

Recent development of electromagnetic wave resistivity tools for logging-while-drilling

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Logging-while-drilling (LWD) is an important and popular logging service which delivers real-time data at transmission rates quadruple the industry standard and acquire high-quality data for geosteering and formation evaluation. Electromagnetic wave resistivity (EWR) tools have the ability to estimate the resistivity of the formation and are widely used in LWD systems. In this paper, the most popular commercial EWR tools are reviewed, including the tools developed by Advanced Products and Systems (APS), Baker Hughes, General Electrical (GE), Halliburton, PathFinder and Schlumberger. Besides, an EWR tool named ZT-EWR is introduced and discussed about the tool responses to the sensor geometrical parameters. Numerical analysis and simulations were employed to analyze the amplitude ratio of, and phase difference between, the voltages measured in two receivers of the ZT-EWR tool, which are shown in Figure 1. Field data are presented, from which a comparison is made between this tool and a wireline tool. It is demonstrated that it is often possible to obtain a direct reading of the true formation resistivity with the ZT-EWR tool.

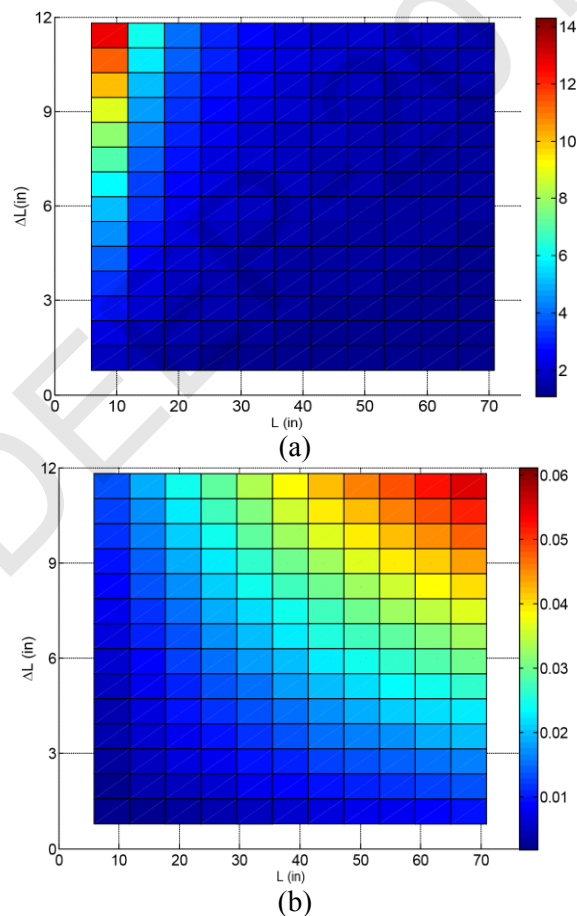


Figure 1. Top view of amplitude ratio (a) and phase difference (b) as the function of the receiver interval ΔL and the transmitter-receiver spacing L