



## **Paleo-glaciers and equilibrium-line altitude across Southeastern Europe - new data from the Southern Carpathians and from the Central Balkan Peninsula**

Balázs Madarász (1), Zsófia Ruszkiczay-Rüdiger (2), Zoltán Kern (2), Marjan Temovski (2,3), Petru Urdea (4), Régis Braucher (5), Aster Team (5,6)

(1) Geographical Institute, Research Centre for Astronomy and Earth Sciences, MTA; Budapest, Hungary, (2) Institute for Geological and Geochemical Research, Research Centre for Astronomy and Earth Sciences, MTA; Budapest, Hungary, (3) Isotope Climatology and Environmental Research Centre, Institute for Nuclear Research, MTA, Debrecen, Hungary, (4) Department of Geography, West University of Timisoara, Romania, (5) Aix-Marseille University, CEREGE, CNRS, LN2C, Aix-en-Provence, France, (6) Georges Aumaître, Didier Boulrès, Karim Keddadouche

Past glaciations in mountain areas above 2000 m a.s.l. in SE Europe have produced typical landscape features such as glacial cirques, U-shaped valleys, moraines and erratic boulders. However, scarce data are available regarding their extent and the chronology of deglaciations.

Previous studies on glacial geomorphology and preliminary glacier reconstruction suggest the occurrence of an icefield with 4.6-7 km long glacier tongues during the maximum ice extent at the Jablanica Mt ( $\sim 41.25^\circ$  N; Central Balkan Peninsula, Macedonia; [1]). In the Retezat Mts ( $\sim 45.35^\circ$  N; Southern Carpathians, Romania; [2-4]) ice-covered plateaus existed to the south of the main drainage divide. This led to an asymmetric glacier system: on the north glaciers were steep and up to  $\sim 8$  km long, while the length of the gently sloping southern glacier system reached  $\sim 20$  km.

In this study, paleo-glaciers have been reconstructed accounting for possible past existence of glacier confluences and ice plateaus, as a basis for the estimation of paleo-equilibrium-line altitudes (ELA). The ELA depends on the temperature and available moisture. As the distribution of precipitation is more variable than the temperature, the study of the regional trends and local differences of the paleo-ELAs may reveal past directions of moisture transport.

The most extended glacial phase in the Retezat Mt was dated using cosmogenic in situ  $^{10}\text{Be}$  exposure ages to the LGM (MIS 2). The ELA of the southern valley system was then  $\sim 100$  m lower than that of the northern valleys, suggesting southerly moisture transport.

The dating of the Jablanica Mt paleo-glacier extents is still in progress. The ELA of its most extensive glacial phase was similar to the MIS 6 ELA of the inland ranges of the Balkan Peninsula [5] and to the LGM ELA of the Retezat Mt, tentatively placing the maximum ice extent of the Jablanica Mt to the MIS 2 or to the MIS 6.

Our preliminary results are in agreement with previous studies suggesting an enhanced meridional moisture transport in the Mediterranean [6-9], and indicate that this had a considerable effect as far inland as the Southern Carpathians.

This research was supported by the NKFIH FK124807 and K119309, by the GINOP-2.3.2-15 projects and by the INSU/CNRS and the ANR through the program "EQUIPEX Investissement d'Avenir" and IRD.

### **References:**

- [1] Temovski, et al., 2018. *Geosciences* 8, 270, 0-21; doi:10.3390/geosciences8070270
- [2] Ruszkiczay-Rüdiger, et al., 2016. *Quaternary International* 415, 216-229.
- [3] Ruszkiczay-Rüdiger, et al., 2017. *GRA* 19, EGU2017-2755
- [4] Ruszkiczay-Rüdiger, et al., 2018. *Geologica Balcanica*; XXI. CBGA Abstracts; 240-241.
- [5] Hughes et al., 2010. *QSR* 29, 3690-3708.
- [6] Florineth and Schlüchter, 2000. *Quat. Res.* 54, 295

[7] Kuhlemann et al., 2008. *Science*, 321, 1338–1340, 10.1126/science.1157638

[8] Kuhlemann et al., 2013. *Quat. Int.* 293, 51–62.

[9] Becker et al., 2016. *Geogr. Helv.* 71. 173-187