

## Valère R. Lambert

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## Education

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**California Institute of Technology**, Pasadena, CA,  
Ph.D. in Geophysics, minor in Mechanical Engineering 2021  
Thesis: *Constraining Earthquake Source Processes through Physics-Based Modeling*  
Thesis Advisor: Nadia Lapusta  
**California Institute of Technology**, Pasadena, CA, M.Sc. in Geophysics 2017  
**California Institute of Technology**, Pasadena, CA, B.Sc. in Physics with Honors 2014  
Thesis: *Multimodel Inference Ranking and Applications to Physics at the Large Hadron Collider*  
Thesis Advisor: Maria Spiropulu

## Research Positions

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National Science Foundation (NSF) EAR Postdoctoral Fellow, 06/2021 - Present  
Department of Earth and Planetary Sciences, UC Santa Cruz  
Graduate Research Assistant, 2016-2021  
Seismological Laboratory, California Institute of Technology  
Research Assistant in Earthquake Physics, 2015-16  
Earth Observatory of Singapore, Nanyang Technological University  
User Physicist with CMS ECAL and Pixel Software and Particle Identification Algorithms groups 2012-15  
Compact Muon Solenoid Experiment, European Organization of Nuclear Research (CERN)  
Research Assistant in Experimental Particle Physics 2014-15  
Physik-Institut, Universität Zürich, Switzerland  
CERN Summer Student 2013  
Compact Muon Solenoid Experiment, European Organization of Nuclear Research  
Rose Hills and Musk Foundation Undergraduate Research Fellow 2012-14  
High Energy Physics Group, California Institute of Technology  
Kiyo and Eiko Tomiyasu Undergraduate Research Fellow 2011-12  
Tectonics Observatory, California Institute of Technology

## Publications

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- **Lambert, V.**, Lapusta, N. and D. Faulkner (2021). Scale dependence of earthquake rupture prestress in models with enhanced weakening: Implications for event statistics and inferences of fault stress, *J. Geophys. Res. Solid Earth*, 126, doi:10.1029/2021JB021886.
- **Lambert, V.**, Lapusta, N. and S. Perry (2021). Propagation of large earthquakes as self-healing pulses or mild cracks. *Nature* 591, 252-258, doi:10.1038/s41586-021-03248-1.
- **Lambert, V.** and N. Lapusta (2020). Rupture-dependent breakdown energy in fault models with thermo-hydro-mechanical processes. *Solid Earth*, 11(6), 2283-2302, doi: 10.5194/se-11-2283-2020
- **Lambert, V.** and V. C. Tsai (2020). Time-dependent stresses from fluid extraction and diffusion with applications to induced seismicity, *J. Appl. Mech.*, 87(8), 081002, doi:10.1115/1.4047034.
- Perry, S., **Lambert, V.** and N. Lapusta (2020). Nearly Magnitude-Invariant Stress Drops in Simulated Crack-Like Earthquake Sequences on Rate-and-State Faults with Thermal Pressurization of Pore Fluids. *J. Geophys. Res. Solid Earth*, 125, doi:10.1029/2019JB018597.
- Erickson, B., et al. (2020), The SCEC Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS), *Seismo. Res. Lett.*, doi:10.1785/0220190248.
- Moore, J., et al. (2017). Rapid imaging of localised and distributed deformation following the 2016 Mw 7.1 Kumamoto earthquake. *Science*, 356, 6334, 163-167, doi:10.1126/science.aal3422.
- Barbot, S., Moore, J. and **V. Lambert** (2017). Displacements and Stress Associated with Distributed Anelastic Deformation in a Half Space. *Bull. Seis. Soc. Amer.*, 107, 2, 821-855, doi:10.1785/0120160237.

