Magnesium Isotope Variations in Aqueous Samples from a Small Catchment in the Czech Republic

M. NOVAK[1], A. ANDRONIKOV[1]*, O. SEBEK[1], P. KRAM[1], J. FARKAS[2], M. STEPANOVA[1], J. CURIK[1], F. VESELOVSKY[1], E. PRECHOVA[1], I. ANDRONIKOVA[1] AND J. HRUSKA[1]

[1] Czech Geological Survey, 11821 Prague, Czech Republic (*correspondence: alexandre.andronikov@geology.cz)

[2] The University of Adelaide, Department of Earth Sciences, Australia (juraj.farkas@adelaide.edu.au)

Magnesium is one of the major elements in fresh water having key physiological functions in plants. $^{26}Mg/^{24}Mg$ isotopic ratios in aqueous samples from small catchments can provide new insights into Mg cycling in the Critical Zone. We studied Mg isotope systematics of aqueous samples from a small forested catchment (NAZ) located on amphibolite bedrock. Samples of runoff, soil water, bulk precipitation and canopy throughfall were collected in winter and in late spring. Except for bulk precipitation (0.03 ppm in winter and 0.04 ppm in spring), concentration of Mg was season dependant. Mean throughfall Mg concentration was 0.24 ppm in winter and 0.40 ppm in spring. Soil water displayed Mg concentration of 1.2 ppm in winter and 0.90 ppm in spring. Runoff samples had 1.6 ppm Mg in winter and 3.8 ppm in spring that was consistent with variations in the discharge rate. $\delta^{26}Mg$ values were season dependant for all types of aqueous samples. Mean $\delta^{26}Mg$ value of bulk precipitation was significantly lower in sample collected summer than in those collected in winter (-1.4 vs. -1.0‰, respectively). Similar relations were observed for throughfall (-1.0 and -0.8‰, respectively), soil water (-1.1 and -0.6‰, respectively), and runoff samples (-1.0 and -0.5‰, respectively). In all cases, aqueous samples Mg was isotopically lighter than the bedrock Mg (mean $\delta^{26}Mg$ of bedrock was -0.3‰). Variations in $\delta^{26}Mg$ values for bulk precipitation may reflect input from dust and aerosol of different origin. Season variations in throughfall Mg isotopic composition are consistent with such variations in bulk precipitation, but could partly be due to interaction with plants, which, in turn are known to change their isotopic composition during different periods of the growing cycle. Observed seasonality in Mg isotopic composition of the runoff is consistnt with $\delta^{26}Mg$ variations in soil water, one of the major sources for small streams. In winter, the shift toward heavier Mg isotopic composition of the runoff may indicate stronger contribution of mineral weathering from saprolite which was characterized by higher $\delta^{26}Mg$ values.