Array processing – a new method to detect and correct errors on array resistivity logging tool measurements

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In recent years more and more multi-array logging tools, such as the array induction

and the array lateralog, are applied in place of conventional logging tools resulting in increased resolution, better radial and vertical sounding capability and other features. Multi-array logging tools acquire several times more individual measurements than conventional logging tools. In addition to new information contained in these data, there is a certain redundancy among the measurements. The sum of the measurements actually composes a large matrix. Providing the measurements are error-free, the elements of this matrix show certain consistencies. Taking advantage of these consistencies, an innovative method is developed to detect and correct errors in the array resistivity logging tool raw measurements, and evaluate the quality of the data.

The method can be described in several steps. First, data consistency patterns are identified based on the physics of the measurements. Second, the measurements are compared against the consistency patterns for error and bad data detection. Third, the erroneous data are eliminated and the measurements are re-constructed according to the consistency patterns. Finally, the data quality is evaluated by comparing the raw measurements with the re-constructed measurements. The method can be applied to all array type logging tools, such as array induction tool and array resistivity tool. This paper describes the method and illustrates its application with the High Definition Lateral Log (HDLL, Baker Atlas) instrument. To demonstrate the efficiency of the method, several field examples are shown and discussed.