Geophysical Research Abstracts
Vol. 17, EGU2015-11272-4, 2015
EGU General Assembly 2015

The glaciers of Sierra Segundera (Zamora, NW Spain) during their Maximum Ice Extent: area, volume, Glacial Equilibrium Line Altitude and paleo-climatic implications

Jose María Fernández (1), Jose Ubeda (2), and David Palacios (3)

(1) Universidad Complutense, Dep. AGR y Geografía Física, Madrid, Spain (josemariafernandez@ucm.es), (2) Instituto Geológico Minero y Metalúrgico, Peru. Autoridad Nacional del Agua, Peru. Departamento de AGR y Geografía Física. Universidad Complutense de Madrid, Spain. NGO Guías de Espeleología y Montaña, Spain, (3) Universidad Complutense, Dep. AGR y Geografía Física, Madrid, Spain

The aim of this paper is to reconstruct the Quaternary glaciers which formed the eastern sector of the Sierra Segundera ice-cap (NW Iberian Peninsula) during its Maximum Ice Extent (MIE) local phase (33 ka) in a surface area of 165 km2, to estimate the ice volumes and Equilibrium Line Altitudes (ELAs). The study area presents a wide altimetric range of approx. 1200 m, from the Tera glacier front to the Peña Trevinca (42º14'33" N, 6º47'46" W; 2127 m) and Peña Negra (42º14'58" N, 6º47'39" W; 2121 m) horns, covering a wide plateau at an altitude of over 1700 m.

The reconstruction of the MIE paleoglaciers used a combination of various tools: a rheological numerical model which describes the ice flow, GIS and geomorphological field work to validate the results. The model used here allowed the reconstruction of the surface topography of the paleoglacial ice, even though there is no existing geomorphologic evidence to reveal the thickness of the ice at that time. The GIS enabled the creation of Digital Elevation Models (DEMs) and the estimation of thicknesses and volumes. The reconstructed topography and the delimitation of the geomorphologic features were used to estimate the ELA using the following methods: Area x Altitude Balance Ratio (AABR), Accumulation Area Ratio (AAR), Terminus Headwall Altitude Ratio (THAR) and Maximum Elevation of Lateral Moraines (MELM).

The DEM reconstructed for the surface of the paleoglaciers obtained an estimated maximum ice thickness of over 450 m during the MIE, and a total ice volume of 2.63 x 10(10)m3 for the eastern half of the ice-cap. When estimating the paleo-ELAs, the AABR and AAR methods obtain more logical values. The AABR method obtains BR=1, which questions the BR=2 assumed as representative for medium latitude glaciers with oceanic influence; the paleo-ELA AABR was 1739 m. Applying the AAR method with the ratio 0.65 gives the result 1735 m. The THAR and MELM methods give values of 1637 m and 1651 m respectively for the ELAs, which are different from the values obtained by the methods mentioned above. AABR and AAR are shown to be the most reliable methods as they do not depend on the conservation level of geomorphological features.

The estimated paleoELA in our case study is in an intermediate position between those estimated in nearby glaciers of the same type during the MIE in the Serra da Estrela and la Sierra de Béjar, at 1650 and 2010 m. The contrast is more difficult, however, with the Cordillera Cantábrica, with ELAs ranging from 1100 to 2000 m, depending on orientation.

Research funded by Cryocrisis project (CGL2012-35858), Government of Spain