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Field Trip to the Betic Cordillera and the Carboneras Fault Zone (SE Spain)

TSG Tectonic Studies Group

The Geological Society serving science & profession

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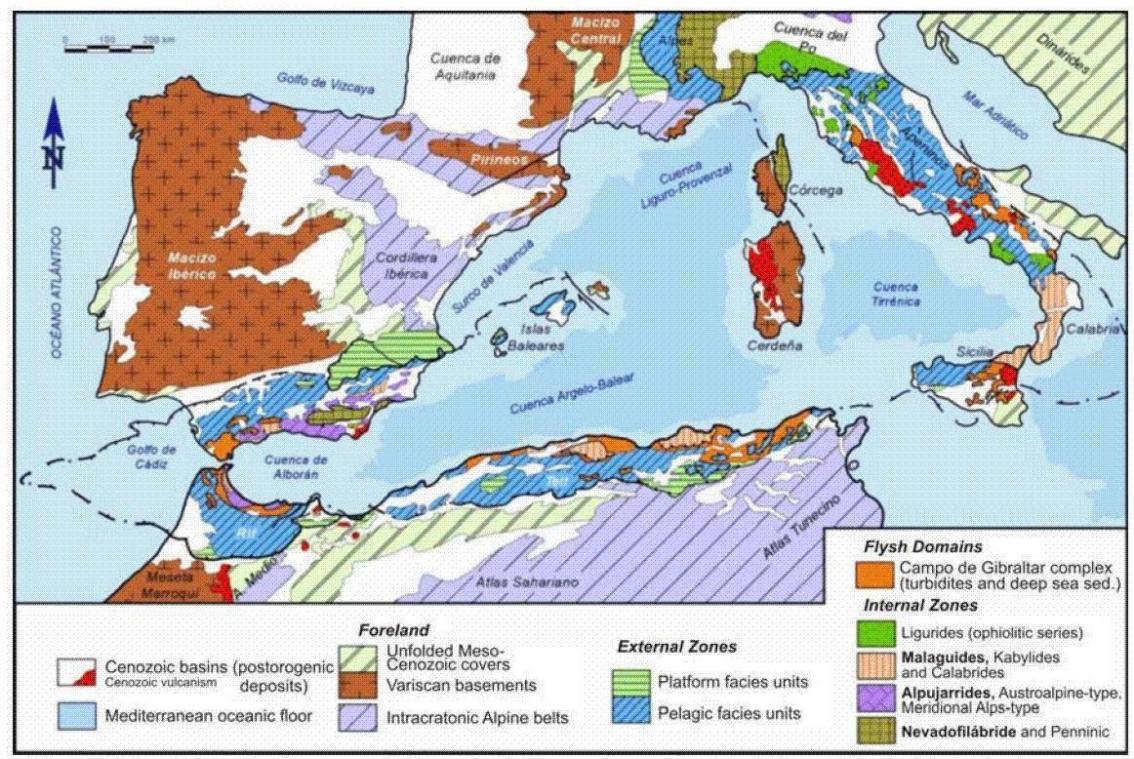
What's there to see?

The Betic Zone is an interesting and important piece of the Mediterranean geologic puzzle, featuring an Alpine orogenic belt that reached its metamorphic peak during early Miocene times, followed by extensional collapse and the formation of metamorphic core complexes flanked by late-Miocene intramontane basins.

Why is it interesting?

The Late Miocene extension produced NE-SW extended basins linked by strike-slip faults and bounded by major stretching transforms, including the Carboneras fault zone. This separates the wedge of the Betic cordilleras to the north, stretched as a result of the Gibraltar subduction zone rollback, from less extended crust to the south. At the same time, N-S convergence between Africa and Iberia has continued.



(from Moreno-Mota 2010)

It is a perfect place, onshore, to demonstrate non-rigid plate tectonics.

This field trip will take you to appreciate:

- The evolution of the Internal Betic Zone characterized by Miocene regional extensional and strike-slip tectonics, that continues today.

