Geophysical Research Abstracts
Vol. 20, EGU2018-1834, 2018
EGU General Assembly 2018

The detailed nature of microseisms revealed by 3-component array analysis of short duration time windows.

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In the last two decades, advances have been made to extract information from the continuous microseisms wavefield and have improved our understanding of the nature of such signals, the mechanism which drives their generation and the medium that they propagate through. Microseisms are commonly described as continuous background oscillations of the solid Earth and their presence dominates the seismic wavefield in the period range of ∼2-20 seconds when no earthquake energy is present. But how continuous is the wavefield on closer analysis?

We present an array based study which analyses primary and secondary microseisms on a time scale of seconds and allows to answer the above question. We select the USA as our test site given the large number of seismic arrays and well studied upper crust. A novel 3-component matched field processing approach is employed which incorporates velocity heterogeneities, accounts for wavefront bending and accurately estimates inter-station time delays. We analyze primary microseism Rayleigh and Love waves and find that these sources radiate energy in the form of pulses rather than a continuous signal. A single storm generating secondary microseism energy resembling PKP, PKIKP and PP is analysed and the same pulse like nature is observed. We demonstrate how these findings can be exploited to extract additional information (e.g. spatial localization of Rayleigh and Love waves, array self calibration, differential travel times deviations) from the microseism wavefield.