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# A Tale of an Isotope: Where Does the Water Come from in Tropical Andean Ecosystems? A Case of Study in South Ecuador

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Only few catchments in the Andean mountain range are currently monitored. Most basins in the region remain ungauged, and as a result, little knowledge is available on the processes governing their hydrological behavior. In particular, despite the importance of tropical alpine grasslands of the northern Andes (commonly known as the páramo) as providers of abundant high-quality water for downstream populations as well as a variety of other environmental services, very little is known about their hydrologic functioning. Understanding the hydrological behavior of the fragile Andean páramo ecosystems is critical given their high susceptibility to global and local stressors such as changes in land use, and the impacts of climate change and variability. To improve this situation, an analysis of the isotopic composition of oxygen-18 in the Zhurucay River experimental catchment (7.53 km2) located in south Ecuador between 3400 and 3900 m a.s.l. was conducted. Water samples for isotopic analysis were collected in rainfall, streamflow, and soils between May 2011 and May 2013. The main soils in the study site are the Andosols mainly located in the steep slopes, and the Histosols (Andean páramo wetlands) predominantly located at the bottom of the valley. Results from the tracer analysis show that pre-event water stored in the Histosols is the primary source of runoff generation, demonstrating hydrologic connectivity between the Histosols and the drainage network; while the most common soils, the Andosols, laterally drain the infiltrated rainfall recharging the lower situated Histosols. Overall, these findings depict that the use of stable isotopes for investigating hydrological processes at catchment scale provides a more complete understanding of the ecosystem's hydrologic functioning. Moreover, in developing regions, such as the Andean region, acquiring better understanding of the origin and fate of water is a crucial step towards the establishment of scientifically-based programs of management and conservation of water resources.