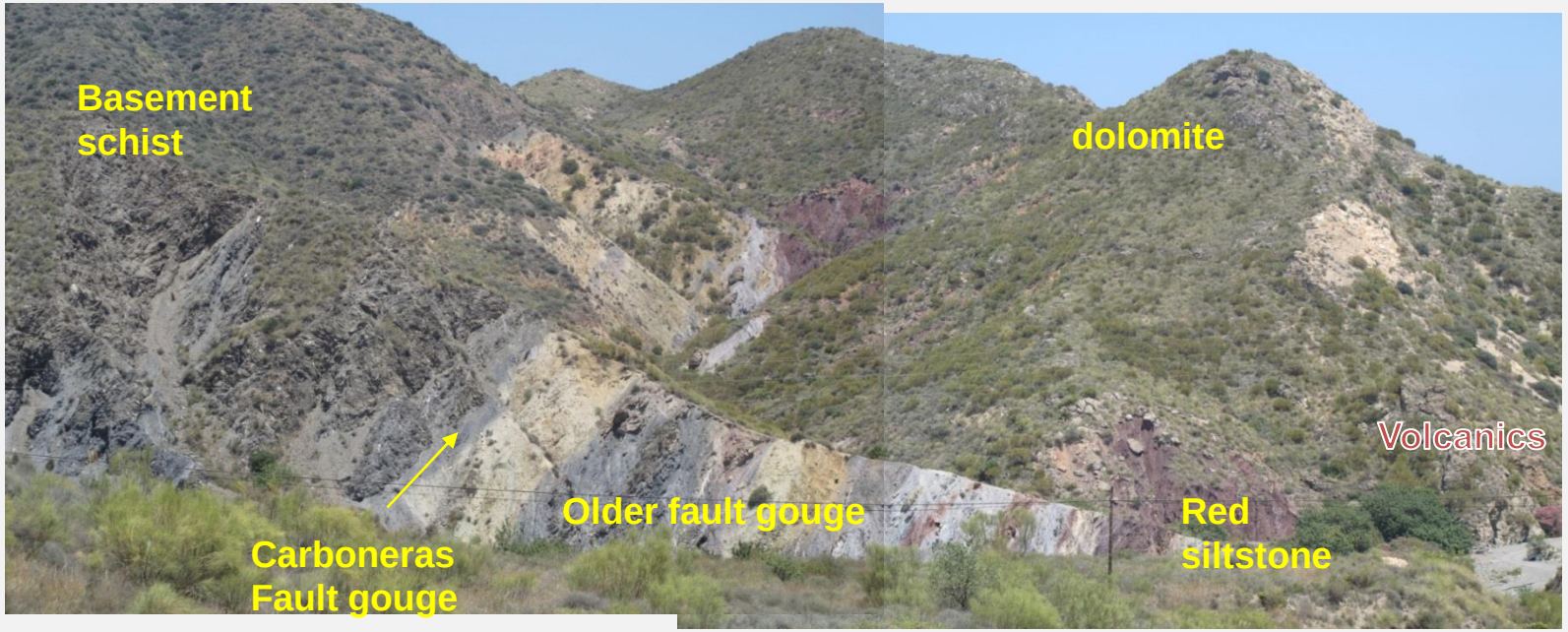
- The structural features of the basement rocks across the Sierra Cabrera metamorphic core complex, and the stratigraphic aspects of the Cenozoic sequence in the Sorbas Basin, linked to the basement by low angle detachment faults.

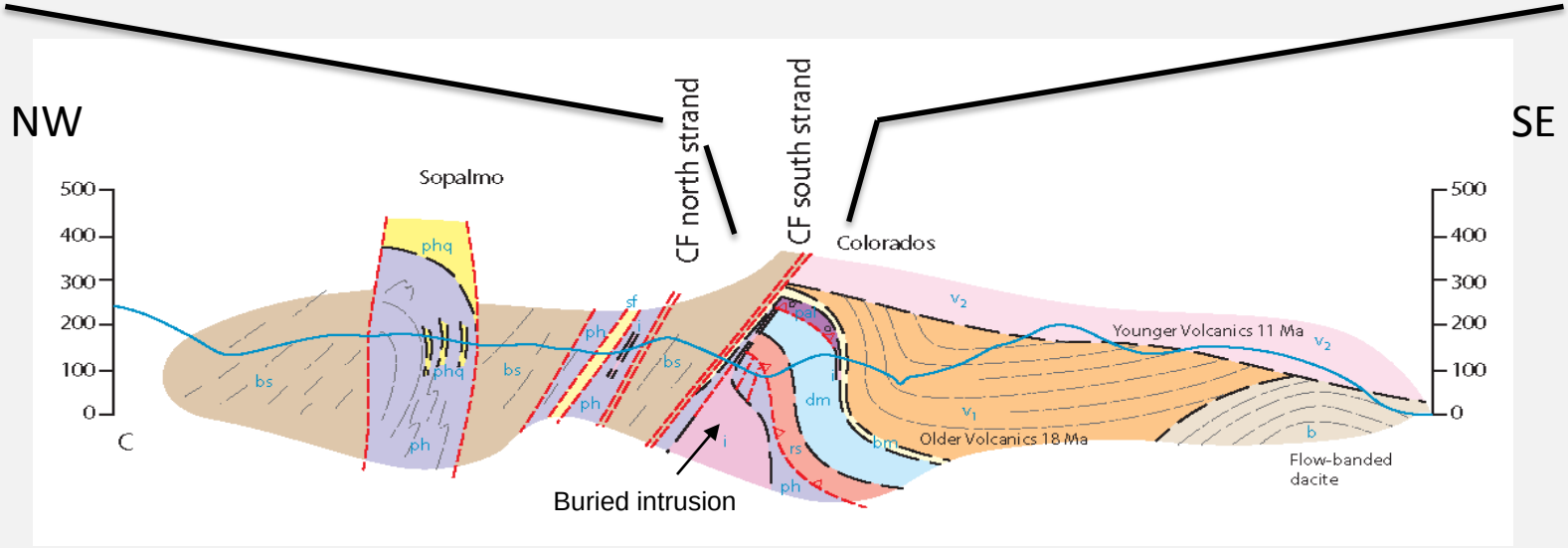
- The spectacular strike-slip tectonics of the Carboneras Fault Zone (CFZ), a part of the Trans-Alboran Shear Zone, a complex of strike-slip stretching transform faults that extends for 450 km between Alicante and Morocco.

