

AGENDA – ROSE meeting 2-3rd May 2011

Location: P1 in PTS1, S.P. Andersens veg 15, Trondheim.

Monday 2nd May

09:45 Coffee and registration

10:00 Welcome

Session 1: Rock physics

Chair:

- 10:10 Ultrasonic attenuation and permeability in a brine saturated sandstone, *Tony Siggins, CSIRO*
- 10:40 Shales and clays: Velocities and velocity anisotropy – dependence on stress and lithology, *Rune M Holt, NTNU/ SINTEF*
- 11:10 Rock physics modelling and interpretation of 4D seismic time shifts in Troll East, *Per Avseth, Odin Petroleum/NTNU*
- 11:30 Mindlin's friction term and implications for shear modulus and anisotropy in granular media, *Kenneth Duffaut, NTNU*
- 11:50 The most important is to δ , *Mohammad Hossein Bhuiyan, NTNU*
- 12:10 **LUNCH**
- 13:00 Grain scale modelling of rock mechanical and petrophysical behaviour, *Idar Larsen, SINTEF*
- 13:20 Synthetic Rock Mass modeling for determination of geomechanical properties reservoir rock masses, *Nicholas Thompson, NTNU*
- 13:40 Water in clays as seen by a discrete particle model, *Morten Kolstø, NTNU*
- 14:00 Cross-hole electromagnetic and seismic modeling for CO₂ detection and monitoring in a saline aquifer, *Davide Gei, OGS, Trieste*
- 14:20 Kinematical parameters in TTI media, *Pavel Golikov, NTNU*
- 14:40 Low-frequency extension of the Backus effective medium, *Alexey Stovas, NTNU*
- 15:00 **Coffee break**

Session 2: Time lapse and reservoir characterization

- 15:30 Seismic monitoring of an old underground blow out – 20 years later, *Martin Landrø, NTNU*.
- 16:00 4D interpretation of gas migration in shallow sand layers – compared to reservoir simulation, *Eli Langseth, NTNU*
- 16:20 Time lapse refraction analysis and full wave form inversion, *Hadi Balhareth, NTNU*

19:00 Dinner, Palmehaven, hotel Britannia, Dronningens gt. 5

Tuesday 3rd May

Chair:

- 9:00 Frequency effects at pre-, near- and post-critical offsets observed on water-plexiglas interface, *Lyubov Skopintseva, NTNU*
- 9:20 Time-lapse attenuation as a tool for separating pressure and saturation changes, *Mirko van der Baan, University of Alberta, Canada*
- 9:40 Patchy saturations and thickness estimations of a thin CO₂-layer, *Amir Ghaderi, NTNU/SINTEF*
- 10:00 **Coffee break**
- 10:30 Time lapse CSEM monitoring, *Anwar Bhuiyan, NTNU*
- 10:50 4D Case Study in the Deep Water Gulf of Mexico: Hoover, Madison and Marshall, *Dez Chu, ExxonMobil*
- 11:10 High frequency noise from air guns, *Daniel Barker, NTNU*
- 11:30 PhD plans: *Sandra Witsker, Sissel Grude, Anastasiya Tantsereva, Olena Silinska and Tuhin Bhakta present their plans.*

12:00 LUNCH

Session 3: Imaging and inversion

Chair:

- 12:40 Time extrapolation of the double-square-root equation: prestack exploding reflector modeling and migration, *Tariq Alkhalifah, KAUST*
- 13:00 Blended shot migration with an inverse source, *Børge Arntsen, NTNU*
- 13:20 Massively parallel structured approach direct Helmholtz solver, RTM-based inverse scattering and FWI, *Martijn de Hoop, Purdue University*
- 13:40 Anisotropic wide-azimuth angle gathers for wave-equation migration, *Paul Sava, Colorado School of Mines*
- 14:00 **Coffee break**
- 14:30 Reverse-time migration velocity analysis, *Wiktor Waldemar Weibull, NTNU*
- 14:50 Separate P- and SV-wave equations for VTI media, *Bjørn Ursin, NTNU*
- 15:10 Processing issues in marine MT data and road ahead, *Lutz Mutschard, NTNU*
- 15:30 Contrast source inversion of CSEM and MT data, *Torgeir Wiik, NTNU*
- 16:00 Discussion and adjourn

4th -5th May: Course on seismic imaging, P1, 8:30 Paul Sava and Ian Jones. (course description on next page). Course ends at 17:00 5th May

SEISMIC IMAGING

*a 2day course
by*

*Paul Sava & Ian Jones, 4-5th May 2011,
auditorium P1 at 08:30, PTS building, NTNU*

Day 1, Paul Sava:

Seismic imaging is the key technology for oil and gas exploration. Recent trends in exploration targets and acquisition methodology fundamentally impact seismic imaging. First, areas under investigation are increasingly complex structurally and stratigraphically. This situation places higher demands on data processing for more accurate images and richer information content about the investigated geology. Second, we are witnessing significant advances in seismic data acquisition methodology, including 3D wide-azimuth acquisition of wide-band seismic data, dense sampling of land and marine data and other innovative approaches to data acquisition. Coupled with improvements in high-performance computing, all those trends impact seismic methodology and are responsible for the significant advances of recent years.

The Wavefield Seismic Imaging course provides a survey of current seismic imaging methods designed for acoustic wavefield data. Wavefield seismic imaging (also known as wave-equation migration) is presented in a unified theoretical framework in connection with related topics, including migration velocity analysis (MVA) and amplitude versus angle analysis (AVA). The main target audience for this course are graduate students engaged in seismic imaging research and practicing geophysicists with a basic understanding of seismic data processing and imaging who wish to get familiar with modern imaging techniques available to the industry. Geologists and reservoir engineers can also benefit from a short version of this course, by familiarizing themselves with the underlying concepts behind practical imaging techniques, their applicability and limitations.

Day 2, Ian Jones:

The day will initially cover the motivations for building detailed velocity models, and briefly discuss the inherent limitations on our ability to build a detailed model, then move-on to review the history and evolution of model building techniques. Current-day practice will be covered, exemplified via several case-studies, and we will briefly discuss the less well known and emerging techniques. The approach will not be mathematical, but rather will try to concentrate on an intuitive understanding of the principles, and demonstrate them via case histories. The bias in this course is towards those techniques that have seen widespread industrial use over the past 30 years.

Unfortunately, some topics will not be covered, in-part due to the time constraints, and in-part due to my own ignorance on those topics. The omissions will include VSP and multi-component data, as well as the topographic aspects of land processing.

- Why do we need a detailed velocity model?
 - The limitations of time migration and benefits of depth migration
 - Snell's law and how to ignore it
 - How does depth migration differ from time migration?
 - Is depth migration always necessary?
 - (or... would contractors just like to make more money?)
 - How accurate does an image need to be?
- How detailed can we get?
 - Sources of uncertainty
 - Non-uniqueness and ambiguity
 - Limits on resolution
- Model building through the ages
 - The linear compartmentalized approach
 - The iterative multidisciplinary approach
 - Picking versus inverting
 - Density of picking (and the need for automation)
 - Vertical velocity update
 - Tomographic update
 - Scanning
 - CRS
 - CFP
 - Anisotropy versus heterogeneity (and other higher order moveout effects)
- Current industrial practice
 - What does tomography need to accomplish?
 - Iterative model update
 - Layered, gridded and hybrid tomography
 - Complex water layers
 - Near-surface velocity anomalies
- Less well known techniques & emerging R&D directions
 - Wavepath tomography
 - Waveform inversion
 - Seismic interferometry
- Case studies
 - A selection of contributions from colleagues throughout the industry
- Discussion