

Abstract

During a seismic survey, sound waves are sent into the subsurface and picked up again by microphones. These echoes are plotted on a reflection chart. In order to know where an echo was located, we need the propagation velocity of the sound wave. We can then multiply this speed by the travel time to calculate a distance. To determine these speeds we use an iterative inversion technique.

We use one of these inversion techniques — Full-Waveform Inversion (FWI) — to create a velocity map from a reflection chart of the Utsira formation. This Utsira formation has been injected with CO₂ since 1994. On the velocity map, we can distinguish CO₂ layers due to their lower propagation velocity. The aim of the study is to discuss the CO₂ migration of this Utsira formation and to discuss further applications of FWI.

For the implementation of the FWI we use PyLops, a Python software package. Due to limitations of this software, the final velocity map is not suitable to discuss CO₂ migration. We therefore discuss JUDI, a Julia software package as a solution for future research.

After analysing various applications of FWI, it appears that the technique is promising for future research that uses reflections to image study objects.