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Quaternary Tectonic Activity of the Central Part of the Polish Carpathian Foredeep, Evidences from Archaeological Open Site at Brzezie near Kraków

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The fossil graben and associated with it the normal faults and joints within the Vistulian and Holocene sediments are the object of considerations here. These structures were observed in the archaeological open site at Brzezie, in the central part of the Polish Carpathian Foredeep (Fig. 1A).

The normal faults cut the Pleistocene gleyed loess, laminated loess, Eoholocene buried soil and the lower part of the Mezoholocene deluvium that includes an archaeological artefacts from the Neolith and early Bronze Age (Fig. 1B). These structures die out within the middle and upper part of the Neoholocene deluvium including archaeological artefacts from the Lusatian culture. The normal faults strike mostly NNE-SSW and dip steeply about 65–850 (Fig. 1C). Some of them, the master normal faults, bound the fossil graben (Fig. 1B). The surfaces of the normal faults are slightly striated. The fault-slip analysis shows that the maximum principal stress axis (σ1) was in subvertical position, the minimum principal stress axis (σ3) was horizontal and WNW-ESE-directed (Fig. 1D). The joints occur within the graben and outside of it. They group into three sets: 1) the NNE-SSW-trending; 2) the WNW-ESE-trending and 3) the ENE-WSW-trending (Fig. 1E). The joints of the two first sets predominate. They form an orthogonal joint pattern, where the joints of the (1) set strike parallel to the normal faults and the joints of the (2) set strike perpendicular to them. Additionally, these joints are closely spaced close to the normal faults. Stewart and Hancock (1990) described the similar relationships between joints and faults and suggesting that the development of joints was connected with the normal faulting. Therefore we believe that jointing was simultaneous with faulting at Brzezie. The basement of the study area is cut by NE-SW-trending faults that represent fragment of the Kurdwanów-Zawichost Fault Zone (Fig. 1A). There are some evidences of sinistral reactivation of this fault zone during the Late Miocene and later (Rauch-Włodarska et al. 2005). The normal faults and joints observed at Brzezie could be caused by activity of the Kurdwanów-Zawichost fault zone during the Pleistocene and Holocene.

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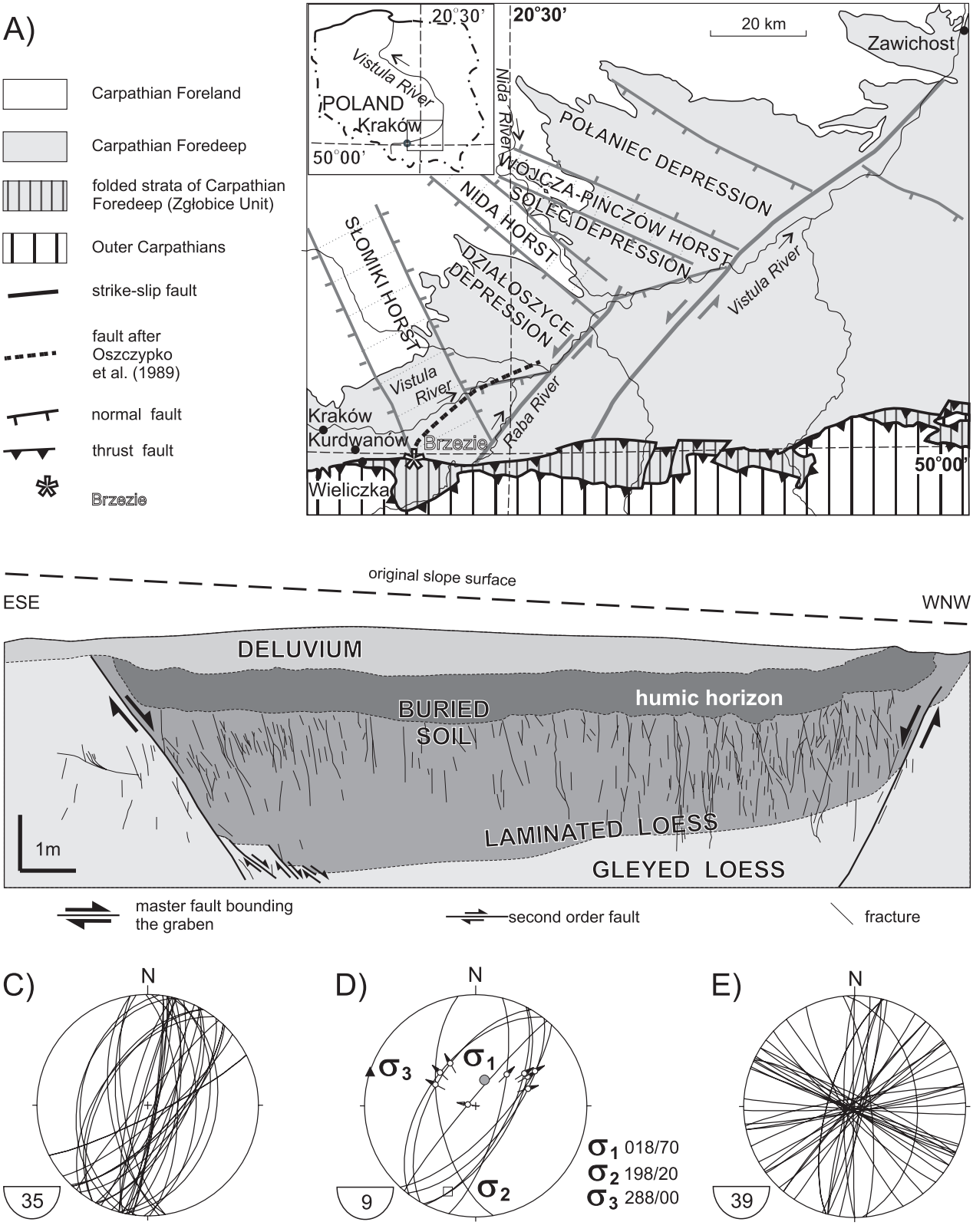

■ **Fig. 1.** A) Tectonic sketch of the central part of Polish Carpathian Foredeep (after Krysiak 2000) showing location of Brzezie, the Zgłobice Unit after Połtowicz (1991, simplified); B) Cross-section of graben; C) Plot of normal fault surfaces; D) Plot of normal faults with striations and orientation of reconstructed principal stress axes (using program TectonicsFP); E) Plot of joint surfaces. All plots on the lower hemisphere.