- **Lambert, V.** and S. Barbot (2016). Contribution of viscoelastic flow in earthquake cycles within the lithosphere-asthenosphere system. *Geophys. Res. Lett.* 43, 10,142-10, 154, doi:10.1002/2016GL070345

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### European Organization of Nuclear Research (CERN) Reports

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- Implementation and training of charm-tagging algorithms in TMVA and CMSSW. CMS Analysis Note 2015/101, CERN, 2015.
- A study of the Higgs boson pair production cross section at 14 TeV in the decay channel to two photons and two b-jets. Technical Report CMS-PAS-FTR-13-001, CERN, 2013.
- Measurement of the Higgs pair production cross section at 14 TeV in the decay channel to two photons and two b-jets. CMS Analysis Note 2013/050, CERN, 2013.
- Measurement of the CMS ECAL Performance with Z Dielectron Decay Events in 2012 Data. CMS Analysis Note 2012/408, CERN, 2012.

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### Student Advising

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<b>Taeho Kim</b> , Caltech PhD student (Applied Mechanics) co-advising with Nadia Lapusta	2021-present
Seismicity trends on heterogeneous numerical fault models with enhanced dynamic weakening	
<b>Joseph Wick</b> , SCEC SOURCES intern (Physics) SCEC 11568	2021-present
Optimizing viscoelastic earthquake sequence simulations using hierarchical matrices	
<b>Yanke Song</b> , Caltech SURF (Applied & Computational Math) SCEC 8402	2018-20
Adaptive time-stepping algorithms for earthquake sequence simulations	
<b>Lily Coffin</b> , Caltech FSRI (Mech. Engineering) Modeling stick-slip motion of Whillans ice stream	2020
<b>Yuling (Aileen) Zhang</b> , Caltech SURF (Astrophysics) SCEC 9904	2019
Updating Caltech Millikan Library Shaker for time-lapse seismic imaging	
<b>Luis Camargo-Carlos</b> , Caltech FSRI (Physics) Poroelastic modeling of reservoir fluid extraction	2018
<b>Cheng Xuan</b> , NTU CN Yang Fellow (Earth Sciences) AGU G51B-1101 and G31B-0906	2016-17
Geodetic inversion of afterslip and viscous relaxation for 2012 Mw 8.6 Indian Ocean EQ	
<b>Arjun Goswami</b> , Caltech SURF (Physics), AGU T13A-2682	2016
Earthquake sequence simulations with poroelasticity and pore fluid flow	
<b>Jared Filseth</b> , Caltech SURF (Physics)	2016
Joint geodetic inversion of afterslip and viscous relaxation in Southern California	

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### Teaching

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California Institute of Technology, Pasadena, CA, Certificate of Practice in University Teaching 2019

#### Guest Lecturer:

- Caltech Ae/Me/Ge 266: *Dynamic Fracture and Frictional Faulting*, Spring 2020 (4 lectures)
- Caltech Me/Ce/Ge 174: *Mechanics of Rocks*, Spring 2019 and Winter 2021 (3 lectures)
- Caltech Ae/Me/Ge 102/160a: *Continuum Mechanics of Fluids and Solids*, Fall 2018-20 (10 lectures)

**Teaching Assistant:** Lectured recitations and ran laboratory sessions, conducted office hours and prelab sessions, developed and graded problems for assignments and exams

- Caltech Ae/Me/Ge 266: *Dynamic Fracture and Frictional Faulting*, Spring 2020
- Caltech Me/Ce/Ge 174: *Mechanics of Rocks*, Spring 2019
- Caltech Ae/Me/Ge 102/160a: *Continuum Mechanics of Fluids and Solids*, Fall 2018 and 2019
- Caltech Ge166: *Hydrology*, Spring 2018
- Universität Zürich PHY122: *Praktikum zur Physik II (physics lab course)*, Spring 2015
- Caltech Ph 5/105: *Analog Electronics Laboratory*, Fall 2012

#### Workshop Instructor:

- Earth Observatory of Singapore, *Bayesian Inference*, Spring 2016
- Earth Observatory of Singapore, *Introduction to Green's Functions*, Spring 2016

#### Caltech Teaching Conference Session Coordinator:

- Discussions on remote teaching and creating inclusive and accessible classrooms*, Fall 2020
- Effective Recitations: The Power of Being Prepared*, Fall 2019
- Considerations for Effective Mentoring*, Fall 2018
- Teaching the Global Classroom*, Fall 2017
- Caltech 101: What you need to know if you're going to teach undergraduates*, Fall 2017, 2018, and 2019

