

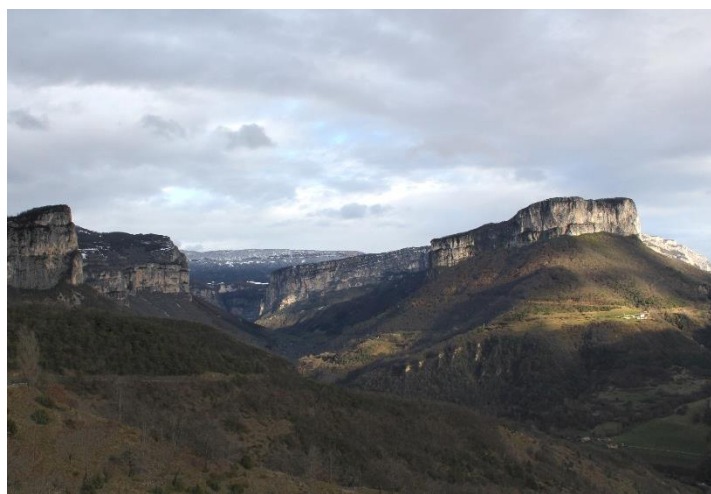


## F-TRG newsletter April-July 2016

### This issue...

This newsletter outlines recent F-TRG fieldwork in the French Sub-Alpine Chains and Sawtooth Range, Montana; Masters projects; F-TRG interns; logistical information on the F-TRG sponsors meeting in October 2016, relevant conferences, as well as recent publications relevant for fold-thrust belts.

### F-TRG Sponsors Meeting 2016



The Sponsors Meeting for 2016 is set for the Vercors district of the French Sub-Alpine Chains. These notes supplement the circular issued earlier this year. The base is ideal for us to showcase some of our research results from this first year of activity within FTRG and to discuss some applications of this research to the needs of sponsors. The meeting runs from **9-14 October**, ex Lyon airport. We'll meet participants at the airport and transfer to the hotel – and provide transport back to Lyon at the end.

Participants need to confirm arrival times into Lyon airport (flights or maybe train!) as soon as possible so that we can schedule pick up. You'll see from the first circular issued earlier in the year that we'd like to get away from the airport by lunchtime so that the afternoon can be used for scene-setting. Monday-Thursday we'll run a mixture of field-based knowledge transfer plus indoor activities. We'll also schedule a business meeting to discuss FTRG work plans for the following year.

The idea is to end the workshop by close of play on 13th, with participants either transferring back to Lyon that evening or...

We are offering a bolt-on field excursion to look at other Alpine thrust structures running straight on from the main sponsors meeting.

The idea is to travel from the Vercors to visit inverted basement faults in the Ecrins then to examine thrust and fold structures in sandstone-shale sequences (the Oligocene Champsaur Sandstone) on the south side of the Ecrins. Details of where we'll stay will follow – nothing is booked until we know who's coming! We return to Lyon airport late on the Sunday 16th so participants can travel onwards first thing on the 17th.

We need to have confirmed numbers for this additional component by end July latest.

For 2017 we are proposing to run the business component of the sponsors meeting in London – on **30th October 2017**, just ahead of the Geological Society's conference on Fold-Thrust Belts (31 Oct-2 Nov, see below for more information). We'll also run a field-based knowledge exchange component to Pembrokeshire (SW Wales) to look in detail at small-scale fold-thrust structures – either before or straight after the meeting and Fold-Thrust Belts conference.



## Fieldwork

In May 2016 Hannah spent 2 weeks undertaking fieldwork in the Chartreuse, Bauges and Bornes regions of the French Sub-Alpine chains. The main focus of the work was to collect structural data from the region to construct a series of very closely spaced cross sections. Once constructed, these sections will be used to analyse in detail how fold geometry may vary in mountain fronts, and what the causes of this structural variation may be. Results will be shared with sponsors at a later date.



