UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Geophysical Prospecting

2627-1-F7402Q003

Aims

Providing the theoretical and practical: to correctly apply the methods of geophysical prospecting (seismic refractio and reflection / geo-electrical) and know how to interpret geophysical data.

Contents

Geophysical data inversion, Geophysical signal analysis, Seismic refraction method, seismic reflection method, DC geo-electrical method, Induced polarisation. Laboratory and field experiences on seismic and geo-electrical methods.

Detailed program

Introduction to the inversion of geophysical data: data and model spaces and a priori assumptions: the regression problem of experimental data as an inverse problem. Introduction to geophysical signal processing and their basics (spectral analysis, filtering, convolution and cross-correlation). Introduction to the signal processing in different domains (time, frequency and wave numbers). Waves and their generality, acoustic and elastic wave propagation: seismic wave fronts and rays. Relationships between wave velocities and elastic moduli. Seismic refraction and its theoretical basics. Data acquisition techniques and methods of inversion seismic refraction data: single profile, profiles, reciprocal, time-delay, GRM. Imaging techniques in refraction seismic and seismic tomography of first arrivals.
Seismic reflection method and its theoretical basics. Techniques of seismic reflection data acquisition and data configuration. Processing domains and main steps of seismic reflection data processing: Input geometry, filtering, gain, since the sorting, velocity analysis, NMO correction, stacking and migration.
Basic theory of the method of DC resistivity. Archie's Law. Vertical electrical soundings, resistivity profiles and

electrical tomography. Inversion and interpretation of geo-electric data with numerical inversion and auxiliary curve methods. Method of induced polarization in the time domain and frequency. Notes on other prospecting methods: basic theories, measurable parameters and fields of application.
For the considered methods will be given special emphasis to their potentiality in different areas of exploration and the limitations. Finally, for seismic and geo-electrical techniques will be treated the practical design of surveys in the field and the acquisition protocols including the measurement procedures and experimental logistics.

Prerequisites

Physics basics: mechanics and electromagnetism, Waves, Earth physics

Teaching form

21 two-hour lectures, in person, Delivered Didactics
10 two-hour lab activities, in person, Interactive Teaching
2 two-hour field activities, in person, Interactive Teaching

Textbook and teaching resource

Lesson slides,

Seismic processing and interpretation softwares

Geo-electrical interpretation software

Kearey, P., M. Brooks, I. Hill. An Introduction to geophysical Exploration. Blackwell Pub., ISBN 0-632-04929-4.

Semester

March-June

Assessment method

Home exercise and report editing on the interpretation of seismic and geoelectrical data

Interview during wich will be discussed the report contents and lesson topics

Office hours

On demand by e-mail

grazia.caielli@igag.cnr.it

roberto.defranco@cnr.it

Sustainable Development Goals

CLIMATE ACTION | LIFE ON LAND