## **Funding**

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**NSF EAR Postdoctoral Fellowship:** PI: Valère Lambert (\$174,000)

2021 *The scale-dependent interplay between fault material strength, roughness and friction*

**SCEC Awards:** PI: Nadia Lapusta, VRL helped write the proposals and executed the work

2018-21 *Constraining friction properties of mature low-stress faults such as SAF*

Awards: #21005 (\$39,788), #20079, (\$38,864), #19085 (\$38,648), #18085, (\$37,909)

2018-21 *Optimizing and further developing simulations of sequences of earthquakes and aseismic slip*

Awards: #21006(\$30,821), #20080 (\$30,575), #19086 (\$28,243), #18174 (\$28,513)

## **Student/Early Career Funding**

US Nat. Commi. for Theoretical and Applied Mechanics Presenter Fellowship for ICTAM 2020+1 2021

Numerical Modeling of Earthquake Motions workshop travel award 2019

Cargèse School on Earthquakes travel award 2017

George W. Housner Discovery award 2012

## **Awards**

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Demetriades - Tsafka - Kokkalis Prize in Seismo-Engineering, Prediction, and Protection 2021

NSF EAR Postdoctoral Fellowship 2021

Dept. of Energy Computational Science Graduate Fellowship, Honorable Mention 2017

Caltech GPS Graduate Fellowship 2016

Caltech Campus Life and Master's Award 2014

CERN Summer Student Fellowship 2013

Musk Foundation Undergraduate Research Fellowship 2012

Rose Hills Foundation Fellowship 2012

SEG Foundation Scholarship 2012

Kiyo and Eiko Tomiyasu Fellowship 2011

Anadarko/SEG Foundation Scholarship 2011

Yonghe and Grace Sun Scholarship 2010

Rotary Scholarship, Rotary Club of Coronado 2010

Robert C. Byrd Scholarship 2010

## **Professional Affiliations**

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Society for Industrial and Applied Mathematics, since 2018

Seismological Society of America, since 2016

American Geophysical Union, since 2016

American Physical Society, since 2013

Southern California Earthquake Center, since 2011

## **Synergistic Activities**

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- Co-leader of SCEC Advancing Simulations of Earthquakes and Aseismic Slip (SEAS) Working Group
- Associate Editor for AGU Journal of Geophysical Research - Solid Earth
- Assistant co-editor and contributing author for Report to the National Science Foundation: *Modeling Earthquake Source Processes: from Tectonics to Dynamic Rupture*
- Guest Associate Editor of 2019-2021 Journal of Geophysical Research - Solid Earth special issue: *Creep on continental faults and subduction zones: Geophysics, geology and mechanics*
- Journal referee (Nature Communications, Geophysical Research Letters, Earth and Planetary Sciences Letters, Journal of Geophysical Research-Solid Earth, Journal of Structural Geology, Bulletin of the Seismological Society of America, Seismological Research Letters., Journal of Seismology)

## **Conference convenership**

- 2021 EGU General Assembly, Convener for TS4.2: *Seismic and aseismic deformation at seismogenic faults: from distributed to localized deformation*
- 2020 AGU Fall Meeting, Primary Convener of S026: *How do earthquakes start?*
- 2020 EGU General Assembly, Convener for TS5.4/GS9.4/SM2.9, AGU Tectonophysics co-sponsor: *Interplay between Seismic and Aseismic Slip on Seismogenic Faults*

- 2019 AGU Fall Meeting, Session Chair for T027:  
*Interplay between Seismic and Aseismic Slip on Seismogenic Faults*
- 2019 AGU Fall Meeting, Primary Convener of S021: *How do earthquakes start?*
- 2018 AGU Fall Meeting, Primary Convener of T025:  
*Interplay between seismic and aseismic slip: Implications for fault physics*
- 2018 AGU Fall Meeting, Convener of S006:  
*Earthquake Source Physics: Unified perspectives from Kinematic Source Imaging, Physics-based Modeling, Laboratory Experiments, and Earthquake Geology*

