Some Inverse Problems for Coupled Maxwell's and Lamé System

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ABSTRACT

We study a interaction of an electromagnetic field with an isotropic inhomogeneous elastic medium. The phenomena is described as a simulteneous solution of coupled Maxwell's and Lamé system.

INTRODUCTION

During the last 30 years a lot of papers have been published describing the connection and conversion of seismic energy to electromagnetic energy and waves in geological environments and detection of electric or magnetic signals as a method of geological exploration (Potapov et al., 1995). Similar phenomena can be observed when a seismic wave propagates in the Earth's constant magnetic field. However the phenomena involved in the conversion of seismic energy and waves to a electromagnetic energy and waves are not fully understood. This problem needs both experimental and theoretical investigations. Ones divide the coupled mechanism into the following groups:

- the interaction determined, basicly, by the Lorenz force (Nowacky, 1986);
- the interaction based on the electrokinetic effect (Parhomenko, 1968);
- the interaction based on the piezoelectric effect (Kondrashov, 1980).

We represent some results of investigation of direct and inverse problems in the case of the interaction determined by Lorenz force.

INVERSE PROBLEMS OF ELECTROMAGNETOELASTICITY

The elastic oscillations propagating through medium will excite the oscillations of the electromagnetic field and themselves will change under the influence of the latter. The waves arising as a result of such interaction are usually reffered to a magnetoelastic. We describe the theoretical analysis of the joint inversion (Avdeev, Priimenko et al. 1996, 1997, 1998 and Lavrentiev, Priimenko, 1995) in the case of linearized coupled Maxwell's and Lamé system. The problem of determination of unknown source of elastic oscillations in the case of nonlinear interaction is considered too (Lorenzi, Priimenko, 1996). We also demonstrate the examples of numerical joint inversion.

CONCLUSION

There were studied some direct and inverse problems of electromagnetoelasticity using the interaction mechanism between electromagnetic and elastic fields. We demonstrated the possibility of joint inversion for determination of both electromagnetic and seismic parameters from coupled Maxwell's and Lamé system. Using of this approach could increase effetiveness of geophysical prospecting.

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