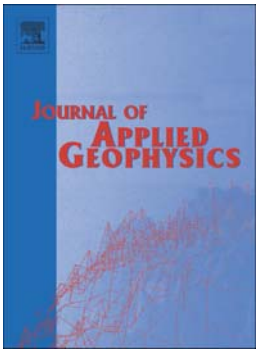

Rapid simulation of electromagnetic telemetry using an axisymmetric semi-analytical finite element method

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Rapid simulation of electromagnetic telemetry using an axisymmetric semianalytical finite element method

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Abstract

An axisymmetric semianalytical finite element method is proposed and employed for rapid simulations of electromagnetic telemetry in layered underground formation. In this method, the layered media is decomposed into several subdomains and the interfaces between subdomains are discretized by conventional finite elements. Then a Riccati equation based high precision integration scheme is applied to exploit the homogeneity along the vertical direction in each layer. This semianalytical finite element scheme is very efficient in modeling electromagnetic telemetry in layered formation. Numerical examples as well as a field case with water based mud as drilling fluid are given to demonstrate the validity and effectiveness of this method.

Keywords: Electromagnetic telemetry; Measurement-while-drilling; Semianalytical finite element method; High precision integration; Layered media.

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