

TOMOGRAPHIC INVERSION IN REFLECTION SEISMOLOGY

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In reflection seismic exploration we attempt to determine as much as possible about the nature of a region of the earth (near the surface) from the propagation of energy from some artificial source, e.g. an explosion located at or near the surface, to an array of receivers. At each receiver a record of displacement or velocity against time after source activation is produced for analysis. In most such work the source and receivers are colinear and a "seismic line" is shot by interspacing the shotpoint source location and receivers along the line (with a typical receiver separation being 25-50m.), and repeating the shooting process many times until shots have been made all along some desired length. For such a line the problem is assumed to be two-dimensional, with no significant variation perpendicular to the vertical plane containing the line in its vicinity (the interpretation being subject to correction for large systematic variations revealed by cross-lines). A typical length of seismic line in exploration work would be several km. long, made up of repeated use of an array containing 24-48 receivers with length up to ~1 km.

Energy reaches the receivers either directly (surface waves) or by reflections from or refractions by changes in the earth's properties. The direct energy is not generally very informative, but in regions of the crust where it is stratified, i.e. composed of a series of