

Black Subaqueous Pyroclast-rich Deposits: Primary or Secondary Origin?

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Numerous types of black volcanoclastic rocks occur within the graptolite-bearing shales of the Ordovician Beauceville Formation. There are several types of fine-grained siliceous rocks deposited by low to high density turbulent flows, and coarser-grained rocks composed of idiomorphic to broken feldspar, volcanic quartz crystals and felsic volcanic rock fragments deposited by high density turbulent flows. Also common, but more difficult to interpret, are doubly graded successions of beds that have structures similar to proposed subaqueous pyroclastic deposits. The coarse-grained massive lower division also contains abundant lapilli- and tuff-size pumice with glass shards. However, the black color of these pyroclast-rich rocks indicates a thorough mixture with non-volcanic black shale, a feature incompatible with a primary origin. Massive beds often contain black shale rip-up clasts of various shapes, orientations, and sizes (> 2.5 meters in length) that give a chaotic aspect to some beds. Rare rip-up clasts of laminated fine-grained tuff also occur. Alternating light-colored and dark-colored laminae and beds characterize the upper part of the lower and upper divisions, thus indicating elutriation and sorting of the finer-grained non-volcanic material. These features support a model of rapid resedimentation by slope failure of primary pyroclast-rich deposits laid down on thick black shales. Caution must be used in assessing a primary origin to subaqueous volcanoclastic rocks based on the presence of a doubly graded divisions and relative abundance of pyroclasts.