## Committees

- UC Santa Cruz Institute for Geophysics and Planetary Sciences Seminar Committee 2021-present
- Caltech Institute Computing Advisory Committee 2018-21
- Caltech Seismolab Seminar Organizing Committee 2018-19
- 10th Annual Knowles Lectures and Symposium on Solid Mechanics, Organizing Committee 2019
- Caltech Academic Policies Faculty Board Committee 2017-19
- Caltech Teaching Conference Planning Committee 2017-19
- NSF Workshop on Modeling Earthquake Source Processes, Local Organising Committee 2018
- Caltech Honor Code Board of Control 2012-14
- Caltech Physics Student-Faculty Committee, Committee chair 2012-13
- Caltech Core Curriculum Steering Committee 2011-12

## Experimental and Field Experience

- Refurbishment and operation of Caltech Millikan Library Shaker for controlled seismic source experiments with the Pasadena Distributed Acoustic Sensing Array, 2018-21
- Seismic node deployment and retrieval for imaging of the San Gabriel Basin, CA 2018-19
- Seismometer deployment for Caltech/JPL/LBNL Goldstone optical fiber seismic experiment, Goldstone Deep Space Communication Complex, CA 2017

## Community Involvement

- Convener for Caltech Summer Undergraduate Research Fellow (SURF) Seminars, Judge for Perpall Speaking and Gee Poster Competitions 2016-21
- Adopt-a-Physicist, American Physical Society 2015-21
- Caltech Science for March, Seismological Laboratory Public Outreach Booth 2018-19
- Instructor for CERN and ETH Zürich International Physics High School Masterclasses 2014-15
- Tour guide, Compact Muon Solenoid Experiment and CERN 2014-15
- Juror for the Swiss Young Physicists Tournament 2015
- Caltech tour guide, tour guide captain (2012-14) 2011-14

## Invited Talks and Seminars

- UC Berkeley Seismological Laboratory scheduled, 2021
- UC Santa Cruz Institute for Geophysics and Planetary Physics (IGPP) 2021
- Penn State Department of Geosciences Colloquium Series 2021
- American Geophysical Union (AGU) Fall Meeting, Session S016 2020
- Southern California Earthquake Center (SCEC) Workshop on Co-seismic Fault Friction 2020
- Laboratoire de Géologie, École Normale Supérieure de Paris, France 2019
- Department of Earth Sciences, University of Liverpool, United Kingdom 2019
- National Research Institute for Earth Science and Disaster Resilience (NIED), Tsukuba, Japan 2019
- SCEC Community Stress Model Workshop 2019
- 9th Knowles Symposium on Solid Mechanics, Caltech 2018
- Computational Infrastructure for Geodynamics (CIG) Crustal Deformation Modeling Workshop 2017
- American Geophysical Union Fall Meeting, Session T22B 2016

