The Magnetotelluric Method
Theory and Practice

Alan D. Chave
Woods Hole Oceanographic Institution, Massachusetts

Alan G. Jones
Dublin Institute for Advanced Studies

The magnetotelluric method is a technique for imaging the electrical conductivity and structure of the Earth, from the near surface down to the 410 km transition zone and beyond. This book forms the first comprehensive overview of magnetotellurics from the salient physics and its mathematical representation, to practical implementation in the field, data processing, modeling and geological interpretation. Electromagnetic induction in 1-D, 2-D and 3-D media is explored, building from first principles, and with thorough coverage of the practical techniques of time series processing, distortion, numerical modeling and inversion. The fundamental principles are illustrated with a series of case histories describing geological applications. Technical issues, instrumentation and field practices are described for both land and marine surveys. This book provides a rigorous introduction to magnetotellurics for academic researchers and advanced students and will be of interest to industrial practitioners and geoscientists wanting to incorporate rock conductivity into their interpretations.

Preface; List of contributors; 1. Introduction to the magnetotelluric method; 2. The theoretical basis for electromagnetic induction; 3. Earth’s magnetic environment: 3A. Conductivity of Earth materials; 3B. Description of the magnetospheric/ionspheric sources; 4. The magnetotelluric response function; 5. Estimation of the magnetotelluric response function; 6. Distortion of magnetotelluric data: its identification and removal; 7. The 2D and 3D forward problems; 8. The inverse problem; 9. Instrumentation and field procedures; 10. Case histories and geological applications; Index.