Geophysical Research Abstracts
Vol. 18, EGU2016-5573, 2016
EGU General Assembly 2016

Landslide-induced changes in soil phosphorus speciation and availability in Xitou, Central Taiwan

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Phosphorus is an important nutrient in forest ecosystem. In tropical/subtropical areas, phosphorus is generally limited because of strong soil weathering but its speciation and availability can be changed by disturbances, such as the geological landslide events. In this study, we evaluated the changes in soil P speciation and availability after landslide in a mountainous forest ecosystem in Xitou, central Taiwan. Five soil pedons along a landslide/nonlanslide affected sequence from deep landslide deposit to nonlandslide were collected. The Hedley's sequential extraction procedure and synchrotron-based phosphorus x-ray adsorption near edge structure (XANES) spectroscopy were applied for the surface 0-10 cm and 10-20 cm soils to provide information concerning chemical and structural composition of phosphorus. The results indicated that plant available P (Resin-P + $NaHCO_3$ extract P) and total P were reduced after landslide, from 150 and 500 mg kg-1, respectively, at nonlandsliding sites to 50 and 350 mg kg-1 at landsliding sites. However, the apatite-type P was significantly increased after landslide, from about 70 mg kg-1 at nonlandsliding sites to around 200 mg kg-1 at landsliding sites. Similar trend of enhanced apatite-type P after landslide was also observed in the XANES spectra. The ryegrass pot experiment confirmed that the landsliding soils were less fertile and had less growth rate. However, both nitrogen and phosphorus nutrients were limited at landsliding sites. The results demonstrated that soil P speciation and availability were significantly altered after landslide; these resultant changes are expected to influence functions in forest ecosystems.