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*The hardening process of ferruginous
accumulations in New Caledonian oxisols*

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A sheet of peridotite, mainly dunite and harburgite, covers 30% of the surface of the tropical island of New Caledonia (166° to 168°E, 20 to 22°S). Since the Miocene, intensive tropical weathering has affected the peridotite massif. On the peridotite formations, the yearly average rainfall ranges from 2000 to over 4000 mm.

Under rapid conditions of drainage, and a humid climate, MgO and SiO₂ (which represent respectively 45 and 40% of the peridotite chemical composition) are wholly exported in solution from landscape, and the weathering residues are essentially Fe₂O₃ (> 60%), Al₂O₃ (5-10%), Cr₂O₃ (1-3%). The exportation of 90% of the initial rock component creates some "karstic" features, and dolines are frequent.

These weathering residues form very thick oxidic soil profiles (over 20 m) where Al substituted goethite (10-12% Al₂O₃) is the main component of the upper part of the soil profile. These soils are never indurated when located on slopes, with good drainage conditions. However, the top of most of the peridotitic mounds, flat peneplains stepped on the sides of isolated peridotite massifs, and the southern plain are composed of strongly indurated hydroxydes forming a 1 to 2 m thick hard horizon. This horizon always occurs on the upperpart of the weathering zone. This induration process has been observed in a large swampy depression located in the peneplain of the Great Southern Massif. A rapid decrease in the water level (caused by a tectonic movement) induced the precipitation of a very low Al substituted goethite associated in places with lepidocrocite around pores or around plant roots. In these reduced conditions, goethite is associated with manganese oxydes and with siderite. Goethite pseudomorphs after vegetal cells forms a reticular network, which is composed of vermiform or scoriaceous hard accumulations. This type of hardening is fast, recent (< 120 000 yrs), massive and generalized to the whole flat platform that has emerged from the swampy depression. The hardening may occur in all dolines or swampy depression filled with oxidic materials in reduced conditions, when the watertable level drops rapidly. This hardening process may also be extended to the formation of most ironpans occurring on New Caledonian peridotites. The vermiform and scoriaceous accumulations resembles formation of plinthite, but not ferricrete because there are no hematitic concretion and/or pisolitic accumulation. These hard accumulations do not form in kaolinic environments with contrasted climatic conditions, but in oxidic environments with humid climatic conditions.

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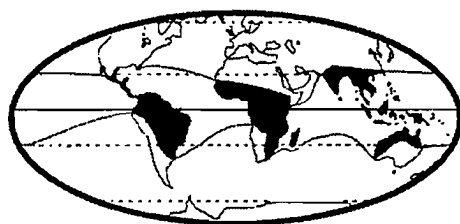
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