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Mantle Flow beneath continental Rift Zones

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Upon extension of continental lithosphere, necking of the crust occurs. Also the mantle part of the lithosphere thins, and the base of the lithosphere is brought to shallower depths. This upward movement of the Moho and base of the mantle lithosphere during rifting should be accompanied by upwelling of asthenosphere material beneath the rift zone. Indeed, tomographic studies show low seismic wave velocities at shallow depths beneath many rift zones (West Antarctic Rift System, Rio Grande Rift), that are often interpreted as thinned lithosphere. Teleseismic studies have revealed complete replacement of sub-continental mantle lithosphere by asthenosphere (Woodlark rift).

It is not known how far the influence of the diverging continental plate motion extends. In this study, we investigate mantle flow beneath rift zones with numerical models. Questions that are addressed with 2-D models include from how deep mantle material might actually well up underneath the rift zone, how strong the upwelling is, and which parameters influence the process. First results show that rheology of the mantle plays a dominant role in mantle flow. With 3-D models we look at lateral flow of mantle beneath (propagating) rifts. According to the models, material may flow in the length-direction of rifts when they propagate.