



FAULT2SHA ESC Working Group

Fault2SHA Working group – 2nd Annual Report – 2017-2018

By Oona Scotti & Laura Peruzza

With contributions from: Bruno Pace, Maria Ortuño, Graeme Weatherill, Joanna Faure Walker, Francesco Visini, Lucilla Benedetti, Julian Garcia-Mayordomo



CENTRAL ITALY LAB GROUP



BETICS LAB GROUP



PARTICIPANTS AT THE KAUST WORKSHOP



Scope & Key Issues	3
2017 – 2018 Expanding the Community	3
Subscriptions and Governing Board	3
Meetings & Workshop	3
Fault2SHA Test Labs	4
Funding	6
Publications & Editorial activities	6
The KAUST Workshop	7
2018 - 2019 Ongoing and Future activities	8



SCOPE & KEY ISSUES

Scope and Key Issues of the Working Group remains the same quoted in the 1st Annual [2016-17 Report](#). We refer to it for the description of the initial activities too.

2017 – 2018 EXPANDING THE COMMUNITY

The second year of activity was focussed on the enlargement of the community inside and outside Europe, on the establishment of natural test areas, and on the search for funds to support the network. Activities culminated with the General Assembly of the European Seismological Commission in Malta in September 2018, and with a workshop, not planned in the 1st activity report, hosted and funded by the King Abdullah University of Science and Technology in Saudi Arabia in November 2018.

SUBSCRIPTIONS AND GOVERNING BOARD

People are asked to join to Fault2SHA working group by a form, accessible since Jan 2018 on a fully renewed website (<http://fault2sha.net/join-fault2sha/>). As of November 2018, about 98 members from 22 countries had signed; they regularly receive news and information about the ongoing activities, via e-mail messages and social platforms (twitter, facebook) too.

The nine people that offered to act as governing board (Executive Committee, ExCom), elected with a ballot in 2017, continue their duties of leading some activities, always as voluntary, non-paid contributors. The Fault2SHA ExCom is composed of the following members:

- Oona Scotti (coordinator of the Working Group activities and responsible for reporting to the ESC)
- Laura Peruzza (cofounder)
- Bruno Pace
- Francesco Visini
- Lucilla Benedetti
- Julian Garcia-Mayordomo
- Maria Ortuño
- Graeme Weatherill
- Joanna Faure Walker

MEETINGS & WORKSHOP

The WG continues in the organization of sessions during well-known International Conferences; here we list those organized between July 2017 to December 2018, only if they explicitly use the “brand” Fault2SHA. Some details about the target and the participants that



will follow are available on the website page <http://fault2sha.net/what/conferences/> too.

- April 2018 at EGU General Assembly in Wien –A: *Paleoseismicity, active faulting, surface deformation, and the implication on seismic hazard assessment (Fault2SHA)*, first convener E. Hintersberger; about 50 contributions coming from all over the world <https://meetingorganizer.copernicus.org/EGU2018/orals/27065>
- May 2018 at the SSA Annual Meeting in Miami –USA: *Fault to seismic hazard assessment (Fault2SHA) in Latin (Central and South) America*, first convener L. Audin; 12 submissions <https://www.seismosoc.org/meetings/past-and-future-ssa-annual-meetings/2018-technical-sessions/> Seism. Research Letter, 89/2B, 825-7
- September 2018 at the ESC General Assembly in Malta: *Fault2SHA: so what?*, first convener L. Peruzza, 15 submissions http://www.escmalta2018.eu/page/Sessions_n#S14

Some Skype and live meeting took place inside the activities of the WG Test Labs, mentioned in a separate block below.

Finally, the Fault2SHA WG co-organized with the Saudi Arabia University KAUST, a KAUST-funded and hosted Workshop (<https://eqhazard.kaust.edu.sa/events>) that took place in Nov. 2018, similarly described with some details in the followings.

FAULT2SHA TEST LABS

The two laboratories chosen by the Fault2SHA WG for testing fault-source seismogenic models are both major tectonically active area in Europe for which good data is available.

BETICS LAB

Key Aims and Purpose of the central Eastern Betics laboratory are as follows:

- To share active tectonics data from the faults of the Eastern Betic Shear Zone (EBSZ, SE Spain) within the Spanish community,
- To develop common standards in the estimation of crucial parameters (e.g., slip rate) for these faults,
- To learn and experiment about fault-source modelling.

