PNN PREMIUM

Research excites oil industry

Friday, 31 October 2008
David Upton

GEOSCIENTISTS at the University of Sydney are quietly working on research that is revolutionising the understanding of petroleum-producing basins in the heart of continents.

The research explains the greater-than-predicted sediment thicknesses in many intracontinental basins around the world, including the Eromanga Basin in Australia and Russia's West Siberian Basin – a prolific oil producer.

It also provides a vastly different model for the depositional and erosional histories in these basin types, which could have huge implications for the search for oil.

Shell and Total have been quick to recognise the project's potential. The international oil majors this month signed up to provide funding through the Australian Research Council (ARC) to take the University of Sydney research into a new stage.

Key findings of the project were presented last month to the third Eastern Australasian Basins Symposium (EABS) by Christian Heine, now working at StatoilHydro in Norway, and by his PhD supervisor, associate professor Dietmar Müller, who is also head of the school of geosciences.

Müller said the initial goal was to understand the processes behind the formation of large, saucer-shaped basins that could not be categorised as either rift basins or foreland basins.

"These so-called sag basins had a long history of gentle subsidence, with very little faulting. We soon found they also typically had greater thicknesses of sediments than was predicted by crustal thinning.

"So we started to look at whether down-wellings in the earth's mantle might have contributed to the subsidence of the basins."

Using data that was already available, the researchers compared anomalous sediment thicknesses in intracontinental basins with histories of plate movements, mantle currents and eustatic sea level changes, using well-established models.

The net result was a new predictive model for sediment thicknesses and a new understanding of the history of sediment deposition and erosion in this type of basin.

When applied to the sedimentation history of the Eromanga and Murray basins, the team's new model for mantle-driven dynamic topography explained tectonic subsidence patterns that previously had no known cause.

Müller said Australia's intracontinental basins provided a great laboratory for developing an understanding of an important new process of dynamic topography.

"Australia is unique in the Tertiary period because large areas of the continent were progressively inundated, despite the fact that sea levels around the world were falling since the late Cretaceous.

"Our research found that large areas were subsiding at a faster rate than sea levels because of down wellings in the mantle below central Australia."

The research team's findings are based on work in the relatively young and shallow sediments of the Cenozoic period because these provide an abundance of data from drillholes and seismic survey activity.

However, the model is believed to be just as valid at greater depths and in rocks from much older time periods.

Extending the research to older rocks, and focusing more sharply on frontier basins of interest to oil explorers, are key objectives of the new stage of the research being jointly funded by Shell, Total and ARC.

The researchers have also recently attracted a grant from StatoilHydro to link its interactive GPlates software with geodynamic models to quantify the influence of mantle convection on basin evolution.

A particular focus of this research will be on factors predicting the best targets for oil exploration.

"This is a very active area of research now, particularly with explorers seeking to extend their existing search for oil and gas into deeper sediments," Müller said.

He said the project could have particular relevance in the Centralian Superbasin, which developed between 550 million and 800 million years ago and had all the characteristics of a sag basin.

The superbasin includes the Officer, Amadeus, Georgina and Darling basins.

Interestingly, Queensland's department of mines and energy announced in July the discovery of a new, deep basin centred about 100 kilometres east of Cloncurry.

The newly discovered Millungera Basin, which has sediments up to 540 million years old, was hidden until now by the larger Carpentaria Basin.

And in New South Wales, a new regional seismic line across part of the Darling Basin by Geoscience Australia and the NSW Department of Primary Industries has revealed much deeper sediments than were previously known.

The survey area is interpreted as an extensive sediment-filled structural low, a large part of which reaches basement depths of more than 3500m.

The Officer, Amadeus and Georgina basins are attracting increasing numbers of oil explorers, despite their much greater age than conventional oil basins and the higher risks of oil degrading or leaking compared to younger basins such as the Cooper.

The additional risk is balanced by the greater thickness of sediments and the potential for reservoirs that are orders of magnitude greater compared to younger basins.

The cost advantage of exploring onshore for such large targets is also a major attraction.

Explorers can already benefit from the work by the University of Sydney team by accessing its web-published ICONS atlas (an acronym for intracontinental basins) at www.earthbyte.org/Resources/ICONS.

The atlas contains crustal and lithospheric structure data from all of the world's intracontinental basins, and was a starting point for the team's research.

Aspermont Limited
Street Address613-619 Wellington Street, Perth WA Australia 6000
Postal Address PO Box 78, Leederville, WA Australia 6902
Head Office Tel +61 8 6263 9100 **Head Office Fax** +61 8 6263 9148
e-mail contact@aspermont.com **website** www.aspermont.com **ABN** 66 000 375 048