



SEG 2009 Summer Research Workshop

CO₂ Sequestration Geophysics

23–27 August 2009 • Banff, Canada

MEETING SCHEDULE

Portions of the
Workshop sponsored by:



Society of Exploration Geophysicists
The international society of applied geophysics

SEG 2009 SRW TECHNICAL PROGRAM

SUNDAY, 23 AUGUST

9:00 am-5:00 pm....Field Trip along Rocky Mountains thrust front, lakes & glaciers (pre-registration required)

6:00 pm.....Registration Open

6:00-6:30 pmMeeting for organizing committee and session chairs

7:00-9:00 pmWelcome and Icebreaker, MB Lounge/Foyer

MONDAY, 24 AUGUST

8:00 amBreakfast, Vistas Dining Room

9:00 am ►► **Session 1: Overview: CO₂ sequestration challenges and the role of Geophysics**

Oral Presentation/Discussion Leaders:

- Highlights of the 2009 Hedberg CO₂ Conference, *D. Lunley, U. of W. Australia*
- The role of geophysical monitoring in design and planning of sequestration projects; Current status and needed research, *L. Myer, Lawrence Berkeley Lab*
- Facing the main challenges in carbon capture and sequestration, *R. Snieder, Colorado School of Mines*

10:30-10:45 am.....Break

10:45 am ►► **Session 2: Geophysical site characterization for CO₂ storage**

Oral Presentation/Discussion Leaders:

- Introductory Remarks, *R. Masters, Shell and D. Lawton, U. of Calgary*
- Challenges in CO₂ geological storage and the role of geophysics, *S. Bachu, Alberta Research Council*
- Structural framework and petrophysical integrity of the Seals of the Weyburn CO₂ sequestration environment, *S. Sule, U. of Saskatchewan*

12:15 pm.....Lunch, Vistas Dining Room

1:15 pm ►► **Session 3: Rock and fluid physics of CO₂-saturated rocks**

Oral Presentation/Discussion Leaders:

- Quantitative CO₂ saturation estimation from P-wave velocity changes by considering patchy saturation, *C. Konishi, OYO Japan*
- Ultrasonic elastic wave velocity measurements in a limestone reservoir rock sample using various pore fluids, SEM analysis and integration into a seismic survey taken before and after a CO₂ sequestration flood, *W. Harbert, NETL/DOE*
- Rock physics model for free CO₂: An illustration combining laboratory P and S wave measurements with a model of CO₂ state behavior, *H. Yam, U. of Alberta*

2:45-3:00 pmBreak

3:00 pm ►► **Session 4: Geophysical modeling of CO₂ injection simulations**

Oral Presentation/Discussion Leaders:

- Poroelastic AVO responses for mixed H₂O-CO₂ saturated reservoirs, *D. Aldridge, Sandia National Labs*
- Mass balance and layer thickness uncertainty: Calibrating a model for the Utsira CO₂ plume, *A. Cavanagh, Permedia Research Group*
- A physics and seismic numerical methodology for modeling CO₂ geological storage, *S. Picotti, OGS, Italy*

TUESDAY, 25 AUGUST

8:00 amBreakfast, Vistas Dining Room

9:00 am ►► **Session 5: Non-seismic geophysical techniques for CO₂ projects**

Oral Presentation/Discussion Leaders:

- Gravity and EM modeling of CO₂ movement during geological sequestration, *E. Gasperikova, Lawrence Berkeley Lab*
- Coupled reservoir-geomechanical modeling and geophysical monitoring, *J. Rutqvist, Lawrence Berkeley Lab*

- CO₂ SINK project – main focus on geoelectric monitoring of geological CO₂ storage at Ketzin, Germany, *D. Kiessling, Helmholtz Centre Potsdam*

10:30-10:45 am.....Break

10:45 am ►► **Session 6: Seismic data acquisition for CO₂ projects**

Oral Presentation/Discussion Leaders:

- Seismic survey design for CO₂ sequestration on a Class A nature reserve to improve historically poor seismic data quality, *J. Cocker, Chevron Australia*
- Borehole seismic monitoring for small scale sequestration pilots, *T. Daley, Lawrence Berkeley Lab*
- How to design a sparse array for seismic monitoring?, *L. Huang, Los Alamos Lab*

12:15 pm.....Lunch, Vistas Dining Room

AfternoonFree time to explore/hike Banff area

7:00-10:00 pm ►► **Poster session and discussion period: CO₂ Geophysics**

- 18 posters on a variety of CO₂ topics from around the world
- On the use of PSInSAR™ for CO₂ sequestration monitoring, *G. Falorni, TRE Canada*
- Pembina Cardium CO₂ monitoring project: Integrated surface seismic and VSP time-lapse seismic analysis, *A. Alshuhail, U of Calgary*
- Regional magnetic surveys in different parts of Eastern Ghat Mobile Belt and possible inferences, *B. Babu, Andhra U.*
- Active and passive seismic imaging and monitoring of CO₂ storage sites in Germany, *S. Buske, Freie U Berlin*
- Passive microseismics: A valuable technique for monitoring CO₂ injections, *J. Daugherty*
- Electromagnetic monitoring of CO₂ storage using novel front evolution techniques, *O. Dorn, U of Manchester*

