

Isotopic characteristics of Indian Precipitation

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ABSTRACT

Hydrogen ($^2\text{H}/^1\text{H}$) and oxygen ($^{18}\text{O}/^{16}\text{O}$) isotopic ratios were measured in precipitation (900 samples) collected from several locations in India during the period 2003–2006 (12 locations in 2003 and 18 locations in 2004–2006). The amount of rainfall along with air temperature and humidity were also measured. The meteoric water line developed for India using isotopic data of precipitation samples, namely, $\delta^2\text{H} = 7.93(\pm 0.06) \times \delta^{18}\text{O} + 9.94(\pm 0.51)$ ($n = 272$, $r^2 = 0.98$), differs slightly from the global meteoric water line. Regional meteoric water lines were developed for several Indian regions (i.e., northern and southern regions of India, western Himalayas) and found to be different from each other (southern Indian meteoric water line, slope is 7.82, intercept or D excess is 10.23; northern Indian meteoric water line, slope is 8.15, intercept is 9.55) which is attributed to differences in their geographic and meteorological conditions and their associated atmospheric processes (i.e., ambient temperature, humidity, organ, and source of vapor masses). The local meteoric water lines developed for a number of locations show wide variations in the slope and intercept. These variations are due to different vapor sources such as the northeast (NE) monsoon that originates in the Bay of Bengal; the southwest monsoon (SW) that originates in the Arabian Sea; a mixture of NE and SW monsoons; retreat of NE and SW monsoons and western disturbances that originate in the Mediterranean Sea. The altitude effect in the isotopic composition of precipitation estimated for western Himalayan region also varies from month to month.