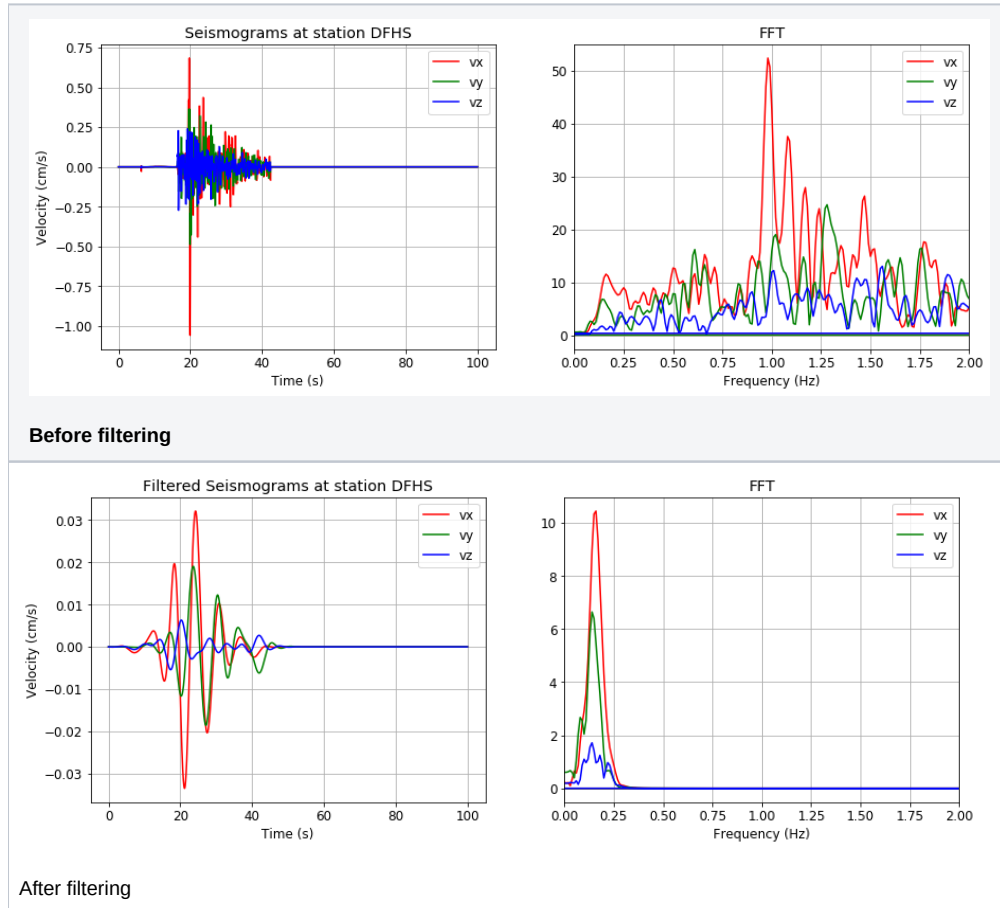


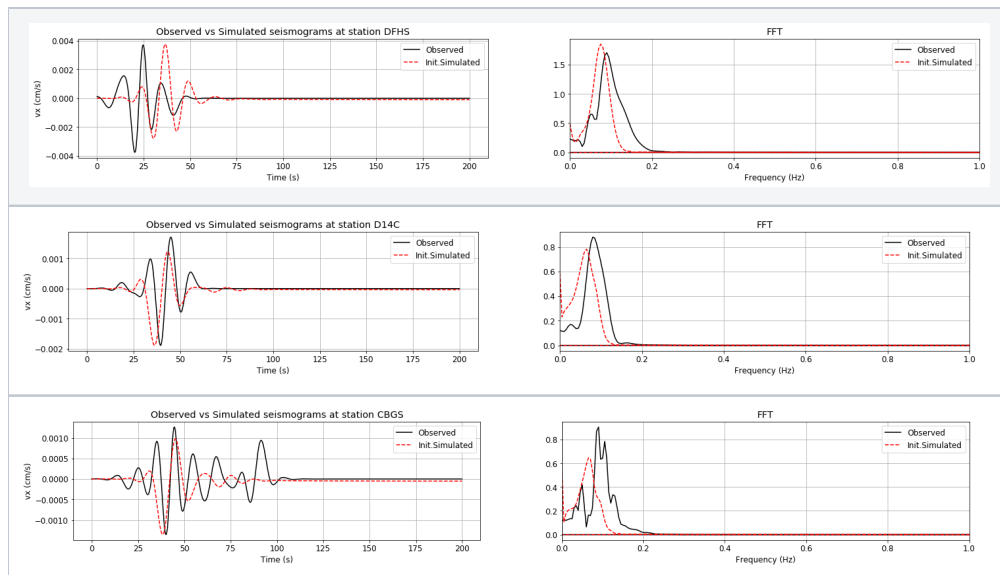
Processing observed data for 4 recorded events

