Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 9	Graz 2004

EXHUMATION OF HIGH-PRESSURE ROCKS IN A CRETACEOUS (EO-ALPINE) SUBDUCTION/COLLISION ZONE: MECHANISMS AND TECTONIC CONSEQUENCES (TEXEL COMPLEX, EASTERN ALPS, AUSTRIA/ITALY)

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High-pressure rocks from the western part of eo-Alpine High-Pressure Belt (Texel Complex, Eastern Alps) were exhumed within a c. 15 km broad eo-Alpine high strain zone striking SW-NE. The 4-5 km broad Schneeberg Normal Fault Zone represents the structurally upper part of this shear zone. It separates pre-Alpine basement rocks (Ötztal-Stubai Complex) in a hanging wall position in the NW from eo-Alpine high-pressure rocks in a footwall position in the SE. This is in accordance with a slight increase of Rb-Sr ages in biotite samples from the Ötztal-Stubai Complex above the normal fault zone.

Contemporaneous shearing and folding with fold axes parallel to the stretching lineation characterize ductile deformation in the fault zone from pressure-dominated amphibolite facies to lower greenschist facies conditions, implying shortening perpendicular to the shear zone boundary and the direction of maximum stretching, a feature typical for stretching faults.

Deformation during the earliest part of exhumation was homogeneously distributed over the whole shear zone. Subsequent deformation was partitioned into flattening deformation in the more internal part and simple shear deformation in the external parts of the wedge and “weak” lithologies such as marble, abundantly present in the area.

According to new Sm-Nd results on garnets from the Schneeberg Normal Fault Zone and the eclogite-bearing Texel Complex exhumation must have started around 95 Ma ago. A calcite-white mica Rb-Sr age of 76 Ma from a low greenschist facies mylonite within the normal fault zone indicates that exhumation has been active for around 15 Ma, exhuming eclogite facies rocks to shallow levels of the crust.

Eo-Alpine (WM Rb-Sr age of about 77 Ma) mylonites in a footwall position relative to the high-pressure rocks show a top to E-ESE sense of shear, placing eo-Alpine high-pressure rocks on top of pre-Alpine basement rocks (Campo Complex, Mauls-Penserjoch Complex). Contemporaneous shearing and folding with fold axes parallel to the stretching lineation is typically present also in this part of the eo-Alpine exhumation-related high strain zone.

Together with the Schneeberg Normal Fault Zone this thrusting shear zone formed an extruding wedge exhuming eo-Alpine high-pressure rocks of the Texel Complex towards E-SE (Fig 1a).

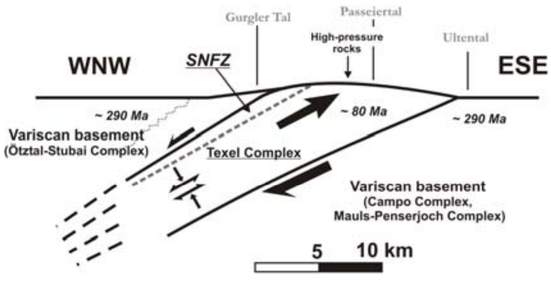
This extrusion/thrusting direction is definitely opposite to the published W-directed tectonic transport direction for the eo-Alpine collision event. Generally, the kinematics and geometry of the Texel Complex can be explained by two geometric subduction-exhumation models:

a) the down-going lower plate and the upper wedge contact form an obtuse angle during W-directed subduction (Fig. 1b) and

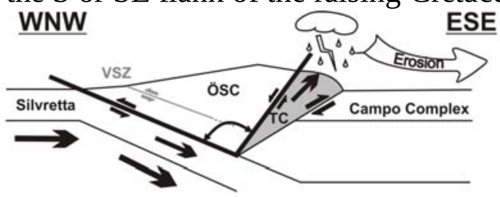
b) the down-going lower plate and the upper wedge contact form an acute angle or are almost parallel during E-directed subduction (Fig. 1c).

A local change in boundary conditions of the otherwise brittle collision/subduction wedge must have happened to locally raise exhumation rates and induce ductile flow in the Texel extruding wedge. A strongly increased sedimentation input from the N (Bernoulli and Winkler, 1990; Bichsel and Haring, 1981) into neighboring flysch basins in the S

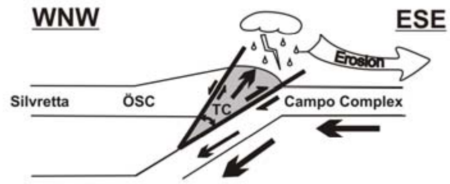
(Lombardian Flysch basin) at exactly the same time as exhumation started in the Texel Complex indicates that an increase in erosion at the S or SE flank of the raising Cretaceous



a) Schematic geometry and kinematics in the study area



b) Geometric model: obtuse angle between lower plate and upper wedge contact



c) Geometric model: acute angle between lower plate and upper wedge contact

ductile flow. A similar model has recently been applied to explain locally increased ductile flow in the Himalayas and New Zealand (Beaumont et al., 2004; Koons, 1990; Zeitler et al., 2001).

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