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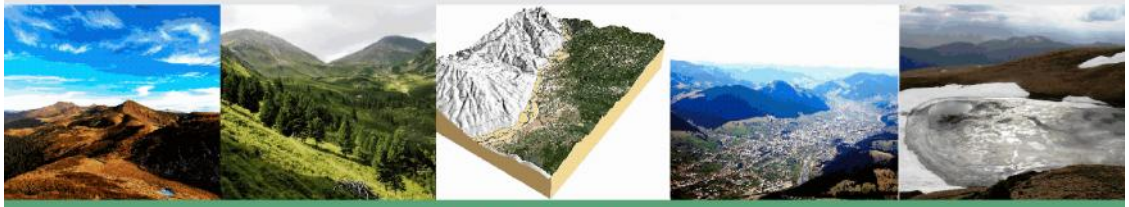

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Cirque development and the glaciation of the Carpathians

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The moderate altitudes of the Carpathian Mountains limited glaciation to cirque and short valley glaciers, but these were widespread: well-developed cirques are found in Romania, Ukraine, Slovakia and Poland. The 'marginal' nature of glaciation means that glaciers formed first on the most favourable (shadiest and leeward) mountain slopes, giving valuable indications of former wind directions (from west-northwest in Romania). Some cirques are completely isolated from others, but several mountain ranges rose sufficiently high above snowline that glaciers and cirques developed on all slopes, as in the Retezat, Făgăraş¸ and especially the High Tatra. However, differences in snowline (palaeo-ELA) are found between different slopes there also. The Low Tatra, by contrast, are strongly asymmetric, with many north-facing cirques.

Cirque development is measured both subjectively (5 grades) and objectively: the relation between these measures is shown by an R^2 of 62% (for Romania) when grade is predicted from maximum gradient, minimum gradient, and plan closure. Cirques larger in horizontal dimensions have better grades. Cirque enlargement in plan is faster than vertical enlargement, as shape changes with size (allometry).

Despite being in an active orogenic belt, Romanian cirques are more similar to those in Britain than to those in British Columbia, where relief and thus vertical dimensions are greater. 'Cirque-in-cirque' forms are common in the higher ranges of Romania: Retezat, Godeanu and Făgăraş. Isolated cirques are relatively simple. Lakes are most frequent on granite, as in the Retezat and High Tatra. Geology affects especially vertical dimensions and gradients. Cirque form relates firstly to glaciological (climatic) factors and secondly to geologic (lithological and structural) factors.

Uplift of the Carpathians is recent and ongoing, so that traces are found only of recent glaciations, and glacial transformation is immature or incomplete. Mountain ranges can be ranked in terms of glacial modification, from the High Tatra and Retezat to the Suhard, Ciucaş and Bihor Mountains. This correlates with the degree of local asymmetry (of cirque aspect).