



## **Obvious contradictions or hidden consensus? Multi-method approach to infer hydrological processes understanding in a tropical Andean rainforest.**

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Tropical hydrology is, at all scales, highly complex and multifaceted. Numerous studies, conducted in tropical regions around the globe, have investigated the hydrological processes and shed light on the unique interplay of the drivers and the emerging hydrological patterns within tropical ecosystems.

Based on the research question at hand, researchers often deem one method to be the one and only to yield the best answer. Anyhow, given the complex nature of those ecosystems, the application of an individual method could be one sided, and potentially obscure the full hydrological process dynamics.

As an example we will take a closer look at the research conducted within the Rio San Francisco catchment (76.9 km<sup>2</sup>) and its various sub-catchments (0.08 to 34.9 km<sup>2</sup>), located in the tropical Andean rainforests of south Ecuador, which have now been under investigation for around 20 years.

We will present results of multiple methods applied over the years within the designated study area. Often, particularly at the beginning of the study, seemingly contradictory results challenged our previous conceptual understanding of the hydrological system. Studies span from the headwaters to the major outlet. While some found high contributions of event water and short transit times of water upstream, other studies identified high contributions of base flow and thus old water just a few kilometers downstream. However, we will show that all applied methods in the end tell a more or less coherent story of the same hydrological system, just with different perspective at different scales.

The spectrum of applied methods thereby ranges from simple two-component hydrograph separation, to transit time estimations, isotope studies, multivariate statistical analyses, and finally physically based modeling techniques.