INTRODUCTION TO DECEMBER FOCUS:
Microseismic User Group
Special Coordinator: Paige Mamer

An Analytical Approach to Hydraulic Fracturing and Induced Seismicity Monitoring
JOHN L. J. DUHAULT

Determination of the Stress State – An Additional Benefit of Background Seismicity Monitoring
ZUZANA JECHUMTÁLOVÁ AND DAWID SZAFAŃSKI

Interpreting Microseismic Data from Hydraulic Fracturing: Understanding Subsurface Deformation Through Numerical Modeling
NEDA BOROUMAND AND DAVID EATON

Beyond the Microseismic Clouds: A Comprehensive Approach to Unconventional Gas Development
JASON HENDRICK, ADAM BAIG, ERIC VON LUNEN, AND TED URBANCIC

The Microseismic User Group (MUG) has been active for nearly five years, providing an avenue for those interested in learning more about microseismic topics in an open and educational setting. Since its inception, MUG has brought together geoscientists, engineers and microseismic enthusiasts from oil and gas operating companies, service companies, government, and academic institutions from across North America. The group has covered topics ranging from microseismic case studies, microseismic and hydraulic fracture research, and induced seismicity, to name a few. This special edition of the CSEG RECORDER highlights some of the work of MUG’s past speakers and participants. In this issue, four articles are presented that address different aspects of passive monitoring.

Whether to monitor for induced seismicity during well completions or disposal, when monitoring is not mandated, can be a difficult decision for companies to make. In the first article, John Duhault presents a straight-forward decision making framework for companies to employ when evaluating monitoring needs in areas of active development. The assessment framework is one that can be easily adapted to any play and can be easily digested by non-specialists and company management.

One factor that can impact the need to monitor is the presence of natural seismicity. This topic is tackled by Zuzana Jechumtálová and Dawid Szafrański in the second article. The authors present results from fifteen months of background monitoring in Arkansas, during which several natural seismic events were recorded. Source mechanism determination and subsequent stress inversion has allowed for the stress state to be established. The article also demonstrates that there is a minimum number of sensors and amount of time required to establish background seismicity rates prior to monitoring hydraulic fracturing and disposal activities.

Getting back to the roots of microseismic monitoring, Neda Boroumand and David Eaton tackle a question that is seemingly straightforward at first glance – why do hydraulic fractures behave as they do? This third article reveals the complex nature of hydraulic fracture growth. Boroumand takes a deep look into the factors that impact the answers to this question through energy considerations during hydraulic fracturing, numerical modeling with an energy-based approach and using a coupled fluid and geomechanical 3D simulation. This article represents the culmination of research that led to Boroumand’s PhD thesis. In an effort to battle the brain drain that is inevitably occurring as geoscience jobs are lost in high proportions in the oil and gas industry, the last article by Jason Hendrick et al., attempts to capture half a decade of corporate microseismic research and development in the Horn River Basin. Jason discusses Nexen’s advances in microseismic acquisition, processing flows, and interpretation. Hendrick also highlights the importance of corporate commitment and investment in furthering microseismic science and technology.

Paige Mamer works for ITASCA Microseismic and Geomechanical Evaluation (iMaGE) on a variety of microseismic and induced seismicity topics. Paige has been a facilitator of the Microseismic User Group since its launch in 2012.