

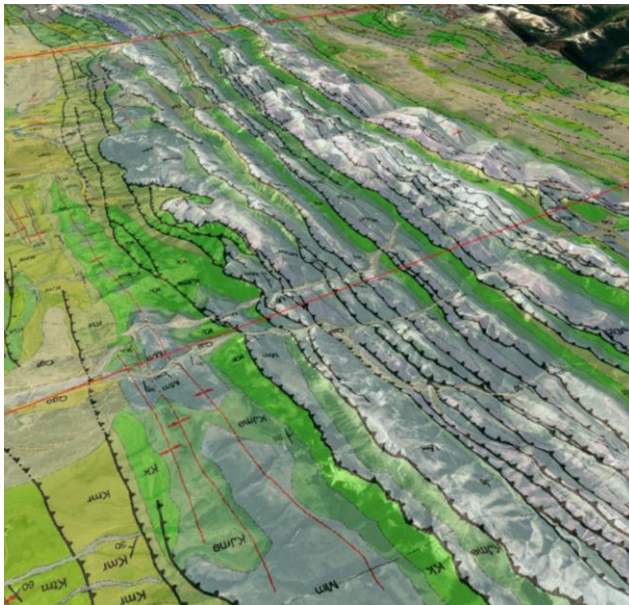


## F-TRG newsletter October 2016-January 2017

### This issue...

This issue of the F-TRG newsletter includes information about ongoing research on fold-thrust structures of the Sawtooth Range, Montana and French Alps; F-TRG-associated Masters projects based on data from the French Alps and Papua New Guinea; recent conference attendances; upcoming conferences and recently published papers relevant to fold-thrust belts.

### Ongoing research and other work



F-TRG are currently working on a field dataset collected from the Sawtooth Range in Montana. Initially this project involves constructing regional cross sections through the fold-thrust belt to illustrate along strike variation in structural style and detachment level, as well as the variation in fold geometry in lithological units with different rheology's. In future the Sawtooth project will extend to include construction of 3D models to analyse how individual fold structures might vary on a reservoir-scale, and fracture analysis to determine how fractures vary with position, lithology and small-scale changes in fold geometry.

*Above: Google Earth screenshot with Geology map overlay and section traces, Sawtooth Range, Montana. Closely-spaced thrusts cause repetition of the Madison Group carbonates (blue), along with Devonian and Cretaceous sedimentary units (purple and green).*

Before the Christmas break F-TRG work focussed on characterising different damage styles and their distribution along transects through a carbonate fold forelimb in the Vercors region of the French Sub-Alpine Chains. At outcrop, damage styles are far more diverse than simple planar fractures, as can be often assumed when considering damage in fold forelimbs. Along short transects a wide range of damage styles including veins, planar fractures, stylolites, minor faults, and cemented and uncemented breccias can be found, as well as regions that appear totally undeformed. A correlation between deformation facies and lithology can be observed, but the origin of some damage styles is still poorly understood.

Since the F-TRG sponsor meeting in October 2016, we have also begun uploading relevant knowledge exchange material to the F-TRG SharePoint site, including a Google Earth library of global fold-thrust



belt cross sections; field photographs from F-TRG study areas; Masters project reports using data from the Papuan Fold Belt; and relevant conference presentations by F-TRG members.

We also have two Masters students working on F-TRG projects. The first project will use seismic and well data provided by sponsors Santos and Oil Search to analyse the petrophysical properties of detachments. The second project uses field data from the French Sub-Alpine chains to calculate the thermal and structural evolution of fold-thrust structures. Both projects run from January-April 2017, and results will be shared with F-TRG sponsors.

### Conferences attended

**AGU 2016.** Clare attended the AGU (American Geophysical Union) Fall Meeting 2016 in San Francisco, 12-16<sup>th</sup> December. Various F-TRG-related presentations were given at the conference:

- Fluid flow in deforming media: interpreting stable isotope signatures of marbles. **Clare Bond**
- Public engagement in 3D flood modelling through integrating crowd sourced imagery with UAV photogrammetry to create a 3D flood hydrograph. **Clare Bond, Rob Butler** and John Howell.
- 'FracPaQ: a MATLAB<sup>TM</sup> toolbox for the quantification of fracture patterns', David Healy, Roberto Rizzo, David Cornwell, Natalie Farrell, **Hannah Watkins**, Nick Timms, Enrique Gomez-Rivas and Michael Smith.

**Joint Assembly 2017.** Clare and Hannah attended the Joint Assembly conference hosted by TSG (Tectonic Studies Group), VMSG (Volcanic and Magmatic Studies Group) and the BGA (British Geophysical Association) at the University of Liverpool, 4<sup>th</sup>-6<sup>th</sup> January 2017. A number of F-TRG and associated presentations and posters were given at the conference, including:

- 'Heterogeneity in tectonometamorphic systems; insights from Rb-Sr mica ages from the Cycladid Blueschist Belt, Syros (Greece)', **Clare E. Bond**, Robert A. Cliff, **Robert W. H. Butler** and John E. Dixon.
- 'Using laterally compatible cross sections to infer fault growth and linkage models in foreland thrust belts', **Hannah Watkins, Robert W. H. Butler**, and **Clare E. Bond**.
- 'Stackpole Quay: A case study on the applicability of virtual outcrops in structural model building', Adam J. Cawood, **Clare E. Bond**, Yukitugu Totake, John A. Howell & **Robert W. H. Butler**.
- 'Linkage and imbrication of fold-thrust structures, offshore Northwest Borneo', Yukitugu Totake, **Robert W. H. Butler** and **Clare E. Bond**.
- 'FracPaQ: a MATLAB<sup>TM</sup> toolbox for the quantification of fracture patterns', David Healy, Roberto Rizzo, David Cornwell, Natalie Farrell, **Hannah Watkins**, Nick Timms, Enrique Gomez-Rivas and Michael Smith.



