Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)
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HGM021-08 Room:301A Time:May 25 16:00-16:15

Field experiments of limestone weathering: dissolution rates and hydrological conditions

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To examine dissolution rate of limestone under various hydrological environments, field experiments for dissolution of limestone tablets were performed in Abukuma mountains and Akiyoshidai Plateau. Field experiments in Abukuma Mts. were conducted in 4 sites with different lithological or hydrological conditions around a karst plateau. Another series of experiment was conducted at 4 sites around a doline in the Akiyoshidai karst area. Tablets were buried in soil at depths of 50 cm or 15 cm. Limestone blocks taken from the Abukuma area were used for tablets (diameter of 3.5 cm and thickness of 1 cm), and these tablets were placed in stream sediments or soil more than 2 years. Alkalinity, pH and major ion concentrations were measured every month for stream sites in Abukuma, and soil moisture contents were measured at soil sites. The result indicated that hydrological condition, the soil moisture response, in particular. Unsaturated soil sites give dissolution rate of 0.08-0.10%/year, whereas dissolution rate increases upto 3% at saturated soil sits. Stream sites also give higher dissolution rate (2-6 %/y) except for karst stream where the saturation indices of calcite (SIc)The dissolution rate increased with decreasing SIc value is very high (-0.3).

Keywords: limestone, karst landform, field weathering experiment, dissolution rate