



NEWSLETTER June 2010

Message from the LPS President:

It is hard to believe that we are half way through the LPS's programme of events for 2010. As ever, time marches on and there is never enough time to do all we need to do. I know it is often hard to get to the LPS evening meetings but I would urge you to attend. The standard of presentations is consistently high and it is a good opportunity to network with fellow petrophysicists and we even supply a glass or two of free wine.

Thank you to Iain Whyte for presenting BP's work on the *Integration of cased hole and open hole logs* at the May evening meeting. Iain obviously enjoyed his visit because he has volunteered to work with Derek Thomas as VP Technology. Welcome to the committee Iain.

The June evening meeting is next Monday, 7th June. Daniel Hopkins and Nathan Thomas from Leicester University will be discussing their MSc research projects. Daniel & Nathan received financial support for their research through last year's Iain Hillier Academic Award Scheme.

If you have ever pondered over which cementation factor or T2 cutoff to use in a carbonate reservoir then I am sure you will be interested in our next one day seminar, Carbonates III on the 16th September. If you have a paper you would like to present at the seminar or to register please contact Robert Webber, robert.webber@bg-group.com

All the best

Adam Moss: LPS President



Dates for Your Diary

Monday 7th June, LPS Evening Meeting, Geological Society, London, Piccadilly. 6pm.

Nathan Thomas – University of Leicester. A geological and petrophysical investigation of wireline logs through the Borrowdale Volcanic Group, using data from the deep nuclear waste repository investigations at Sellafield.

Daniel Hopkins – University of Leicester. Biologically inspired acoustic interrogation of simulated geological layered media: a laboratory study.

Monday 12th July, LPS Evening Meeting, Geological Society, London Piccadilly. 6pm.

Geoffrey Page, Stephen Vickers – Baker Hughes Incorporated.

“Hydrophysics”: The Petrophysics of drilling fluids and their effects on log data.

Thursday 16th September, LPS One Day Seminar, Geological Society, London Piccadilly – “Carbonates III”.

Next Evening Talks:



Biologically inspired acoustic interrogation of simulated geological layered media: a laboratory study

Daniel Hopkins

Supervisors: Mike Lovell¹, Clare Hopper¹, Said Assou¹ and David Gunn²

¹ University of Leicester; ² British Geological Survey

Abstract

Acoustic techniques have evolved to a stage where ultrasound is used for material thickness characterisation (Hopper *et al* 2008). In geology we regularly use transit time techniques for geophysical and petrophysical evaluation. This research presented here is innovative, taking inspiration from natural systems, in particular bats and dolphins, but does not use transit time measurements. Standard ultrasound uses frequencies in the megahertz range, this novel approach from biological inspiration, has adapted to use multi-spectral chirp type signals at lower frequencies, i.e. in the kilohertz frequency range (Assous *et al* 2008), and thus at lower energy levels. These biologically inspired signals operate in the same frequency range as these animals, aiming to achieve the same levels of performance with reduced energy budgets. Chirp based signals were developed as they can deliver a spectrum of frequencies, where different frequencies are necessary as they respond to different structural scales. The research is based on a laboratory evaluation of the application of broadband acoustic signals (multi-spectral) in a pulse echo based system for characterisation of dual layered media. A bespoke broadband transducer operating at a 40 – 200 kHz frequency range was used; a frequency range which to date has been relatively unexplored for this application (Assous *et al* 2008). The results thus far have demonstrated a potential method for material thickness classification; a strong relationship between overall target thickness and the shape of the spectra produced has been observed. The method also provides a potential for target composition to be characterised. This approach is aimed at interrogating multi layered targets and has many potential applications within geophysics and petrophysics where improved resolution is sought after by using lower frequencies to overcome the problem of highly attenuating media. Possible applications range from marine seismic profiling of the near surface and measurements in boreholes to petrophysical laboratory studies

References

- C. Hopper, S. Assous, D. A. Gunn, P. D. Jackson, R. G. Rees, M. A. Lovell, and L. M. Linnett. 2008. Biologically inspired ultrasonic signals for physical characterisation of geological materials. 2008. Widening Horizons in Acoustics, University of Reading; Institute of Acoustics: University of Reading, pp 706-713.
- S. Assous, L. M. Linnett, C. Hopper, D. A. Gunn, P. D. Jackson, R. G. Rees, and M. A. Lovell. 2008. Bat and dolphin inspired signals for acoustic systems. 2008. Presented at the Biological Approaches for Engineering Conference, Institute of Sound and Vibration Research, University of Southampton, UK, pp 151 - 154.

A geological and petrophysical investigation of wireline logs through the Borrowdale Volcanic Group, using data from the deep nuclear waste repository investigations at Sellafield

Nathan Thomas

Supervisors: Mike Lovell¹, Andrew Kingdon², Sarah Davies¹ and Joanne Tudge¹.

¹University of Leicester, ²British Geological Survey

Abstract

The Borrowdale Volcanic Group is a highly complex set of volcanoclastic rocks formed in the Ordovician. Wireline logs were recorded through the BVG in Sellafield, West Cumbria as part of an earlier investigation for a nuclear waste repository. The interpretation of the subsurface formations is complicated and this talk focuses on statistical analysis of a small set of logs: spectral gamma ray (K, Th, U), sonic travel time, bulk density and resistivity. The technique chosen is Iterative Non Hierarchical Cluster Analysis (INCA) (Tudge *et al* 2009). INCA generates clusters using the combined data and it is these clusters that are then interpreted in terms of the geological and physical characteristics of the formation. The variance within these clusters is investigated with respect to core measurements within the BVG. INCA successfully separates the St Bees Sandstone (SBS) from the BVG, and the separate members which make up the BVG are also identifiable. Th/K patterns within the BVG can define lithology while changes in the density define fracture groups throughout. When compared to NIREX core reports clustering follows the alteration and fault rock identified in the reports.. Clustering of the Sides Farm Member which is a 50 metre section in RCF 3, shows that calcite veining can be identified; clustering is controlled in this instance by the resistivity and density values.

References

- Tudge, J., Lovell, M.A., Davies, S. J., Harvey K., Saito. S., and Expedition 314 Scientists. 2009. Petrophysically determined lithofacies at the Nankai Trough Accretionary Prism: NanTroSEIZE, IODP Expedition 314, Journal of the Geological Society, 166, 961-968.
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