AGU 100 ADVANCING EARTH AND SPACE SCIENCE | **FALL MEETING**
Washington, D.C. | 10–14 Dec 2018

S53A-03: Virtual seismology: from hydrocarbon reservoir imaging to induced earthquake monitoring

Friday, 14 December 2018
14:20 - 14:40
 Marriott Marquis - Independence F-H

Recent developments in exploration seismology have enabled the creation of virtual sources and/or virtual receivers in the subsurface from reflection measurements at the earth's surface. Unlike in seismic interferometry, no physical instrument (receiver or source) is needed at the position of the virtual source or receiver. Moreover, no detailed knowledge of the subsurface parameters and structures is required: a smooth velocity model suffices. Yet, the responses to the virtual sources, observed by the virtual receivers, fully account for multiple scattering. This new methodology, which we call virtual seismology, has led to a breakthrough in hydrocarbon reservoir imaging, as is demonstrated in a companion paper (Staring et al., Marchenko redatuming for multiple prediction and removal in situations with a complex overburden). The aim of the present paper is to discuss applications of virtual seismology beyond exploration seismology, in particular induced earthquake monitoring, and to highlight the connections between these applications. The ability to retrieve the entire wave field between (virtual or real) sources and receivers anywhere in the subsurface, without needing a detailed subsurface model, has large potential for monitoring induced seismicity, characterizing the source properties (such as the moment tensor of extended sources along a fault plane), and forecasting the response to potential future induced earthquakes. This will be demonstrated with numerical models and preliminary real-data results.

Authors

Cornelis P A Wapenaar
Delft University of Technology

Jan Thorbecke
Delft University of Technology

Joeri Brackenhoff
Delft University of Technology

Evert C Slob
Delft University of Technology

Myrna Staring
Delft University of Technology

Find Similar

View Related Events

Day: Friday, 14 December 2018