The carbonate weathering-related carbon sink fluxes under different land uses/covers: a case study from the Shawan Simulation Test Site, Puding, SW China

QINGRUI ZENG[12] ZAIHUA LIU[1]

[1] State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, CAS, Guiyang, China. zengqingrui@mail.gyig.ac.cn

[2] University of Chinese Academy of Sciences, Beijing, China.

In the science of global carbon cycle, carbonate weathering-related carbon sink makes a large contribution to the missing carbon sink. Establishing an optimal land use/cover may be an effective and feasible way to increase the carbon sink potential. However, understanding both the hydrologic (runoff depth-RD) and hydrochemical (dissolved inorganic carbon-DIC) features under different land uses/ covers is essential for making rational plans of land use/ cover changes to increase the carbon sink. Considering the complexes of a natural karst catchment, a simulated water-carbon fluxes test site, Shawan Simulation Test Site with five land uses/covers (bare rock land, abandoned land, crop land, grass land and shrub land), was established in Puding, SW China to make catchment boundary, land use/cover and runoff clear and under control. Hydrochemical parameters and flow rates were measured regularly from Jul. 2015 to Sep. 2016 covering a complete hydrologic year to investigate the hydrochemical and hydrologic responses to land use/cover and weather conditions. The average DIC concentration ([DIC]) ranking, from high to low, was grass land, shrub land, crop land, abandoned land and bare rock land, which was determined by corresponding soil CO_2 concentrations. However, RD almost ranked in a reverse order. It was, from high to low, bare rock land, abandoned land, crop land, shrub land and grass land. The carbon sink fluxes (CSF) ranking, from high to low, was grass land, crop land, shrub land, bare rock land and abandoned land. A new parameter named LCIC (Land use/cover Change Impact on CSF) was defined to compare the impacts of land use/cover change on [DIC] and RD, and evaluate their combined effects on the CSF. Compared to bare rock land, the absolute values of LCIC (|LCIC|s) were greater than 1, and CSFs were larger for the three tanks with vegetation coverage; while $|LCIC| < 1$, and the CSF is smaller for abandoned land. Finally, it was found that grass land may be an optimal land use for increasing potential carbonate weathering-related CSF, which is important for the carbon management against global warming.