

Rainwater chemistry of acid precipitation occurrences due to long-range transboundary haze pollution and prolonged drought events during southwest monsoon season: climate change driven

ABSTRACT

The purposes of this research were to study the characteristics chemistry of pH, anions and cations in rainwater, and to identify the possible sources that contributing to the acid precipitation during southwest monsoon season with occurrence of extreme drought event. During the southwest monsoon season, it normally occurs along with haze phenomenon that every year will hit Southeast Asia. This condition will aggravate with high acidic particles in the atmosphere due to the prolonged drought. The analysed parameters which involved pH, anions (NO₃⁻, SO₄²⁻ and Cl⁻) and cations (Ca²⁺, Mg²⁺, Na⁺ and K⁺) were analysed using pH meter, Hach DR 2800, argentometric method and ICP-OES. From the findings, it showed that acid rain occurred during the southwest monsoon season with the range of pH values from 4.95 ± 0.13 to 6.40 ± 0.03 and the total average of pH 5.71 ± 0.32. Anions NO₃⁻, SO₄²⁻ and Cl⁻ were found to be the dominant compositions of the acid rain occurrences with higher concentrations detected. In overall, rural area recorded with higher acidity of precipitation at total average of pH 5.54 ± 0.39 compared to urban area at pH 5.77 ± 0.26. Rural area surprisingly recorded higher frequency occurrences of acid rain with pH lesser than 5.6 and below compared to urban area. As for public health and safety, all rainwater samples during the acid rain event were found exceeded the allowable limits of NWQS and WHO standards, that shown not suitable for skin contact, recreational purposes even for drinking purposes.