates the regional differences in stable isotope compositions of precipitation in the Pannonian Basin based on hydrogen and oxygen isotope analyses of daily rainwater samples collected in seven distinct meteorological stations in Hungary (Farkasfa, Kecskemét, Szeged, Pécs, Kékes, Budapest, Siófok) since April 2012. Thus, this work provides the first "comprehensive map"of isotopic composition of precipitation for Hungary. Additionally, we present an investigation about the determination of air moisture source regions for each location during the studied period. To reconstruct the path of the air moisture from the source region, we ran the NOAA HYSPLIT trajectory model using the GDAS database with 1° spatial and 6 hours temporal resolution for every precipitation event, for heights of 500, 1500 and 3000 m. We determined the location where water vapor entered into the atmosphere by calculating specific humidity along the trajectories. Five possible moisture source regions for precipitation were defined: Atlantic, North European, East European, Mediterranean and continental (local/convective).

Stable isotope variations show systematic and significant differences between the regions, especially large differences in the local meteoric water line were observed between the stations in West and East Hungary. The variability of moisture source shows also systematic distribution. Interestingly, the most dominant among the identified source regions in all stations is the Mediterranean area; while the second is the Atlantic region. The ratio of the precipitations originated in Eastern and Northern Europe seem to correlate with the geographic position of the meteorological station. Additionally, the ratios of the different moisture sources show intra annual variability.

In each location, the amount weighted d-excess values were calculated for the identified moisture sources. The precipitation originated in the Mediterranean regions has systematically higher d-excess values than that originated in the Atlantic sector, independently from the absolute value which apparently changes from station to station. The precipitation fraction attributed to the Northern European sector has also relatively elevated d-excess values that might be related to the cold-season domination of moisture transport from this region.

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Track Classification: Isotopes in Precipitation