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Cosmogenic Be-10 surface exposure data from the Sub-Antarctic Kerguelen Archipelago

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The Kerguelen archipelago (around 49°S 69°E) is the emerged part of the Kerguelen Plateau, a large igneous province in the southwestern Indian Ocean. Information on past climatic and environmental conditions in the region is vital for understanding the past behaviour of the southern westerly winds. The cross-disciplinary project SOUTHSPEERE seeks to investigate past variations in this weather system through reconstruction of temporal and spatial glacier variability from lake records and glacial landforms N and NE of the Cook Ice Cap. Reliable and accurate chronological control is crucial in this context.

Surface exposure dating of glacial geomorphological features S and SE of the Cook Ice Cap has previously been done using in situ cosmogenic Cl-36 [1, 2]. Solifluction and gelifraction processes appear very active in our field area, as do aeolian erosion. Also, highly variable geochemical composition of the basalts and associated intrusions, as well as the degree and type of metamorphism, lead to strong lithology-dependant weathering and erosion rates, as evident from differential weathering reliefs on cm and m scales. The very active surface environment constitutes a challenge for obtaining accurate surface exposure ages.

In the NW part of the archipelago, basaltic lava units altered by meteoric-hydrothermal fluids contain a wide variety of secondary silicate and carbonate minerals [3]. In settings where quartz-filled geodes and fractures in the basalt are located in favourable positions on bedrock and boulder surfaces, analysis of Be-10 in euhedral and microcrystalline quartz offers a means of validating in situ Cl-36 surface exposure ages. Moreover, multi-nuclide analysis would open up for a wide range of process and landscape development studies on this young archipelago. Percolation of hydrothermal fluids in fractures and geodes is probably related to the intrusion of younger (15-5 Ma) subvolcanic rocks [see 3 and references therein]. A meteoric source of the fluids would imply that the secondary silicates contain meteoric Be-10. As meteoric production is greater than in situ production, this may represent a problem for utilising in situ Be-10 for surface exposure dating. If secondary silicate formation occurred early, rather than late in the intrusive phase, complete radioactive decay of the meteoric Be-10 component is expected prior to surface exposure.

110 rock samples were collected for surface exposure dating with in situ cosmogenic nuclides during a field campaign in November and December 2019. Here we present the first Be-10 data from rock surfaces of glacially transported boulders and exposed bedrock.

[1] Jomelli et al. 2017. *Quaternary Science Reviews* 162, 128-144.

[2] Jomelli et al. 2018. *Quaternary Science Reviews* 183, 110-123.

[3] Renac et al. 2010. *European Journal of Mineralogy* 22, 215-234.