Geophysical Research Abstracts, Vol. 8, 03530, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03530

Sill-like intrusions in the lower crust: are lamellae part of a stabilising (corset) network?

R. Meissner and H. Kern

Institute of Geoscience, Christian Albrechts-University, Kiel,Germany

(rmeissner@email.uni-kiel.de / Phone: +49-431-8803908)

(kern@min.uni-kiel.de / Phone: +49-431-8802919)

In various tectonic units (old shields, mountain roots, molasse basins) earthquakes occur in the deep continental crust. They cannot be explained by the widely accepted "jelly sandwich model" of a ductile and creeping lower crust. The various tectonic settings are so different that, most probably, different explanations for the deep earthquakes have to be found. Here, we suggest a mechanism which may be applicable to laminated lower crust. Such characteristic reflectivity patterns are found in about 15 to 25 % of crusts, mostly in extensional areas. A favourite explanation for the lamellae is that they represent thin sill-like, mafic/ultramafic sub-horizontal intrusions within a felsic environment. The visibly strong and numerous layers are supposed to be fed and later stiffened by sub-vertical, mafic/ultramafic feeder dykes, invisible by conventional seismic methods, but indicated by diffractions and S-wave anisotropy. Hence, we present a network model which may explain (1) the strong and numerous sub-horizontal reflections, (2) the general low average velocities (only thin intrusions in sialic or intermediate strata), (3) the deep earthquakes. After cooling, the intrusions might form a stabilising strong and rigid (corset-like) network in the lower crust, even at high temperatures. We think that such a corset-like network might form also in non-laminated lower crusts where massive underplating has caused an increase in mafic material and velocity. In all cases a stress transfer (from a nearby belt or plate boundary) is a necessary precondition for the accumulation and release of stresses in a conventional rupture process. We observe that laminated lower crust in the Molasse basins north of the Alpine Belt do show deep earthquakes.