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Caltech Seismological Laboratory
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Education

California Institute of Technology, Pasadena, CA,

Ph.D. in Geophysics, subject minor in Mechanical Engineering Projected June, 2021

Thesis: *Constraining Fault Physics and Earthquake Source Processes through Physics-Based Modeling and Innovative Imaging*

Thesis Advisors: Nadia Lapusta and Zhongwen Zhan

California Institute of Technology, Pasadena, CA, M.S. in Geophysics 2017

California Institute of Technology, Pasadena, CA, B.S. in Physics with Honors 2014

Thesis: *Multimodel Inference Ranking and Applications to Physics at the Large Hadron Collider*

Thesis Advisor: Maria Spiropulu

Research Positions

Graduate Research Assistant, 2016-present
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

- **Lambert, V.**, Lapusta, N. and S. Perry (in press). Propagation of large earthquakes as self-healing pulses or mild cracks. *Nature*.
- **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

European Organization of Nuclear Research (CERN) Reports

- Implementation and training of charm-tagging algorithms in TMVA and CMSSW. CMS Analysis Note 2015/101, CERN, 2015.
- Measurement 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.

Awards

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

Invited Talks and Seminars

S016 AGU Fall Meeting, San Francisco	2020
SSA Annual Meeting, Albuquerque, NM	cancelled due to COVID-19, 2020
SCEC Workshop on Co-seismic Fault Friction, Pomona, CA,	2020
École Normale Supérieure de Paris, France	2019
University of Liverpool, United Kingdom	2019
NIED, Tsukuba, Japan	2019
SCEC Community Stress Model Workshop, Pomona, CA	2019
9th Knowles Symposium on Solid Mechanics, Pasadena, CA	2018
CIG Crustal Deformation Modeling Workshop, Golden, CO	2017
T22B AGU Fall Meeting, San Francisco, CA	2016

Funding

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

2018-20 *Constraining friction properties of mature low-stress faults such as SAF*
Awards: #20079, (\$38,864; 2020), #19085 (\$38,648; 2019), #18085, (\$37,909; 2018)

2018-20 *Optimizing and further developing simulations of sequences of earthquakes and aseismic slip*
Awards: #20080 (\$30,575; 2020), #19086 (\$28,243; 2019), #18174 (\$28,513; 2018)

Student Funding

Numerical Modeling of Earthquake Motions workshop travel award	2019
Cargèse School on Earthquakes travel award	2017
George W. Housner Discovery award	2012

Teaching

California Institute of Technology, Pasadena, CA, Certificate of Practice in University Teaching	2019
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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 (2 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

Undergraduate Students Supervised

Yanke Song	Caltech SURF, SCEC contribution 8402	2018-20
Lily Coffin	Caltech FSRI	2020
Yuling (Aileen) Zhang	Caltech SURF, SCEC contribution 9904	2019
Luis Camargo-Carlos	Caltech FSRI	2018
Cheng Xuan	NTU CN Yang Fellow, AGU abstracts G51B-1101, 2016; G31B-0906	2016-17
Arjun Goswami	Caltech SURF, AGU abstract T13A-2682	2016
Jared Filseth	Caltech SURF	2016

Synergistic Activities

- 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*
- Leadership team and benchmark designer for SCEC Simulations of Earthquakes and Aseismic Slip (SEAS) project and community code comparisons
- Journal referee (Journal of Geophysical Research - Solid Earth, Geophysical Research Letters, 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

- Caltech Institute Computing Advisory Committee 2018-present
- 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

Professional Affiliations

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

Experimental and Field Experience

- Refurbishment and operation of Caltech Millikan Library Shaker for controlled seismic source experiments with the Pasadena Distributed Acoustic Sensing Array, 2018-20
- 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, 2016-20
Judge for Perpall Speaking and Gee Poster Competitions
- Adopt-a-Physicist, American Physical Society 2015-20
- 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

Conference presentations

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

*presenting author, if not first author

- **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.