

Thomas Theunissen

CONTACT INFORMATION

UIB
Department of Earth Science
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RESEARCH INTERESTS

Geodynamic modelling, seismology, earthquake location, seismotectonics, subduction zone processes, seismic hazard, passive margins formation, coupling between tectonics and surface processes

ACADEMIC EXPERIENCE

UIB (University of Bergen), NORWAY

Researcher position **November, 2016 - present**
COLORS project : Coupling and feedbacks between tectonics and surface processes during rifting. Subsidence and magmatism during rifting. Strain partitioning during oblique rifting. Advisor : Ritske S. Huisman.

Postdoctoral position **November, 2013 - November 2016**
MULTIRIFT project : Coupling and feedbacks between tectonics and surface processes during rifting. Advisor : Ritske S. Huisman.

Teaching Assistant **November, 2013 - present**
GEOV 251 - 2015,2017,2018 : Advanced structural Geology (strain, stress, brittle deformation, extensional tectonics)
GEOV 219 - 2015-2018 : Computational methods in geophysics (signal processing, inverse problems)

IRAP (Institut de Recherche en Astronomie et Planétologie), Toulouse, FRANCE

Postdoctoral position **September, 2012 - November, 2013**
Pyrenean orogenic wedge southwest of France : Understanding the 3-D structure and its associated seismicity from crust to mantle. Earthquake location, arrival-times tomography, receiver functions, joint inversion (Pyrope / Topo-Iberia projects). Advisors : Sébastien Chevrot / Matthieu Sylvander.

University of Paul Sabatier III - IRAP, Toulouse, FRANCE

Teaching Assistant **September, 2011 - August, 2012**
General geology at Licence level and geophysics/seismology at Master level (Plate tectonics, subduction zones, seismology).

University of Montpellier II - Geosciences Montpellier, Montpellier, FRANCE

Teaching Assistant **September, 2010 - August, 2011**
General geology at Licence level and geophysics/seismology at Master level. Field trip in sedimentology, volcanology and geodynamics in Limagne Basin and in the Chaîne des Puys (France).

Graduate Student - Teaching assistant **September, 2007 - September, 2010**
Includes within Ph.D. research, Teaching general geology at Licence level and geophysics/seismology at Master level. Field trip in sedimentology, volcanology and geodynamics in Limagne Basin and in the Chaîne des Puys (France).

Secondary School, Paris, FRANCE

Professor **September, 2004 - September 2006**
Teachers in secondary school of Life and Earth Sciences for Baccalaureat preparation.

EDUCATION

University of Montpellier II, Geosciences Montpellier, FRANCE

Ph.D., Geophysics-Seismology-Seismotectonics-Geodynamics, (defense in July 2011)

- Dissertation Topic : “Deformation at the transition between subduction and collision east of Taiwan : seismological approach”
- Advisors : Serge Lallemand and Yvonne Font

University of Nice-Sophia Antipolis, GeoAzur, FRANCE

M.S., Geophysics (Seismology), June, 2007

- Dissertation Topic : “Crustal discontinuities in the region of the Gulf of Corinth from receiver functions using teleseismic and local earthquakes”
- Advisor : Anne Deschamps

University of Paris 6, Paris, FRANCE

M.S., Life and Earth Sciences with a speciality in Geology, Agregation (National competitive exam), June, 2004

Licence, Biology, biochemistry, geology, June, 2002

Lycee Janson de Sailly, Paris, FRANCE

Post-secondary preparatory school, Biology, Chemistry, Physics, Earth Sciences, June, 1998

FIELD AND
LABORATORY
EXPERIENCES

Analysis of seismic data, CSTJF, TOTAL, Pau, France

Collaboration

November, 2016 - October, 2018

Collaborations with Frank Despinois and Tristan Cornu. Use of the SISmage software from TOTAL.

Extraction and analysis of seismological data, Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan

Collaboration

October, 2008 - December, 2008

Collaborations with Wen-Tzong Liang, Min-Hung Shih, Yi-Lin Huang and Bor-Shouh Huang. Use of the IRIS Antelope software.

OBS deployment and recovery, Pacific Ocean (North China Sea) east of Taiwan

RATS experiment

July, 19-22, 2008 and October, 19-24, 2008

Deployment and recovery of CNRS-INSU instruments. R/V : Ocean Researcher 1 (Taiwan).

