Students' Thesis Abstracts

Three student members of the NSW PESA branch recently completed petroleum focused honours theses and have written short descriptions of their work for *PNR*. Amanda and Arvic have also been student reps on the NSW committee. Amanda and Emma were recipients of PESA scholarships in 2012 which assisted with the completion of their work.

The Geology and Structural Style of the Juha gas field, PNG

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The Papuan Fold Belt, located in the highlands of Papua New Guinea (PNG), has had a long history of petroleum exploration. A high level of ambiguity exists in the structural analysis of the fold belt because of PNG's highly mountainous terrain, dense equatorial jungle and limited access. This often results in the acquisition of poor quality seismic data and limits the ability to collect geological data from surface exposures.

The Juha structure and associated Cecilia Anticline, are located in the frontal area of the Papuan Fold Belt. The Juha Anticline can be clearly identified on aerial photographs and is 8 km in width by 25.2 km in length. The drilling of three wells on the Juha Anticline in the 1980s resulted in the discovery of significant gas reserves.

The study aims to better constrain the timing and style of extensional and compressional deformation at Juha. This will provide one component of the petroleum system analysis for this field.

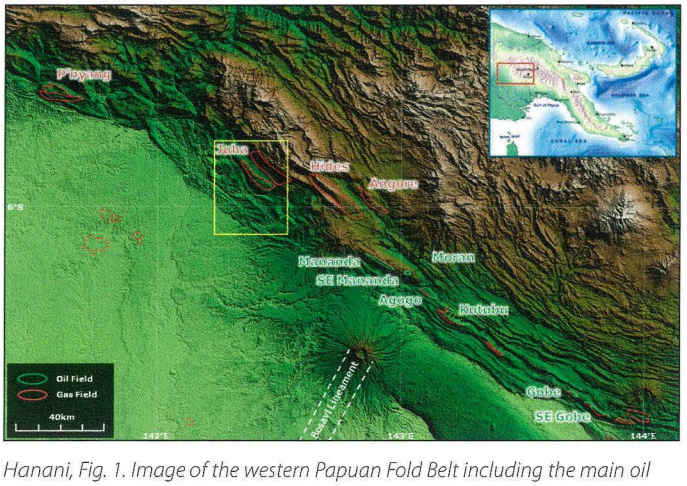
Twenty-five 2D seismic lines totalling 303.03 km in length were interpreted, and seven wells were used to tie the seismic horizons to depth. Eight horizons were mapped, and the creation of three two-way-time (TWT) structure maps enabled analysis of the structural framework. The results of this analysis revealed the presence of two unconformities in the Ieru Formation, whereas, only one unconformity had been previously identified. From this study it appears that orogenesis that had commenced in the northeast of the fold belt at 25 Ma reached the Juha area in the Plio-Pleistocene.

The forward modelling technique was used to assess a detachment style of deformation to explain the observed structures. The resulting features indicate that the Juha structures were driven by thick-skinned compressional tectonics. Deformation started with an inverted basement fault beneath the Juha area. The deformation was transferred by a décollement and reached the surface in the Cecilia Anticline. The development of the Wai Asi and Cecilia Anticlines have been identified as fault propagation folds, on the leading edge of this thrust system.

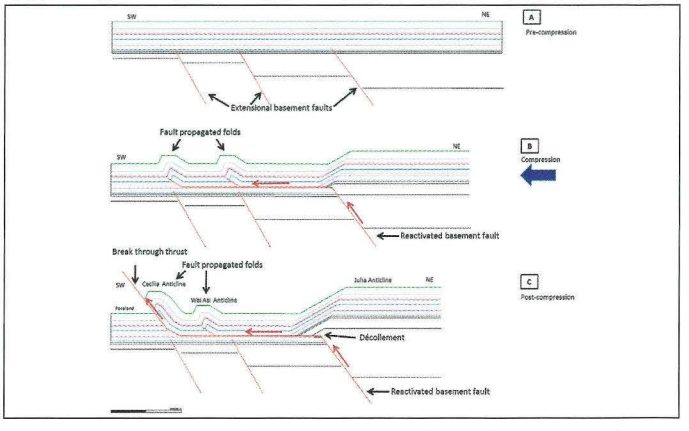
Other fields in the frontal range show similarities and differences with the thrust system proposed for the Juha structure. At Hides and P'nyang, thick-skinned tectonics like that proposed at Juha are responsible for the structural architecture of the anticlines. Further south, the Kutubu structure has components of both thick and thin-skinned models of thrusting.

The structure and timing of the Juha Anticline has allowed for the entrapment of considerable quantities of hydrocarbons. This structural study has improved our understanding of the petroleum system at Juha. This will help develop the resource and assist in exploration efforts in the Papuan Fold Belt.

Amanda thanks Oil Search for providing the data needed for this project and for support through training and mentoring. She also acknowledges her supervisors Dr. Paul Lennox (UNSW) and Dr. Kevin Hill (Oil Search) for their guidance and invaluable teaching throughout this year.



Hanani, Fig. 1. Image of the western Papuan Fold Belt including the main oil fields (green) and gas fields (red) fields have been labelled. The yellow box highlights the location of the Juha study area (image courtesy of Oil Search Limited).



Hanani, Fig. 2. Forward Model illustrating the evolution of structures in the Juha area. Rifting in the Triassic was followed by deposition of sediments (A) with compression reactivating a basement fault and developing fault propagation folds (B). To accommodate further shortening a break-thrust develops creating further uplift of the Cecilia Anticline (C).

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