
Clay Mineral Formation in a Deeply Weathered Boulder Conglomerate in North-East Scotland*

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Abstract: The clay minerals formed in a deeply weathered boulder conglomerate of Middle Old Red Sandstone (Devonian) age in north-east Scotland have been studied by a variety of physical and chemical techniques. The granite and granulite boulders in this deposit are completely weathered. With the exception of microcline, all the feldspars in these rocks—orthoclase feldspar, orthoclase-microperthite, albite, and oligoclase—weather to a Cheto-type montmorillonite, poor in iron. Electron and optical microscopy indicate that the weathering transformation is a direct one, without the intervention of any intermediate crystalline or well-defined amorphous phase. Structural control of the primary mineral over the formation of the montmorillonite seems to have been a minimal factor and the evidence suggests that the clay mineral crystallized from the soluble or colloidal products arising from the decomposed feldspars. Smaller amounts of kaolinite also formed during weathering but largely from the weathering of muscovite. The environment in which these changes occurred seems to have been alkaline in a relatively closed system. Chemical analyses of related cores and weathered shells of granite and granulite boulders show only a slight decrease of silica and an increase in magnesia. Judging from the extent of alteration to secondary clay minerals, the order of resistance towards weathering of the primary minerals in these rocks is plagioclase = orthoclase < muscovite < biotite < microcline < quartz.

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