



[Start](#) | [Grid View](#) | [Author Index](#) | [View Uploaded Presentations](#) | [Meeting Information](#)

GSA Connects 2022 meeting in Denver, Colorado

Paper No. 198-15

Presentation Time: 2:00 PM-6:00 PM

USING CESIUM-137 TO DETERMINE SEDIMENTATION PATTERNS IN TWO PROGLACIAL LAKES - LAGO ARGENTINO, SOUTHERN PATAGONIAN ICEFIELD, ARGENTINA, AND LAKE JOSEPHINE, GLACIER NATIONAL PARK, MONTANA, USA

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Glaciers are a key driver of bedrock erosion in alpine settings, and sediment deposition in proglacial lakes provides a useful record of glacier retreat, subglacial erosion rates, and other evidence of environmental change. Sedimentation rates reflect a variety of processes and characteristics such as glacier and lake size, proximity to the glacier, depositional patterns, other sources of sediment in the basin, and summer melt rates. Accurate dating of lake sediments in glacial systems can be challenging, particularly on sub-millennial timescales due to limited terrestrial organic matter in these environments. Atmospheric fallout of cesium-137 from aboveground nuclear weapon detonation has been used as a tracer for modern sediment age and deposition rates in northern hemisphere terrestrial landscapes; fewer studies have been done in the southern hemisphere, especially farther south than 50° S, and results are likely complicated by lower atmospheric concentrations recorded there. Here we analyze a downvalley transect of cores from two alpine lakes, the ~100 km long ice-contact Lago Argentino in Argentina and from ~2 km long Lake Josephine in Glacier National Park, Montana, the third in a series of paternoster lakes, to assess downvalley variability in sedimentation rates in two endmember glacial lake types.

We subsampled cores in 1 cm intervals and gamma-ray spectroscopy used to measure cesium-137 decays, which was converted to activity based on dried weight. Peak cesium-137 activity in the cores is an approximate equivalent for peak atmospheric radionuclide fallout from 1962-1965 (Agudo, 1998). In Lago Argentino, analyzed cores showed average post-1963 sedimentation rates from 23 mm/yr 20 km from the ice front, to 2.3 mm/yr 80 km downvalley in the main basin (after Van Wyk de Vries et al., 2022). Preliminary results suggest high and episodic sedimentation in ice proximal settings may complicate cesium-137 interpretation. At Lake Josephine, sedimentation rates varied from 0.4-0.8 mm/yr on the upvalley side from cesium-137 and lead-210 dating (Diener, 2015) to 0.4-0.5 mm/yr on the downvalley end using radiocarbon ages (Wydeven, 2009). As expected, cesium-137 concentrations were higher in the North American glacial lake, but southern hemisphere levels were high enough to detect using standard techniques, and coupled with other tools such as varve counting (Van Wyk de Vries et al., 2022) provide a useful dating tool in glacial lakes.

Session No. 198--Booth# 53

[T81. Radiogenic Isotopes as Tracers of Geologic Processes: Dates, Rates, and Proxies \(Posters\)](#)

Tuesday, 11 October 2022: 2:00 PM-6:00 PM

[Exhibit Hall F \(Colorado Convention Center\)](#)

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[Back to: T81. Radiogenic Isotopes as Tracers of Geologic Processes: Dates, Rates, and Proxies \(Posters\)](#)

[<< Previous Abstract](#) | [Next Abstract >>](#)
