



Delft University of Technology

Document Version

Final published version

Citation (APA)

Mittempergher, S., Succo, A., Bruna, P.-O., Bistacchi, A., Martinelli, M., Storti, F., Meda, M., Bertotti, G., & Balsamo, F. (2017). *Multiscale characterization of fracturing in folded platform carbonates: the case study of the Island of Pag, External Dinarides of Croatia*. 164-164. Abstract from Fold and Thrust Belts: Structural style, evolution and exploration, London, United Kingdom.

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

In case the licence states "Dutch Copyright Act (Article 25fa)", this publication was made available Green Open Access via the TU Delft Institutional Repository pursuant to Dutch Copyright Act (Article 25fa, the Taverne amendment). This provision does not affect copyright ownership.
Unless copyright is transferred by contract or statute, it remains with the copyright holder.

Sharing and reuse

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.

Multiscale characterization of fracturing in folded platform carbonates: the case study of the Island of Pag, External Dinarides of Croatia

Silvia Mitterpergher¹, Andrea Succo², Pierre Olivier Bruna³, Andrea Bistacchi¹, Mattia Martinelli¹, Fabrizio Storti², Marco Meda⁴, Giovanni Bertotti³, Fabrizio Balsamo²

¹ *Università degli Studi di Milano Bicocca, Department of Environmental and Earth Sciences, Piazza della Scienza 4, 20126 Milano*

² *NEXT – Natural and Experimental Tectonics group, Università di Parma, Dipartimento di Scienze Chimiche, della Vita e della Sostenibilità Ambientale, Parco area delle Scienze 157/A, 43124 Parma, Italy*

³ *TU Delft, Department of Geoscience and Engineering, Applied Geology section, Stevinweg 1, 2628 CN Delft, The Netherlands*

⁴ *ENI Spa, Upstream and Technical Services, San Donato Milanese – Italy*

Fractures are a primary factor controlling the fluid storage and transport properties of hydrocarbon reservoirs. The quantitative characterization of fractures in outcrop analogues allows a better understanding of natural fracture systems, to extrapolate predictive laws useful for integrating the limited data available for buried reservoirs. Here we present the methodological workflow we are applying for a multiscale characterization of fracturing in a folded Cretaceous carbonate platform in the Island of Pag, in the External Dinarides of Croatia, along with our preliminary results.

The External Dinarides are a fold and thrust belt developed between the Paleogene to Miocene, characterized by general SW vergence. The Pag anticline involves about 1 km of Cenomanian-Santonian rudist-bearing limestones overlain, through an unconformity, with transgressive Foraminiferal limestones of Eocene age. The outcrops are almost free of vegetation and display nice pavement and cross sectional exposures, although strongly affected by karst dissolution. The exceptional exposure conditions allowed us integrating remote sensing techniques with drone and ground-based photogrammetric surveys for characterizing the fracture network at multiple scales. For the analysis of digital outcrop models we developed a semi-automatic fracture detection method, combined with the 3D analysis tools available in Gocad. Traditional geological surveys and structural stations served for determining the crosscutting relations between multiple fractures and stylolites sets.

At the km-scale, the fold shows a high along-axis continuity for ca. 30km between the NW and SE periclinal terminations. In cross section, it has a box geometry, with sub-vertical to overturned limbs and a gently undulating hinge zone. The gently NE-dipping hinge zone is overthrust over the NE limb through a sub-horizontal thrust fault. The fold is crosscut by other minor thrust faults verging both to NE and SW, and by sub-vertical strike-slip faults striking either NS or EW. Thrust and strike-slip faults determine an increase in fracture intensity clearly visible in drone imagery. At the outcrop scale, fractures and stylolites occur in both systematic and non-systematic arrays. Non-systematic, locally very intense fracturing is mostly found in thick mudstone-wackestone banks, while in packstone-grainstone dominated intervals fractures are more systematic and evenly spaced.

Our preliminary data suggest that the observed kilometer-scale tight folding of the Cretaceous platform is associated with multiple thrusts and back-thrusts at the decametric to hectometric scale. The organization and distribution of fractures is primary controlled by sedimentary facies, being more intense in mudstone-wackestone, and by the vicinity of thrust or strike-slip faults.