A new sample holder for fast xrd investigation on uhpc

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Powder X-ray diffraction (XRD) is a time consuming and challenging task, in particular if a comprehensive series of experiments have to be investigated. The quality and significance of the resulting diffractogram is strongly dependent on the kind of preparation, e.g. type of mill, grain size, packing or ordering of the grains, besides the technical issues of XRD. In principle, preparing a fine grained powder is required to achieve good statistics of every crystal orientation, if the starting material is a coarse aggregate concrete. Fine grained concrete like ultra-high performance concrete (UHPC) with average grain size <50 μm could be investigated straightly without milling. In this study, small UHPC cylinders were investigated with different preparations methods (milling and cutting or grinding with water or petroleum). Powders were measured in the conventional manner, while solid cylinders were investigated with the new designed sample holder. The results show a significant influence of the preparation on the susceptible phases like portlandite and ettringite. Besides difference in phase content, good counting statistics and a low signal to noise ratio were achieved. Finally, the new designed sample holder provides a reliable and fast method of investigation fine grained concrete without time consuming preparation.

Lithospheric strength variations across the Kenya Rift region as constrained by data-driven 3D gravity and thermal modelling

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Tectonic deformation is largely controlled by the strength of the lithospheric plate. Predictions on the rheology of the lithosphere, in turn, require knowledge about lithological variations and the thermal configuration of the plate. To better understand the relationships between strength variations and tectonic observables (seismicity, volcanism, fault distribution etc.), we investigate the present-day thermal and mechanical state of the lithosphere in a tectonically active region, the Kenya Rift. To assess lateral strength variations in the lithosphere of Kenya, we follow a stepwise data-driven approach. The lithospheric density configuration is constrained by 3D gravity modelling and a simultaneous integration of multi-disciplinary data such as surface geology, borehole, reflection and refraction seismic data, and seismological observations. According to differences in lithology, compaction state, and hence density configuration, we differentiate the sedimentary and volcanic cover of the crystalline crust into six depositional domains. P-wave velocities and gravity-constrained densities indicate that both the upper and the lower crustal units show a general west-to-east trend towards denser and more mafic rocks. We interpret these results in terms of lithologies and assign corresponding thermal properties (heat production and thermal conductivity) to calculate the lithosphere-scale 3D conductive thermal field across the region. Finally, we discuss how far the