In November 2017, a group (18 participants) of earthquake geologists with previous experience in the EBSZ gathered in a two-days seminar in order to: 1) promote a constructive discussion on the currently available geological data in the study region; 2) come up with agreed values of different seismic parameters (i.e. fault rupture models, slip rate) and the uncertainties affecting them; and 3) discuss within the Fault2SHA WG on the most suitable strategy to model multi-fault rupture.

Among the main achievements of this collective work was the definition of five different



earthquake rupture hypotheses/models. The data agreed upon for the EBSZ lead to a preliminary implementation of the SHERIFS (Seismic Hazard and Earthquake Rate Modelling In Fault Systems) approach, one of the codes developed within the Fault2SHA group. This meeting was followed by a “hands-on” session (10 participants) in Paris (November 2017) in order to promote the use of Fault2SHA codes: FISH, already published, and SHERIFS, a code developed in the framework of Thomas Chartier’s thesis.

Tasks and Timeframes

- Continuation of the collaborative activities within the Betics group.
- Organizing the 2019 4th Fault2SHA workshop in Barcelona.
- Sending out the first call for abstracts (achieved November 2018)
- Finalizing the second call (January 2019) and the organization of the meeting,
- A special session devoted to the Eastern-Betics laboratory will be held in the meeting (3rd-5th June). The group aims to benefit from the workshop to exchange with the seismologists specialist in the Betics, recently incorporated into Fault2SHA group. For preparing the session, a meeting in Madrid with some of the members of the group-lab is planned in March 2019.

CENTRAL ITALY LAB

Key Aims and Purpose of the central Italy laboratory are as follows:

- To provide a forum within the Fault2SHA Working Group for key persons within the Fault2SHA Working Group with a focus on the Italian Apennines,
- To create a database of mapped fault locations within the chosen field area within the Italian Apennines,
- To design a database structure for fault parameters required for a fault-based seismic hazard assessment,
- To create a database of fault characteristics (such as displacement-rates) needed for input to seismic hazard calculations within the field area,
- To perform seismic hazard calculations for faults within the field area.

Following a few Skype calls, a full meeting took place at the University of Chieti, Italy in June 2018 leading to the formalization of Central Italy as a test case.

Tasks and Timeframes

- Collate fault maps from group (achieved April 2018)
- Review of similarities and differences (achieved May 2018)
- Discussion of how to proceed (June 2018.)
- Decide geographical extent (achieved May 2018)



Other activities that have taken place within the group and that will continue next year.

FUNDING

As mentioned above, as the ESC WGs are not financially supported, their activities and member participation are based on voluntary contributions, in terms of time or economic resources. The quest for funding to expand the community, to organize meetings and workshops, and to provide the group with a more long-term vision has been a central action of the Fault2SHA ExCom members during the year 2017-2018. In particular:

- 1) a proposal to IGCP-UNESCO through the call “Earth Science for Society” has been submitted by the Spain representatives (Maria Ortuño and colleagues). This proposal was focused on the request of funds for mobility of young scientists within the group, for an interaction with modellers/data providers from Mexico and Colombia. The proposal was not selected.
- 2) A COST proposal was submitted by the ExCOM German representative (Graeme Weatherill) in the call OC-2018-1: in November 2018, the evaluation process ended, again with a negative result.
- 3) Finally, in 2018 there was the submission and the end of the evaluation process of another ITN proposal (led by Lucilla Benedetti, France, with the participation of many Fault2SHA members), again with negative results.

Further funding opportunities are being investigated.

PUBLICATIONS & EDITORIAL ACTIVITIES

The editorial activities up to date are:

- The special issue in Natural Hazards and Earth System Sciences (NHES) dedicated to Fault2SHA themes (https://www.nat-hazards-earth-syst-sci.net/special_issue864.html) has been completed with the last papers published in Feb 2018, and the preface in May 2018.
- A special issue of Tectonics dedicated to the 2016 earthquake sequence in Italy ([http://agupubs.onlinelibrary.wiley.com/hub/issue/10.1002/\(ISSN\)1944-9194.SEISMIC1/](http://agupubs.onlinelibrary.wiley.com/hub/issue/10.1002/(ISSN)1944-9194.SEISMIC1/)) which collection dates closed end of December, 2018, with 14 papers published or in publication, and 2 under review.

