

The Dalradian Supergroup contains three distinct glacigenic units, formerly termed 'Boulder Beds', which are correlated with widespread Neoproterozoic glaciations. The oldest and thickest unit, the Port Askaig Formation, marks the Appin–Argyll group boundary of the Dalradian Supergroup and has been correlated with the Middle Cryogenian (Sturtian) glaciation. The Auchnahyle Formation, a diamictite-bearing sequence near Tomintoul in NE Scotland, exhibits strong lithological similarities to the Port Askaig Formation. Both these glacigenic 'Boulder Bed' units contain abundant dolomite clasts in their lower parts and more granitic material at higher levels. Both metadiamictite units are overlain by thick shallow-marine quartzite units. C isotope data from Appin Group carbonate strata below the Auchnahyle Formation support this correlation. U–Pb laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) detrital zircon data from the Auchnahyle Formation metadiamictite differ slightly from the Port Askaig Formation, but are similar to detrital zircon spectra obtained from the Macduff Formation, a diamictite unit in the younger Southern Highland Group of the Dalradian Supergroup; both apparently reflect derivation from local basement rocks. No detritus younger than 0.9 Ga is observed, so the data do not constrain significantly the depositional age of the glacial strata. A thin tholeiitic pillow basalt unit in the lower part of the Auchnahyle Formation is geochemically distinct from pre-tectonic metadolerite sills and from basic metavolcanic rocks up-section. A Sturtian (c. 720–700 Ma) age for the Auchnahyle Formation metadiamictite would imply that this basaltic volcanism represents the oldest recorded volcanic activity in the Dalradian Supergroup and is inferred to represent an early, local phase of proto-lapetan rifting within the Rodinian supercontinent.