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TECTONIC MODELS OF EXHUMATION AND UPLIFT OF THE TAUERN METAMORPHIC CORE COMPLEX TESTED BY THE TRANSALP DEEP SEISMIC LINE

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Many processes have been proposed to contribute to the exhumation and final surface uplift of previously buried continental crust exposed in central sectors of orogens, as e. g. exposed within the Tauern metamorphic core complex. These processes include: (1) early isostatically driven exhumation of high-pressure rocks (forming now the Eclogite Zone and the basal Glockner nappe) along the subduction channel, (2) uplift and exhumation of a duplex complex over underthrusted crust by wedge formation during fore-thrusting opposite to the subduction direction, (3) exhumation due tectonic unroofing due to formation of a transtensional overstep along strike-slip fault system, and exhumation from mid-crustal levels by tectonic and erosional unroofing due to orogen-parallel extension, and finally, (4) exhumation and uplift thickened crust due to late-stage back-thrusting opposite to the subduction direction.

The geological interpretation of the TRANSALP deep seismic line clearly shows a double-vergent orogen with continuous crustal thickening towards the centre of the orogen, with thickest crust beneath the Tauern window (TW). The sub-Tauern ramp is displayed by a reflective zone extending from 15 km, with several breaks, down to ca. 35 km) and appears to delimit the continuous European basement beneath ca. the northern edge of the TW [1]. Two major gently S-dipping reflective zones can be traced from beneath the central TW (ca. 20 resp. 30 km) to beneath the Southalpine unit (SA) (ca. 25 resp. 35 km). These structures together are interpreted to represent a major crustal-scale fore-thrust with several major splays along which basement-cover nappes were stacked towards north.

The TW area does not display many reflective zones in shallow structural levels. The northern shallow gently N-dipping reflective zones can be interpreted to represent cover schists along the upper margins of the window. A central shallow reflective zone may represent a synform. Major portions in shallow southern levels are transparent (Variscan Central Gneiss). Some gently north-dipping reflectors occur in 20 km depth (vibroseis) and coincide there with the orientation of the Periadriatic fault. These are possible buried European sediments. Consequently, the TW Penninic units form a duplex-type structure, which is wedged into the Austroalpine units by ca. northward thrusting.

These data show that all above mentioned processes, except the in two dimensions untestable overstep, can be shown to have worked in sequence during exhumation of the Tauern metamorphic core complex.

References

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