## News and events

### F-TRG sponsor meeting 2017.

Following the F-TRG sponsor meeting in October 2016, it was agreed that the 2017 F-TRG meeting would be held in the UK at the end of October/beginning of November 2017, coinciding with a conference at the Geological Society of London titled 'Fold and Thrust Belts: Structural style, evolution and exploration', 31<sup>st</sup>-2<sup>nd</sup> November 2017. The business meeting will be accompanied by a fieldtrip to the Pembrokeshire coast, West Wales, looking at small-scale Variscan fold-thrust structures. Dates are yet to be confirmed but will either be 28<sup>th</sup>-30<sup>th</sup> October or 3<sup>rd</sup>-5<sup>th</sup> November 2017.

### Upcoming conference: Deformation, Rheology and Tectonics (DRT).

Clare, Rob and Hannah are part of the organising committee for the DRT conference to be held in Inverness, Scotland. The conference will be held between **30<sup>th</sup> April-4<sup>th</sup> May 2017** and will include a series of oral and poster sessions, as well as pre, mid and post conference field excursions to the Scottish Highlands. Conference topics will focus on small to large scale aspects of structural geology, including rock mechanics and physics of fractured rocks; interplay between fluid flow, deformation and mineral reactions; structural geology, tectonics and geophysics for exploration of production of energy resources; continental tectonics and mountain building: from deep to shallow; and 3D geometry and kinematics of tectonic structures.

For more information see <http://www.abdn.ac.uk/geosciences/events/drt2017-1091.php>.

### 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 31<sup>st</sup> October-2<sup>nd</sup> November 2017**. Proposed 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 and abstract deadlines etc 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

Beidinger, A. & Decker, K., 2016. Paleogene and Neogene kinematics of the Alpine-Carpathian fold-thrust belt at the Alpine-Carpathian transition. *Tectonophysics*, 690, 263-287.

Cain, T., Leslie, G., Clarke, S., Kelly, M. & Krabbendam, M., 2016. Evidence for pre-Caledonian discontinuities in the Achnashellach Culmination, Moine Thrust Zone: the importance of a pre-thrust template in influencing fold-and-thrust belt development. *Scottish Journal of Geology*, doi:10.1144/sjg2015-002.

Farzipour Saein, A., 2016. 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*, DOI 10.1007/s00531-016-1364-6.

Fuentes, F., Horton, B. K., Starck, D. & Boll, A., 2016. Structure and tectonic evolution of hybrid thick-and thin-skinned systems in the Malargüe fold-thrust belt, Neuquén basin, Argentina. *Geological Magazine*, 153, 5/6, 1066-1084.

Healy, D. Rizzo, R. E., Cornwell, D. G., Farrell, N. J., Watkins, H., Timms, N. E., Gomez-Rivas, E. & Smith, M., 2017. FracPaQ: A MATLAB™ toolbox for the quantification of fracture patterns. *Journal of Structural Geology*, 95, 1-16. <http://www.sciencedirect.com/science/article/pii/S0191814116302073>  
<https://uk.mathworks.com/matlabcentral/fileexchange/58860-davehealy-aberdeen-fracpaq>

Koyi, H., Nilfouroushan, F. & Hessami, K., 2016. Modelling role of basement block rotation and strike-slip faulting on structural pattern in cover units of fold-and-thrust belts. *Geological Magazine*, 153, 5/6, 827-844.

Lacombe, O. & Bellahsen, N., 2016. Thick-skinned tectonics and basement-involved fold-thrust belts: insights from selected Cenozoic orogens. *Geological Magazine*, 153, 5/6, 763-810.

Malekzade, M., Bellier, O., Reza Abbassi, M., Shabanian, E. & Authemayou, C., 2016. The effects of plate margin inhomogeneity on the deformation pattern within west-Central Zagros Fold-and-Thrust Belt. *Tectonophysics*, 693, 304-326.

Mazur, S., Mikolajczak, M., Krzywiec, P., Malinowski, M. Lewandowski, M & Bueffenmyer, V., 2016. Pomeranian Caledonides, NW Poland – A collisional suture or thin-skinned fold-and-thrust belt? *Tectonophysics*, 692, 29-43.

Saha, P., Bose, S. & Mandal, N., 2016. Sandbox modelling of sequential thrusting in a mechanically two-layered system and its implications in fold-and-thrust belts. *Journal of Geodynamics*, 100, 104-114.



Solon, F. F., Fontes, S. L. & Meju, M. A., 2015. Magnetotelluric imaging integrated with seismic, gravity, magnetic and well-log data for basement and carbonate reservoir mapping in the São Francisco Basin, Brazil. *Petroleum Geoscience*, 21, 285-299.

### **Next issue...**

The next issue of the F-TRG newsletter will be issued in April 2017 and will include an update on F-TRG activities to date and ongoing research.