Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AHW026-11 Room:201A Time:May 27 17:00-17:15

Do ion dynamics represent the hydrochemical characteristics in headwater catchments?

Tomomi Terajima[1*], Mihoko Moriizumi[2], Tomohiro Nakamura[3]

[1]DPRI, Kyoto University, [2]Nat. Agr. Res. Ctr., [3]Suri Keikaku Co.Ltd.

To understand the effect of complexation in transporting major metals, the concentrations of Na, Mg, Ca, Si, and fulvic acid like materials (FAM) were measured in two headwater streams of coniferous and deciduous catchments. The differences of concentration between total elements (T-Na, -Mg, -Ca) and ionic materials (Na+, Mg2+, and Ca2+) were equated with the concentration of non-ionic materials (NIM). The rates of NIM to the total elements in the coniferous and deciduous catchments respectively ranged 0% to 40% and 0% to 70% in stream baseflows and 5% to 60% and 20% to 60% in stormflows. In the stream baseflows, the relationships between NIM and total Si (T-Si) showed the high correlation ($r>0.9$) in both catchments. In contrast, in the stormflows, the relationships between T-Si and FAM showed good correlations ($r>0.8$) in both catchments, implying the organic-inorganic complexation was promoted. However, in the coniferous catchment, the good correlations ($r>0.8$) between NIM and T-Si or FAM were provided mainly at the rising limbs of the hydrograph, contrastive to the good correlations ($r>0.8$) both at the rising and falling limbs of the hydrograph in the deciduous catchment. These things exhibited that #1) in the low flow conditions, the complexation of the major metals with clay minerals could be the main process in transporting NIM in both catchments, #2) throughout the storm events, the complexation of clay minerals and humic substances (organic-inorganic complex) could be promoted in both catchments, #3) only at the rising limb of the storm hydrograph in the coniferous catchment, the complexation of the NIM with the organic-inorganic complex may have been the main process in transporting NIM, however, at the falling limb of the hydrograph, the NIM transport may have resulted from the effect of other materials such as organic acids, likely due to the more active production of organic acids in the soils of the coniferous than in the deciduous catchments, and #4) in the deciduous catchment, the NIM transport in the stormflows could be mainly controlled by the organic-inorganic complex throughout the storm events, on account of the small effect of the organic acids that may have resulted from low production in the soils. These findings emphasize that not only the ion dynamics but also the active complexation of Na, Mg, and Ca in freshwater environments, as well as the effect of differing vegetation on their complexation, should be carefully examined in the headwater hydrology.

Keywords: fulvic acid, organic acid, major metal, fresh water environmt, organic-inorganic interaction