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Ways to study mid-crustal properties and behaviour - the great flow debate continues

Taija Torvela

University of Leeds, Institute of Applied Geosciences, School of Earth and Environment, United Kingdom
(t.m.torvela@leeds.ac.uk)

The properties and behaviour of middle and lower crust during and at the late stages of an orogen remain largely elusive. Especially the theory so-called mid-crustal flow has been a centre of hot debates since its inception. Mid-crustal flow, resulting from proposed drastic weakening of thickened, partially molten middle and lower orogenic crust, is suggested to be the reason for the formation of e.g. the high-grade mid-crustal channel in the frontal Himalayas, and for the present eastward movement of the Tibetan upper crust. However, there are very few ways to observe the potential mid-crustal flow, directly or indirectly. One can use exposed analogues in old, eroded orogenic roots, or study currently exposed rocks in Himalayas or Tibet and attempt deducing the large-scale processes at depth from them. Another option is to use geophysical methods, such as seismic reflection/refraction data or seismic tomography. The biggest problem is, that a huge gap in terms of data and observation scale exists between these two approaches make observations - field data is usually collected at the scale of an outcrop, but can be extrapolated in a well exposed area for kilometres; however, the data lacks significant depth component, i.e. lacks 3D information, and, furthermore, the observed geometries in e.g. dome complexes are not unique in terms of their genesis, so that multiple genetic interpretations of a single geometry are often possible. Geophysical data on the other hand gives 3D information, but all detail is lost as geophysical data from the crust is usually at a scale of at least hundreds of meters or more.

In this presentation, I will discuss these and other problems related to the verification vs. falsification of mid-crustal flow theory. I will also present a potential way to improve seismic reflection data, using seismic attributes, to gain more detailed information about the crustal structures and fabrics at depth, which may help in the study of Himalayas, Tibet, and other areas where more detailed information about the crustal structure would be beneficial.