TO DO: To have a proper low frequency data required for solving tomography problem, we need to list the specific stations recording the event from a general station list of the Canterbury region; re-sample the recorded seismogram to expected sampling rate; shift the recorded data based on the given time shift; and filter the data to the frequency band interested.

Example of recorded data before and after applying filter from 0-0.2Hz for event **3550173m4pt7** at station **DFHS**



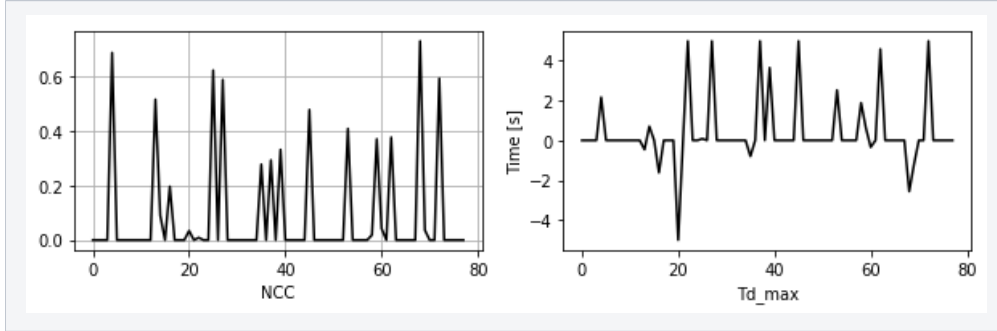
Comparison between the observed seismogram and seismogram simulated using emod3d with srf source for a homogeneous model; both are filtered from 0-0.1Hz



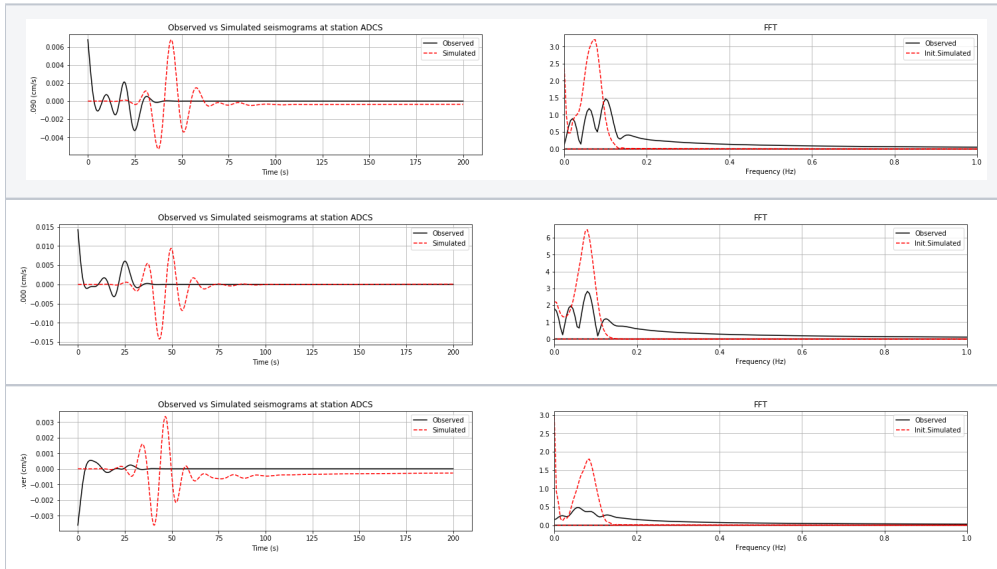
Quantify waveform similarity between synthetic and observed seismograms for 78 stations according to event **3550173m4pt7** using normalized correlation coefficient (NCC) defined as