TAIGER experiment

November, 2007

Deployment of Lamont and Scripps instruments (USA). R/V : Ocean Researcher 1 (Taiwan).

PUBLICATIONS

Theunissen T., S. Chevrot, M. Sylvander, V. Monteiller, M. Calvet, A. Villaseñor, S. Benahmed, H. Pauchet, F. Grimaud ; Absolute earthquake locations using 3-D versus 1-D velocity models below a local seismic network : example from the Pyrenees, *Geophysical Journal International*, Volume 212, Issue 3, 1 March 2018, Pages 1806–1828, <https://doi.org/10.1093/gji/ggx472>

Gutscher, M.-A. , F. Klingelhoefer, T. Theunissen, W. Spakman, T. Berthet, T.K. Wang, C.-S. Lee. 2016. Thermal modeling of the SW Ryukyu forearc (Taiwan) : Implications for the seismogenic zone and the age of the subducting Philippine Sea Plate (Huatung Basin), *Tectonophysics*, doi : 10.1016/j.tecto.2016.03.029.

Béthoux, N., T. Theunissen, M.-O. Beslier, Y. Font, F. Thouvenot, J.-X. Dessa, S. Simona, G. Courrioux, A. Guillen. 2016. Earthquake relocation using a 3D a-priori geological velocity model from the western Alps to Corsica : Implication for seismic hazard, *Tectonophysics*, <http://dx.doi.org/10.1016/j.tecto.2015.12.016>.

Lallemand, S., T. Theunissen, Y. Font, F. Klingelhoefer, P. Schnürle, C.-S. Lee, C.-S. Liu and S. Gautier. 2013. Indentation of the Philippine Sea plate by the Eurasia plate in Taiwan : details from recent marine seismological experiments, *Tectonophysics*, <http://dx.doi.org/10.1016/j.tecto.2013.03.020>.

Font, Y., M. Segovia, S. Vaca and T. Theunissen. 2013. Seismicity pattern along the Ecuadorian

subduction zone : New constrains from earthquake location in a 3D a priori velocity model, GJI, doi : 10.1093/gji/ggs083.

Theunissen, T., S. Lallemand, Y. Font, S. Gautier, C.-S. Lee, W.-T. Liang, and F. Wu. 2012. Crustal deformation at the southernmost part of the Ryukyu subduction (East Taiwan) as revealed by new marine seismic experiment, *Tectonophysics*, doi :10.1016/j.tecto.2012.04.011.

Theunissen, T., Y. Font, S. Lallemand, and S. Gautier. 2012. Improvements of the Maximum Intersection Method for 3D absolute earthquake location, *BSSA*, vol.102-4, August 2012, 1764-1785, doi : 10.1785/0120100311.

Klingelhoefer, F., T. Berthet, S. Lallemand, P. Schnurle, C.-S. Lee, C.-S. Liu, F. Wu, K. McIntosh, and T. Theunissen. 2011. Tomographic inversion of OBS data of the ACTS wide-angle seismic profile offshore eastern Taiwan through the Ryukyu subduction zone, *Tectonophysics*, doi :10.1016 / j.tecto.2011.10.010.

Theunissen, T., Y. Font, S. Lallemand, and W.T.Liang. 2010. The largest instrumentally recorded earthquake in Taiwan : revised location and magnitude, and tectonic significance of the 1920 event, *Geophys. J. Int.*, 183, 1119-1133, doi :101111/j.1365-246X.2010.04813.x.

SUBMITTED PAPERS Theunissen, T., R.S. Huismans. december 2018 to JGR. Long-term coupling and feedback between tectonics and surface processes during non-volcanic rifted margin formation.

PAPERS IN PREPARATION Gautier S., C. Tiberi, M. Lopez, O. Foix, S. Lallemand, T. Theunissen, C. Hwang, E. Chang. Joint inversion of seismological and gravity data : New constraints on the lithospheric structures at the transition between Taiwan and the southernmost Ryukyu Arc. January 2019 to *Tectonophysics*.

Theunissen T., R.S. Huismans, Lu G. 2-D numerical modelling of mantle ehumation at magma-poor rifted margin : a competition between frictional shear zones and thermally weakened necking domains. Submission by the end of february 2019 to *Geology*.

