1. Estimation of core-equivalent porosities from the homomorphic deconvolution of logs

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Abstract: The most widely used methods of log deconvolution have focussed on the modelling of the tool response function and the design of practical inverse filters. Their success has been dictated by the degree to which they overcome the problems of measurement error, imprecise knowledge of the form of response functions and associated stochastic and non-linear properties. As an alternative approach, cored intervals are used to supply a desired output signal of porosities to be matched by the deconvolution of input logs. This operation has the advantages that it is computed in-place, with accommodations of local borehole environment and lithology factors, and that its performance can be judged explicitly against the core porosities used as a standard. Since many cored sequences are likely to vary in mineralogical composition, a composite porosity derived from multiple porosity logs is the appropriate input signal. This input represents a porosity signal smoothed by a compounded filter of individual tool response functions. Homomorphic filtering has been applied in seismic data processing and is a non-linear deconvolution technique. Analytical comparison of the complex cepstra of the core and log porosity sequences allows the design of an operator to transform the input log to an estimate of core porosities. Comparison of the estimates with measured core porosities can be made statistically to judge the relative degree of improvement over raw log readings. If satisfactory, the operation may be extended to logged sections with no core control. The method is illustrated by an example from an Arbuckle well in Kansas. © SPWLA 24th Annual Logging Symposium 1983. All rights reserved. (8 refs)
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