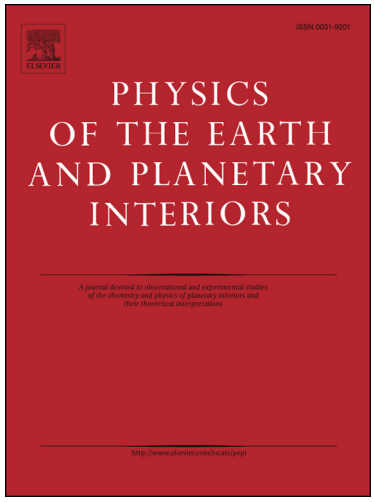

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Claire Birnie, Kit Chambers, Doug Angus

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Seismic arrival enhancement through the use of noise whitening

Claire Birnie[a], Kit Chambers[b], Doug Angus[c]

[a]*Institute of Applied Geoscience, University of Leeds, UK*

[b]*Nanometrics Inc., UK*

[c]*previously Institute of Applied Geoscience, University of Leeds, UK, now at ESG Solutions, Canada*

Abstract

A constant feature in seismic data, noise is particularly troublesome for passive seismic monitoring where noise commonly masks microseismic events. We propose a statistics-driven noise suppression technique that whitens the noise through the calculation and removal of the noise's covariance. Noise whitening is shown to reduce the noise energy by a factor of 3.5 resulting in microseismic events being observed and imaged at lower signal to noise ratios than originally possible - whilst having negligible effect on the seismic wavelet. The procedure is shown to be highly resistant to most changes in the noise properties and has the flexibility of being used as a stand-alone technique or as a first step before standard random noise attenuation methods.

Keywords: passive seismology, microseismic, noise whitening, noise suppression

1. Introduction

Noise is an ever present obstacle in all seismic data recordings, often preventing the user from extracting the desired signal. As such, noise suppression is one of the main topics of interest across all seismic monitoring scenarios ranging from reflection seismics (Yilmaz, 2001) to surface wave tomography (Bensen et al., 2007). In this paper we use the example of a surface microseismic monitoring scenario to introduce a noise suppression technique applicable to all seismic monitoring scenarios.