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Validation of shallow microseismic monitoring array for deep reservoir monitoring

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SUMMARY

Monitoring reservoir stimulation operations provides data for predicting production performance and for reservoir characterization but also, potentially, for compliance with local regulations. With improved drilling and completion technology the depth of the unconventional reservoirs produced increases and the options for deploying cost-effective microseismic monitoring equipment become limited. The monitoring technology has to adapt by optimizing acquisition geometry and data processing as well as the procedures that demonstrate the validity of the results. A practical solution for microseismic monitoring of stimulation operations in an unconventional reservoir under development is a surface or shallow distributed array. We are analyzing two such datasets together with complementary deep borehole sensor datasets in order to understand how to predict and validate the expected performance of distributed surface and shallow arrays. The surface recorded data is processed by stacking and event detection and location are accepted based on statistical criteria. This catalog of events is compared to the one obtained from borehole array where waveforms can be analyzed individually in order to validate the quality of event analysis.