

## Late Pleistocene deglaciation and paleo-environment in the Retezat Mountains, Southern Carpathians

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This study aims to use in situ produced  $^{10}\text{Be}$  based Cosmic Ray Exposure (CRE) ages to reconstruct glacier evolution in the Retezat Mts, the Southern Carpathians most glaciated area with peak elevations up to 2509 m asl. In the study area currently devoid of glaciers, the calculated theoretical ELA is at  $\sim 2860$  m asl. The paleo-Equilibrium Line Altitudes (ELAs) were calculated over the  $\sim 21$  to  $\sim 13$  ka time period based on the reconstructed glacial stillstands or re-advances geometries using the ssAAR method [1, 2]. Regarding the Northern side of the Retezat Mts, new and re-evaluated  $^{10}\text{Be}$  CRE ages ( $n=34$ ) [3] were used while regarding the Southern side, they all result from a new sampling ( $n=25$ ).

According to the data, the most extended glaciation occurred during the LGM, down to  $\sim 1050$  m asl. on both sides of the Retezat Mts with most probable  $^{10}\text{Be}$  CRE ages of  $21.0^{+0.8}_{-1.5}$  ka and  $20.7^{+0.9}_{-1.0}$  ka. The reconstructed ELA depression in the North was  $\sim 1010$  m while it was  $\sim 1190$  m, in the South where the valleys glacial system (Lăpușnicu – Judele) was significantly larger with longer glacier tongues. At the beginning of the Lateglacial ( $\sim 17$ - $18$  ka) the glaciers withdrew and the North-South difference between the ELA depression was decreased ( $\sim 885$  m and  $\sim 945$  m, respectively). The ELA differences further reduced and vanished for the  $\sim 15.3$  ka glacial event – the last cold stage before the abrupt Bölling/Alleröd warming – with ELA depressions of  $\sim 728$  m and  $\sim 712$  m, respectively. The last glacial phase in the area characterized by small cirque glaciers occurred at  $13.5^{+0.6}_{-0.6}$  ka in the North and  $13.9^{+0.9}_{-0.4}$  ka in the South. By this time, the ELA depression was reduced to  $\sim 660$ - $680$  m. Due to the small glacier size this value may have been influenced by local topoclimatic factors. So far, no data support Younger Dryas or Holocene glaciation of the Retezat Mts.

The elevation difference of the ELAs suggests more precipitation on the Southern side of the Retezat Mts during the LGM. This may indicate a southerly wind regime at this part of Europe, which subsequently gave place to the westerly winds during the warming climate of the Lateglacial.

Using a Chironomidae-based summer temperature (T) reconstruction from the area [4], T and mean annual precipitation (P) at the ELA were calculated for the  $\sim 15.3$  ka stage. Based on Ohmura et al. [5] a  $\sim 4.5$ - $4.9$  °C decrease of T and a  $\sim 10$ - $15\%$  increase of P compared to the present values were calculated.

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