

Accepted Manuscript

Finite-element time-domain modeling of electromagnetic data in general dispersive medium using adaptive Padé series

Hongzhu Cai, Xiangyun Hu, Bin Xiong, Michael S. Zhdanov

PII: S0098-3004(17)30007-9

DOI: [10.1016/j.cageo.2017.08.017](https://doi.org/10.1016/j.cageo.2017.08.017)

Reference: CAGEO 4014

To appear in: *Computers and Geosciences*

Received Date: 3 January 2017

Revised Date: 2 July 2017

Accepted Date: 29 August 2017

Please cite this article as: Cai, H., Hu, X., Xiong, B., Zhdanov, M.S., Finite-element time-domain modeling of electromagnetic data in general dispersive medium using adaptive Padé series, *Computers and Geosciences* (2017), doi: 10.1016/j.cageo.2017.08.017.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Finite-element time-domain modeling of electromagnetic data in general dispersive medium using adaptive Padé series

Hongzhu Cai^{a,b}, Xiangyun Hu^c, Bin Xiong^{d,*}, Michael S. Zhdanov^{a,b,e}

^a*Consortium for Electromagnetic Modeling and Inversion (CEMI), University of Utah, Salt Lake City, Utah, USA 84112*

^b*TechnoImaging, Salt Lake City, UT 84107 USA*

^c*China University of Geosciences, Institute of Geophysics and Geomatics, Wuhan, China*

^d*College of Earth Sciences, Guilin University of Technology, Guilin, Guangxi, China 541004*

^e*Moscow Institute of Physics and Technology, Moscow 141700, Russia*

Abstract

The induced polarization (IP) method has been widely used in geophysical exploration to identify the chargeable targets such as mineral deposits. The inversion of the IP data requires modeling the IP response of 3D dispersive conductive structures. We have developed an edge-based finite-element time-domain (FETD) modeling method to simulate the electromagnetic (EM) fields in 3D dispersive medium. We solve the vector Helmholtz equation for total electric field using the edge-based finite-element method with an unstructured tetrahedral mesh. We adopt the backward propagation Euler method, which is unconditionally stable, with semi-adaptive time stepping for the time domain discretization. We use the direct solver based on a sparse LU decomposition to solve the system of equations. We consider the Cole-Cole model in order to take into account the frequency-dependent conductivity dispersion. The Cole-Cole conductivity model in frequency domain is expanded using a truncated Padé series with adaptive selection of the center frequency of the series for early and late time. This approach can significantly increase the accuracy of FETD

*Corresponding author

Email addresses: caihongzhu@hotmail.com (Hongzhu Cai), xyhu@cug.edu.cn (Xiangyun Hu), hsiungbin@hotmail.com (Bin Xiong), michael.s.zhdanov@gmail.com (Michael S. Zhdanov)

Download English Version:

<https://daneshyari.com/en/article/6922284>

Download Persian Version:

<https://daneshyari.com/article/6922284>

[Daneshyari.com](https://daneshyari.com)