$$NCC_n = \max_{\Delta t} \left[\frac{\int_{t_n^0}^{t_n^1} \bar{s}_n(t) s_n(t - \Delta t) dt}{\sqrt{\int_{t_n^0}^{t_n^1} \bar{s}_n^2(t) dt \int_{t_n^0}^{t_n^1} s_n^2(t - \Delta t) dt}} \right]$$

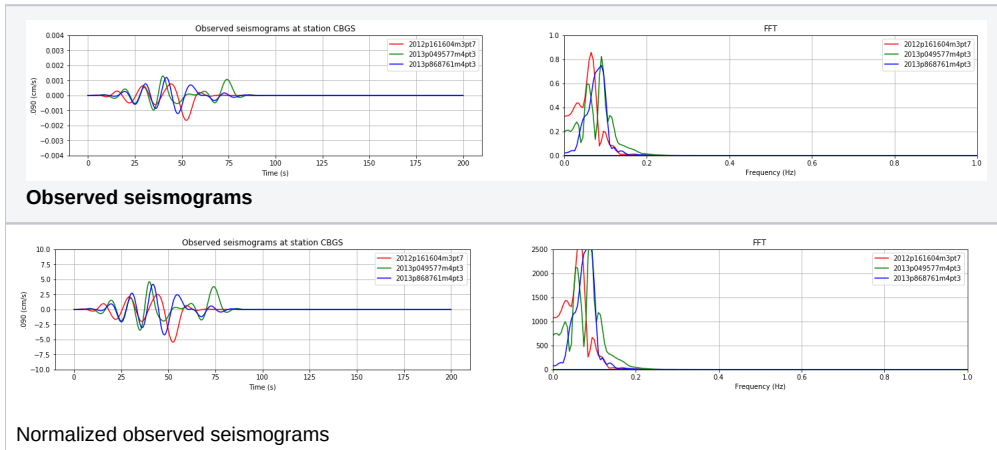
Here, the synthetic seismograms are generated using srf source for a homogeneous model of Vs=3.0km/s, Vp=6.0 km/s



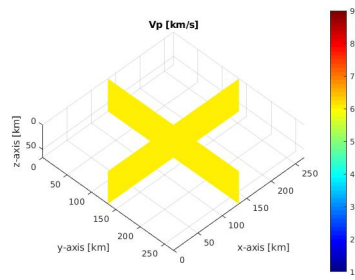
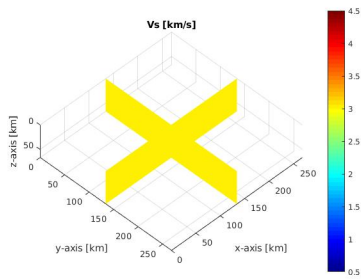
Example of removing low-quality observed seismograms with NCC<0.2



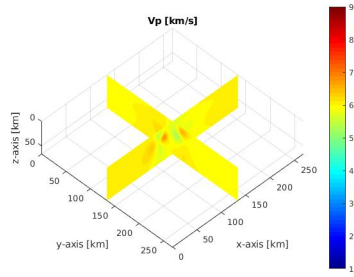
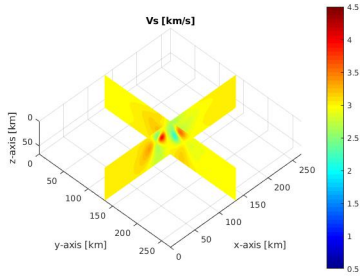
Normalize the observed seismogram (filtered from 0-0.1 Hz) at a station for 3 different events:



