F-TRG newsletter July-October 2017

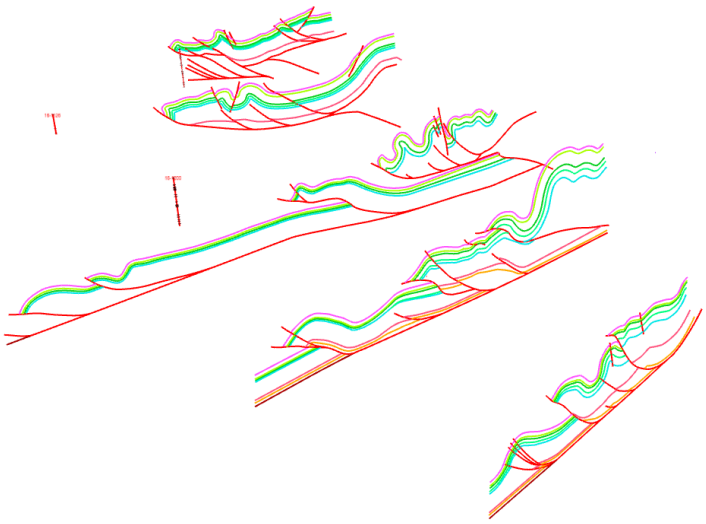
This issue…

Recent fieldwork and ongoing research in the French Sub-Alpine chains; seismic interpretation of the Papuan Fold-Belt; recently completed MSc projects; upcoming events; recent fold-thrust publications.

Ongoing research and other work

Along strike structural variation in the French Sub-Alpine chains

F-TRG are currently using field data and field observations from the French Sub-Alpine chains to construct closely-spaced cross sections. These cross sections illustrate along strike changes in fold geometry and large-scale structural style. Structural style in the study area changes from the south, where shortening is accommodated by large-thrusts and open hangingwall anticlines, to the north, where shortening is accommodated by tight anticline and syncline pairs, in the relative absence of emergent thrusts at outcrop.



Cross section restoration is used to generate pre-thrust stratigraphic templates. These will be analysed to determine how changes in unit thickness along strike might influence the resultant post-thrust fold geometries seen in the study area.

Left: cross sections from the French Sub-Alpine chains, used to illustrate along strike changes in structural style and fold geometry.

French Sub-Alpine chains fieldwork

Hannah spent two weeks in the French Sub-Alpine chains, August-September 2017, collecting samples from throughout the study area. These will be analysed in the upcoming months to calculate palaeotemperatures throughout the region to determine whether variations in the thermal evolution of the fold-thrust belt can be attributed to variations in structural style and fold geometry observed at outcrop. Once results have been analysed, the project will be shared with sponsors.

Along with sample collection, the fieldwork focussed on the Bargy Anticline in the northern French Sub-Alpine chains. This well exposed structure was used to collect field data that will be used to analyse how fold geometry changes along strike, how variations in fold geometry relate to thrust displacement changes, and how fold geometry changes are accommodated by deformation in the fold forelimb. Outcomes from this project will be shared with sponsors, once complete.

Right: cross section view through the forelimb of the Bargy Anticline.

Papuan Fold Belt: alternative seismic interpretations

F-TRG members have been interpreting seismic lines from the P'nyang, Juha/Cecilia, Agogo and Gobe regions of Papua New Guinea to generate alternative interpretations, and highlight areas of structural uncertainty.

We also ran an AAPG student chapter 'Seismic line of the month' session at the University of Aberdeen on 27th September 2017. Attendees were given a blank seismic line from the Juha/Cecilia region of Papua New Guinea to test their seismic interpretation skills. Results from this session will be used as part of our alternative seismic interpretation project. Thanks to all who came along!

Above: University of Aberdeen AAPG Student Chapter members hard at work!

Masters projects

Two MSc students at the University of Aberdeen have been working on subsurface data from Papua New Guinea, provided by Oil Search and Santos. The projects are titled:

- 'Along Strike Structural Variation of the Papuan Fold Belt and the Implications of a Thick-skinned versus Thin-skinned Model' – C.J. Roberston.
- 'Papuan Thrust Belt – Structural Interpretation: Structural Interpretation of PN07-505M and PN96-IAG2' – C. Chittpayak.

