

Inversion of Seismograms for Source Parameters of Contained Democratic People's Republic of Korea Underground Nuclear Explosions

Thursday, 22 June 2023 14:45 (15 minutes)

Source parameters and source time functions of the five contained Democratic People's Republic of Korea underground nuclear explosions, 2009-2017, are obtained from MDJ seismograms by Bayesian inversion. The test site is a few kilometres across. Therefore, the Earth impulse response, or Green's function, from each event to a given distant seismometer, is essentially the same. The Green's function is estimated by deconvolving the seismogram for the modelled source time function. The likelihood of the Green's function is defined as the reciprocal of the normalized root mean square difference of the Green's functions obtained from two sources. Prior probability density functions (pdfs) are applied to the following independent source parameters: internal pressure, Poisson's ratio, P-wave velocity and resonant frequency. The posterior pdf (PPD) is proportional to the likelihood of the Green's function multiplied by the prior parameter probabilities. The estimated source parameters are obtained by a grid search to find the maximum PPD. The estimated Green's functions for the five Democratic People's Republic of Korea events 2009-2017 to the MDJ seismometer are nearly identical, as they should be. The Green's function from the test site to any other seismometer can be obtained by deconvolving the seismogram for the now known corresponding source time function.

E-mail

Anton.Ziolkowski@ed.ac.uk

Oral preference format

in-person

Promotional text

I estimate source parameters and time functions for the DPRK nuclear tests 2009-17 and almost identical Green's functions from these events to the MDJ seismometer. For any other seismometer the Green's function is obtained by deconvolving for the now known source time function.

Primary author: Mr ZIOLKOWSKI, Anton (University of Edinburgh)

Presenter: Mr ZIOLKOWSKI, Anton (University of Edinburgh)

Session Classification: O2.1 Characterization of Treaty-Relevant Events

Track Classification: Theme 2. Events and Nuclear Test Sites: T2.1 Characterization of Treaty-Relevant Events