Theunissen T., R.S. Huismans, F. Despinouis, Lu G., T. Cornu, C. Gout, S. Wolf. Syn-rift subsidence and magmatism of the Central South Atlantic passive margins. October 2019 to *Nature*.

Theunissen T., R.S. Huismans, Reston T. ?, F. Despinouis, Lu G., T. Cornu, C. Gout, S. Wolf. Controls on exhumed mantle geometries : application to distal margin and mid-oceanic ridges. December 2019 to JGR or EPSL.

Theunissen T., R.S. Huismans, F. Despinouis, Lu G., T. Cornu, C. Gout, S. Wolf. Counter-flow of lithospheric continental mantle during rifting : conditions, causes and consequences on distal margin formation and magma content. December 2019 to JGR or EPSL.

CONFERENCE PRESENTATIONS Theunissen T. and R. S. Huismans. 2018. Long term 2-D thermo-mechanical modelling of magma-poor passive margins formation : effects of deep mantle processes on vertical motions. EGU General Assembly 2018, held 8-13 April, 2018 in Vienna, Austria. (talk)

Theunissen T. and R. S. Huismans. 2018. Mantle exhumation at magma-poor rifted margin : a competition between frictional shear zones and thermally weakened necking domains. Consequences on time of breakup at Galicia/Newfoundland margins. EGU General Assembly 2018, held 8-13 April, 2018 in Vienna, Austria. (poster)

Theunissen T. and R. S. Huismans. 2017. Long-term coupling and feedbacks between surface processes and tectonics during rifting. AGU Fall Meeting, December 11-15, 2017, New-Orleans, Louisiana, USA. (talk)

Theunissen T. and R. S. Huismans. 2017. Mantle exhumation at magma-poor rifted margin : a competition between frictional shear zones and thermally weakened necking domains. Consequences on time of breakup at Galicia/Newfoundland margins. AGU Fall Meeting, December 11-15, 2017, New-Orleans, Louisiana, USA. (poster)

- Theunissen T. and R. S. Huismans. 2017. Long-term coupling and feedbacks between surface processes and tectonics during rifting. NetherMod Conference - Putten the Netherlands (27-31 Aug. 2017). (poster)
- Theunissen T. and R. S. Huismans. 2017. Long-term coupling and feedbacks between surface processes and tectonics during rifting. EGU General Assembly 2017, held 23-28 April, 2017 in Vienna, Austria. (talk)
- Theunissen T. and R. S. Huismans. 2017. Mantle exhumation during magma-poor rifted margin formation : from asymmetric detachment faulting to symmetric mid ocean ridge spreading. EGU General Assembly 2017, held 23-28 April, 2017 in Vienna, Austria. (poster)
- Theunissen T. and R. S. Huismans. 2016. Frictional strain weakening in long-term numerical modeling during rifting. Meeting : Faulting, friction and weakening : from slow to fast motion. held 25-26 April, 2016 in London, UK. (poster)
- Theunissen T. and R. S. Huismans. 2016. Long-term coupling and feedbacks between surface processes and tectonics during rifting. EGU General Assembly 2016, held 18-22 April, 2016 in Vienna, Austria. (talk)
- Theunissen T. and R. S. Huismans. 2016. Long-term coupling and feedbacks between surface processes and tectonics during rifting. NGWM (Nordic Geological Winter Meeting), held January 11-13, 2016, Helsinki, Finland. (talk)
- Theunissen T. and R. S. Huismans. 2015. Long-term coupling and feedbacks between surface processes and tectonics during rifting. AGU Fall Meeting, December 14-18, 2015, San Fransisco, California, USA. T51E-2941. (poster)
- Theunissen T. and R. S. Huismans. 2015. Coupling and feedback between tectonics and surface processes during rifted margin formation. EGU General Assembly 2015, held 13-17 April, 2015 in Vienna, Austria. (talk)
- Theunissen T. and R. S. Huismans. 2014. Coupling and feedback between tectonics and surface processes during rifted margin formation. AGU Fall Meeting, December 15-19, 2014, San Fransisco, California, USA. T33B-4685. (poster)
- Theunissen T., L. Serge, Y. Font, C.-S. Lee, W.-T. Liang, M.-H. Shih, Y.-L. Huang, F. T. Wu and the ACTS technical staff. 2014. Crustal deformation offshore East Taiwan in an arc-continent collision context as revealed by new marine seismic experiment. 7th France-Taiwan Earth Sciences Symposium, GEEA (Geodynamics and Environment in East Asia), November 12-15 2014, Hualien, Taiwan, invited speaker. (talk)
- Theunissen T., S. Chevrot, M. Sylvander, V. Monteiller, A. Villasenor, S. Benahmed, M. Calvet. 2013. 3D crustal and lithospheric structure of the Pyrenean orogenic wedge. EGU General Assembly 2013, held 7-12 April, 2013 in Vienna, Austria, id. EGU2013-4000. (talk)
- Theunissen T. , S. Lallemand, Y. Font, S. Gautier, C.-S. Lee, W.-T. Liang, F. Wu and T. Berthet. 2011. Crustal deformation at the southernmost part of the Ryukyu subduction (east Taiwan) as revealed by new marine seismic experiments. AGU Fall Meeting, December 5-9, 2011, San Fransisco, California, USA. (poster)
- Theunissen, T., Y. Font, S. Lallemand, C.-S. Lee, W.-T. Liang, M.-H. Shih, H.-L. Huang, F. Wu, and the ACTS technical staff. 2010. Micro-seismic activity in the southern Ryukyu Forearc : preliminary results from the RATS passive OBS experiment. Geodynamics and Environment in East Asia International Conference & 6th Taiwan-France Earth Science Symposium, Aix-en-Provence, France, 5-9 July, 2010. (talk)
- Theunissen, T., Y. Font, S. Lallemand and W.-T. Liang. 2010. Historical instrumental seismicity off eastern Taiwan : New catalog and special emphasis on the M_W7.7 1920 event. Western Pacific Gophysics Meeting, 22-25 June, 2010, Taipei, Taiwan. (poster)

