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Superhot fluids circulating close to magma intrusions: a contribution from analogue modelling

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Magma overpressure at the time of the emplacement at shallow crustal levels may lead to deformation (i.e. forced folding, fracturing and faulting) in the country rock, both at local and regional scale. To get insights into this process, we reproduced and analysed in the laboratory the fracture/fault network associated with the emplacement of magma at shallow crustal levels. We used a mixture of quartz sand and K-feldspar fine sand as an analogue for the brittle crust, and polyglycerols for the magma.
The models were able to reproduce complex 3D architectures of deformation resulting from magma emplacement, with different deformation patterns -invariably dominated by forced folding and associated brittle faulting/fracturing- resulting from variable parameters. These results provide useful hints into geothermal researches.
Fractures and faults associated with magma emplacement are indeed expected to significantly influence the distribution and migration of superhot geothermal fluids near the edge of the magma intrusion. These structures can therefore be considered as potential targets for geothermal or mineral deposits exploration. In this perspective, the results of analogue models may provide useful geometric and conceptual constraints for field work, numerical modeling, and particularly seismic interpretation for achieving a better understanding and tuning of the integrated conceptual model concerning the circulation of supercritical fluids.
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