*Above left: differences in folding style between Tithonian limestone (folded bottom cliff) and Urgonian limestone (skyline) in the Bornes Massif, French Sub-Alpine Chains. Above right: complex, small scale folding in Mississippian Carbonates, Sawtooth Range, Montana.*

Clare, Hannah and Aberdeen University PhD student Adam Cawood, sponsored by NERC Centre for Doctoral Training in Oil and Gas, alongside associates Mark Cooper and Marion Warren, spent two weeks of June completing fieldwork in the Sawtooth Range; a carbonate fold-thrust belt on the eastern edge of the Rocky Mountains in Montana. The fieldwork focussed on regional-scale data collection for cross section construction, small scale structural data collection to analyse localised fold geometry variation and fracture data collection to determine potential structural and lithological controls on fracturing. The results of this work will be collated and shared with sponsors in the future.

## Ongoing research and other work

**Masters students.** Daniel Warren was working on seismic data from Papua New Guinea for his MGeol dissertation project. The work focussed on alternative interpretations and kinematic modelling of the Juha section line, provided by Oil Search. He has now completed his work and the results will be delivered at the F-TRG sponsor meeting in October 2016.

Seismic, well and outcrop data provided by InterOil and Oil Search has also been given to two MSc students who are using the data for their dissertation projects over the summer. If these projects deliver relevant results they will be presented as a verbal report at the 2016 F-TRG sponsors meeting, with a view to provide digital versions of their results at the end of the year.



### **F-TRG Interns.**

We are employing two student interns, part sponsored by NERC, over the summer who are supporting our knowledge exchange activity. Zuzanna and Russell have been working on collating published cross sections from the French Sub-Alpine Chains into Move and Google Earth to create a 3D visual library for our main study area. Final versions of these will be delivered at our sponsor meeting in October 2016, and we will circulate beta versions in the upcoming weeks for your comment and feedback.

For the remainder of the summer Russell will start to create a virtual fieldtrip in Google Earth, using our own field photographs, notes and sketches from the French Sub-Alpine Chains. We plan to deliver these at our 2016 sponsor meeting.

### **Knowledge exchange.**

We have begun compiling a database of published journal articles relevant to the Fold-Thrust Research Group. We aim to search back through past articles systematically and add them to a group on Mendeley. Research group partners have been given instructions of how to access this database. The database will be continuously updated throughout the life of the consortium. If you have any comments/feedback on the Mendeley format, or if you are having problems accessing the Mendeley group, please let us know.

### **News and events**

#### **EGU 2016.**

Rob and Hannah attended the European Geosciences Union (EGU) meeting in Vienna in April 2016. There were presentations given relevant to the F-TRG including the effect of mechanical stratigraphy on regional-scale structure; the effect of salt on fold-thrust structures; the impact of velocity models in depth conversion on the structural interpretation in thrust belts; modelling thrust initiation in fold-thrust belts to determine controls on thrust distribution and spacing; the impact of overburden thickness on fold-thrust belt geometry; and the impact of pre-existing structure on internal deformation, shortening and overall wedge geometry in fold-thrust belts.

F-TRG members were involved in several EGU presentations:

- ‘Why style matters – uncertainty and structural interpretation in thrust belts’. **Rob Butler, Clare Bond, Hannah Watkins.**
- ‘Sand fairway mapping as a tool for tectonic restoration in orogenic belts’. **Rob Butler.**
- ‘A workflow for 3D model building in fold-thrust belts’. **Hannah Watkins, Clare Bond & Rob Butler.**
- ‘Beyond data collection in digital mapping: interpretation, sketching and thought process elements in geological map making’. **Hannah Watkins, Clare Bond & Rob Butler.**



- ‘Seismic depth conversion vs. structural validation’. Yukitsugu Totake, **Rob Butler, Clare Bond**.
- ‘Structural modelling of thrust zones utilizing photogrammetry: Western Champsaur basin, SE France’. Yukitsugu Totake, **Rob Butler, and Clare Bond**.
- ‘Exploring the seismic expression of fault zones in 3D seismic volumes’. David Iacopini, **Rob Butler**, and Steve Purves.
- ‘Seismic texture and amplitude analysis of large scale fluid escape pipes using time lapse seismic surveys: examples from the Loyal Field (Scotland, UK)’. Daniele Maestrelli, Ali Jihad, David Iacopini and **Clare Bond**.
- ‘Mapping 3D thin shale and permeability pathways within a reservoir system: Case study from the Sleipner Field’. Roy Ponfa Bitrus, David Iacopini and **Clare Bond**.

