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2.1.3 The mechanical equations 2.1.3.1 Strain-stress relationships; 2.1.3.2 The field equations; 2.1.3.3 Note regarding the material properties; 2.1.3.4 Force balance equations; 2.1.4 The Maxwell equations; 2.1.5 Analysis of the wave modes; 2.1.6 Synthetic case studies; 2.1.7 Conclusions; 2.2 Poroelastic medium filled with a Newtonian fluid; 2.2.1 Classical Biot theory; 2.2.2 The u-p formulation; 2.2.3 Description of the electrokinetic coupling; 2.3 Experimental approach and data; 2.3.1 Measuring key properties; 2.3.1.1 Measuring the cation exchange capacity and the specific surface area 2.3.1.2 Measuring the complex conductivity 2.3.1.3 Measuring the streaming potential coupling coefficient; 2.3.2 Streaming potential dependence on salinity; 2.3.3 Streaming potential dependence on pH; 2.3.4 Influence of the inertial effect; 2.4 Conclusions; Chapter 3 Seismoelectric theory in partially saturated conditions; 3.1 Extension to the unsaturated case; 3.1.1 Generalized constitutive equations; 3.1.2 Description of the hydromechanical model; 3.1.3 Maxwell equations in unsaturated conditions; 3.2 Extension to two-phase flow 3.2.1 Generalization of the Biot theory in two-phase flow conditions 3.2.2 The u-p formulation for two-phase flow problems; 3.2.3 Seismoelectric conversion in two-phase flow; 3.2.4 The effect of water content on the coseismic waves; 3.2.5 Seismoelectric conversion; 3.3 Extension of the acoustic approximation; 3.4 Complex conductivity in partially saturated conditions; 3.5 Comparison with experimental data; 3.5.1 The effect of saturation; 3.5.2 Additional scaling relationships; 3.5.3 Relative coupling coefficient with the Brooks and Corey model 3.5.4 Relative coupling coefficient with the Van Genuchten model

Sommario/riassunto

The seismoelectric method consists of measuring electromagnetic signals associated with the propagation of seismic waves or seismic sources in porous media. This method is useful in an increasing number of applications, for example to characterize aquifers, contaminant plumes or the vadose zone. This book provides the first full overview of the fundamental concepts of this method. It begins with a historical perspective, provides a full explanation of the fundamental mechanisms, laboratory investigations, and the formulation of the forward and inverse problems. It provides a recent extension