



## **A Lateglacial to late Holocene glacial chronology for the Cairngorm Mountains (Scotland): effects of boulder inheritance and snow shielding on age distributions.**

Martin Kirkbride (1), Jez Everest (2), and Doug Benn (3)

(1) University of Dundee, School of Environment, Geography, Dundee, United Kingdom (m.p.kirkbride@dundee.ac.uk), (2) British Geological Survey, Murchison House, West Mains Road, Edinburgh, United Kingdom, (3) University Centre in Svalbard, PO Box 156, N-9171, Longyearbyen, Svalbard.

It is thought that British glaciers disappeared after the Younger Dryas Stadial (YDS, 12.9 – 11.7 k yr). We present cosmogenic  $^{10}\text{Be}$  ages of cirque moraines in the Cairngorm Mountains which include two Lateglacial advances, a speculative early Holocene advance, and a late Holocene moraine probably deposited by a Little Ice Age glacier (17th – 18th century AD). One cirque (CLE) contains evidence of a YDS advance peaking at c. 12.3 k yr, and a probable Little Ice Age (LIA) advance dated to <0.9 k yr. Another cirque (CLW) has an outer moraine dated to between 15.3 and 12.0 k yr. An inner moraine, conventionally regarded as YDS in age, yields  $^{10}\text{Be}$  ages of 11.5 to 8.3 k yr (Lal/Stone time-dependent production model).

The putative YDS moraines are well dated in cirque CLE, but appear too “young” in CLW. We consider how snow-shielding and boulder recycling may have affected age distributions. If these ages are minima from a YDS moraine, snow-shielding and delayed deposition from debris-covered ice may explain low  $^{10}\text{Be}$  concentrations, but this does not explain why similar adjustments are not needed in the neighbouring cirque. Alternatively, ages may be maxima from an early Holocene moraine which incorporated existing boulders. The LIA moraine in CLE contains a high proportion of inherited boulders, but the YDS moraine here contains few. Therefore the proportion of inherited boulders is estimated to be a function of the ratio of debris production during the glacial period and debris production during the preceding paraglacial period. The ratio describes the likelihood of sampling an inherited boulder if the geomorphological history is understood. By this reasoning, an alternative interpretation of the “YDS” moraine in CLW is that an early Holocene glacier (speculatively, the 8.2 k event?) incorporated post-YDS paraglacial rock fall debris.