

Chemical Composition of Cloud and Rainwater at a High-Altitude Mountain Site in Western India: Source Apportionment and Potential Factors

Ranjeeta R. Shinde - Gawhane

Indian Institute of Tropical Meteorology (IITM), Dr. Homi Bhabha road, Pashan, Pune-411008, India

Author list (excluding presenting author)

Krishnakant B. Budhavant, Vinayak V. Waghmare, Subrata Mukherjee, Govindan Pandithurai, B. Padmakumari

Abstract

This study focuses on the chemical composition of cloud water (CW) and rainwater (RW) collected at Sinhagad, a high-altitude station located in the western region of India. The samples were collected during the monsoon over two years (2016-17). The concentration of total ionic constituents was three times higher in CW than in RW, except for NH_4^+ (1.0) and HCO_3^- (0.6). Even though we found higher SO_4^{2-} and NO_3^- concentrations in CW than in RW, the weighted average RW pH (6.5 ± 0.3) was slightly more alkaline than CW (6.1 ± 0.5). This can be attributed to the high concentrations of neutralizing ions such as Ca^{2+} , Mg^{2+} , K^+ , and NH_4^+ . These ions counteract the acidity generated by SO_4^{2-} and NO_3^- . A high correlation between Ca^{2+} , Na^+ , K^+ , NO_3^- , and SO_4^{2-} makes it difficult to estimate the contribution of SO_4^{2-} from different sources. Anthropogenic Sulfur emissions and soil dust may both make important contributions. The positive matrix factorization model was used to identify the contribution of different sources to the samples. In the CW, the extracted factors were cooking and vehicles, aging sea salt, agriculture, and dust. In RW, the factors were industries, cooking and vehicles, agriculture and dust, and aging sea salt. The findings of this study have significant implications for the monsoon build-up, ecosystems, agriculture, and climate change.

Early Career Scientist

YES, I am an early career scientist.

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