Geol. Paläont. Mitt. Innsbruck, ISSN 0378–6870, Band 25, S. 1–242, 2001

THE DENSITY STRUCTURE OF THE EASTERN ALPINE CRUST

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Recent results of the seismic profile TRANSALP initiated new investigations of the density structure in the Eastern Alps. This new experiment and results of previous western Alpine profiles lead to new ideas, which are tested by the use of inverse and forward modelling of potential fields.

The modelling indicates that the Bouguer gravity field in the Eastern Alps is mainly caused by two sources: the density contrast at the crust-mantle boundary (350 kg/m^3), and the density inhomogeneities in the upper 10 km of the crust, which contributes to the overall gravity field by amounts of approximately 30 $*10^{-5}$ m/s^2.

These uppermost 10 km of the model are well constrained by both observations from geology and seismic and clearly connected with the obvious near-surface tectonic regime.

This means that near surface geologic formations can be rather easily identified in the short wavelengths of the Bouguer anomaly, e.g. the uplift of the Tauern window. The small scaled structures cause gravity anomalies that superpose and interfere with the regional gravity field caused by the Moho interface. Therefore, it is impossible to separate the small and long wavelengths of the gravity field in such complex environment by a simple low-pass filtering. Forward modelling under constraining conditions seems to be the only possibility to eliminate gravity effects of near-surface structures with the consequence that a regional (deeper) field can be calculated on the base of constrained information. This kind of regional field eases the construction of deeper located density structures.

Aside of the "gravity stripping method" two other methods have been used to investigate lower crust and upper mantle density distributions, the first was an interactive 3D forward model matching. In this, a starting model was constructed on base of the seismic results and findings by the TRANSALP profile, which was stepwise interactively modified, and the second was gravity inversion.

The inversion procedure provides detailed insight into the crust mantle interface that is independent from the pre-existing seismic velocity model. It is of value that uncertainties, if present in the velocity model, are not propagated into the density model. Essentially, the two methods agree in the resulting Moho.

Important features of the Moho are the crustal roots along the central part of the Alpine arch, that achieves a depth of 55 km. In the southwest a shallowing of the Moho is found that coincides with the gravity high of the Vicenza area. Moho depth here is significantly less than in the seismic results. The deepening of the Moho towards the central part of the Alps is relatively steeper in the Adriatic domain than in the Alpine domain, indicating an asymmetry with respect to the Alpine Arch. To the North of the Alps the two models agree to a gradual shallowing of the Moho depth to 30 km.

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