Geophysical Research Abstracts
Vol. 17, EGU2015-5696-1, 2015
EGU General Assembly 2015

A Europe-wide perspective on Younger Dryas glacier-climate

Ramon Pellitero (1), Brice Rea (2), Matteo Spagnolo (3), Jostein Bakke (4), Philip Hughes (5), Susan Ivy-Ochs (6), Sven Lukas (7), Hans Renssen (8), and Adriano Ribolini (9)

(1) University of Aberdeen, School of Geosciences, Aberdeen, United Kingdom (r.pellitero-ondicol@abdn.ac.uk), (2) University of Aberdeen, School of Geosciences, Aberdeen, United Kingdom (b.rea@abdn.ac.uk), (3) University of Aberdeen, School of Geosciences, Aberdeen, United Kingdom (m.spagnolo@abdn.ac.uk), (4) University of Bergen, Department of Earth Sciences, Bergen, Norway (Jostein.Bakke@geo.uib.no), (5) University of Manchester, School of Environment, Education and Development, Manchester, United Kingdom (Philip.Hughes@manchester.ac.uk), (6) ETH Zürich, Department of Physics, Zürich, Switzerland (ivy@phys.ethz.ch), (7) Queen Mary University of London, School of Geography, London, United Kingdom (s.lukas@qmul.ac.uk), (8) University of Amsterdam, Faculty of Earth and Life Sciences, Amsterdam, Netherlands (h.renssen@vu.nl), (9) University of Pisa, Department of Earth Sciences, Pisa, Italy (ribolini@dst.unipi.it)

Equilibrium Line Altitudes have been calculated for over one hundred reconstructed palaeoglaciers stretching from North Africa in the south to Svalbard in the north and the Cantabrian Mountains in the west to the Balkans in the east. Palaeoglaciers were reconstructed based on landforms dated to the Younger Dryas and published in the academic literature. Strict quality control checks were applied to the chronology and, where necessary, dates have been recalibrated using modern calculators. 3D palaeoglaciers were reconstructed using a semi-automated GIS tool, based on Benn and Hulton (2010), which calculates ice thickness using the bed topography and assumes perfect-plasticity ice rheology. From the 3D reconstructed surfaces ELAs were calculated using another GIS tool (Pellitero et al., 2015). Where data has been generated for several glaciers in a region a single value is determined for both the AAR and AABR methods following Osmaston (2005).

Preliminary results show a smooth S to N decline in ELA along the western seaboard of Europe, as far north as 60°, where it increases sharply in elevation before declining towards the north again. Along the west-east transect the ELA is located between 2000 and 3000 masl, without any consistent large-scale pattern. Locally gradients are present, for example, across the Cantabrian Range and Eastern Pyrenees, and across the west Balkans. Modern day ELA gradients are determined, where possible, along the same transects. This is achieved by determining the zero net balance ELAs from mass balance time series obtained from the World Glacier Monitoring Service. The modern-day ELA gradients are compared to those determined for the YD and are used to interpret large scale atmospheric circulation patterns. For example, the sharp rise in the ELA at approximately 60°N is assumed to be related to the location of the Polar Front. North of this temperatures would be expected to reduce significantly, but in terms of glacier mass balance, this is more than offset by a greater reduction in precipitation.