

Impacts of Interannual Rainfall Variability and Intensification of the Hydrologic Cycle on Groundwater in a Micro-Watershed in the Amazon Rainforest

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Abstract

Climate change in the Amazon includes the intensification of the hydrological cycle in association with the increase of extreme events. This study aims to identify the impacts on groundwater (GW) within a pristine micro-scale catchment in the Central Amazon related to the observed alterations on hydrological cycle. Precipitation and GW levels from seven piezometers distributed along a hydrological transect covering three zones (lowland, slope and plateau) were collected for the period 2001-2021. External (evapotranspiration, GW storage and climate patterns) and computed (annual recharge) data were used to strengthen the analyses. We identified a generalized growth trend in all compartments (rainfall, evaporation and water table). There was a heterogeneity in water table fluctuations and annual recharge, depending on distance from creek channel and water depth. Surface processes influenced shallows piezometers associated with rapid overflow and low recharge. Conversely, deep piezometers involved slower processes related to water movement, and were more representative of regional GW. Those presented larger seasonal and inter-annual fluctuations, annual recharge and positive trend than shallow piezometers. Besides, all piezometers showed large inter-annual variations in recharge. The El Niño-Southern Oscillation (ENSO) influenced GW level, recharge and storage: positive phase contributed to lower all variables, with recovery in during neutral and negative phase. The larger positive trends in the deeper piezometers are a sign of the resilience of the Alter do Chão aquifer, subject to anthropogenic pressure. As water table play a key-role in shaping the structure and productivity of Amazon forests, further hydro-ecological studies should be conducted to gather information about the fate of GW-dependent Amazonian ecosystems.

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