Calum Robertson was using data from the Agogo and Hedina/Iagifu regions of the Papuan Fold Belt to determine how fold geometry changes along strike, and uncover any potential causes behind this variation. Chittchon Chittpayak was also using data from the Agogo and Hedina/Iagifu regions to generate alternative structural models from two transects, forward model the sections to assess the structural evolution, and explore the implications on the petroleum system. These two projects were completed in August 2017, and are available to sponsors on our online portal.

Conferences attended

Rob co-convened the 2017 William Smith conference at the Geological Society of London, 3rd-5th October 2017. This year's conference was 'Plate Tectonics at 50', which celebrated the 50th anniversary of the proposal of the plate tectonic model. The conference concluded with the annual William Smith lecture given by Dan McKenzie title 'Plate Tectonics at 50'.

News and events

F-TRG sponsor meeting 2017

The 2017 F-TRG sponsor meeting will be held on 25th-28th October 2017 in Pembrokeshire, UK, with delegates meeting in Pembrokeshire in the afternoon/early evening of 24th October. The meeting will include two and a half days in the field, looking at Variscan fold-thrust structures along the Pembrokeshire coastline; half a day of presentations/knowledge exchange updating sponsors on F-TRG activities in the past year; and a business meeting to decide on F-TRG activities for the following year. The F-TRG meeting coincides with a conference at the Geological Society of London titled 'Fold and Thrust Belts: Structural style, evolution and exploration', 31st -2nd November 2017. We are in the final stages of preparing for the meeting, and are looking forwards to another exciting fieldtrip!

Upcoming conference: Fold and Thrust Belts: Structural style, evolution and exploration

Rob is involved with organising the 'Fold and Thrust Belts: Structural style, evolution and exploration' conference at the Geological Society, London. The conference is to be held between 31st October-2nd November 2017. Themes for the conference include:

- Case studies documenting the temporal and spatial evolution of structural style.
- New techniques and approaches to understanding fold-thrust belts.
- New Exploration discoveries in fold and thrust belts, and their impact on understanding and prospectivity.
- Understanding and predicting fold-thrust belt geometry.
- Evolving stress fields and their impact on fault and fracture networks.
- Hydrocarbon modelling in fold and thrust belts.

For more information on the conference see the link below. http://www.geolsoc.org.uk/PG-Fold-and-Thrust-Belts-Structural-style-evolution-and-exploration

Other news and event information

The Fold-Thrust Research Group is on Twitter! Follow us (**@FoldThrust**) for updates on F-TRG activities and relevant fold-thrust information.

Recent/relevant publications

Ahmad Abir, I., Khan, S. D., Aziz, G. M. & Tariq, S., 2017. Bannu Basin, fold-and-thrust belt of northern Pakistan: Subsurface imaging and its implications for hydrocarbon exploration. Marine and Petroleum Geology, 85, 242-258.

Alcalde, J., Bond, C. E. & Randle, CH. 'Framing bias: the effect of figure presentation on seismic interpretation'. Interpretation. DOI: 10.1190/int-2017-0083.1

Arboit, F., Amrouch, K., Morley, C., Collins, A. S. & King, R., 2017. Palaeostress magnitudes in the Khao Khwang fold-thrust belt, new insights into the tectonic evolution of the Indosinian orogeny in central Thailand. Tectonophysics, 710-711, 266-276.

Casas-Sainz, A. M., Román-Berdiel, T., Oliva-Urcia, B., García-Lasanta, C., Villalaín, J. J., Aldega, L., Corrado, S., Caricchi, C., Invernizzi, C. & Osácar, M. C., 2017. Multidisciplinary approach to constrain kinematics of fault zones at shallow depths: a case study from the Cameros-Demanda thrust (North Spain). International Journal of Earth Science, 106, 1023-1055.

Farzipour-Saein, A., 2017. Folding style controlled by intermediate decollement thickness change in the Lurestan region (NW of the Zagros fold-and-thrust belt), using analogue models. International Journal of Earth Science, 106, 1525-1537.

