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Influence of magmatism on the Moho

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The Moho is defined by an abrupt change in seismic velocity, which is often attributed to the petrological crust-mantle boundary between silicate-rich crustal rocks and olivine dominated mantle rocks. However, other transitions may explain observed pronounced seismic reflections, such as metamorphic changes in iso-chemical rocks from granulitic lower crustal rocks to eclogitic facies, or pronounced shear zones. Therefore, it is of crucial importance to have high-resolution models of the seismic velocity around the Moho. Further, the seismic reflectivity in normal-incidence and wide-angle may provide valuable constraints on the structure at the crust-mantle boundary. In areas influenced by strong magmatism with mantle source, e.g. at rift zones and other extended regions, the resulting transition between crust and mantle may assume several forms. A recent data example from a $>$100 km long zone of extremely high seismic velocity (6.8-7.8 km/s) shows strong PmP reflections which are interrupted in a ca. 20 km wide zone. The high velocity is interpreted as mafic magmatic rocks in the crust, and the Moho-free zone as the feeder channels of the mafic batholith. Variation in seismic amplitude along the strike of the batholith provides indication for the mafic content of the deepest rocks in the body. Yet, several examples from recent and old rift zones show extremely strong, random reflectivity of the lower crust and upper mantle which indicates sill like intrusions from magmatic activity. As such, compelling evidence is emerging for a strong role of magmatism on the character of the Moho interface, not least in extensional areas.