

Dr. Lucy M. Flesch

Department of Earth and Atmospheric Science
Purdue University
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West Lafayette, IN 47907

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EDUCATION

Ph. D. Geophysics, Stony Brook University, 2002.

Title: Dynamics of Continental Plate Margins

M.S. Mineral Physics, Stony Brook University, 1997.

Title: Sound Velocities of MgSiO₃ – Orthopyroxene to 10 GPa at Room Temp.

B.S. cum laude, Physics, Departmental Honors, Beloit College, 1995.

APPOINTMENTS

Assistant Professor: Purdue University, August 2005 – present.

Visiting Scientist: Carnegie Institution of Washington, Department of Terrestrial Magnetism,
March 2006 – present.

Postdoctoral Fellow: Carnegie Institution of Washington, Department of Terrestrial Magnetism,
January 2003 – July 2005.

Postdoctoral Associate: Stony Brook University, May 2002 – December 2002.

Research Assistant: Stony Brook University, May 1996 – May 2002.

Teaching Assistant: Stony Brook University, August 1995 – May 1996.

RESEARCH INTERESTS

Kinematics and dynamics of continental lithosphere, mantle lithosphere coupling, shear-wave splitting observations

AWARDS

Best Student Paper, American Geophysical Union Spring Meeting, 2000.

GAANN Fellow, Stony Brook University, 1998.

Outstanding Teaching Assistant Award, Stony Brook University, 1996.

SYNERGISTIC ACTIVITIES

Earthscope, Plate Boundary Observatory – Standing Committee, 2008-present.

Geology Editorial Board, 2008-present.

Tectonophysics Section Program Chair, AGU Joint Assembly, 2007-2008.

Proposed and organized Pardee Special Session “Large-scale Continental Deformation at Plate Boundaries” for the GSA meeting 2008 in Houston with Nathan Niemi – University of Michigan.

Co-convener of the Tectonophysics session “Stress in the Lithosphere: Top Down or Bottom Up Control?” at the AGU 2007 Fall meeting with Noah Fay – University of Arizona.

Manuscript reviewer: *Geology*, *GRL*, *Geophys. J. Int.*, *J. Geophys. Res.*, *EPSL*, *PEPI*, *J. of Geodesy*, *Geological Society of London*.

NSF Proposal reviewer (GEO, TEC, ES, PIRE, CD, Antarctic)

Dr. Lucy M. Flesch

Speaker and participant in the College of Science Woman in Science Program at Purdue (WISE) and Earth and Atmospheric Sciences WISE, Purdue University.

Co-convenor of the Union session “Beyond Plate Tectonics” at the AGU 2005 Fall meeting with Eric Calais, Scott King and Andy Freed – Purdue University.

Led and developed Seismology/Tectonics working groups for the WISE (Women In Science and Engineering) Program for undergraduate and high school students, Stony Brook University, 2000-2001.

PROFESSIONAL MEMBERSHIPS

American Geophysical Union
Geological Society of America

SUBMITTED PUBLICATIONS

Flesch, L.M., and C. Kreemer, Gravitational Potential Energy and Regional Stress and Strain Rate Fields for Continental Plateaus: Examples from the Central Andes and Colorado Plateau, *Tectonophysics, in review*, 2008.

PEER REVIEWED PUBLICATIONS

Bendick, R. and **L.M. Flesch**, Reconciling Lithospheric Deformation and Lower Crustal Flow Beneath Central Tibet: Reply, *Geology, in press*, 2008.

Klein, E.C., **L.M. Flesch**, W.E. Holt, and A.J. Haines, Evidence of Long-term Weakness on Seismogenic Faults in Western North America from Dynamic Modeling, *J.G.R., in press*, 2008.

Ghosh, A., W.E. Holt, L. Wen, A.J. Haines, and **L.M. Flesch**, Joint modeling of lithosphere and mantle dynamics elucidating lithosphere-mantle coupling, *Geophys. Res. Lett.*, 35(16), L16309, 2008.

Wang, C., **L.M. Flesch**, P.G. Silver, L. Chang, and W.W. Chan, Evidence for Mechanically Coupled Lithosphere and Resulting Implications, *Geology*, 36(5), 363-366, doi:10.1130/G24450A, 2008.

Flesch, L.M. and R. Bendick, A comment on “Present-day kinematics at the India-Asia collision zone,” *Geology*, doi: 10.1130/G24443C.1, 2008.

Flesch, L.M., W.E. Holt, A.J. Haines, L. Wen, B. Shen-Tu, The dynamics of western North America: Stress magnitudes and the relative role of gravitational potential energy, plate interaction at the boundary, and basal tractions, *G.J.I.*, 169, 866-896, 2007.

