

Thesis Abstract

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Thesis Title: Luminescence dating tests of detrital grains from sediment traps, Andvord Bay and Brialmont Cove, Antarctic Peninsula
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D_E values ranged between 11.1 ± 0.7 ka and 31.4 ± 3.4 ka ($D_E = 21 - 58$ Gy), depending on season and depth of deposition. This indicates that these glacial marine sediments were unevenly and poorly bleached at deposition. Variations in luminescence traits between seasons and with trap depth may, however, be helpful for studying sedimentation processes in these fjords. Double-SAR experiments also resulted in anomalously high D_E values. SAR data for one sediment trap sample did exhibit characteristics predicted by Bailey et al.'s (2003) $D_E(t)$ model for poorly bleached sediments. Microprobe analyses did not reveal any significant differences in mineralogy between seasons and depth that would affect apparent age results.

Difficulties (e.g., large, diverse, erratic reservoir corrections) with radiocarbon dating have prompted photonic dating tests on Antarctic glacial marine sediments. This technique (clock zeroing is based on the last exposure to daylight of quartz and feldspar grains) was applied to modern-age sediments collected in two well-characterized fjords on the western side of the Antarctic Peninsula. Our deployed sediment traps collected approximately 14 months of deposition between January 2002 and March 2003. We conducted a series of multi-aliquot infrared-stimulated luminescence (IRSL) tests on polymineral silt-sized grains to evaluate the extent of the clock-zeroing process in this setting, to provide a foundation for applications elsewhere in the region. Comparisons were made between samples on the basis of seasonal differences and trap depth. Several double single-aliquot-regenerative (SAR) dose experiments were also performed on one of the sediment trap samples. Sediments representing summer and winter deposition were also characterized by microprobe analyses.

Had the sediments been exposed to sufficient sunlight at deposition, sediment grains collected by these traps would exhibit very low equivalent-dose (D_E) values. However, single and multi-aliquot experiments resulted in high (and variable) D_E values for both Andvord Bay and Brialmont Cove, which yield erroneously old ages, rather than zero. IRSL experiments have resulted in apparent ages for Andvord Bay ranging between 19.8 ± 1.4 ka and 56.8 ± 5.4 ka ($D_E = 48 - 123$ Gy), while Brialmont Cove

