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Glacial cirque development and distribution in the Romanian Carpathians

M. Mindrescu

University of Suceava, Suceava, Romania (marcel_mindrescu@yahoo.com / Phone: +40742051475)

The mountain glaciation of Romania in the Pleistocene was extensive but remarkable for the dominance of cirque development; there are also a number of glacial troughs but none is longer than 18 km (Lăpuşnicul Mare, Retezat). Using 1:10,000 maps with 5 m contour interval for Maramureş and Călimani and 1:25,000 maps with a 10 m contour interval for other ranges, after field checks we recognise 631 cirques in Romania, which is considerably more than previous authors: we have included all features matching the accepted definition, and subdivided the cirque complexes at some valley heads. 62 cirques are classic, 216 well-defined, 253 definite, 73 poor and 27 marginal: these were analysed using the procedures of Evans and Cox (1995) and Evans (2006). 87% of the cirques (89% of the classic ones) are in seven ranges with over 35 cirques each: Rodna, Iezer, Făgăraş, Parâng, Retezat, Godeanu and Ţarcu. Glaciation was heaviest and most symmetrical in Transylvanian Alps (Southern Carpathians), in the Făgăraş because of its high altitude and the length of its main ridge over 2000 m), and in the Retezat because it received more precipitation than ranges farther east. 206 and 84 cirques formed in these two ranges alone. Taking the area above 1800 m as that most exposed to glaciation, the Făgăraş with 238 km2 and the Retezat with 116 km2 are well ahead of the other ranges, which each have less than 75 km2. The Southern Carpathians have 550 cirques in all. The second centre of glaciation was in the north (the Rodna, Maramureş and Călimani Ranges), where regionally lower temperatures compensated for lower altitudes and 81 cirques formed. Average modal floor altitude is 1939 m and average maximum crest altitude is 2217 m. Most cirques (80%) have thresholds between 1650 and 2110 m altitude, and are on mountains 2000 to 2470

m high. They are highest in the Transylvanian Alps and lowest in the north. 86% of lakes in cirques are between 1800 and 2200 m altitude. Most cirques are eroded into gneisses, schists or granites. Structural influences are important, and the resulting differences in morphometry will be presented. The average cirque is 654 m long, 717 m wide, and has a headwall 209 m high. Length and width increase with overall size, faster than does vertical amplitude; coefficients are 1.10, 1.04 and 0.86 respectively, comparing well with those elsewhere (Evans, 2006). Multi-level, cirque-within-cirque features are common in higher ranges such as the Făgăraş. Considering means for six 'major regions', cirque floors (2035 m) and lowest altitudes (1990 m) are some 100 m higher in Făgăraş and Iezer-Bucegi than in the ranges farther west (Parâng-Lotru-Cindrel and Retezat-Godeanu), and maximum crest altitudes (over 2300 m) are some 150 m higher. The Northern region has altitudes over 200 m lower than the western ranges, and the three cirques in the Bihor Mountains are lower still, due to their position on the west side of northern Romania.