

# Théa Ragon

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**INVERSE PROBLEMS - SEISMIC SOURCE AND RUPTURE - SEISMIC CYCLE - FAULT SYSTEMS - GEODESY**

## CURRENT POSITION

Sept. 2019 - present

**Post-doctoral Research Fellow · California Institute of Technology, Pasadena, U.S.A.**

Division of Geological and Planetary Sciences Chair's Prize Postdoctoral Fellowship.

Collaborators: Mark Simons, Zachary Ross

## RESEARCH EXPERIENCE

March 2016 - May 2019

**Research assistant · Géoazur, Université Côte d'Azur, France**

Experienced in inverse problems, Bayesian (MCMC) inference, modeling of the seismic source. Towards a more realistic imagery of earthquakes.

- I developed a method to account for uncertainties related to our poor knowledge of the causative fault geometry in earthquakes source inversion, for both Bayesian and optimization procedures.
- I performed a bayesian exploration of co-seismic static slip models for the Mw 6.1 Amatrice, August 2016, Italian earthquake, accounting for uncertainties related to our model of the Earth physics.
- I investigated the early-postseismic processes of the Mw 6.3 2009 l'Aquila earthquake with a joint Bayesian inversion of strictly coseismic and co+post-seismic observations.
- I analyzed the influence of topography on static slip distributions, focusing on the Mw 7.5 2015 Gorkha and Mw 8.1 Maule earthquakes.

2016 (6 months)

**Junior Geologist · Total, Paris, France – New Venture Africa**

Advisors: M. Allain and J.-L. Rubino.

The Turkana depression (EARS, Kenya): Structural and sedimentary characterization.

Preceded by a 1 month field trip. Global interpretation of +50 seismic lines, well logs, gravimetric data and field observations to reconstruct the current architecture and lithology of the Turkana depression. Proposed an updated rift evolution model and discussed rifting styles and processes.

2015 (5 months)

**Graduate Student Researcher · IPGS- DYLBAS, Strasbourg, France**

Advisors: M. Schuster and A. Nutz.

The Ekitale basin and Topernawi Formation (North West Turkana- Kenya rift): a sedimentary record of the earliest phase of rift initiation. Preceded by a 2 weeks field trip. Characterisation of a previously unseen sedimentary basin: sedimentology, structures, basin evolution. I proposed a basin evolution model and discussed the associated rifting processes.

2014 (2 months)

**Graduate Student Researcher · UiO- CEED, Oslo, Norway**

Advisor: C. Gaina

Metangula karoo graben: geological overview and magnetic depth determination (Nyassa province, Mozambique). Actualization of structural and geological characteristics of the Metangula basin. Calculation of depth to basement and sediment thickness from magnetic data with various methods.

## EDUCATION

March 2016 - May 2019

**Géoazur, Université Côte d'Azur, France**

Ph.D. in Geophysics. Uncertainties in Earthquake Source Estimates.

Advisors: Anthony Sladen and Bertrand Delouis.

Sept. 2012 - 2015

**EOST, Université de Strasbourg, France**

*Diplôme d'ingénieur* in Geophysics, French Grande Ecole diploma, with honours.

M.Sc in geophysics - excellence training program, with honours.

Sept. 2010 - 2012

**CPGE Lycée Pierre de Fermat, Toulouse, France**

Intensive program in Mathematics and Physics preparing for national competitive examinations to enter French Grandes Ecoles.

## PUBLICATIONS

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- 10) A. Nutz, M. Schuster, D. Barboni, G. Gassier, C. Robin, **T. Ragon**, J.F. Ghienne, J.-L. Rubino. **(submitted)** Plio-Quaternary sedimentation in West Turkana (Turkana Depression, Kenya, East African Rift System): paleolake Turkana fluctuations, paleolandscapes and controlling factors *Earth-Science Reviews*, . doi:-. \_
- 9) **Ragon, T.**, Q. Bletery, O. Cavalié, E. Fielding, M. Simons. **(submitted)** A stochastic view of the 2020 Elazığ  $M_w$ 6.8 earthquake *Geophysical Research Letters*, . doi:-. \_
- 8) **Ragon, T.**, M. Simons. **(submitted)** Accounting for uncertain 3D elastic structure in fault slip estimates *Geophysical Journal International*, . doi:-. \_
- 7) **Ragon, T.\***, L. Langer\*, A. Sladen, J. Tromp (\* equally contributing authors). **(2020)** Impact of topography on earthquake static slip estimates *Tectonophysics*, . doi:-. [Preprint on EarthArXiv](#)
- 6) Bletery, Q., O. Cavalié, J.-M. Nocquet, **T. Ragon**. **(2020)** Interseismic coupling along the North and East Anatolian Faults *Geophysical Research Letters*, . doi:-. [Preprint on EarthArXiv](#)
- 5) **Ragon, T.**, A. Sladen, Q. Bletery, M. Vergnolle, O. Cavalié, A. Avallone, J. Balestra, B. Delouis. **(2019)** Joint inversion of co-seismic and early post-seismic slip to optimize the information content in geodetic data: application to the 2009 Mw6.3 L'Aquila earthquake, Central Italy *JGR Solid Earth*, . doi:10.1029/2018JB017053. [Free access link](#)
- 4) **Ragon, T.** **(2019)** Uncertainties in Earthquake Source Estimates *PhD Thesis*, Université Côte d'Azur. doi:-. [Free access link](#)
- 3) **Ragon, T.**, A. Sladen, M. Simons. **(2019)** Accounting for uncertain fault geometry in earthquake source inversions — II: Application to the 2016 Mw6.1 Amatrice earthquake. *Geophysical Journal International*, 218(1), 689–707. doi:10.1093/gji/ggz180. [Free access link](#)
- 2) **Ragon, T.**, A. Nutz, M. Schuster, J.F. Ghienne, G. Ruffet, J.-L. Rubino. **(2019)** Evolution of the northern Turkana Depression (East African Rift System, Kenya) during the Cenozoic rifting: new insights from the Ekitale Basin (28–25.5 Ma). *Geological Journal*, 54: 3468–3488. doi:10.1002/gj.3339. [Preprint](#)
- 1) **Ragon, T.**, A. Sladen, M. Simons. **(2018)** Accounting for uncertain fault geometry in earthquake source inversions — I: theory and simplified application. *Geophysical Journal International*, 214(2), 1174–1190. doi:10.1093/gji/ggy187. [Free access link](#)

