# Ultrafine Particle Movement In The Regolith: Field And Experimental Evidence

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A forest of halloysite struts connecting up fine silt size clay aggregates allow the movement of clay size particles between the struts (0.1 to 2μm). Close packed clay aggregates have microchannels five μm in diameter also allowing fine clay movement. Both types occur in weathered rhyolitic boulder colluvium in Hong Kong. Macropipes are found in this material and originate from joining up of these microforms. Movement of water at $10^{-4} ms^{-1}$ has the drag force to dislodge particles 0.5μm in diameter. Piping can usually commence at and above this permeability. Bulk densities range from 1.2 to 1.7 $tm^{-3}$. Porosities vary from 50 to 25 percent. Experiments with deionised water flowing through tubes packed with remoulded weathered granite under constant head showed very low clay eluviation after an initial flush of clay. Drying and wetting and escape of entrapped air, particularly bubbles, gave rise to severe clay shift. With debris of bulk density 1.84 $tm^{-3}$ channelling commenced at eight hours. With debris of bulk density 2.06 $tm^{-3}$ the tube burst at 812 ml of flow. Under steady conditions the long experiments showed final rates of clay shift of about 30 $\mu g\ g^{-1}\ day^{-1}$.

The prediction of a capillary bundle model where concentration is plotted against amount of water passed applies to these runs. From a start at zero with sulphates in water, clay shift in deionised water rises to a peak and then decays, as it does in a sandy aquifer in South Carolina (Seaman et al.1995) The orientation of the sample tubes is critical; upright, the exit is prone to boiling; downwards, filter action usually blocs silt; horizontal, several process zones occur (Howard & McLane III 1988). If the tube is tilted up slightly (at 7˚) groundwater flow is simulated. Moreover a trap under the exit receives silt from flowing water. Clay movement originates in "film" water (cf New Scientist 24/31 December 2005 p.38).

**References**

Howard, A.D. and McLane III, C.F (1988) Erosion of cohesionaless sediment by groundwater seepage. Water Resources Research, 24 (10), 1659-1674.

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