## Conference/Workshop presentations

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### Oral presentations

- **Lambert, V.** and N. Lapusta (2020, invited). Resolving simulated sequences of earthquakes and fault interactions. AGU Fall Meeting.
- **Lambert, V.** and N. Lapusta (2020). The role of fluids in governing rupture modes and seismic radiation on mature faults. AGU Fall Meeting.
- **Lambert, V.** and N. Lapusta (2020, invited). Constraining physical conditions for the low-stress, low-heat operation of mature faults. SCEC Dynamic Rupture Group Workshop on Fault Friction, Pomona, CA.
- Williams, E.F., Zhan, Z., **Lambert, V.**, and Zhang, Y. (2019). Time-lapse shear-wave velocity profiling in urban Pasadena with a fiber seismic network. AGU Fall Meeting, San Francisco, CA.
- **Lambert, V.** and N. Lapusta (2019). Energy budget of Earthquakes: connecting remote observations with local physical behavior, Numerical Modeling of Earthquake Motions, Smolenice, Slovakia.
- **Lambert, V.** and N. Lapusta (2019). Energy Budget of Earthquakes: Investigating the Relation Between Actual and Seismologically-Inferred Quantities using Dynamic Simulations of Earthquake Sequences, 2nd International Symposium on Crustal Dynamics (2019), Uji, Japan
- Lapusta, N. and **V. Lambert** (2019). Applications of fracture mechanics concepts to earthquake source processes. 56th Annual Technical Meeting of Society of Engineering Science, St. Louis, MO.
- **Lambert, V.** and N. Lapusta (2019, invited). Modeling the low-heat, low-stress operation of mature faults. SCEC Community Stress Model Workshop, Pomona, CA.
- **Lambert, V.** and N. Lapusta (2018). Energy budget of earthquakes: connecting remote observations with local physical behavior, AGU Fall Meeting, Washington DC.
- **Lambert, V.** and Z. Zhan (2017). Global high-frequency source imaging accounting for complexity in Green's functions, AGU Fall Meeting, New Orleans, LA.
- **Lambert, V.** on behalf of N. Lapusta (2017, Invited lecture). Modeling stable and unstable fault slip using combinations of rate-and-state friction and enhanced dynamic weakening, Cargèse School on Earthquakes, Cargèse, France.
- **Lambert, V.** and N. Lapusta (2017) Implications of depth-dependent variations in fault zone properties for the frequency content of seismic radiation, Cargèse School on Earthquakes, Cargèse, France.
- **Lambert, V.**, Barbot, S. and N. Lapusta (2017, invited). Modeling the interaction between fault slip and viscoelastic deformation. CIG Crustal Deformation Modeling Workshop, Golden, CO.
- **Lambert, V.** and S. Barbot (2016, invited). The role of thermal processes in defining the seismogenic zone: The interplay between faults and shear zones. AGU Fall Meeting, San Francisco, CA.
- Moore, J., Barbot, S., **Lambert, V.** et al. (2016). Kinematic inversion of postseismic deformation following the 2016 Mw 7.0 Kumamoto earthquake for the distribution of brittle and ductile crustal processes. AGU Fall Meeting, San Francisco, CA.
- Moore J., **Lambert, V.**, Feng, L., Lindsey, E. and S. Barbot (2016). Postseismic deformation following the 2015 Mw 7.8 Gorkha earthquake and the distribution of brittle and ductile crustal processes beneath Nepal, AOGS 13th Annual Meeting, Beijing, China.
- **Lambert, V.** and S. Barbot (2016). How to Break the Lithosphere: Insight from the 2012 Wharton Basin Earthquake, AOGS 13th Annual Meeting, Beijing, China.
- **Lambert, V.** and S. Barbot (2016). Role of Thermal Processes in the Earthquake Cycle: Insight from the 2012 Wharton Basin Earthquake, Workshop on Geodynamics of the Indo-Eurasia Plate Boundary, IISc Bangalore, India.
- **Lambert, V.** (2013) Measurement of the Higgs Pair Production Cross Section at 14 TeV in the Decay Channel to Two Photons and Two B-Jets, CERN Student Sessions, CERN, Switzerland

