Geophysical Research Abstracts
Vol. 12, EGU2010-14180, 2010
EGU General Assembly 2010

Source-Receiver Interferometry and the Link to Imaging

Andrew Curtis (1) and David Halliday (2)

(1) School of GeoSciences, University of Edinburgh, U.K. (Andrew.Curtis@ed.ac.uk), (2) Schlumberger Cambridge Research, Cambridge, U.K. (DHalliday@slb.com)

In conventional seismic interferometry, noise or impulsive-source wavefields recorded at a pair of receivers are correlated, convolved, or deconvolved in ways that produce estimates of the inter-receiver Green's function – the signal that would be recorded at one receiver if the other had been a source. Thus one receiver is converted into a 'virtual' source. Recently it was shown that recordings from a pair of energy sources at a network of receivers can be combined similarly to convert one source into a virtual receiver that records real energy from the other source; in a previous paper we used this to create a virtual strain seismometer deep in the Earth from a real earthquake source. We now derive the third possible geometrical form of interferometry, that can be applied between a source-receiver pair: this turns a real source and real receiver into a virtual receiver and virtual source, respectively, and requires a double-focussing operation. While this is useful in itself for analysing source-receiver surface waves, we show that by perturbing the medium in source-receiver interferomtry the method can also be directly converted into the double-focussing operation commonly used in seismic imaging or migration. Thus we create a direct and intuitive link between interferometry and imaging/migration theory.