Bendick, R., and **L.M. Flesch**, Reconciling Lithospheric Coupling and Crustal Flow Beneath Tibet, *Geology*, 35, 895-898, 2007.

Wang, C.Y., L.J. Chang, Z.Y. Lu, J.Z. Qin, W. Su, P.G. Silver, and **L.M. Flesch**, Seismic Anisotropy of Upper Mantle in Eastern Tibet Plateau and Related Crust-Mantle Coupling Pattern, *Science in China Series D*, 50, 1150-1160, 2007.

Ghosh, A., W.E. Holt, **L.M. Flesch**, A.J. Haines, The Gravitational Potential Energy of the Tibetan Plateau and the Forces Driving the Indian Plate, *Geology*, 34, 321-324, 2006.

Flesch, L.M., W.E. Holt, P.G. Silver, M. Stephenson, C.-Y. Wang, and W.W. Chan, Constraining the Extent of Crust-Mantle Coupling in Central Asia Using GPS, Geologic, and Shear-Wave Splitting Data, *E.P.S.L.*, 238, 248-268, 2005.

Dr. Lucy M. Flesch

- Flesch, L.M.**, A.J. Haines, and W.E. Holt, Dynamics of the India-Eurasia collision zone, *J. Geophys. Res.*, 106, 16,435-16,460, 2001.
- Flesch, L.M.**, W.E. Holt, A.J. Haines, and B. Shen-Tu, Dynamics of the Pacific-North American plate boundary zone in the western United States, *Science*, 287, 834-836, 2000.
- Flesch, L.M.**, B. Li, and R.C. Liebermann, Sound velocities of MgSiO₃ – orthopyroxene to 10 GPa at room temperature, *Am. Min.*, 83, 444-450, 1998.
- Liu, J., J. Zhang, **L. Flesch**, B. Li, D.J. Weidner, and R.C. Liebermann, Thermal equation of state of stishovite, *Phys. Earth and Planet. Int.*, 112, 257-266, 1999.

OTHER PUBLICATIONS

- Ridgway, K.D., and **L.M. Flesch**, Cenozoic Tectonic Processes Along the Southern Alaska Convergent Margin, *Geology*, 35, 1055-1056, 2007.
- Flesch, L.M.**, A Possible “Window of Escape” in the Southern Cascadia Subduction Zone, *Geology*, 35, 969-960, 2007.

PRESENTATIONS AND ABSTRACTS

- Flesch, L.M.**, Role of Mantle Traction and the Crust, *CIG-Mantle/Lithosphere Meeting*, July 9th-11th Davis, CA, 2008. – INVITED KEYNOTE TALK
- Haq, S.S. and **L.M. Flesch** (2008), Investigating the role of extensional deformation at convergent margins using a combined analog and numerical approach, *Eos Trans. AGU* 89(53), Fall Meet. Suppl., Abstract T23B-2012.
- Holt, W.E., A. Ghosh, L. Wen, A.J. Haines, C. Kreemer, **L.M. Flesch**, Lithosphere-mantle coupling: constraints from the World Stress Map, *Eos Trans. AGU* 89(53), Fall Meet. Suppl., Abstract T11C-1890.
- Flesch, L.M.**, L.L. Dimitrova, A.J. Haines, W.E. Holt, M. Haines, S.S. Haq, Dynamical modeling for generally shaped, layered lithospheric geometries using continuous field variables, *Eos Trans. AGU* 89(53), Fall Meet. Suppl., Abstract DI21A-1785.
- Klein, E.C., W.E. Holt, **L.M. Flesch**, A.J. Haines, Crustal buoyancies dominate over plate boundary effects in the U.S. Basin and Range: The requirement of weak faults, *Eos Trans. AGU* 89(53), Fall Meet. Suppl., Abstract U51B-0025.
- Flesch, L.M.**, and P.G. Silver (2008), Joint Analysis of GPS and shear-wave splitting data to understand large-scale continental deformation in central Asia, *Geol. Soc. Am. Abstracts with Programs*, GSA Joint Annual Meeting.
- Klein, E.C., **L.M. Flesch**, W.E. Holt, and A.J. Haines (2008), The long-term dynamics of the seismogenic layer in Western North America, *Geol. Soc. Am. Abstracts with Programs*, GSA Joint Annual Meeting.
- Holt, W.E., E.C. Klein, and L.M. Flesch (2008), A comparison between the interseismic and long-term strain rate fields in Western North America, *Geol. Soc. Am. Abstracts with Programs*, GSA Joint Annual Meeting.
- Hoesly, M., and **L.M. Flesch** (2008), Comparing mantle anisotropy to surface deformation to understand surface motions in southeast Asia, *Eos Trans. AGU* 89(23), Jt. Assem. Suppl., Abstract G31A-01.
- Flesch, L.M.**, What drives the western United States and how does it deform?, *Earthscope National Meeting*, March 24th, 2007. – INVITED PLENARY TALK
- Ghosh, A., L. Wen, W.E. Holt, A.J. Haines, and **L.M. Flesch** (2007), A best-fit lithosphere-mantle coupling model constrained by plate motions and the velocity gradient tensor field

