Hydrogeochemical and Isotope fingerprinting of major karst springs of Bringi Watershed, NW Himalayas, India

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In third world regions like Indian Himalayas, an attempt has been made to study the major ions, stable isotopes ($\delta^{18}O$ & δD) and ^{3}H of the precipitation, streams and springs of mountainous Bringi catchment of Kashmir region, NW Himalayas, dominated by the carbonate lithology. The main objectives were to delineate the potential recharge areas of karst springs and to distinguish the sources of karst waters - for future management of the valuable source of water. In the third pole of the globe i.e. Himalayan region, the pervasive thinning and receding of the glaciers is faster than any other part of the world. In Kashmir province, as part of the Himalayas, the volume of glaciers, the runoff of streams and rivers, the volume of the lakes (the Dal, the Wular and the Mansbal) and even the Karst springs under study have been substantially affected as a result of unusual and changing global environmental pattern.

The water in the Triassic Limestone aquifer of Bringi watershed is characterized by low levels of mineralization with TDS of the spring water samples ranged between 99 and 222 mg/L except Kongamnag with TDS up to 426mg/L. As expected in an area with dominant carbonate lithology, Ca-HCO3 and Ca-Mg-HCO3 hydrochemical facies were found. The Local Meteoric Water Line (LMWL) for Bringi watershed based on the amount weighted monthly averages is $\delta D = 7.59 \pm 0.32 \times \delta^{18}O + 11.79 \pm 2.07$. The isotopic signature of winter precipitation is reflected in stream and spring water in late spring season and is, therefore, is representative of snow melting. The enriched spring and stream waters in September bear the enriched isotopic signatures of summer rainfall. With the help of local vertical isotopic gradient of precipitation (-0.23‰ per 100 m change in elevation), the mean elevation of precipitation that recharged the aquifer was estimated which ranges between about 2500 - 3500 m amsl. There is a very good correlation (r^2=97) between the seasonal isotope composition of streams and springs indicates the streams and springs either share similar catchments or the springs are recharged by the streams.

Key words: Karst springs, stable isotopes, hydrochemistry, Kashmir Himalayas