Normal faulting in a rigid basin boundary block – field evidence from the Koralm Complex (Eastern Alps)

Gerald Pischinger[1], Franz-Josef Brosch[1] Walter Kurz[1] & Gerd Rantitsch[1]

1 Institut für Angewandte Geowissenschaften, TU Graz, Rechbauerstrasse 12 8010 Graz, Austria (gerald.pischinger@tugraz.at)

2 Department Angewandte Geowissenschaften und Geophysik, Montanuniversität Leoben, Peter-Tunner-Straße 5, 8700 Leoben, Austria

Miocene lateral extrusion of the Eastern Alps resulted in the development of a prominent fault pattern which strongly shapes the present-day morphology of the Eastern Alps (Frisch et al., 2000; Ratschbacher et al., 1991). The formation of several sedimentary basins from the early Miocene onwards (Sachsenhofer, 1996) and the associated volcanism are linked to this tectonic period. Bordered by the Lavant and the Styrian basin the Koralm complex forms a relative brittle and rigid block in this extrusion corridor.

The brittle tectonics of this block has only sparsely been worked on in geological research (Brosch, 1983; Buchroithner, 1984; Kieslinger, 1928; Riedmüller and Schwaighofer, 1978; Tollmann, 1976) and is hence insufficiently documented in the regional geological maps (Beck-Mannagetta, 1980; Beck-Mannagetta, 1991) with the exception of sheet 205 (Kleinschmidt et al., 1989). This shortcoming is documented in the evidence from several infrastructure projects in the Koralm area (Brosch, 1982; Brosch, 1983; Fürlinger, 1978; Koch, 1990; Mähr, 1990; Neumüller et al., 2003; Riedmüller and Schwaighofer, 1978). The begin of the site investigations for the Koralm tunnel from 1996 onwards mark an increased interest for the brittle tectonics of this region of the Eastern Alps (Brosch et al., 2001; Peresson and Decker, 1998; Vanek et al., 2001).

In our contribution we want to present field evidence from the region near Stainz (Styria) for pronounced normal faulting within this block from the eastern realm of the Koralpe. The investigated area is predominately situated in a mylonitic shearzone ("Plattengneis") of Cretaceous age which may be interpreted as an extensional detachment zone resulting from the exhumation of the Middle Austroalpine basement complexes in the central part of the Eastern Alps (Kurz et al., 2002).

Normal faulting from the Neogene onwards resulted in the formation of listric cataclastic shear zones which tend to follow the given anisotropy, the generally flat dipping, often nearly horizontal metamorphic foliation in their lower parts. In several large scale outcrops these foliation parallel structures seem to form detachment-like master faults in which the steeper listric splays seem to terminate. The latter show intense bifurcation and dip either towards east or west. The east dipping faults represent the more continous faults at which the west dipping elements end.

Paleostress analysis of the documented fault data with the P/T method (Turner, 1953) shows clear extension in W-E to WNW-ESE direction. Field evidence additionally reveals subordinate normal faulting in N-S direction, strike slip faulting on N-S and W-E trending slickensides as well as N-S trending striations on foliation planes. The latter form an acute angle with the prominent metamorphic stretching lineation which allows a clear distinction of the two. The strike slip faults show dextral as well as sinistral sense of shear. The age relation as well as the kinematic assignment of these faults is still under discussion.
Currently a morphotectonic analysis is performed to allow a better understanding of the influence of the brittle faults on the overall morphology of the project area. As fault outcrops are most times rare in the Koralm Complex the results should facilitate the identification of brittle tectonic fault zones in this area of the Eastern Alps.