



Data Article

Stable isotope data of daily precipitation during the period of 2013–2017 from K-puszta (regional background monitoring station), Hungary



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ARTICLE INFO

Article history:

Received 30 December 2020

Revised 25 February 2021

Accepted 10 March 2021

Available online 18 March 2021

Keywords:

Daily precipitation

Stable isotope monitoring

Hydrogen isotope

Oxygen isotope

Isotope hydrology

Meteorology

Hungary

ABSTRACT

Precipitation was collected on daily basis at K-puszta regional background monitoring station located near Kecskemét, in the western part of the Great Hungarian Plain, between 1 April 2013 and 31 December 2017 for stable hydrogen and oxygen analyses. The sample collection period covered 24 hours, from 07:00 to 07:00 h LT (Local Time) the next day. Stable hydrogen and oxygen isotope composition of the daily precipitation samples were measured using a Liquid Water Isotope Analyser (LWIA-24d) manufactured by Los Gatos Research Ltd. The dataset includes 472 stable isotopic data representing the continuation of the beforehand monitoring started in 2012 [1]. The dataset provides a unique opportunity to combine daily meteorological data and stable

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isotope composition of daily precipitation which can help to improve our understanding of the processes and factors at relatively high resolution that govern δD and $\delta^{18}O$ values of the precipitation. In addition, the dataset can be used as an isotope hydrological benchmark in comparison with stable isotope dataset obtained from surface- and groundwater or other sources (e.g. climate proxies, agricultural products). Thus, research related to isotope hydrology, agriculture, paleoclimate can benefit from this dataset. Interpretation of this dataset focusing on the relationship between meteorological factors and stable isotope composition of precipitation is in progress.

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Specifications Table

Subject	Earth and Planetary Sciences
Specific subject area	Isotope hydrology, meteorology
Type of data	Table Figure
How data were acquired	Daily precipitation collection was carried out from 1 April 2013 to 31 December 2017. The sample collection period covered 24 hours, from 07:00 to 07:00 h LT the next day. Stable hydrogen and oxygen isotope analysis of the daily precipitation samples was carried out using a Liquid Water Isotope Analyser (LWIA-24d, Los Gatos Research).
Data format	Raw data are provided in Excel file as supplementary material.
Parameters for data collection	Precipitation samples were stored in plastic bottles equipped with double cap to avoid evaporation and protect them from solar radiation until they were analysed. No pre-treatment was required before the stable isotope analysis.
Description of data collection	Stable hydrogen and oxygen isotope values were determined using a Liquid Water Isotope Analyser (LWIA-24d, Los Gatos Research).
Data source location	Hungarian Meteorological Service K-puszta, Hungary: regional background monitoring station: Lat: 46.96667 Long: 19.55000 (46°58'00.0"N 19°33'00.0"E)
Data accessibility	With the article

Value of the Data

- As the stable hydrogen and oxygen isotopes can be used as natural tracers; the dataset provides a benchmark data in ecohydrological, isotope hydrological and hydroclimatic studies.
- The dataset provides reference background data for isotope hydrological research related to groundwater and surface water in the Great Hungarian Plain supporting the water management in the region.
- Combining the dataset with meteorological parameters, it can be used to constrain the factors and processes governing the stable isotope composition of precipitation providing a background information for regional paleoclimate studies.

1. Data Description

Precipitation monitoring for stable hydrogen and oxygen measurements at K-puszta regional background monitoring station (Lat: 46.96667, Long: 19.55000) started on 1 April 2012. The δD

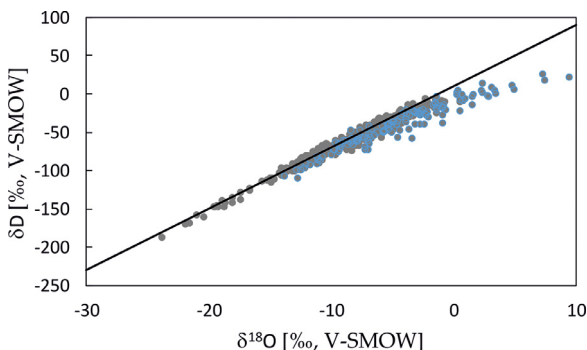


Fig. 1. The stable hydrogen and oxygen isotope composition of daily precipitation collected at K-puszta regional background monitoring station in the period of 2013–2017. The blue circles represent the data which might be influenced by secondary evaporation. The Global Meteoric Water Line (GMWL, [3]) is also shown (black line).