## SCIENTIFIC COMMUNICATIONS

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### INVITED COMMUNICATIONS AND SEMINARS

- 2) **2019**, May, **Institut de Physique du Globe (IPGP)**, Paris, France. *Uncertainties in Earthquake Source Estimates*.
- 1) **2018**, December, **AGU Fall Meeting**, Washington, USA. Ragon, T., A. Sladen, M. Simons. *Accounting for uncertain fault geometry in source inversion problems*.

### ORAL PRESENTATIONS

- 4) **Ragon, T.**, A. Sladen, M. Simons. Accounting for uncertain fault geometry in source inversion problems. 19th General Assembly of Wegener, Grenoble, France, **2018**.
- 3) **Ragon, T.**, A. Sladen, M. Simons. Accounting for uncertain fault geometry in source inversion problems. PhD students annual conference of the doctoral school of fundamental and applied sciences EDSFA, Nice, France, **2018**.
- 2) **Ragon, T.**, A. Sladen, M. Simons. Accounting for uncertainties related to the fault geometry in source inversion problems. G2, Nice, Fr, **2017**.
- 1) **Ragon, T.**, A. Nutz, M. Schuster, J.L. Rubino, M. Bez. The Topernawi Fm (Turkana depression, EARS, Kenya): a recording of early rift opening? Congress of the French Association of Sedimentologists (ASF), Chambéry, Fr, **2015**

### POSTERS

- 8) **Ragon, T.**, A. Sladen, M. Vergnolle, Q. Bletery, A. Avallone, O. Cavalié, J. Balestra, B. Delouis. Optimizing the information content available in geodetic data to jointly estimate co-seismic and early afterslip models. AGU Fall Meeting 2019, Washington, USA, **2019**.
- 7) **Ragon, T.**, A. Sladen, M. Vergnolle, Q. Bletery, A. Avallone, O. Cavalié. Optimizing the information content available in geodetic data to jointly estimate co-seismic and early afterslip models. AGU Fall Meeting 2018, Washington, USA, **2018**.
- 6) **Ragon, T.**, A. Sladen, M. Simons. Accounting for uncertain fault geometry in source inversion problems. Workshop on Modeling Earthquake Source Processes, Caltech, USA, **2018**.
- 5) **Ragon, T.**, A. Sladen, M. Simons. Accounting for uncertainties on the fault geometry in source inversion problems. AGU Fall Meeting, New Orleans, USA, **2017**.
- 4) **Ragon, T.**, A. Sladen, Q. Bletery, M. Simons. Accounting for uncertainty on the fault geometry in source inversion problems. Cargèse School on Earthquakes, Fr, **2017**.
- 3) **Ragon, T.**, A. Sladen, M. Simons. Influence of Fault Geometry Uncertainties on the Slip Distribution of Continental Earthquakes. CIG Crustal Deformation Modeling Workshop, Golden, USA, **2017**.
- 2) **Ragon, T.**, A. Sladen, Q. Bletery, M. Simons, F. Magnoni, A. Avallone, O. Cavalié, M. Vergnolle. Influence of epistemic uncertainties on the slip distribution of continental earthquakes: application to the 2009 L'Aquila (Mw6. 3) and 2016 Amatrice (Mw6. 0) earthquakes, central Italy. AGU Fall Meeting, San Francisco, USA, **2016**.
- 1) **Ragon, T.**, A. Nutz\*, M. Schuster, J.F. Ghiene. Very early rift sedimentation in the Turkana depression (EARS, Kenya): example of the Topernawi Formation. AGU Fall Meeting, San Francisco, USA, **2015**.

