



AGU FALL MEETING

San Francisco | 14 – 18 December 2015

S14A-01: Beyond seismic interferometry: imaging the earth's interior with virtual sources and receivers inside the earth (Invited)

Monday, 14 December 2015

16:00 - 16:15

📍 Moscone South - 307

Imagine one could place seismic sources and receivers at any desired position inside the earth. Since the receivers would record the full wave field (direct waves, up- and downward reflections, multiples, etc.), this would give a wealth of information about the local structures, material properties and processes in the earth's interior. Although in reality one cannot place sources and receivers anywhere inside the earth, it appears to be possible to create virtual sources and receivers at any desired position, which accurately mimics the desired situation. The underlying method involves some major steps beyond standard seismic interferometry. With seismic interferometry, virtual sources can be created at the positions of physical receivers, assuming these receivers are illuminated isotropically. Our proposed method does not need physical receivers at the positions of the virtual sources; moreover, it does not require isotropic illumination. To create virtual sources and receivers anywhere inside the earth, it suffices to record the reflection response with physical sources and receivers at the earth's surface. We do not need detailed information about the medium parameters; it suffices to have an estimate of the direct waves between the virtual-source positions and the acquisition surface. With these prerequisites, our method can create virtual sources and receivers, anywhere inside the earth, which record the full wave field. The up- and downward reflections, multiples, etc. in the virtual responses are extracted directly from the reflection response at the surface. The retrieved virtual responses form an ideal starting point for accurate seismic imaging, characterization and monitoring.

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