BOR-T06: **Well-log based prediction of thermal conductivity: Is there a universally applicable approach for sedimentary rocks?**

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Rock thermal conductivity (TC) is paramount for the determination of heat flow and the calculation of temperature profiles. Due to the scarcity of drill cores compared to the availability of petrophysical well logs, methods are desired to indirectly predict TC in sedimentary basins. Most of the well-log-based approaches published require information on either the mineralogical composition of the rocks encountered or are based on unconventional well logs. Furthermore, empirical prediction equations using standard well logs are usually limited to specific geological formations from which rock samples are implemented in the analysis.

We have selected a twofold approach to further investigate the potential of determining TC from well logs. We studied first for major rock-forming minerals, which three different groups of sedimentary rocks are composed of, the relations between matrix TC and well-log parameters (e.g. density, hydrogen index, volume fraction of shale, sonic transit time, photoelectric factor) using multivariate statistics. There is no universal prediction equation that would cover these groups of rocks. Instead, prediction equations are developed separately for the different mineral combinations of rock types: TC_{ma} = 5.28 - 2.96 $\phi_{N.ma}$ - 2.8 V_{sh} (clastic rocks), TC_{ma} = 5.06 - 0.1 ρ_{ma} - 2.91 V_{sh} (carbonates), TC_{ma} = 14.06 - 10.35 $\phi_{N.ma}$ - 3.37 ρ_{ma} (evaporites). These equations predict matrix TC within an error (RMSE) of 0.17 - 0.45 W/(mK).

In a second step, the relation of bulk TC and standard well-log properties was studied for clastic rocks from four boreholes drilled into the Mesozoic sequence of the North German Basin. The prediction equation, developed by including 1755 laboratory-measured TC values, is: TC_b = 4.75 - 4.19 ϕ_N - 1.81 V_{sh} and allows the determination of bulk TC within an error (RMSE) of 0.4 W/(mK). The application of earlier published approaches to our data set shows that the new equations significantly reduce the RMSE up to 50 %. Using a simple decision tree, the TC prediction equations now allow the computation of TC profiles at full borehole scale for all types of sedimentary rocks.