

A Paleogene succession from Campbell Island, SW Pacific (64°S)

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In November 2009, the University of Otago's research vessel (*RV Polaris II*) supported a short expedition to Campbell Island. As part of the expedition, a small team of geologists was able to make a pilot survey of the Cretaceous-Paleogene strata exposed in coastal cliffs and in sections on the western side of the Island.

The Campbell Island Cretaceous-Paleogene sequence comprises two formations – the Garden Cove and Tucker Cove Formations, named after the coves of Perseverance Harbour, where they crop out at low tide. Across the western part of the Island, the Garden Cove Formation comprises a >30 m thick, non-marine to marine conglomerate to mudstone fining-up succession of Cretaceous to Paleocene age. It is overlain by the Tucker Cove Formation, which comprises a >100m thick micritic limestone succession of Eocene to Oligocene age.

The section at Limestone Point (52°32.986'S 169°05.417'E) in Northwest Bay is ~20 m thick and exposes the contact between the two formations. Here, the uppermost 9 m of the Garden Cove Formation is exposed in a coastal platform and the lower part of the coastal cliff section. It comprises an olive-back micaceous non-calcareous mudstone, which gives way to a bioturbated glauconitic fine sandstone in the upper metre of the Formation. Immediately underlying the glauconitic fine sand, the upper part of the mudstone contains occasional quartz limestones, is less bioturbated and burrowed with original laminations and possible flaser/wavy bedding still visible. Preliminary paleomagnetic studies suggest that the occurrence of dropstones and the development of glaucony is Late Paleocene in age. Dinoflagellates and foraminifera indicate that the overlying >20 m limestone of the Tucker Cove Formation is Early Eocene in age and the two formations are most likely separated by a non-depositional unconformity.

We contend that the succession at Limestone Point records Late Paleocene cryospheric history, with ice rafting producing the dropstones and increased current velocities initially resulting in the accumulation of glaucony but then preventing further deposition at 64°S until warmer conditions prevailed again in the early-middle Eocene, when limestones of the Tucker Cove Formation were deposited.