Collaborative papers are another main objective of the Fault2SHA WG; a partial list below:

- Faure Walker, J. P., Visini, F., Roberts, G., Galasso, C., McCaffrey, K., & Mildon, Z. (2018). *Variable Fault Geometry Suggests Detailed Fault Slip Rate Profiles and Geometries Are Needed for Fault Based Probabilistic Seismic Hazard Assessment*



(PSHA). Bulletin of the Seismological Society of America, <https://doi.org/10.1785/0120180137>

- García-Mayordomo, J., Ortuño, M., Insua-Arévalo, J.M., Scotti, O., Visini, F. & the Fault2SHA-Betics Working Group (2018). *The Fault2SHA-Betics working group: promoting knowledge interchange between earthquake geologists and seismic hazard modellers in the Eastern Betics (SE Spain)*. 3^a Reunión Ibérica sobre Fallas Activas y Paleosismología, Alicante, España, http://2018.iberfault.org/wp-content/uploads/2017/08/Volumen_comunicaciones_Iberfault_2018_web.pdf
- Gómez-Novell, O., García-Mayordomo, J., Ortuño, M., Masana, E., López, R., Chartier, T., & Scotti, O. (2018). *Earthquake rupture hypotheses at the Eastern Betic Shear Zone (SE Spain): what does the SHERIFS approach tell about their magnitude-frequency distributions?*. In EGU General Assembly Conference Abstracts, 20, 7935.
- Verdecchia, A., Pace, B., Visini, F., Scotti, O., Peruzza, L., & Benedetti, L. (2018). *The Role of Viscoelastic Stress Transfer in Long-Term Earthquake Cascades: Insights After the Central Italy 2016–2017 Seismic Sequence*. Tectonics, 37(10), 3411-3428.
- Visini, F.; A. Valentini; T. Chartier; O. Scotti; B. Pace (2019) *Long-term rate of earthquake ruptures in complex fault systems*. Pure and Applied Geophysics (PAAG), under revision.

THE KAUST WORKSHOP

The KAUST workshop anticipated an initiative fostered in 2019 to bring together geologists, PSHA modellers and physics-based researchers. Thanks to the local team (O. Zielke, M. Mai) and to the funds provided by the University for the organization of the event, about 40 participants met in KAUST Campus in Thuwal (SA) for 3 days, discussing about the integration of geological and seismological observations into physics-based rupture simulations. The formula of the workshop was similar to the one adopted in Barcelonnette (F) for the 3rd Fault2SHA Workshop, with 7 long invited lectures, and plenty of time for the discussions. The mind map is given below, the information about the meeting is available on its website: <https://eqhazard.kaust.edu.sa/home>. A synthesis for EOS is in preparation.

