Project Topic: Adaptive waveform inversion

Abstract

Full waveform inversion (FWI) is a geophysical technique that aims to recover a subsurface velocity model that minimises the misfit between the modelled and observed seismogram iteratively from a starting model. FWI has proven to be effective in recovering 3D high-fidelity and high-resolution P-wave velocity models of subsurface structure in practice.

However, conventional FWI suffers a fundamental problem with cycle skipping. Because seismic data are oscillatory, many secondary local minima exist within the misfit function would lead to spurious directions of convergence while inversion.

Adaptive waveform inversion (AWI) is a newly developed method which performs FWI by minimising the waveform misfit with a non-oscillating path. It proposes a new view of the minimization of the waveform differences between predicted and observed datasets. After forward propagation of the source wavefield, for each source-receiver pair, instead of doing subtraction, a Wiener filter is designed as a function of model parameters to adapt the predicted waveform into the observed trace. The new misfit function ensures a smoothing inversing pathway where local minima raised by conventional misfit function are avoided.

AWI is an inversion strategy with a newly presented misfit assessment expression, thus its full potential still remains undiscovered. This PhD mainly aims to get AWI working effectively and efficiently, for both industrial and academic datasets.

Biography

1st year PhD in petroleum geophysics, 3D Full Waveform Tomography group, Imperial College London

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