AGENDA – ROSE meeting 19-20 April 2010

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

Monday 19th April

09:45 Coffee and registration
10:00 Welcome

Session 1: Rock physics

Chair:
10:10 Preferred Orientation and Elastic Anisotropy of Qusaiba Shales, *Frans Kets, independent*
10:30 Laboratory simulation of velocity changes in soft overburden and reservoir rocks induced by inflation and depletion, *Rune M Holt, NTNU/ SINTEF*
11:00 The role of shale anisotropy and heterogeneity in well log reservoir characterization, *Per Avseth, Odin Petroleum/NTNU*
11:20 Application of Synthetic Rock Mass modeling for the behavior of fractured reservoirs, *Nicholas Thompson, NTNU*
11:40 Impact of pore fluid on the nonlinear acoustic wave propagation, *Anna Magdalena Stroisz, NTNU*

12:00 **LUNCH**

13:00 Discrete particle modelling as a molecular dynamics tool to study elastic properties of water in clays, *Morten Kolstø, NTNU*
13:20 Using rock physics for generating synthetic sonic logs, *Alexander Nogzeitig, NTNU*
13:40 Stress dependent P- and S-wave velocities in brine saturated sand-clay mixtures, *Mohammad Hossein Bhuiyan, NTNU*
14:00 Pilot fracture characterization study using seismic attributes derived from singular value decomposition of azimuthal AVO data, *Gabriel Chao, Total*

14:20 **Coffee break**

14:50 The transition from elastic to non-elastic rock behaviour, *Erling Fjær, SINTEF/NTNU*
15:10 4D gravimetric modeling of a compacting reservoir, *Pamela Tempone, NTNU*
15:30 Multicomponent OBS acquisition for wavefield reconstruction, *Lasse Amundsen, Statoil/NTNU*
15:50 Three-dimensional CSEM grid modeling and time-lapse sensitivity analysis for subsurface CO2-storage, *Anwar Bhuiyan, NTNU*

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

Tuesday 20th April

Session 2: Time lapse and reservoir characterization

Chair:

8:30 Benefits of slowness-domain inversion and processing, *Mirko van der Baan, University of Alberta*
8:55 Permanent monitoring at Ekofisk, *Niels Ventzel, ConocoPhillips*
9:20 Avaliability of the AVO inversion of long offset data for curved interfaces, *Lyubov Skopintseva, NTNU*
9:40 Sea bed diffraction and impact on 4D seismic data - observations from synthetic modelling and field data, *Bård Osdal, Statoil*

10:00 **Coffee break**

10:20 Patchy saturations and thickness estimations of a thin CO2-layer at Sleipner, *Amir Ghaderi, NTNU/SINTEF*
10:40 Normal modes revisited – some field observations, *Martin Landrø, NTNU*
11:00 Critical offset analysis of LoFS data from Valhall, *Hossein Mehdi Zadeh, NTNU*
11:20 Single-station SVD-based polarization filtering: theoretical and synthetic data investigations, *Olena Tiapkina, NTNU*
11:40 High frequency noise from air guns, *Daniel Barker, NTNU*

12:00 LUNCH

Session 3: Imaging and inversion

Chair:

13:00 Extended imaging condition for wavefield tomography, *Paul Sava, Colorado School of Mines*
13:25 Evolution equations in seismic imaging, *Anton Duchkov, Novosibirsk*
13:45 Diffractions: Yesterday, today and tomorrow, *Evgeny Landa, OPERA, Pau*
14:05 True amplitude migration, *Børge Arntsen, NTNU*
14:25 The Linearization Space of Wave Equation Migration, *Wiktor Waldemar Weibull, NTNU*

14:40 **Coffee break**

15:00 Illumination analysis of wave-equation imaging with curvelets, *Bjørn Ursin, NTNU*
15:20 New weak-contrast approximation in VTI media, *Pavel Golikov, NTNU*
15.40 Caustics in a periodically layered VTI medium, *Alexey Stovas, NTNU*
16:00 TIV contrast source inversion of marine CSEM data, *Ketil Hokstad, NTNU*
16:20 One-way wav-equation migration of compressional and converted waves in a VTI medium, *Ørjan Pedersen, NTNU*
16:40 Discussion and adjourn

21st -22nd April: Course on seismic imaging, P1, 8:30 ***Paul Sava and Ian Jones. (course description on next page). Course ends at 17:00 22nd April***

SEISMIC IMAGING

a 2day course
by

***Paul Sava & Ian Jones**, 21-22nd April 2010,*
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 interferrometry
- Case studies
    - A selection of contributions from colleagues throughout the industry
- Discussion