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To:
Department of Earth Physics
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Saint Petersburg State University

Berlin, 24th of September, 2015

A review of the PhD thesis presented by Denis Anikiev to the Department of Earth Physics Faculty of Physics Saint Petersburg State University

The thesis addresses the problem of microseismic events detection and location using surface acquisition geometries.

The main challenge in this area is to detect and locate low energy microseismic events in the presence of strong background noise. At the same time one has to avoid so-called "false positive" events, which are artifacts of an event detection procedure. The main contribution of this work is a theoretical development, practical implementation and verification of a method intended to deal with these challenges.

Proposed method of joint event detection and location includes number of algorithms, such as: an algorithm of diffraction stacking that uses estimated moment tensor to correct stacked amplitudes; an algorithm of event detection and verification based on semblance of stacked amplitudes; an algorithm of event location that is not restricted by a spatial grid and provides statistically meaningful location uncertainties.

The method was applied to a real dataset acquired during a hydraulic fracturing stimulation of a shale gas reservoir. The outcome of this feasibility test shows ability of the method to detect and locate low signal-to-noise events with accuracy comparable to other location methods based on arrival time picking.

Summarizing, the thesis addresses an interesting and relevant topic of the area of microseismic data processing. The proposed method of joint event detection, location and source mechanism determination shows advantages to other existing methods.

The author of this dissertation has demonstrated the ability to work independently and creatively in the specific scientific field.

I clearly recommend acceptance of this work.

S. Shapiro

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