

## NanoSeis

# Surface Microseismic Event Quality Control

Reported events from surface microseismic monitoring often contain large numbers of sub-visible events, which are detected by an automatic picker but are not visible to the human eye, and may or may not be actual events. Figure 1 shows results from a survey in which simultaneously recorded borehole microseismic data and surface microseismic data were used to classify reported surface events as visible, sub-visible, or false events.

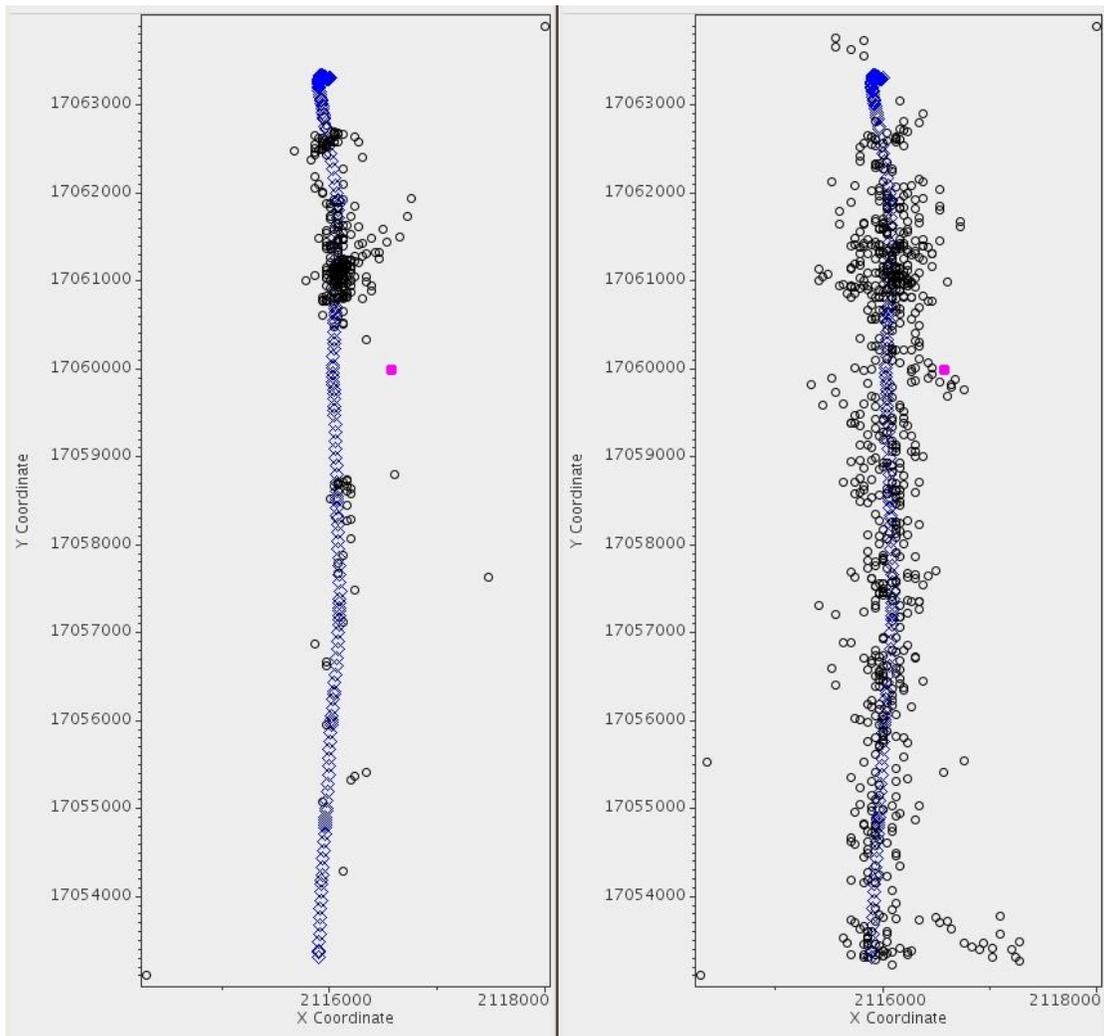


Figure 1. Map view of events that were reported from a commercial surface microseismic vendor. Events that were classified as real based on comparison to borehole data are shown in the left panel, and those that were classified as false events are shown in the right panel. Of the 988 initial events that were reported by the vendor, 118 were classified as visible, 184 were classified as sub-visible, and 686 were classified as false events. Subsequent reprocessing of the surface data showed significant improvement. From Diller and Gardner, 2011 SEG abstract.

NanoSeis provides Event Quality Control services for surface microseismic data. Each reported event is reviewed interactively, and each event is classified as follows:

- 1) “Visible” (visible to the human eye in the waveform data).
- 2) “Sub-visible” (not visible to the human eye in the waveform data, but recognized by the human eye in migrated space).
- 3) “Unrecognized” (not visible to the human eye in the waveform data, and not recognized by the human eye in migrated space).

Note that it is not possible to classify surface events as “false” unless borehole data was recorded simultaneously. Classification of events is somewhat subjective, and requires a trained eye. To provide an audit trail NanoSeis provides the customer with a JPEG image of the “pick scene” for each event, which includes the moved-out waveform data and the migrated event in map view and cross-section view.

For surface microseismic data NanoSeis has focused its research on discriminating small events from false positives, and we have discovered a fast, simple, robust, and intuitively obvious method that is effective. The quantified version of this method we call the Reality Factor. In our Event Quality Control services we provide a Reality Factor score for each event.

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