Identifying factors controlling groundwater flow and chemistry in an agricultural riparian zone in mid-western Korea

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Goundwater flow system and hydrogeochemical processes were assessed by dissolved constituents and water stable isotopes of groundwater in an riparian zone heavily affected by agricultural activities including seasonal groundwater pumping which is much higher during winter to aid in heating of greenhouses. The spatial difference of recharge sources was revealed by water stable isotopes. Concentrations of Fe and Mn were seasonaly fluctuated due to variation of groundwater redox condition, which is, in turn, closely related to changes in groundwater level.

We performed principal component analysis (PCA) with hydrogeochemical variables to identify controlling factors for groundwater chemistry. Three principal components (PCs) were identified: (1) anthropogenic contamination correlated with Ca, Mg and Sr, (2) water-rock interactions positivly involving Na, HCO_3, and F, and (3) redox processes related to dissolved oxigen, Fe, and Mn. A previous study for the regional area with various land uses including the study area showed that contamination processes from agricultural activities, redox processes, and water-rock interactions were represented by PCs 1, 2, and 3 [1]. The difference seems to be reuslted from that our site is composed of paddy and floodplain areas in a riparian zone and it is highly likely to be affected by stream-aquifer interactions. Our study suggested that anthopogenic contamination mainly control variances in groundwater chemistry, which is consistent with the reults of the previous study. It is noteworthy that water stable isotopes were only associated with a sepearte component other than major PCs 1, 2, and 3, which showed that they were less correlated with hydrogeochemical parameters.

[1] Koh et al., 2009, *Hydrol. Process.*, 23, 2915-2928