Geophysical Research Abstracts
Vol. 18, EGU2016-6193-1, 2016
EGU General Assembly 2016

Properies of the microseism wave field in Australia from three component array data

Martin Gal (1), Anya Reading (1), Simon Ellingsen (2), Keith Koper (3), Relu Burlacu (3), and Hrvoje Tkalčić (4)

(1) School of Physical Sciences (Earth Sciences), University of Tasmania, Hobart,Australia (martin.gal@utas.edu.au), (2) School of Physical Sciences (Mathematics and Physics), University of Tasmania, Hobart,Australia, (3) Department of Geology & Geophysics, University of Utah, Salt Lake City, USA, (4) Research School of Earth Sciences, Australian National University, Canberra, Australia

In the last two decades, ambient noise studies in the range of 1-20 seconds have predominantly focused on the analysis of source regions for Rayleigh and P waves. The theoretical excitation of these phases is well understood for primary microseisms (direct coupling of gravity waves in sloping shallow bathymetry) and secondary microseisms (wave-wave interaction) and correlates well with observations. For Love waves, the excitation mechanism in the secondary microseism band is to date unknown. It has been shown, that LQ waves can exhibit larger amplitudes than Rg waves for certain frequencies. Therefore detailed analysis of the wave field are necessary to find indications on the generation mechanism.

We analyse data from two spiral-shaped arrays located in Australia, the Pilbara Array (PSAR) in the North-West and an array in South Queensland (SQspa) in the East. The two arrays are different in aperture and allow for the study of primary and secondary microseisms with SQspa and higher secondary microseisms with PSAR. We use a deconvolution enhanced beamforming approach, which is based on the CLEAN algorithm. It allows the accurate detection of weaker sources and the estimation of power levels on each component or wave type. For PSAR we evaluate 1 year of data in the frequency range of 0.35-1 Hz and find fundamental and higher mode Rg and LQ waves. For the low end of the frequency range, we find the strongest fundamental mode Rg waves to originate from multiple direction, but confined to coastline reflectors, i.e. coastlines that are perpendicular to the main swell direction, while higher mode Rg waves are mainly generated in the Great Australian Bight. For higher frequencies, the source locations of Rg waves move toward the north coast, which is closest to the array and we see an increase in the Lg phase. The majority of fundamental LQ waves are generated at the west coast of Australia and we find some agreement between low frequency Rg and LQ source locations, which becomes uncorrelated with increasing frequency. For higher mode LQ waves the generation region is in the south-west, where Australia is exposed to direct swells from the Antarctic. In the case of Rg-to-LQ power ratio, we find a frequency and backazimuth dependence. Results from SQspa allow lower frequency arrivals around the primary and secondary microseism peak to be investigated.