A possible evidence of urbanization effect on the light precipitation in the mid-Korean peninsula

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The continuous urbanization by a rapid economic growth and a steady increase in population could affect the meteorology in the downstream region [1]. This study presents the associated analysis of long-term (1972~2007) precipitation trends in the mid-Korean peninsula and the WRF model simulation for a golden day (2009/2/11). The mid-Korean peninsula has very favorable geographic characteristics for the study of urbanization effect on the cloud and precipitation in the downstream region such that seoul metropolitan area is located in the west, with relatively flat area in the east, and the big mountains along the east coast. The analysis stations consist of the urban region (Seoul, Incheon, Suwon), its downwind region (Chuncheon, Wonju, Hongcheon), and the mountainous region (Daegwallyeong). The trend of population, as a surrogate of urbanization, continues to increase. The category of precipitation amount (PA) is divided by the intensity such as light precipitation for PA≤1 mm d^{-1}, intermediate for 1 mm d^{-1}<PA≤10 mm d^{-1}, and heavy for PA>10 mm d^{-1}, respectively.

During the long-term period, PA and PF (precipitation frequency) in the downwind region of urban area significantly increased for the westerly and light precipitation case only, while PA and PF in the mountainous region decreased. Especially the enhancement ratio of PA and PF for the downwind area vs. urban area remarkably increased, implying the possible urbanization effect on the downwind precipitation. In addition, the WRF simulation applied for a golden day demonstrates the enhanced convergence and its associated updraft in the downwind area (about 60 km from the urban), leading to an increase in the cloud mixing ratio.

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[1] Alpert *et al*. (2008*) J. Appl. Meteor. and Climat*. **47**, 933-943.

Polysaccharide fractionation of soil organic matter due to reaction with ferrihydrite

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Ferrihydrite, a poorly crystalline Fe oxyhydroxide, is known to be highly reactive towards soil organic matter (OM) and may play an important role in its long-term stabilization. To investigate composition and maximum OM loading of ferrihydrite-OM associations, we performed adsorption and coprecipitation experiments at pH 4.5 using the water-extractable OM of a Podzol forest-floor layer. The reaction products were studied by ^{13}C CPMAS NMR, FTIR and analysis of hydrolyzable neutral polysaccharides. To better understand the behavior of polysaccharides, adsorption and coprecipitation experiments were also done with glucose, galactose and glucuronic acid.

Adsorption and coprecipitation of the forest-floor extract yielded similar maximum loadings of 195 and 170 mg C g^{-1} ferrihydrite. Relative to the original forest-floor extract, the ferrihydrite-associated OM was enriched in polysaccharides, but depleted in aliphatic C and carbonyl C, especially when adsorption took place. Moreover, mannose and glucose were bound preferentially to ferrihydrite, while fucose, arabinose, xylose and galactose remained in the supernatant. This fractionation of sugar monomers was more pronounced during coprecipitation. Experiments with synthetic sugar monomers resulted in relatively low maximum loadings of ~15 and ~25 mg C g^{-1} for glucose and galactose, whereas glucuronic acid produced a maximum loading of 72 mg C g^{-1}. Signals of ferrihydrite-associated glucose and galactose were hardly detectable by FTIR, whereas spectra of ferrihydrite-associated glucuronic acid closely resembled that of the ferrihydrite-associated forest-floor extract.

We conclude that the observed preferential association of polysaccharides from natural OM with ferrihydrite is not caused by direct interaction of the neutral polysaccharides' hydroxyls. Instead of that, we assume that (i) the dominant adsorption mechanism is outer-sphere complexation of carboxyls on the ferrihydrite surface and (ii) the enrichment of glucose and mannose in the ferrihydrite-associated OM may be explained by a preferential association of these monomers with carboxyl-rich compounds.