7:00-10:00 pm ►► **Poster session and discussion period: CO₂ Geophysics**

- Receiver function to improve PS wave statistics for Weyburn 4D-3C processing, *L. Gao, U of Saskatchewan, Canada*
- Safe CO₂: Safety monitoring of CO₂ storages using microseismicity and 4-D seismic modelling – a new CCS project in Norway, *D. Kühn, NOR SAR*
- Pressure-saturation effects on AVO in Weyburn CO₂ sequestration, *J. Ma, U. of Saskatchewan, Canada*
- Geophysical monitoring carbon sequestered brine aquifers-A feasibility study, *S. Mallick, U. of Wyoming*
- Seismic processing challenges in CO₂ geo-sequestration: Examples from Western Canada, *M. Perz, Divestco, Inc.*
- Incorporating various vintages into time-lapse studies: Otway Basin example, *V. Shulakova, CSIRO Petroleum*
- Application of metal-organic frameworks in CO₂ sequestration, *D. Singh*
- CO₂ fluid replacement seismic modeling of the Devonian Leduc Reef in Redwater Area, Alberta, *T. Sodagar*
- Using AVO to map thin layers of CO₂ at Sleipner, *M. Dillen, SINTEF Petroleum Research*
- Controlled source electromagnetic modeling study for CO₂ storage, *M. Dillen, SINTEF Petroleum Research*
- CO₂ monitoring with time-lapse seismic anisotropy?, *M. Urosevic, Curtin U. of Technology*
- Time-lapse attenuation as a tool for monitoring fluid changes, *M. van der Baan, U. of Alberta*
- Fluid substitution: Identifying in-situ saturation type from well logs to predict 4D seismic response for CO₂ sequestration, Otway Basin Project, *P. Wisman, Curtin U. of Technology*

WEDNESDAY, 26 AUGUST

8:00 amBreakfast, *Vistas Dining Room*

9:00 am ►► **Session 7: Geophysical responses to geomechanical effects**

Oral Presentation/Discussion Leaders:

- A strategy for long-term passive seismic monitoring of CO₂ storage sites, *M. Kendall, U. of Bristol*
- Simulations of injection-induced mechanical deformation: A study of the In Salah CO₂ Storage Project, *J. Morris, Lawrence Livermore Lab*
- A comparison of passive seismic monitoring of fracture stimulation due to water versus CO₂ Injection, *J. Verdon, U. of Bristol*

10:30-10:45 amBreak

10:45 am ►► **Session 8: Data processing, imaging of CO₂**

Oral Presentation/Discussion Leaders:

- Seismic monitoring at the CO₂ SINK project site, Ketzin, Germany: Past, present and future, *C. Juhlin, Uppsala U., Sweden*
- Limits of seismic land data repeatability, *R. Pevzner, Curtin U., Australia*
- Microseismic monitoring of CO₂ injection in the Aneth Oil Field, San Juan County, Utah, *J. Rutledge, Los Alamos Lab*

12:15 pmLunch, *Vistas Dining Room*

1:15 pm ►► **Session 9: 4D seismic monitoring of CO₂: Practical considerations**

Oral Presentation/Discussion Leaders:

- *D. Lumley, U. of W. Australia*
- Seismic characterization of a CO₂ flood in Ardley Coals, Alberta, Canada, *J. McCrank, Shell*
- Practical seismic monitoring of CO₂ sequestration, *P. Wills, Shell*

2:45-3:00 pmBreak

3:00 pm ►► **Session 10: Geophysical data interpretation challenges for CO₂**

Oral Presentation/Discussion Leaders:

- Seismic data interpretation dilemmas in CO₂ injection monitoring, *R. Benson, Colorado School of Mines*
- Interpretation challenges for time-lapse seismic monitoring: Experience from the IEA Weyburn-Midale CO₂ Monitoring and Storage Project, *Don White, NRCAN*
- Monitoring CO₂ plume development at Sleipner using time-lapse seismic data, *G. Williams, British Geological Survey*

THURSDAY, 27 AUGUST

8:00 amBreakfast, *Vistas Dining Room*

9:00 am ►► **Session 11: Geophysical data inversion challenges for CO₂**

Oral Presentation/Discussion Leaders:

- Using optimal experiment design to improve CO₂ sequestration monitoring strategies, *J. Ajo-Franklin, Lawrence Berkeley Lab*
- Monitoring CO₂ injection using stochastic methods, *A. Ramirez, Lawrence Livermore Lab*
- Full-waveform inversion for CO₂ monitoring: Application to the Sleipner Field, *C. Ravaut, SINTEF, Norway*

10:30-10:45 amBreak

10:45 am ►► **Session 12: Geophysical data value, risk assessment, closing-the-loop**

Oral Presentation/Discussion Leaders:

- Maturing a CO₂ storage project – A roadmap for assuring value from screening to execution, *J. Coggins, Shell*
- CO₂ sequestration monitoring in a low salinity formation water environment, *D. Murray, Schlumberger*
- Monitoring as the key enabler of dynamic risk assessment, *C. Oldenburg, Lawrence Berkeley Lab*

12:15Lunch, *Vistas Dining Room*

1:15 pm ►► **Session 13: New CO₂ sequestration case studies, field tests**

Oral Presentation/Discussion Leaders:

- MRCSP Michigan test site monitoring results, *J. Gerst, Battelle*
- New CO₂ sequestration projects in Alberta, Canada, *D. Lawton, U. of Calgary*
- Injection of CO₂ into a depleted gas reservoir - can we monitor it?, *M. Urosevic, Curtin U., Australia*

2:45-3:00 pmBreak

3:00 pm ►► **Session 14: Geophysics-CO₂ lessons learned and research opportunities**

Panel and Audience Discussion



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