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## **Comparison of Detection and Location Capabilities of Surface and Subsurface Microseismic Monitoring Algorithms for The Purposes of Monitoring Underground Storage Facilities**

The challenge of the surface microseismic monitoring (MSM) is that small-scale seismic activity which occurs as a result of human activities or industrial processes is often hidden in surface noise on individual seismic records. The monitoring of underground storage facilities also presents the problem that the storage facility will also act as a noise source (from active machinery and operations) which could hide any tunneling activities. MSM algorithms used for shale gas hydraulic fracture stimulation must detect and locate signals with average signal-to-noise ratio (SNR) significantly less than 1. To improve SNR MSM algorithms compute a cost function over a large set of seismic records. The maximum of such a function indicates presence, time, and location of the seismic signal. Other algorithms, such as Phase Robust Statistically Optimal and Diagonal Maximum Likelihood Adaptive algorithms offer accuracy improvements of location and detection in presence of correlated industrial noise. In this poster we use synthetic seismograms and seismic observation to compare accuracy of event locations using several algorithms of surface microseismic monitoring. We also show the use of cross correlation techniques with surface and downhole monitoring arrays to identify sources of noise and or activity in the subsurface (with examples from underground mining and carbon sequestration storage).

### **Which "Key Question" does your Abstract address?**

NEW1.2

### **Which alternative "Key Question" does your Abstract address? (if any)**

NEW2.2

### **Topics**

NEW1

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