Two-component hydrograph separation in a Tropical Forested Watershed, Puchong, Selandor, Malaysia

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The hydrograph separation using isotope tracers is effective to identify the storm water sources. However, there are not enough investigations to specify the rainfall-runoff processes based on the hydrograph separation in peninsular Malaysia.

We aim to clarify the contributions of the groundwater to the storm runoff and rainfall-runoff process by using stable isotopes (deuterium and oxygen-18) and geochemical tracers in a tropical rainforest catchment with an area of 4.69 km^2 in Puchong, Selangor, Malaysia.

We performed an intensive water sampling campaign for the storm of July (low stream flow season) and November (high stream flow season) in 2018. The storm runoff ranged from 0.15 m^3/s to 0.21 m^3/s in the low-flow season, whereas that ranged from 0.5 m^3/s to 1.1 m^3/s in the high-flow season. The NO$_3^-$ concentration of the stream in the high-flow season was higher than that in the low-flow season, suggesting that shallow subsurface water contributed to the runoff dominantly in the high-flow season. The SiO$_2$ concentration and δ^{18}O of the stream decreased at the runoff peak and recovered during the recession limb of the runoff, showing that the stream water was affected by the event water during the rainstorm. We applied an End Member Mixing Analysis using SiO$_2$ as a tracer to separate the storm hydrograph into the event water and pre-event water components. The pre-event water component contributed to the storm runoff dominantly ranging from 70% to 98% in both the low-flow and the high-flow seasons. Our result shows that the groundwater takes an important role in the storm runoff during the rainfall events in the tropical rain forest with a consideration of previous data taken at the tropical regions.