



Investigation of temporal and lateral variations of seismic velocities in south Iceland using ray tracing.

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Tools for ray-tracing through one dimensional earth models consisting of layers of constant velocity gradients, and continuous values across layers, have been developed. They are used to investigate stability and robustness of earthquake locations and velocity determinations in the South Iceland Lowlands (SIL) a transform seismic zone.

These tools will also be used to invert for velocity functions for different regions and time periods, by inverting simultaneously for micro-earthquake source parameters and P and S velocities.

Increase of velocity gradient with depth will cause rays with different take-off angles to cross, which can result in focusing and triplication when velocity is plotted versus time. It is therefore important to constrain the velocity solutions to avoid this. Large changes in gradient between adjacent layers causes variability of ray density and geometrical spreading, particularly for rays that turn just below the boundaries. This may create artificial clustering in the depth distribution of micro-earthquake source solutions. Resampling of the velocity functions using cubic spline interpolation can be used to reduce these effects.

The software is open source and can be accessed at <https://github.com/4dseismic>