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Research Article

02 Jan 2014

Assessing accuracy of gas-driven permeability measurements: a comparative study of diverse Hassler-cell and probe permeameter devices

C. M. Filomena[1,*], J. Hornung[2], and H. Stollhofen[1]
[1]GeoZentrum Nordbayern, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany
[2]Institut für Angewandte Geowissenschaften, Technische Universität Darmstadt, Darmstadt, Germany
[*]current address: Shell Global Solutions B.V., Rijswijk, the Netherlands

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Abstract. Permeability is one of the most important petrophysical parameters to describe the reservoir properties of sedimentary rocks, pertaining to problems in hydrology, geothermics, and hydrocarbon reservoir analysis. Outcrop analogue studies, well core measurements, and individual sample analysis take advantage of a variety of commercially available devices for permeability measurements. Very often, permeability data derived from different devices need to be merged within one study (e.g. outcrop minipermeametry and lab-based core plug measurements). To enhance accuracy of different gas-driven permeability measurements, device-specific aberrations need to be taken into account. The application of simple one-to-one correlations may draw the wrong picture of permeability trends. For this purpose, transform equations need to be established.

This study presents a detailed comparison of permeability data derived from a selection of commonly used Hassler cells and probe permeameters. As a result of individual cross-plots, typical aberrations and transform equations are elaborated, which enable corrections for the specific permeameters. Permeability measurements of the commercially available ErgoTech gas permeameter and the TinyPerm II probe permeameter are well-comparable over the entire range of permeability, with $R^2 = 0.955$. Aberrations are mostly identified in the permeability range < 10 mD, regarding the TinyPerm II and the minipermeameter/Hassler-cell combination at Darmstadt University, which need to be corrected and standardized. Applying standardizations which consider these aberration intervals strongly improves the comparability of permeability data sets and facilitates the combination of measurement principles. Therefore, the utilization of such correlation tests is highly recommended for all kinds of reservoir studies using integrated permeability databases.

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