Perm-Fit: a new program to estimate permeability at high P-T conditions

Evangelos Moulas and Claudio Madonna

ETH Zurich, Inst. f. Geochemie und Petrologie, Earth Sciences, Zurich, Switzerland

Several geological processes are controlled by porous fluid flow. The circulation of porous fluids influences many physical phenomena and in turn it depends on the rock permeability. The permeability of rocks is a physical property that needs to be measured since it depends on many factors such as secondary porosity (fractures etc).
We present a numerical approach to estimate permeability using the transient step method (Brace et al., 1968). When a non-reacting, compressible fluid is considered in a relative incompressible solid matrix, the only unknown parameter in the equations of porous flow is permeability. Porosity is assumed to be known and the physical properties of the fluid (compressibility, density, viscosity) are taken from the NIST database. Forward numerical calculations for different values of permeability are used and the results are compared to experimental measurements. The extracted permeability value is the one that minimizes the misfit between experimental and numerical results. The uncertainty on the value of permeability is estimated using a Monte Carlo method.

REFERENCES

Brace, W.F., Walsh J.B., & Frangos, W.T. 1968: Permeability of Granite under High Pressure, Journal of Geophysical Research, 73, 6, 2225-2236