## Poster presentations

- **Lambert, V** and N. Lapusta (2021). Resolving simulated sequences of earthquakes and fault interactions. SCEC Annual Meeting.
- Lapusta, N. and **V. Lambert** (2021). Modeling absolute stress levels on mature faults: Implications for seismic radiation and earthquake statistics. SCEC Annual Meeting.
- Wick, J. and **V. Lambert** (2021). Optimizing Numerical Simulations of Earthquake Sequences Including Off-Fault Viscoelastic Deformation using Hierarchical Matrices. SCEC Annual Meeting.
- Jiang, J., Erickson, B. and **V. Lambert**, et al. (2021). Community Code Verification Exercises for Simulations of Earthquake Sequences and Aseismic Slip (SEAS): Three-Dimensional Problems. SCEC Annual Meeting.
- Erickson, B. et al. (2021). Community Code Verification Exercises for Simulations of Earthquake Sequences and Aseismic Slip (SEAS): Dynamic Effects and Dipping Fault Geometries. SCEC Annual Meeting.
- **Lambert, V** and N. Lapusta (2021). Resolving simulated sequences of earthquakes and fault interactions. 25th International Congress of Theoretical and Applied Mechanics (Virtual).
- **Lambert, V.** and N. Lapusta (2021, virtual lightning) Examining critical stress conditions for rupture occurrence in numerical simulations of sequences of earthquakes and aseismic slip (SEAS). Northern California Earthquake Hazards Workshop.
- **Lambert, V.** and N. Lapusta (2021, virtual lightning) Examining critical stress conditions for rupture occurrence in numerical simulations of sequences of earthquakes and aseismic slip (SEAS). ShakeAlert R&D Workshop.
- **Lambert, V** and N. Lapusta (2020). Resolving simulated sequences of earthquakes and fault interactions. SCEC Annual Meeting, Palm Spring, CA.
- Lapusta, N. and **V. Lambert** (2020). Relation between absolute stress levels, rupture style, and seismic radiation on mature faults. SCEC Annual Meeting, Palm Springs, CA.
- Williams, E.F., Heaton, T.H., **Lambert, V.** and Z. Zhan (2020) Structural healing of Millikan Library over 20 years of continuous seismic monitoring. SCEC Annual Meeting, Palm Springs, CA.
- Erickson, B.A. et al. (2020). Community Code Comparisons for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS): Exploring Full dynamics and 3D Effects. SCEC Annual Meeting, Palm Springs, CA.
- **Lambert, V.** and N. Lapusta (2019). Combining kinematic and energy-based inferences to constrain physical conditions surrounding the low-stress, low heat operation of mature faults. AGU Fall Meeting, San Francisco, CA.
- Zhang, Y., Williams, E.F., **Lambert, V.**, and Z. Zhan (2019). Updating the Caltech Millikan Shaker for time-lapse seismic imaging in Southern California. SCEC Annual Meeting, Palm Springs, CA.
- Erickson, B.A. et al. (2019). The Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS). SCEC Annual Meeting, Palm Springs, CA.
- **Lambert, V.** and N. Lapusta (2019). Modeling the low-stress, low-heat operation of mature faults. SCEC Annual Meeting, Palm Springs, CA.
- **Lambert, V.** and N. Lapusta (2019). Energy budget of dynamic shear ruptures: connecting remote observations with local physical behavior, Engineering Mechanics Institute, Pasadena, CA.
- Erickson B. A. et al. (2018). The Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS): Initial Benchmarks and Future Directions, AGU Fall Meeting, Washington DC.
- Song, Y., **Lambert, V.**, and N. Lapusta (2018). Investigation of Adaptive Time-Stepping Algorithms for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS). SCEC Annual Meeting, Palm Springs, CA.
- **Lambert, V.**, Perry, S. and N. Lapusta (2018) Earthquake Sequences in Rate-and-State Fault Models with Thermal Pressurization, SCEC Annual Meeting, Palm Springs, CA.

- Erickson, B.A. et al. (2018). The Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS): Initial Benchmarks and Future Directions. SCEC Annual Meeting, Palm Springs, CA.
- Cheng, X., **Lambert, V.**, et al. (2017). Joint models of GPS and GRACE data of postseismic deformation following the 2012 Mw 8.6 Indian Ocean earthquake. AGU Fall Mtg., New Orleans, LA.
- **Lambert, V.** and N. Lapusta (2017). Implications of depth-dependent variations in fault zone properties for the frequency content of seismic radiation, SCEC Annual Meeting, Palm Springs, CA.
- Cheng, X., **Lambert, V.** et al. (2016). Joint inversion of afterslip and viscoelastic relaxation following the 2012 Mw 8.6 Indian Ocean earthquake. AGU Fall Meeting, San Francisco, CA.
- Goswami, A.S., Barbot, S., Moore, J., and **V. Lambert** (2016). Pore fluid pressure in impermeable fault zones throughout earthquake cycles. AGU Fall Meeting, San Francisco, CA.
- **Lambert, V.** and S. Barbot (2016). Thermo-mechanical coupling of faults and mantle shear zones, EGU Meeting, Vienna, Austria.
- **Lambert, V.**, Barbot, S. and J.-P. Avouac (2011) Elastostatic Solutions for Realistic Slip and Stress around Shear Cracks, Implications for Inverting Geodetic Measurements for Fault Slip, SCEC Annual Meeting, Palm Springs, CA.