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- int the plate boundary zones, *EOS Trans. AGU*, 88(52) Fall Meet. Suppl., Abstract T21-B-0582.
- Flesch, L.M.**, S.D. King, E. Calais, and M. Hoesly (2007), Thinking deeply: Is there a contribution to Asian tectonics from large-scale mantle flow?, *EOS Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract T21B-0581.
- Puskas, C.M., R.B. Smith, **L.M. Flesch**, and K. Settles (2007), Effects of the Yellowstone Hotspot on Western U.S. Stress and Deformation, *EOS Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract V51F-04.
- Puskas, C. M., **L. Flesch**, R. B. Smith, K. Settles, and F. Pollitz, (2007), Geodynamics of the Western U.S. interior, *Geol. Soc. Am. Abstracts with Programs*, 39(6), 202.
- Puskas, C. M., **L. Flesch**, and R. B. Smith, (2007), Kinematics and dynamics of Western U.S. deformation, *Earthscope National Meeting*.
- Flesch, L.M.**, Continent Scale Dynamics, MYRES-II, Verbania, Italy, July, 2006. – INVITED KEYNOTE TALK
- Flesch, L.M.**, P.G. Silver, C. Wang, L. Chang, W.W. Chan, Evidence for Mechanically-Coupled Asian Lithosphere from the Joint Analysis of Surface Deformation and Seismic Anisotropy Data, *Eos Trans. AGU*, 87(52), Fall meet. Suppl., Abstract T32B-05 – INVITED.
- Ghosh, A., L. Wen, W.E. Holt, A.J. Haines, and **L.M. Flesch**, Global Lithospheric Stress Field and Laterally Varying Lithosphere-Mantle Coupling, *EOS Trans. AGU, Joint Assembly*, 87, Suppl. Abstract T24A-05, 2006. - INVITED
- Klein, E.C., W.E. Holt, **L.M. Flesch**, and A.J. Haines, Thin Sheet Modeling for the Seismogenic Crust of Western North America: How Strong is the top Slice of the “Sandwich Bread” above the “Jelly”?, *Eos Trans. AGU*, 87(52), Fall meet. Suppl., Abstract S52A-06, 2006.
- Ghosh, A., W.E. Holt, L. Wen, **L.M. Flesch**, and A.J. Haines, Plate Motions, Lithospheric Stress Field and Lithosphere-Mantle Coupling, *Eos Trans. AGU*, 87(52), Fall meet. Suppl., Abstract G41A-03, 2006.
- Flesch, L.M.**, and P.J. Silver, A Two-Layer Model of Deformation Along the San Andreas Fault System: Evidence from Shear-Wave Splitting, GPS, and Geologic Data, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract U52A-02, 2005.
- Silver, P.G., and **L.M. Flesch**, Constraints of the Style of Tibetan Lithospheric Deformation and their Consequences for Resolving the Orogeny Paradox, *Eos Trans. AGU*, 86(52) Fall Meet. Suppl., T22B-01, 2005. - INVITED
- Ghosh, A., L. Wen, W.E. Holt, A.J. Haines, and **L.M. Flesch**, Three Dimensional Modeling of Lithosphere and Mantle Dynamics Elucidating Lithosphere-Mantle Coupling, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract U53A-02, 2005.
- Puskas, C.M., R.B. Smith, **L.M. Flesch**, and W.L. Chang, The Yellowstone Hotspot: Its Influence on the Magmatic and Tectonic Evolution of the Western U.S., *Geological Society of America Abstracts with Programs*, 37(7), 126, 2005.
- Flesch, L.M.**, W.E. Holt, P.G. Silver, M. Stephenson, C.-Y. Wang, and W.W. Chan, Constraining the Extent of Crust-Mantle Coupling in Central Asia Using GPS, Geologic, and Shear-Wave Splitting Data, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract T34A-01, 2004.
- Klein, E.C., W.E. Holt, **L.M. Flesch**, A.J. Haines, Evidence of long-term weakness on faults in western North America from dynamic modeling, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract T33E-04, 2004.

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- Ghosh, A., W.E. Holt, **L.M. Flesch**, A.J. Haines, The Gravitational Potential Energy of the Tibetan Plateau and the Forces Driving the Indian Plate, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract T31A-1276, 2004.
- Puskas, C.M., R.B. Smith, G. Waite, and **L.M. Flesch**, Kinematic Deformation of the Interior Western U.S. