Seismic Migration

Course description:

Seismic migration is a key tool for constructing subsurface imagery based on industry seismic data. This short course aims to examining the basic methodology and underline geophysical principles of seismic migration. Some common migration methods, such as Kirchhoff, phase-shift, and full-wave migration, will be studied and illustrated with literature examples. Relevant topics to be discussed include pre-processing of migration data and velocity model building. In particular, the dependency of migration on the velocity-depth model and migration velocity analysis will be analized. The course will focus on principles, practicality, and future directions of seismic migration.

Who Should Take this Course?

Students in applied geophysics and employees of the petroleum industry, particularly those who deals with seismic migration as processors or interpreters, as well as anyone who is interested in the methodology of subsurface imaging using reflection seismology.

Course outline:

This course will be delivered following a set of class notes by Dr. H. Zhou titled "Seismic Migration". The chapters are: 1. Introduction to Migration: Definition and outline of methods • Time Processes before Imaging • Stacking Velocities • Math background; 2. Common Tangent Method: The exploding reflector concept • Hand-made migration • Advantages and limitations; 3. Kirchhoff Migration: Kirchhoff integral • Rayleigh integral • Kirchhoff migration • Traveltime and ray tracing; 4. Time versus Depth and Poststack versus Prestack Migrations: Time Migration • Depth Conversion of Time Migration • Post-stack Migration • Pre-stack Migration; 5. Migration Velocity Analysis: Initial velocity model • The depth and velocity ambiguity • Focusing analysis • Tomographic velocity analysis • Residual curvature analysis; 6. Frequency Domain Migration: Time versus frequency domains • Geometrical overview of f-k migration • Phase-shift migration; 7. Finite Difference Migration: Approximations of up-going wave equation • Retarded Coordinates • Finite differencing wave equations; 8. Prestack Depth Migration: Kirchhoff depth migration • Reverse time migration • Full-wave migration.