

Hydrodynamical, geochemical and isotopic preliminary results of Andean groundwater in an active volcanic zone, Mulalo (Ecuador)

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Mulaló aquifer is located 80 km south of Quito, between the Royal and Western Cordilleras. The Upper Pleistocene Latacunga formation contains the aquifer (maximum depth 250 m). It is composed of fluviolacustrine deposits, pumice and volcanic ashes that give high water potential to this formation. The aquifer is partly phreatic but the presence of quaternary Holocene deposits (ash and lahar) in the central area, possibly makes the aquifer semi-confined. The study area covers about 200 km² and concerns the north part of aquifer. Annual precipitation is around 900 mm. There are about 50 water points between boreholes, wells and springs. The flow direction is from north to south. This groundwater is used for domestic water supply, irrigation of orchards and greenhouses where roses are cultivated, which is the main economic activity in this region. To improve the knowledge of this aquifer and guarantee a good management of groundwater use, a hydrodynamic and geochemical monitoring was made during the past few years that was completed by two campaigns of water stable isotopes sampling. Results indicate that the underground phreatic level lies between 2-3 m and 26 m, and fluctuates weakly year round, less than 0.5 m. Electrical conductivity was found between 100 and 4500 IS cm, with the more mineralized samples associated with geothermality or deeper aquifer levels. The chemical type is mainly HCO₃⁻ - Mg²⁺ (2 3 of samples) or HCO₃⁻ - Na⁺, which is linked with ashes and volcanic material mineralogy from the Cotopaxi volcano that overhangs the study area, or other volcanoes around. Isotopic composition shows values from -10.5 to -12.8‰ (18O) and -84 to -91‰ (2H). The most depleted values reflect the isotope content of annual precipitation at this altitude according to the isotopic record of Quito. Plotted points are aligned with a very low slope of 3, which may reveal current or past geothermic processes or a mixing process between aquifers.

