

Introduction to Environmental Geophysics

1 What are applied and environmental geophysics?

- 1.1 Aims of geophysical investigation
- 1.2 Required physical property contrast for various methods and their applications
- 1.3 Basic concepts of geophysical measurements (passive and active measurements)
- 1.4 Arrangements of measurements (profiling and sounding)
 - 1.4.1 Optimum station interval

2 Electrical resistivity methods

- 2.1 Resistivity
- 2.2 Current flow in a homogenous earth
- 2.3 Electrode configurations and geometric factors
 - 2.3.1 General case
 - 2.3.2 Electrode configurations
 - 2.3.4 Modes of deployment
- 2.4 Interpretation of geoelectric data
 - 2.4.1 Possible Interpretation errors
 - 2.4.1.1 Equivalent Models
 - 2.4.2 Methods of the determination of lateral variations
 - 2.4.3 Reciprocity
- 2.5 Case histories

3 Electromagnetic methods

- 3.1 Introduction
- 3.2 Principles of EM surveying
- 3.3 Depth of penetration of electromagnetic fields
- 3.4 Principle of the Slingram method
 - 3.4.1 Signal decomposition
 - 3.4.2 The Slingram anomaly

- 3.4.3 Airborne systems
- 3.4.4 Case histories
- 3.4.5 Ground conductivity meters (measurements at low induction numbers)
 - 3.4.5.1 Case histories
- 3.5 The Very Low Frequency (VLF) method
- 3.6 The radiomagnetotelluric (RMT) method
 - 3.6.1 RMT surveys
- 3.7 Ground Penetrating Radar
 - 3.7.1 Modes of data acquisition
 - 3.7.2 Case studies

4 Seismic methods

- 4.1 Introduction
- 4.2 Seismic waves
 - 4.2.1 Stress and strain
 - 4.2.2 Types of seismic waves
 - 4.2.2.1 Body waves
 - 4.2.2.2 Surface waves
- 4.3 Seismic wave velocities
 - 4.3.1 Elastic wave velocity as a function of geological age and depth
 - 4.3.2 Time average equation to estimate rock porosity
- 4.4 Raypaths in layered media
 - 4.4.1 Reflection and transmission of normally incident seismic rays
 - 4.4.2 Reflection and refraction of obliquely incident rays
- 4.5 Seismic data acquisition systems
- 4.7 Seismic reflection surveying
 - 4.7.1 Introduction and general considerations
 - 4.7.2 Geometry of reflected ray paths
 - 4.7.2.1 Single horizontal reflector
 - 4.7.3 Data acquisition
 - 4.7.4 Case studies

4.8 Seismic refraction surveying

4.8.1 General principles

4.8.2 Geometry of the refracted ray paths

5 Geomagnetic methods

5.1 Basic concepts and units of geomagnetism

5.2 The earth's magnetic field

5.2.1 Internal magnetic field – the main depth field

5.2.2 External magnetic field – time variable field

5.2.3 Local field

5.3 Field measurements – reduction of magnetic observations

5.4 Interpretation