### **Seismix 2016.**

Rob was part of the organising committee for the Seismix conference held in Aviemore, Scotland in May 2016. F-TRG members were also involved in several presentations at this conference:

- ‘Where is the fault? – Effect of seismic image quality on fault interpretation uncertainty’. J. Alcalde, **C. E. Bond**, G. Johnson, J. F. Ellis & **R. W. H. Butler**.
- ‘Learning interpretation: time-lapse seismic interpretation experiment with masters students’. J. Alcalde, **C.E. Bond**, G. Johnson, J.F. Ellis, **R.W.H. Butler** & M. Cooper.
- ‘Exploring seismic facies within fault zones in 3-D seismic volumes: an image processing workflow model’. D. Iacopini, **R.W.H. Butler**, S. Purves & N. McArdle.
- ‘Exploring seismic facies within fault zones in 3-D seismic volumes: some examples from thrust and normal faults systems’. D. Iacopini, **R.W.H. Butler**, S. Purves & N. McArdle.
- ‘Multiple structural interpretations of seismic reflection data – using the Virtual Seismic Atlas to collate and assess uncertainty’. **R.W.H. Butler**, T.M. Torvela & W.D. McCaffrey.

### **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 or 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.

We are planning on organising the 2017 F-TRG sponsors business meeting in London on 30<sup>th</sup> October 2017, and a field-based knowledge exchange component to Pembrokeshire (SW Wales) to look in detail at small-scale fold-thrust structures – either before (October) or straight after (Nov) the meeting/conference.

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 now on Twitter! Follow us (**@FoldThrust**) for updates on F-TRG activities and relevant fold-thrust information.

### **Recent/relevant publications**

Bhattacharyya & Ahmed, 2016. Role of initial basin width in partitioning total shortening in the Lesser Himalayan fold-thrust belt: Insights from regional balanced cross-sections. *Journal of Asian Earth Sciences*, 116, 122-131.

Burberry & Swiatlowski, 2016. Evolution of a fold-thrust belt deforming in a unit with pre-existing linear asperities: Insights from analog models. *Journal of Structural Geology*, 87, 1-18.

Habibou, Ouardi, Habibi & Mercier, 2016. Faulting and fracturing in the Jurassic carbonate ramp folds of southern Rif ridges (Northern Morocco). *Arab J Geosci*, 9, 233.

Li, Wen, Li, Peng, Qiu, Zheng, Luo, Zhang & Jia, 2016. The Madong Early Paleozoic fold-thrust belt in southern Tarim Basin. *Journal of Asian Earth Sciences*, 115, 247-256.

Liu, Eckert & Connolly, 2016. Stress evolution during 3D single-layer visco-elastic buckle folding: Implications for the initiation of fractures. *Tectonophysics*, 679, 140-155.

Porter, Rutherford, Speece & Mosolf, 2016. Cordilleran front range structural features in northwest Montana interpreted from vintage seismic reflection data. *Journal of Structural Geology*, 85, 115-129.



Torres Carbonell, Guzmán, Yagupsky & Dimieri, 2016. Tectonic models for the Patagonian orogenic curve (southernmost Andes): An appraisal based on analog experiments from the Fuegian thrust-fold belt. *Tectonophysics*, 671, 76-94.

Ukar, Ozkul & Eichhubl, 2016. Fracture abundance and strain in folded Cardium Formation, Red Deer River anticline, Alberta Foothills, Canada. *Marine and Petroleum Geology*, 76, 210-230.

Zhou, Zhang & Xu, 2016. Effects of lateral friction on the structural evolution of fold-and-thrust belts: Insights from sandbox experiments with implications for the origin of landward-vergent thrust wedges in Cascadia. *GSA Bulletin*, 128, 3-4, 669-683.

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

The next F-TRG newsletter will be issued at the end of the third quarter of 2016, and will also be available on our website ([www.abdn.ac.uk/research/foldthrust](http://www.abdn.ac.uk/research/foldthrust)). We will outline progress of F-TRG research, outline more papers relevant to fold-thrust belts and more...