First inversion of the Canterbury velocity model using gsdf broad band selection of the adjoint source for 4 frequencies [0.025 0.05 0.075 0.1] Hz and observed seismograms from 4 earthquake events: 2012p161604m3pt7, 2013p049577m4pt3, 2013p868761m4pt3, 3550173m4pt7

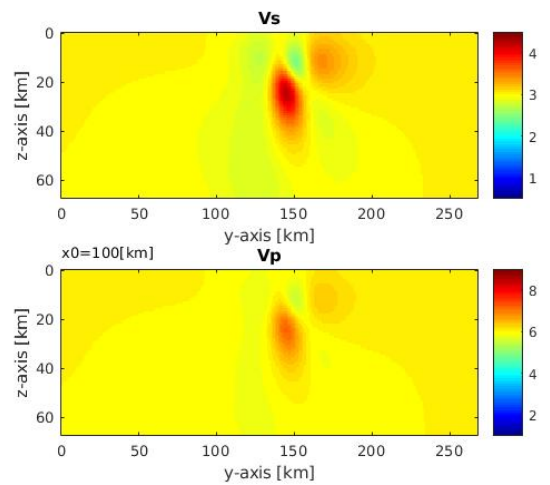
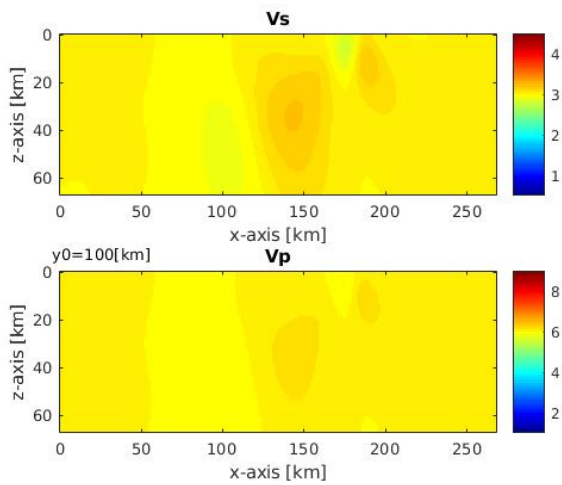


Initial model

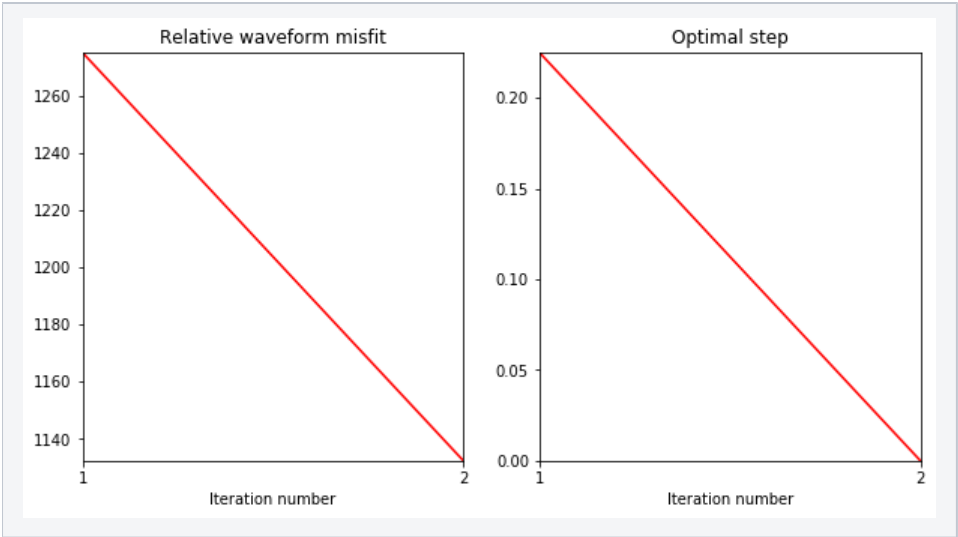


Inverted model after one iteration

Cross-sections of the inverted model



Misfit function and step length:



Waveform comparison between observed and simulated seismograms after one iteration for event **2012p161604m3pt7**