Li, J., Zhao, G., Johnston, S. T., Dong, S., Zhang, Y., Xin, Y., Wang, W., Sun, H. & Yu, Y., 2017. Permo-Triassic structural evolution of the Shiwandashan and Youjiang structural belts, South China. Journal of Structural Geology, 100, 24-44.

Misch, D., Leu, W., Sachsenhofer, R. F., Gratzer, R., Rupprecht,B. & Bechtel, A., 2017. Shallow hydrocarbon indications along the Alpine Thrust Belt and adjacent foreland basin: distribution and implications for petroleum exploration. Journal of Petroleum Geology, 40, 4, 341-362.

Nakapelukh, M., Bubniak, I., Yegorova, T., Murovskaya, A., Gintov, O., Shlapinskyi, V. & Vikhot, Y., 2017. Balanced geological cross-section of the outer ukranian carpathians along the pancake profile. Journal of Geodynamics, 108, 13-25.

Obaid, A. K. & Allen, M. B., 2017. Landscape maturity, fold growth sequence and structural style in the Kirkuk Embayment of the Zagros, northern Iraq. Tectonophysics, 717, 27-40.

Pei, Y., Paton, D. A., Wu, K. & Xie, L., 2017. Subsurface structural interpretation by applying trishear algorithm: An example from the Lenghu5 fold-and-thrust belt, Qaidam Basin, Northern Tibetan Plateau. Journal of Asian Earth Sciences, 143, 343-353.

Ramírez-Peña, C. F. & Chávez-Cabello, G., 2017. Age and evolution of thin-skinned deformation in Zacatecas, Mexico: Sevier orogeny evidence in the Mexican Fold-Thrust Belt. Journal of South America Earth Sciences, 76, 101-114.

Soleimani, M., Shokri, B. J. & Rafiei, M., 2017. Improvement of seismic structural interpretation of Zagros fold-thrust belt by dip scanning in common diffraction surface imaging method. Acta Geodaetica et Geophysica, 52, 283-299.

Sonnette, L., Lee, J-C. & Horng, C-S., 2017. The arcuate fold-and-thrust belt of northern Taiwan: Results of a two-stage rotation revealed from a palaeomagnetic study. Journal of Asian Earth Sciences, 147, 284-309.

Stockmeyer, J. M., Shaw, J. H., Brown, N. D., Rhodes, E. J., Richardson, P. W., Wang, M., Lavin, L. C. & Guan, S., 2017. Active thrust sheet deformation over multiple rupture cycles: A quantitative basis for relating terrace folds to fault slip rates. GSA Bulletin, 129, 9/10, 1337-1356.

Tibaldi, A., Russo, E., Bonali, F. L., Alania, V., Chabukiani, A., Enukidze, O. & Tsereteli, N., 2017. 3-D anatomy of an active fault-propagation fold: A multidisciplinary case study from Tsaishi, western Caucasus (Georgia). Tectonophysics, 717, 253-269.

Torres Carbonell, P. J., Cao, S. J. & Dimieri, L. V., 2017. Spatial and temporal characterization of progressive deformation during orogenic growth: Example from the Fuegian Andes, southern Argentina. Journal of Structural Geology, 99, 1-19.

Totake, Y., Butler, R. W. H., Bond, C. E. & Aziz, A. 'Analyzing structural variations along strike in a deep-water thrust belt'. Journal of Structural Geology. DOI: 10.1016/j.jsg.2017.06.007.

Vatandoust, M. & Farzipour-Saein, A., 2017. Prediction of open fractures in the Asmari Formation using geometrical analysis: Aghajari Anticline, Dezful Embayment, SW Iran. Journal of Petroleum Geology, 40, 4, 413-426.

Wang, W., Yin, H., Jia, D. & Li, C., 2017. A sub-salt structural model of the Kelasu structure in the Kuqa foreland basin, northwest China. Marine and Petroleum Geology, 88, 115-126.

Yang, X., Peel, F. J., Sanderson, D. J. & McNeill, L .C., 2017. Episodic growth of fold-thrust belts: Insights from Finite Element Modelling. Journal of Structural Geology, 102, 1113-129.

Next issue…

The next issue of the F-TRG newsletter will be issued in January 2018 and will include an update on F-TRG activities to date and ongoing research.