## GRANTS AWARDED

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2019 - 2020	Caltech GPS Chair's Prize Postdoctoral Fellowship.
2016 - 2019	French Ministry of Research and Higher Education Fellowship.
2015	Rift Lake Sedimentology RiLakS Total research project — M. Sc. grant.

## TEACHING EXPERIENCE

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Years 2016-2017 and 2017-2018.

<b>Informatics</b>	L1 (21h x2 = 42h). Practical work with Scilab for 1st year bachelor students.
<b>Mathematics</b>	L2 (15h x2 = 30h). Algebra seminars or tutorials for 2nd year bachelor students.
<b>Plate Tectonics</b>	L2 (15h). Seminars about plate tectonics and geomagnetism for 2nd year students.
<b>Physics of the Earth</b>	L2 (9h x2 = 18h). Seminars or tutorials for 2nd year bachelor students.
<b>Field trips</b>	for L1, L2 and L3 (21h x2 = 42h). Cartography and geophysics (seismic acquisition, electric acquisition).

## MENTORING

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### Graduate students

Mathilde Banjan, 2017 (6 months)	Master's thesis internship on the impact of seismic rupture characteristics on tsunami-generated ionospheric signature. Advised for 15%, co-advised with L. Rolland and A. Sladen.
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### Caltech Women Mentoring Women program

2019 - 2020	Mentored one second year graduate student and one fifth year graduate student.
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## MEDIATION AND OUTREACH EXPERIENCE

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<b>UCA Complex Days, 2019</b>	Flash talk of 5 minutes and poster. Outreach about uncertainties in earthquake estimates to non-geosciences scientific researchers.
<b>MEDITES program, 2016-2018</b>	Volunteer for ~40h in three middle schools to explain and play with earthquakes and seismology concepts. Years 2016-2017 and 2017-2018.
<b>3 minutes thesis, National competition, 2017</b>	I gave a talk on <i>Accounting for what we don't know to model earthquakes, explained with chocolate</i> at the regional finale of the competition. 2017.

### INVITED COMMUNICATIONS

<b>Université Côte d'Azur, Nice, 2018</b>	<i>Accounting for uncertainties to model earthquakes, explained with chocolate</i> . Event <i>Mon TPE en 300s</i> , Université Côte d'Azur, May 17, 2018.
<b>Observatoire Côte d'Azur, Nice, 2017</b>	<i>Accounting for uncertainties to model earthquakes, explained with chocolate</i> . Scientific days of the Observatoire Côte d'Azur, November 9, 2017.

## LEADERSHIP EXPERIENCE AND SCIENTIFIC COMMUNITY

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**Reviewer for scientific journals:** *Geophysical Journal International*, *Geophysical Research Letters*, *Comptes Rendus Geoscience*.

**Reviewer for funding agencies:** National Fund for Scientific and Technological Development (FONDECYT, Chile).

**Judge** for the AGU Outstanding Student Paper Award (OSPA), 2019.

**International conference chair and convener · In charge of seminars**

Dec. 2020            Primary convener of the session S031: “Modeling and imaging complex earthquake ruptures”, 2020 AGU Fall meeting.  
Dec. 2019            Primary convener of the session S031: “Resolving the complexity of earthquake processes”, 2019 AGU Fall meeting.  
2016 - 2019           In charge of seminars for the Earthquake team, Géoazur.

**Representative in several education and administrative boards**

2018 - 2019           Student representative in the administrative board of Observatoire Côte d’Azur.  
2017 - 2019           Student representative in the Géoazur laboratory committee.  
2013 - 2016           Student representative in the board of Géophysique, EOST former students’ association.  
2012 - 2014           Student representative in the EOST board of education.  
2012 - 2013           Secretary of the EOST (IPG Strasbourg) student association.

**Organizer of training cycles**

April 2019            ”How to write an article in Geosciences” for 1st and 2nd year PhD students, Géoazur.

**FIELD EXPERIENCE**

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2019                    **Los Angeles area, CA, USA**  
Deployment of seismometers (nodes) for the Northern Los Angeles Basin seismic experiment (1 day).  
Jul. 2015 (5 weeks)   **West Turkana County, Kenya**  
Continuation of Oct. 2014 work, along with sedimentary facies analysis and interpretation, cartography, sections logging, archaeology on the Plio-Pleistocene Nachukui Fm.  
Oct. 2014 (2 weeks)   **Topernawi, West Turkana County, Kenya**  
Study of the Topernawi Miocene unknown sedimentary basin: cartography, sedimentary facies analysis and interpretation, depositional environments, structural mapping, log sections.  
2014 (4 + 4days)     **Heissenstein and La Soutte, Alsace, France**  
Subsurface geophysics and logging.  
2013 - 2014 (1 + 1week) **Swiss Alps, Switzerland and Digne-les-bains, Alpes de Haute Provence, France**  
Foreland basin geology, tectonics, sequence stratigraphy, geomorphology, cartography.