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SEMMERING BASE TUNNEL SITE INVESTIGATIONS: NEW INSIGHTS TO THE TECTONICS

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The alignment of the Semmering base tunnel transects various major geological units at the north-eastern spur of the Eastern Alps. Proceeding from north to south, these units are the nappes of the Upper East Alpine Grauwacken zone, consisting of early and late Paleozoic, very low-grade metamorphosed sediments and volcanic rocks, as well as the nappes of the Lower East Alpine unit, consisting of a polymetamorphic basement with an Alpine metamorphic Permo-Mesozoic sedimentary cover.

The crystalline basement of the Lower East Alpine unit consists mostly of quartzphyllite. Its Permomesozoic sedimentary cover includes phyllite, quartzite, marble and rauhwacke. The Paleozoic sequence of the Upper East Alpine "Grauwackenzone" contains quartzconglomerate, meta-sandstone, greenstone, chloritic and graphitic phyllites with intercalations of anhydrite and gypsum.

Site investigations between 1988 and 1998, which include the evaluation of satellite images, geological mapping, core drilling, geophysical survey and the construction of a pilot tunnel have indicated the existence of two large thick-skinned, basement involved, thrusts within the Lower East Alpine tectonic unit. Each thrust sheet includes a thick inverted sequence of the sedimentary cover in the foot-wall and tectonically reduced, isolated remnants of the sedimentary cover in the hanging wall.

Furthermore, detailed mapping, trenching and core drilling revealed new information on location and tectonic architecture of the "Noric Overthrust".

The transport of the upper thrust sheet occurred along a northerly dipping, low-angle, shear zone which is dominated by clayey gouge, crushed quartzite, marble and rauhwacke.

Of great importance in view of the tunnel project are brittle high-angle faults which have generated gouge and intensely fractured rocks. Outcrop studies coupled with satellite images have shown that the pattern of brittle faults consists of strike-slip duplexes trending NNE-SSW, NE-SW and E-W. The youngest faults seem to be N-S striking extensional oblique-slip faults. Geometry and kinematics of the young brittle faults comply with the Neogene eastward extrusion of the Central Alps.

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