

## Is the chloritized and sericitized Mt. Roe basalt, Pilbara, Australia, Archean paleosol?

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The alteration of 2.75 Ga. Mt. Roe basalts, Australia were studied to estimate if they are paleosols or hydrothermal products. Mt. Roe basalt changes to chloritized basaltic layer, sericitized layer then to sandstone toward upward. The sandstone is overlain by another flow of basaltic tuff with diaspore-pyrophyllite vein in it. Total iron content and Ferric/Ferrous ratio increase upward in chloritized layer. The former decreases deeply in the layers other than chloritized one. The filling temperature of vein quartz is rather low, and methane was detected. These evidences suggest that the basalt and basaltic tuff have been weathered under rather oxic condition, and that at the later stage mainly tuffaceous layer hydrothermally altered to sericite.

Two alteration profiles of Mt. Roe basalts occurred near Wimcreek, Western Australia were studied to estimate if they are paleosols or hydrothermally altered zones. The Mt. Roe basalts sit near the bottom of the Fortescue Group and were erupted 2765 Ma±10 (Arndt et al., 1990). There have been several studies on the alteration zones of Mt. Roe basalts (Macfarlane et al., 1994), in which the zones were reported as paleosols and as a strong evidence of oxygen poor atmosphere around 2.7 Ga.

Samples of two alteration zones were collected at the same localities to previous studies, and referred to as MR-1 and MR-2 samples. In the field observation, both profiles show the repeated flow of basaltic lavas and basaltic tuffs. Sometimes sediments are interbedded among them.

In the MR-1 profile, rather fresh Mt. Roe basaltic lava changes to chloritized basaltic lava layer, sericitized layer then to sandstone with ripple mark toward upward. The change from chloritized layer to sericitized layer is rather sharp. The sandstone is overlain by another flow of basaltic tuff with diaspore-pyrophyllite vein in it.

In the MR-2 profile, the change is the same as MR-1 profile except for not having sediment layer.

Mineralogical study of two profiles by XRD and microprobe analyses along with the microscopic observation shows that the sericitized layers are basaltic tuffs.

The contents of major and trace elements including REEs were analyzed by XRF method. The ratio among Al, Ti, Zr and Hf is almost constant throughout two profiles, suggesting that the basalt and tuff were in the same origin. Total iron content and Ferric/Ferrous ratio increase upward in chloritized layer. The former decreases deeply in the sericitized layer.

Quartz veins occurred in basaltic layer, tuffaceous layer and sediments contain lots of fluid inclusion. The filling temperature of which measured by Laser-Raman method is rather low (less than 150 degrees Celsius). Methane gas was weakly detected in the inclusions, but other gasses such as carbon dioxide were not.

These evidence suggest that the basalt and basaltic tuff have been weathered under rather oxic condition, and that at the later stage mainly tuffaceous layer hydrothermally altered to sericite, associated with diaspore-pyrophyllite, apatite vein and reformed veinlets of monazite, rutile and/or iron hydroxide. The weakly acidic- and reduced hydrothermal solution flew into porous tuffaceous layer leaching alkali and alkaline elements as K, Na, Ca, Mg and Fe.