

Franciscus Martinus (Frans) Aben

nationality: Dutch

f.aben@ucl.ac.uk, frans.aben42@gmail.com

Employment

Nov 2018, post-doctoral research associate, NERC-funded

University College London, funded until November 2021

Post-doc advisor: Dr. N. Brantut.

Feedback between faulting and fluid flow throughout the seismic cycle: An experimental approach.

Jan 2017 - Oct 2018, post-doctoral research associate, NERC-funded

University College London

Post-doc advisors: Dr. T.M. Mitchell, Dr. N. Brantut.

Conducting research on coseismic off-fault damage by ways of 1) laboratory experiments using a novel unique triaxial impact rig, split-Hopkinson pressure bar, standard rock experimental apparatus, seismic velocity and acoustic emission tomography, 2) structural observations along active fault zones.

Oct 2013 - Nov 2016, early stage research fellow in Marie Curie ITN 'FlowTrans' (Ph.D.), EU-funded

Université Grenoble Alpes

Thesis supervisors: Dr. M.-L. Doan, Prof. Dr. F. Renard, Dr. J.-P. Gratier.

Thesis subject: *Creating and healing of damage in fault damage zone rock by simulating the seismic cycle in the laboratory.* Experience in rock deformation experiments on split Hopkinson pressure bar and conventional gas-medium triaxial apparatus.

Relevant skills and experience

- Operating, maintaining, and refurbishing experimental rock physics equipment: split Hopkinson pressure bar, uni- and triaxial deformation rigs, fluid percolation systems. Apparatus instrumented with passive and active ultrasonic methods, strain gauge based sensors.
- Petrophysical methods: X-ray CT, ultrasonic wave speed measurements, Brauner-Emmett-Teller surface area analysis, gas pycnometry.
- Microstructural methods and analysis: Optical and electron microscopy, X-ray computed tomography, development of image analysis algorithms.
- Geochemical methods: SEM & EBSD, XRF, ICP-AES.
- Rock magnetic methods.
- Field experience: North Anatolian fault, Turkey; Borrego- and Laguna Salada faults, Mexico; San Andreas fault, California, USA; Mt. Etna, Italy.
- Computer/programming skills: MatLab (advanced), LaTeX (advanced), Adobe Illustrator (advanced), Microsoft Office (advanced), Julia (moderate), Adobe photoshop (moderate), LabView (basic), Mathematica (basic).

Education

2013-2016 Ph.D. in Geophysics, University Grenoble Alpes

Thesis supervisors: Dr. M.-L. Doan, Prof. Dr. F. Renard, Dr. J.-P. Gratier.

Title of thesis: *Creating and healing of damage in fault damage zone rock by simulating the seismic cycle in the laboratory.*

2011-2013 MSc in Earth Sciences (Earth Structure and Dynamics, Earth Materials) *cum laude* graduated, Utrecht University

Thesis supervisors: Dr. M.J. Dekkers, Dr. D.J.J. van Hinsbergen

Title of thesis: *Greigite related complex polarity records unraveled through an integrated rock magnetic analysis: A case study on Neogene sections in East Timor (Indonesian Archipelago).*

2007-2010 BSc in Earth Sciences, Utrecht University

Thesis supervisors: Prof. Dr. C.J. Spiers (Utrecht University), Prof. Dr. R.J. Chalaturnyk (University of Alberta)

Title of thesis: *Impact of CO₂ on the composition, micro structure and strength of reservoir rocks recovered from the 'Marly sequence' at the Weyburn field, Canada.*

Academic service and funding

Research funding

- 2019, UCL Cities Partnership Programme with Paris '*Breaking news for earthquakes: Integrating field and laboratory results with earthquake rupture simulations to study damage and ground motion.*', PI (pound 2707)
- 2010, CATO-2 travel subsidy (euro 2500)

Reviewer for

- Earth and Planetary Science Letters
- Journal of Geophysical Research: Solid Earth
- Geophysical Journal International
- Journal of Structural Geology
- Solid Earth
- Philosophical Transactions of the Royal Society A
- Mechanics of Materials
- Acta Geophysica
- Terra Nova
- Journal of Petroleum Science and Engineering

Conference session convener

- EGU General Assembly 2020, Vienna, Austria

Awards

- 2018 Outstanding reviewer - Journal of Structural Geology

Teaching and mentoring

Co-supervision

- Giles Ostermeijer (Ph.D.), University College London (2015 - 2019)

- Pania Rabipour (MSc), Université Grenoble Alpes (2014)

Teaching

- 2018, First Marker MSc dissertation, UCL
- 2018, Undergraduate module ‘*Maps, images, and structures*’, UCL
- 2017-2018, MSc module ‘*Research methods*’, rock mechanics session, UCL
- 2017-2019, UCAS & UCL open days, lab demonstrations, UCL
- 2010-2012, Demonstrator 1st year BSc field course, Utrecht University
- 2009-2012, Professional STEM-tutor high school students, PIOS Hilversum & HIP Bilthoven.

