Migrating Reflections from the Moho Using a Refraction Velocity Model – An Example from the Slave Craton, NWT

Joaquin Aristimuno*
Carleton University, Ottawa, Ontario, Canada
jasidore@connect.carleton.ca

and

Claire Samson
Carleton University, Ottawa, Ontario, Canada

Abstract
The Moho discontinuity marks the boundary between the Earth's crust and mantle, and is characterized by an abrupt increase in seismic velocity. In the Archean Slave Craton, NWT, coincident refraction and reflection surveys have been conducted in 1996 – 1997 as part of the Lithoprobe project. Examination of pre-stack time migrated sections from the SNORCLE profile reveals different reflection patterns in the interpreted Moho. In the Yellowknife area, in particular, layers in the lower crust appear to project downward through the reflection Moho.

Due to limited source-receiver offsets achieved in the field during reflection surveys, seismic velocity analysis based on reflection data has poor resolution at longer traveltimes. Traveltime inversion of the wide-angle reflections and refractions recorded during refraction surveys, on the other hand, can provide a detailed velocity model of the lower crust and upper mantle.

A new 2D velocity model under the SNORCLE profile has been derived from traveltime inversion of P-wave arrivals reflected and refracted in the upper and lower crust, and along the Moho. This paper presents depth migrations of the SNORCLE reflection seismic data using three different velocity models: 1) an average constant velocity value; 2) a 1D approximation of the refraction velocities, and 3) the new 2D refraction velocity model. The effects of these different velocities on the migration of deep structures will be constrasted.

This contribution is part of a larger research project aiming at investigating why different seismic techniques can lead to different estimates of Moho depth.