論　文

Distribution of Ultisols and Oxisols in the serpentine areas of East Kalimantan, Indonesia

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Summary

In Southeast Asia, Ultisols are commonly distributed on sedimentary rocks and Oxisols on ultramafic rocks. To investigate the importance of parent material on the formation and distribution of Ultisols and Oxisols, the effects of parent material on soil physico-chemical and mineralogical properties were analyzed using soils derived from serpentine and sedimentary rocks in East Kalimantan. The pH and concentrations of bases and Fe oxides in soils decreased in the order serpentine>mudstone>sandstone. Oxisols are rapidly formed through loss of Si and relative accumulation of Fe oxides on the easily-weatherable serpentine and the richness of bases and Fe limits lessivage and maintains a high base saturation. On Fe-rich mudstone, Ultisols are formed through lessivage and acidification. On base and Fe-poor sandstone, clay destruction by acidification and lessivage is responsible for clay enrichment of the subsoil. In East Kalimantan, the major pedogenetic processes are lessivage and acidification. Ferralitization is not a common process. The leaching condition and the lower concentrations of bases and Fe in sedimentary rocks than in serpentine could acconnt for the dominance of Ultisols in East Kalimantan. Because serpentine is easily weathered to oxic materials, parent material is also a primary factor responsible for the distribution of Oxisols in this area.

1. Introduction

In the humid tropics, the vast majority of soils are strongly weathered and heavily leached over long periods of time (Eyre, 1963). The most typical soils of tropical regions are Oxisols and Ultisols, which account for 23% and 20% of land area, respectively (FAO-Unesco, 1971-1979). Oxisols are characterized by a deficiency of easily-weatherable minerals, and a dominance of low activity clay (e.g. kaolins) and Al and Fe oxides (Buol and Eswaran, 1999). This is caused by ferralitization, a process resulting in an absolute loss of Si (desilicification) and a relative accumulation of Al and Fe oxides (Bravard and Righi, 1989). Oxisols are formed on continental shields of South Africa and America and on localized ultramafic rocks (Buol and Eswaran, 1999). Ultisols, or red-yellow podzolic soils (in Indonesia), are characterized by argillic or kandic B horizons with silicate clay illuviation and low base saturation (West *et al.*, 1997). These features result from acidification and clay migration driven by lessivage and chemical dissolution (Bravard and Righi, 1991; Koch *et al.*, 1992; Do Nascimento *et al.*, 2004). Ultisols are formed on both flat and sloping topography and on a variety of parent materials (FAO-Unesco, 1979).

In Southeast Asia, Ultisols are the most widespread soils, representing 51% of land area (FAO-Unesco, 1979)

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