- Ultimately, the relationship between the Fault Zone, the Miocene basinal sedimentation, and the calc-alkaline Cabo de Gata volcanic complex that dominates the region to the south of the CFZ.

A view of The R. Granatilla section – probably the most visited section through the CFZ

(from Rutter et al 2012)





Organization info

The trip will take place between the **7th and the 11th of September 2014** and the participants will be based in the lively **town of Carboneras**, by the sea (Google Maps). Accommodation will be at the Hotel Don Felipe (TripAdvisor).

During the field visits, transportation will be arranged on hired minibuses.

Brief schedule breakdown:

- **7th** Arrival at the airport of Almeria (Google Maps) and heading to Carboneras on minibuses.
- **8th , 9th and 10th** Field visits during the day, relax in the late afternoon in front of a nice selection of delicious tapas and cold beer. Discussions are very welcome in that setting!
- **11th** Back to the airport and home.

Some practical information

- In southern Spain, unlike in Manchester, the sun shines hard and true! Remember to bring and use a hat at all times in the field, as well as sunscreen. Temperatures will not be as high as in the summer, but it's still strongly suggested that you bring plenty of water with you in the field.
- It would be best to wear long trousers, both for reducing the risk of sunburn and for protection from low and thorny arid climate vegetation. Goes without telling, the use of appropriate footwear is recommended.
- Lastly, as some of the stops could be alongside the road, it is recommended to have a reflective jacket at the ready both for the protection of your life and the welfare of your wallet (the fines can be quite steep!)

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Would you like to know more on the subject?

Here is a brief list of interesting papers.

Gutscher, M. A. 2012. Subduction beneath Gibraltar? Recent studies provide answers. Eos, 93, 133–134.

Gutscher, M. A., Malod, J., Rehault, J. P., Contrucci, I., Klingelhoefer, F., Mendes-Victor,L. & Spakman, W. 2002. Evidence for active subduction beneath Gibraltar. Geology, 30, 1071–1074.

Lonergan, L. & White, N., 1997. Origin of the Betic-Rif mountain belt. Tectonics, 16(3), pp.504–522.

Meijninger, B.M.L. & Vissers, R.L.M. 2006. Miocene extensional basin development in the Betic Cordillera, SE Spain revealed through analysis of the Alhama de Murcia and Crevillente Faults. Basin Research, 18, 547– 571, doi: 10.1111/j.1365-2117.2006. 00308.x

Moreno Mota, X. 2010. Neogene and paleoseismic onshore-offshore integrated study of the Carboneras fault (Eastern Betics, SE Iberia). PhD thesis, University of Barcelona.

Royden, L. 1993: The tectonic expression of slab pull at convergent plate boundaries. Tectonics, 12: 303-325.

Rutter, E.H. et al., 2013. Reduction of friction on geological faults by weak-phase smearing. Journal of Structural Geology, 51, pp.52–60.

Rutter, E.H., Faulkner, D.R. & Burgess, R., 2012. Structure and geological history of the Carboneras Fault Zone, SE Spain: Part of a stretching transform fault system. Journal of Structural Geology, 45, pp.68–86.

Vissers, R.L.M., 2012. Extension in a convergent tectonic setting: a lithospheric view on the Alboran system of SW Europe. Geologica Belgica, 15, pp.53–72.

Mather, A., M. Martin, J., Adrian H., Braga J., 2009. A Field Guide to the Neogene Sedimentary Basins of the Almeria Province, South-East Spain. Wiley-Blackwell 368.

We look forward to showing you the geology of south-eastern Spain!

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