Geochemical and isotopic investigations of surface waters in Chuncheon, Korea

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The Han River is the largest river in South Korea in terms of the size of watershed and water discharge, and consists of two major tributaries: the North Han and South Han Rivers (NHR and SHR). The Soyang River (SR) is one of the major tributaries of the NHR, and joins the NHR at the Euiam Lake. In order to investigate geochemical and isotopic characteristics of river waters affected by a medium-sized city, Chuncheon, we have collected a total of 109 surface water samples from the NHR, the SR and the Euiam Lake. Of these surface waters, the SR is directly influenced by the city of Chuncheon, and it is characterized by much higher concentration of dissolved ions in the lower reaches relative to the NHR the Euiam Lake waters. Especially, it is observed that the concentration of dissolved ions of the SR is the highest in summer. Compared to the SR, the NHR is much lower in concentrations of dissolved solutes, indicating little contamination by anthropogenic sources. The Euiam Lake is located at the confluence point of both rivers, thus this lake waters plot between chemical compositions of both rivers indicating a mixing relation. On a plot of oxygen and hydrogen isotopic compositions, all water samples plot in a similar range near the local meteoric water line (LMWL) of Park *et al.* (2006), and this indicates all surface waters originate from similar sources of meteoric origin. Most samples are enriched in oxygen isotopic compositions, and thus slightly deviate from the LMWL, implying slight evaporation from reservoir surfaces.

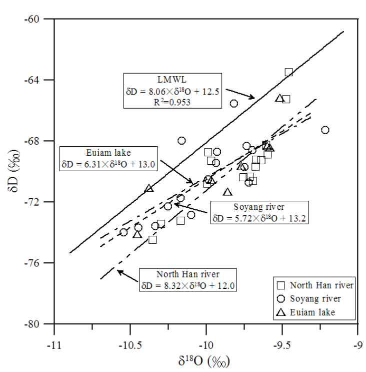

Figure 1. Oxygen and hydrogen isotopic compositions of the surface water samples collected in the Chuncheon area.

Reference

Park Y., Lee K.S. and Yu J.-Y. (2006), *Journal of the Geological Society of Korea*, **42**, 283-292 (in Korean with English abstract).

Diel biogeochemistry of the Rio Agrio, Argentina

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Rio Agrio in Argentina is a geogenically acidic stream that derives its low-pH waters from springs on the flanks of the active Copahue Volcano. These springs are fed partially by off-gassing (SO_2, HCl, HF) of the magma-chamber beneath the volcano. This study reports the results of three diel (24-h) water samplings in three different pH regimes (3.2, 4.4 and 6.3) along the river which is acidic for ~40km. Changes in the concentration and speciation of Fe dominated the diel chemical changes at all three sites. At the two lower pH sites, dissolved Fe(III) concentrations decreased during the day and increased at night, while dissolved Fe(II) showed the inverse temporal pattern. These cycles are explained by Fe(III) photoreduction, as well as a diel, temperature-dependent change in the rate of precipitation of hydrous ferric oxide (HFO). A correlation was observed between Fe(III) and As at the pH 3.2 site, most likely due to co-precipitation of As with HFO. At the downstream (pH 6.3) location, Fe(II) concentrations increased at night, as did concentrations of rare earth elements. Photoreduction does not appear to be an important process in this reach, although it may be indirectly responsible for the observed diel cycle of Fe(II) due to advection of photochemically produced Fe(II) from acidic upstream waters. These results are very similar to diel trends recently obtained from mining-impacted streams receiving acid rock drainage (Parker *et al.*, 2007). The results help form a link between geochemistry and microbiology in acidic riverine ecosystems. For example, Fe(III) photoreduction produces chemical potential energy (in the form of metastable Fe^{2+}) that helps support the bacterial community in this unique extreme environment.

References

Parker *et al*., (2007) *Water, Air, Soil Pollut.* **181**, 247-263.