

EARTHQUAKE LOCATION VIEWED AS AN INVERSE PROBLEM

*M. S. Sambridge***1. Introduction**

The earth is continuously being subjected to both internal and external stresses of varying magnitudes. If the stresses are not too large, elastic or plastic deformation may occur. However if in some region of the earth they are allowed to accumulate over a period of time to the point exceeding the strength of the material, then according to Reid's elastic rebound theory (1911) this will rapidly lead to fracture. Fracture inside the earth involves the sudden release of elastic strain energy; such an event is commonly known as an earthquake. An earthquake generates shear and compressional kinetic energy which both radiate from the source and travel through the earth as elastic (or seismic) waves. This energy may be detected by a seismic network of receivers at the earth's surface which record the ground motion caused by the passage of these waves. A major problem in seismology is to deduce the earthquake source parameters and seismic properties of the earth from a set of observations at the surface.

In the hypocentral location problem one wishes to determine only the four hypocentral parameters of an earthquake x_k , $k = 1 \dots 4$, i.e. the three spatial coordinates and the origin time of the event. [Note we essentially neglect the detailed structure of the source region and consider a point solution]. The data for the problem consists of the observed first arrival times at a network of seismic stations of