Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AHW26-11 Room:203 Time:May 23 17:15-17:30

Monthly Oxygen-18, Deuterium and Chloride characteristics of precipitation in the Ndop plain, North West Cameroon

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Knowledge of stable isotopes and chemical tracers in meteoric water has been used as a valuable tool in various environmental studies. A systematic monthly sampling of precipitation, in the Ndop plain, was carried out to generate basic data on d18-O, dD and Cl-, determine their seasonal variations and controlling factors to be used as baseline data in hydrological studies. The d18O-dD relationship of rainfall gives a regression line: dD = 7.93 d18O + 13.26 (R2 = 0.99), which represents the Ndop Meteoric Water Line (NMWL). The slope is similar to the Global Meteoric Water Line (GMWL), but, with a high d-excess, which suggests a contribution of continental recycled moisture to precipitation. Precipitation shows a wide variation, throughout the year (2012) in d18O and dD, from +3.86 and +38.62 per-mille in January to -7.98 and -53.18 per-mille in September, respectively. The volume-weighted mean of precipitation, which plots close to June rainfall, is -5.61 and -31.93 per-mille for d18O and dD, respectively. Light convective pre-monsoon and post-monsoon showers, under low relative humidity conditions, are isotopically more enriched than heavy orographic monsoon rain, under high relative humidity conditions. Chloride varies from 1.56 mg/l in the pre-monsoon to 0.06 mg/l during the monsoon rains; like d18O and dD, it shows high values in early and late rains. Apart from January, all d-excess values in monthly rains are $>$10 per-mille. The high d-excess values at the beginning and end of the rainy season suggest the contribution of recycled moisture to precipitation occurs during these periods, under low relative humidity conditions. Assuming a constant condensation temperature, the observed seasonal variation in isotopic composition of precipitation is probably as results of the (1) rain out of Atlantic moisture, (2) monthly rainfall amounts, (3) addition of inland recycled moisture, (4) rain formation mechanism, and (5) varied relative humidity. The varied Cl- concentrations are due anthropogenic and oceanic sources, and rainfall amounts.

Keywords: monthly rainfall events, stable isotopes, chloride, Ndop Meteoric Water Line, Cameroon