and $\delta^{18}\text{O}$ values of daily precipitation between 1 April 2012 and 31 March 2013 have already been published [1]. The current dataset (Supplementary file, Table S1) covers the period from 1 April 2013 to 31 December 2017. Table S1 contains also the amount of the precipitation and the d-excess values ($\text{d-excess} = \delta\text{D} - 8 \times \delta^{18}\text{O}$, [2]). Although the majority of the data points plot close to the Global Meteoric Water Line (GMWL, [3]) in Fig. 1, there are several values which show deviation from this line, plotting on the right side of the GMWL. These values were obtained from low amount of precipitation (typically less than 1 mm) or/and during summer when temperature was elevated while relative humidity was low. In the Fig. 1 we marked the samples with blue circles and in the Table S1 with “*” that have amount lower than 1.0 mm or have significantly low d-excess values. The samples characterized with low d-excess values likely suffered from secondary evaporation during the fall of the raindrops. Although the duration of the precipitation collection was always 24 hours and the precipitation collector was immediately closed with a cap after the precipitation activity had stopped, we can not fully exclude the possibility that some evaporation of small magnitude could have taken place inside the collector. Therefore, these data points should be treated carefully or completely discarded in further studies.

2. Experimental Design, Materials and Methods

2.1. Sample collection

Daily precipitation at K-puszta regional background monitoring station (Lat: 46.96667, Long: 19.55000) was collected from 1 April 2013 to 31 December 2017 for stable isotope analyses. This campaign represents the continuation of the previously conducted monitoring; and it follows the same sample collection procedure presented in [1]. Each sample was collected in 24 hours from 07:00 to 07:00 h LT (Local Time) the next day. In case of heavy precipitation events, the precipitation collector was emptied more frequently and a replacement collector was installed. The automatic precipitation collector was heated above 0 °C to melt the snow and to avoid the freezing of the collected water during winter. The snow-water equivalent was considered in the case of snow. In addition, to avoid evaporation during dry periods, the automatic precipitation collector was equipped with a cap that was only open during precipitation activity. After sampling the precipitation, the water samples were filled into plastic (HDPE) containers with a double cap and stored in a refrigerator to protect the samples from solar radiation and to avoid evaporation.

2.2. Analytical methods

Stable hydrogen and oxygen isotope composition of the precipitation water samples were determined using a Liquid Water Isotope Analyzer (LWIA-24d, Los Gatos Research) at Institute for Geological and Geochemical Research. The instrument uses off-axis integrated cavity ring down spectroscopy to measure the absolute abundances of $^2\text{H}^1\text{H}^{16}\text{O}$, $^1\text{H}^1\text{H}^{18}\text{O}$ and $^1\text{H}^1\text{H}^{16}\text{O}$ via laser absorption. We used homemade laboratory standards, which were calibrated to international standards ($\delta\text{D} = -9.0\text{‰}$; -74.9‰ ; -147.7‰ ; $\delta^{18}\text{O} = -0.53\text{‰}$; -10.41‰ ; -19.95‰ for BWS1, BWS2, BWS3, respectively; BWS stand for Budapest Water Standard) to evaluate the final isotopic composition of the samples [4]. The samples and homemade standards were pipetted into 2 mL vials and arranged on the tray in the following way: 3 laboratory standards – 5 unknown samples – 3 laboratory standards, etc. to prevent the effect of ambient temperature variation [5]. A “CTC Analytics GC PAL” autosampler equipped with a Hamilton syringe was used to take 1 μL water from the 2 mL vials and injected into the vaporizer of the laser analyser where the water was evaporated at 80 °C in low vacuum (~ 0.1 mbar) and introduced into the cavity of the analyser [6]. From each vial 6 injections were carried out, however, to minimize the memory effect, for determination of the final isotope composition, only the measurements of the latest 4 injections were taken into account. All samples were measured at least two times, if it was necessary (e.g. the differences between the two measurements exceeded 1‰ and 0.15‰ for δD and $\delta^{18}\text{O}$, respectively) we conducted additional analyses. The isotopic compositions of the water samples are expressed as δD and $\delta^{18}\text{O}$ in ‰ relative to V-SMOW (Vienna Standard Mean Ocean Water; [7]). The precision is better than 1.0‰ and 0.15‰ for δD and $\delta^{18}\text{O}$, respectively.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

Acknowledgments

Authors are grateful to the Hungarian Meteorological Service for providing us the precipitation samples. The research was supported by the ÚNKP-19-3 New National Excellence Program of the Ministry for Innovation and Technology, the National Research, Development and Innovation Office (project No. OTKA NK 101664, PD 121387) and the Széchenyi 2020 program, the European Regional Development Fund and the Hungarian Government (GINOP-2.3.2-15-2016-00028). The János Bolyai Research Scholarship of the Hungarian Academy of Sciences financially supported György Czuppon's work.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.dib.2021.106962](https://doi.org/10.1016/j.dib.2021.106962).

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