

Measurement and characterization of hydraulic conductivity of peridotites in New Caledonia

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The Peridotite Nappe obducted on New Caledonia in Late Eocene. Since its emersion in Oligocene, a deep weathering profile has developed and now covers the fractured and serpentized peridotites. From top to bottom, the weathering profile consists in one hard layer of ferricrete, a semi-impervious layer of laterites (also termed 'red laterites') and saprolites ('yellow saprolites' or 'fine saprolites'), and a coarse saprolites and fissured / highly fractured peridotites layer. In the study area which is the southern part of the Massif du Sud of New Caledonia, ferricrete is around 5 m thick, laterites around 40 m and coarse saprolites around 10 m. Thickness of fissured peridotites is an ongoing research topic.

This complex aquifer has been characterized through the study of hydraulic conductivity of the laterite–fine saprolites and coarse saprolites-fissured peridotites layers. Slug tests have been performed on nearly 40 piezometers of the Massif du Sud. Additionally, 11 short duration pumping tests have been analyzed and the hydraulic conductivity estimated. Distribution of this parameter is established for the two main layers of the weathering.

Hydraulic head data and the statistical distribution of field hydraulic conductivity data are used to regionalize hydraulic conductivity over a 30 km² area. This map allows highlighting structural heterogeneities from hydrodynamic data only. Finally, hydraulic conductivity data estimated from various nesting-scales, i.e. slug tests, pumping tests and regionalized hydraulic conductivity, are used to analyze scale effects.