Theunissen T., Y. Font, S. Gautier, S. Lallemand, and W.-T. Liang. 2009. 3D absolute earthquake location in subduction zone using MAXI method : Application to the Ryukyu Subduction (Taiwan). AGU Fall Meeting, December 14-18, 2009, San Fransisco, California, USA. (poster)

Theunissen T., S. Lallemand, Y. Font, A. Villasenor and W.-T. Liang. 2009. Historical Instrumental Seismicity (1900-2008) off Eastern Taiwan : New Catalog and special Emphasis on M7.7 1920 Event. AGU Fall Meeting, December 14-18, 2009, San Fransisco, California, USA. (poster)

COMPUTER SKILLS

- Languages : C, C++, f90, Unix shell scripts, HTML, PHP, MySQL
- Applications : Generic Mapping Tools (GMT) - Unix mapping software, L^AT_EX, Matlab, Antelope (Seismic Database Management), Microsoft Office
- Algorithms : Maximum Intersection Algorithm for Absolute Earthquake Location (MAXI), LSQR, linear inversion, ALE algorithm (thermo-mechanical finite element modelling), implicit fluvial erosion for landscape modelling
- Operating Systems : Unix/Linux, Windows.

HONORS AND AWARDS

Outstanding student paper award of the Tectonophysics Section of the American Geophysical Union, 2011. (AGU Fall Meeting in San Francisco, California) AGU website

OTHER VOLUNTEER WORK

- Organization of the weekly Geodynamics group meeting 2016-2018
- PhD students assistant-delegate 2008-2009 and 2009-2010.
- PhD student day organization at Geosciences Montpellier 2008, 2009 and 2010
- Webmaster : <http://www.surmonventre.com>

MAIN REFERENCES

- Ritske S. Huisman (UIB - Norway) 0047-5558-8117
- Serge Lallemand (Geosciences Montpellier - France) 0033(0)46714-3301
- Yvonne Font (GeoAzur - France) 0033(0)49376-3888
- Wen-Tzong Liang (IES - Academia Sinica - Taiwan) 00886-2-2783-9910 ext. 522
- Francis Wu (DGSES - Binghamton University - USA)(607) 777-2512
- Stéphanie Gautier (Geosciences Montpellier - France) 0033(0)46714-3648
- Sébastien Chevrot (IRAP - France) 0033(0)556133-3030
- Anne Deschamps (GeoAzur - France) 0033(0)49294-2616
- Sébastien Chevrot (IRAP - France) 0033(0)56133-3030
- Matthieu Sylvander (IRAP - France) 0033(0)56133-2982