Peer-reviewed articles

1. Brantut, N. and **Aben, F.M.**, (submitted)
Fluid pressure heterogeneity during fluid flow in rocks: New laboratory measurement device and method. *Preprint*, arXiv:2006.16699.
2. **Aben, F.M.**, Brantut, N., and Mitchell, T.M., (2020)
Off-fault damage characterisation during and after experimental quasi-static and dynamic rupture in crustal rock from laboratory *P*-wave tomography and microstructures. *Journal of Geophysical Research: Solid Earth*, in press.
3. **Aben, F.M.**, Doan, M.L, Mitchell, T.M., (2020)
Variation of hydraulic properties due to dynamic fracture damage: Implications for fault zones. *Journal of Geophysical Research: Solid Earth*, **125**(4).
4. Ostermeijer, G.A., Mitchell, T.M., **Aben, F.M.**, Dorsey, M.T., Rockwell, T.K., Fletcher, J.M., Browning, J., Ostermeijer, F. (2020)
Damage Zone Heterogeneity on Seismogenic Faults in Crystalline Rock; a Field Study of the Borrego Fault, Baja California. *Journal of Structural Geology*. **137**, 104016.
5. **Aben, F.M.**, Brantut, N, Mitchell, T.M., David, E. (2019)
Rupture energetics in crustal rock from laboratory-scale seismic tomography. *Geophysical Research Letters*, **46**(13), 7337-7344
6. **Aben, F.M.**, Doan, M.-L., Gratier, J.-P., Renard, F. (2017).
Experimental postseismic recovery of fractured rocks assisted by calcite sealing *Geophysical Research Letters*, **44**(14), 7228-7238
7. **Aben, F.M.**, Doan, M.-L., Gratier, J.-P., Renard, F. (2017).
High strain rate deformation of porous sandstone and the asymmetry of earthquake damage in shallow fault zones. *Earth and Planetary Science Letters*, **463**, 81-91
8. Fondriest, M., Doan, M.-L., **Aben, F.M.**, Fousseis, F., Mitchell, T.M., Voorn, M., Secco, M., Di Toro, G., (2017).
Static versus dynamic fracturing in shallow carbonate fault zones. *Earth and Planetary Science Letters*, **461**
9. **Aben, F.M.**, Doan, M.-L., Mitchell, T.M., Toussaint, R., Reuschlé, T., Fondriest, M., Gratier, J.-P., Renard, F. (2016).
Dynamic fracturing by successive coseismic loadings leads to pulverization in

active fault zones. *Journal of Geophysical Research: Solid Earth*, **121**

10. **Aben, F.M.**, Dekkers, M.J., Bakker, R.R., van Hinsbergen, D.J.J., Zachariasse, W.J., Tate, G.W., McQuarrie, N., Harris, R., Duffy, B. (2014). Untangling inconsistent magnetic polarity records through an integrated rock magnetic analysis: A case study on Neogene sections in East Timor. *Geochemistry, Geophysics, Geosystems*, **15**(6), 2531-2554

Peer-reviewed monograph contributions

1. **Aben, F.M.**, Doan, M.-L., Gratier, J.-P. and Renard, F. (2017). Coseismic damage generation and pulverization in fault zones: insights from dynamic Split-Hopkinson Pressure Bar experiments. In: M.Y. Thomas, T.M. Mitchell, and H.S. Bhat (eds.), *Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture*, Wiley, Hoboken, NJ.