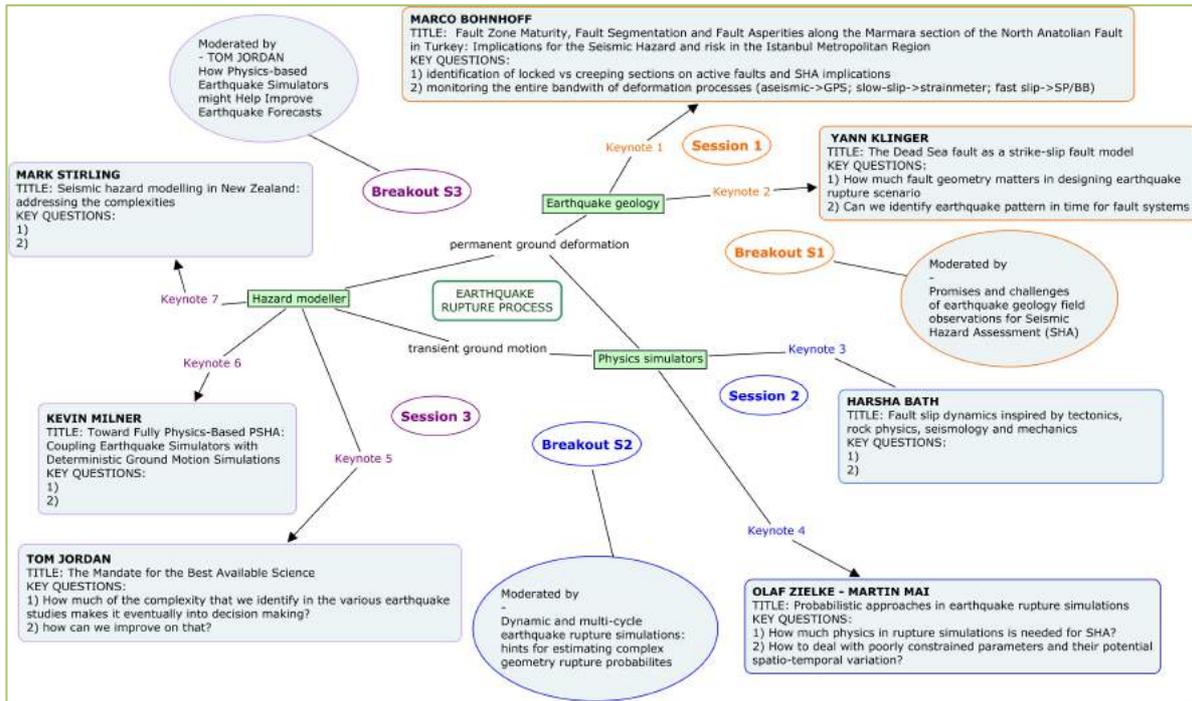


Figure 1 – Mind map of the KAUST Workshop, held in Thuwal (SA) in November 2018.

2018 - 2019 ONGOING AND FUTURE ACTIVITIES

The first issue to tackle during the 3rd year of activity of the WG is improving the network of interested researchers, and sharing tools and information within and outside of the group.

For these reasons, additional efforts will be devoted to funds search, and functionalities will be added to the Fault2SHA website, including availability of open source codes, list of selected references, and multi-task calendars.

The second objective is to help the co-organization of the Spanish initiative to host the 4th Fault2SHA Workshop in Barcelona, Spain, (<http://fault2sha.net/2018/11/01/inter-action-barcelona-2019/>) postponed to June 2019 after the tight schedule of the KAUST Workshop.

The third objective is to finalize, for the Central Italy Lab, the building of the fault database (Fig. 2) and possibly to start testing the different approaches developed within the group.

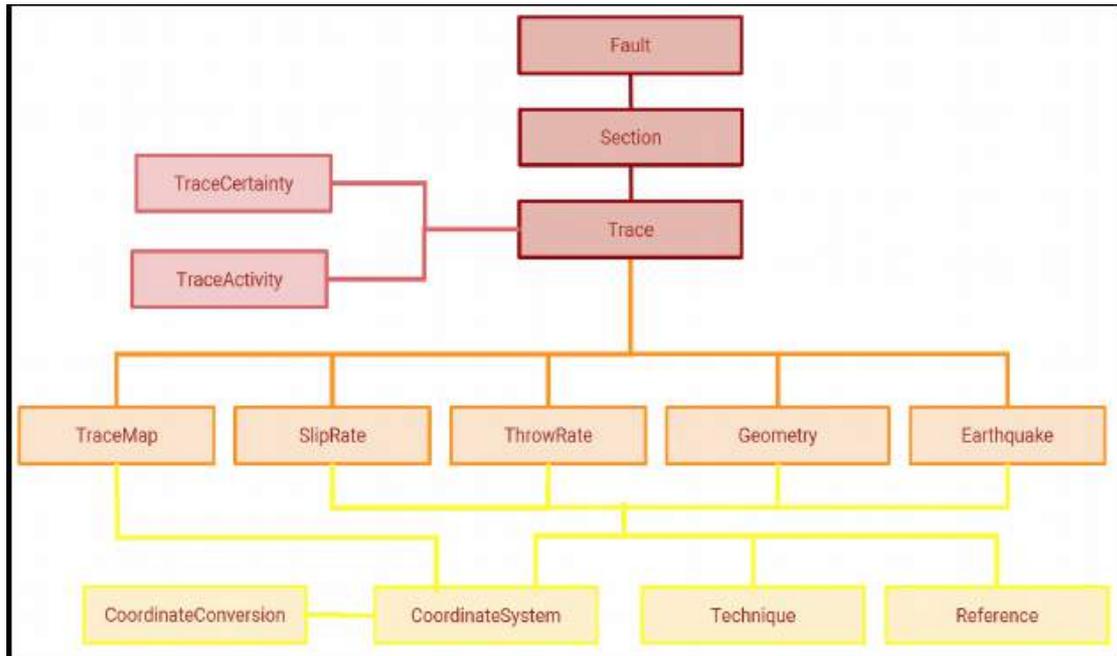


Figure 2 - Architecture of the fault database for the Central Apennines laboratory, agreed in September 2018.

Up to now, two Fault2SHA sessions have been planned in 2019, one at EGU in Wien (main convener E. Hintersberger) and one at SSA in Seattle (WA), intended to be a co-organized ESC-SSA session (main convener L. Peruzza).

Details of upcoming and past events are regularly updated on the website (<http://fault2sha.net/events/>), by email messages to members, and via social media.