

Researchers reveal stable isotope variation during below-cloud evaporation

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Below-cloud evaporation is the evaporation of raindrops under unsaturated water vapor pressure and from cloud base to the ground during precipitation, leading to variability in the ratio of stable isotopes

in rainfall. It can affect local small-scale rainfall events. Therefore, it is necessary to investigate the evolution mechanism of stable isotopes in arid and semi-arid areas under below-cloud evaporation.

A research team led by Prof. Li Zongxing from the Northwest Institute of Eco-Environment and Resources of the Chinese Academy of Sciences (CAS) collected 1,310 precipitation event-scale samples of [stable isotopes](#) to measure below-cloud [evaporation](#) rate value in the Qilian Mountains. Related findings were published in *Chinese Geographical Science* on Aug. 4.

The researchers found that stable isotopes in precipitation of the Qilian Mountains are enriched by sub-cloud evaporation. Evaporation rates on the northern slopes were significantly higher than that on the southern slopes, mainly due to differences in temperature, precipitation and elevation between the two slopes.

The team assessed stable isotopic variations in precipitation during the below-cloud evaporation from the cloud base to the ground in the Qilian Mountains. Results indicated that the monthly [precipitation](#) enrichment rates of stable oxygen isotopes in the Qilian Mountains from May to October were 29.18%, 23.35%, 25.60%, 22.99%, 31.64%, and 14.72%, respectively.

For the summer half year, the mean below-cloud evaporation rate was 12.00%, and changes of oxygen isotope concentration from cloud base to the ground increased by 0.92 ‰ for every 1.00% increase of raindrop evaporation rate in the Qilian Mountains. When the evaporation rate was less than 5.00%, the changes in the oxygen isotope concentration from the cloud base to the ground also increased by 1.00 ‰ for every 1.00% increase in the [evaporation rate](#) of raindrops.

"This study can help us to understand hydrology and [water resources](#) as

reflected by the stable isotopes," said Prof. Li, corresponding author of the study.

More information: Juan Gui et al, Influence of Evaporating Under the Clouds on the Precipitation Stable Isotope in the Transition Zone Between Tibetan Plateau and Arid Region of China, *Chinese Geographical Science* (2023). [DOI: 10.1007/s11769-023-1371-z](https://doi.org/10.1007/s11769-023-1371-z)

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