Conference contributions (as presenting author)

1. **Aben, F.M.** and Brantut, N. (2020). (**Online**). On the loading conditions for pore fluid stabilisation of failure in crustal rock. EGU General Assembly, April 2020, Vienna, Austria
2. **Aben, F.M.**, Hangx, S.J.T., Brantut, N. (2019). (**Poster**). Effective moduli and Thomsen's parameters of randomly packed spheres under triaxial stress conditions. AGU fall meeting, December 2019, San Francisco, CA, USA
3. **Aben, F.M.**, Brantut, N., Mitchell, T.M., David, E. (2019). (**Oral, invited**). Off-fault damage characterization during and after experimental quasi-static and dynamic rupture in crustal rock. AGU fall meeting, December 2019, San Francisco, CA, USA
4. **Aben, F.M.**, Brantut, N., Mitchell, T.M., David, E. (2019). (**Oral**). Off-fault damage characterization during and after experimental slow and fast rupture in crustal rock. GeoProc2019, Utrecht, the Netherlands
5. **Aben, F.M.**, Doan, M.-L., Mitchell, T.M. (2018). (**Poster, invited**). Petrophysical Changes in Fault Damage Zone Rock Induced by Single and Repeated Earthquakes: a Laboratory Study, AGU fall meeting, December 2018, Washington DC, USA
6. **Aben, F.M.**, Brantut, N., Mitchell, T.M., David, E. (2018). (**Oral**). Rupture Energetics and Changing Elastic Properties in Crustal Rock from Laboratory-scale seismic tomography, AGU fall meeting, December 2018, Washington DC, USA
7. **Aben, F.M.**, Brantut, N., Mitchell, T.M., David, E. (2018). (**Poster**). Seismic structure and energy budget of a growing rupture in crustal rock. Gordon Research Conference/Seminar on Rock Deformation, August 2018, Andover, NH, USA
8. **Aben, F.M.**, Brantut, N., Mitchell, T.M., David, E. (2017). (**Oral**). Comparing slow and fast rupture in laboratory experiments, AGU fall meeting, December 2017, New Orleans, LA, USA
9. Doan, M.L., **Aben, F.M.**, Mitchell, T.M. (2017). (**Poster**). Dynamic permeability in fault damage zones induced by repeated coseismic fracturing events, AGU fall meeting, December 2017, New Orleans, LA, USA

10. **Aben, F.M.**, Doan, M.L., Gratier, J.-P., Renard, F. (2016). (**Oral & Poster**). Mechanical behavior, fracturing and the formation of compaction bands during dynamic coseismic loading of Rothbach sandstone. Gordon Research Conference/Seminar on Rock Deformation, August 2016, Andover, NH, USA
11. **Aben, F.M.**, Doan, M.-L., Gratier, J.-P., Renard, F. (2015). (**Poster**). High strain rate behavior of saturated and non-saturated sandstone: implications for earthquake mechanisms. AGU fall meeting, December 2015, San Francisco, CA, USA
12. **Aben, F.M.**, Doan, M.-L., Gratier, J.-P., Renard, F. (2015). (**Oral**). High strain rate behavior of saturated and non-saturated sandstone: implications for earthquake mechanisms. FlowTrans 2015 International Conference, November 2015, Strasbourg, France
13. **Aben, F.M.**, Doan, M.-L., Renard, F., Toussaint, R., Reuschlé, T., Gratier, J.-P. (2014). (**Oral**). Coseismic Damage Generation in Fault Zones by Successive High Strain Rate Loading Experiments. AGU fall meeting, December 2014, San Francisco, CA, USA
14. **Aben, F.M.**, Doan, M.-L., Toussaint, R., Reuschlé, T., Renard, F., Gratier, J.-P. (2014). (**Poster**). Successive high strain rate loading experiments as an analogue for coseismic damage generation induced by earthquakes. Gordon Research Conference/Seminar on Rock Deformation, August 2014, Andover, NH, USA
15. **Aben, F.M.**, Bakker, R.R., Dekkers M.J., van Hinsbergen, D.J.J., Harris, R.A., Zachariasse, W.J. and Duffy, B.G. (2013). (**Oral**). Greigite related complex magnetic polarity records unraveled through an integrated rock magnetic analysis: A case study on Neogene sections in East Timor. AGU fall meeting, December 2013, San Francisco, CA, USA

**Invited seminars
and keynote
lectures**

- Keynote speaker, Congress of Società Geologica Italiana, Parma, Italy (Sep 2019)
- Seminar, Birkbeck Student Society of Geological and Planetary Science, Birkbeck University, UK (Jan 2018)
- Seminar, Department of Geological Sciences, San Diego State University, CA, USA (Oct 2017)
- Seminar, PGP, University of Oslo, Norway (Aug 2017)
- Seminar, Niels Bohr Institute, University of Copenhagen, Denmark (Dec 2015)
- Solid Rock Seminar, Department of Earth Sciences, Utrecht University, the Netherlands (Dec 2010 and Oct 2016)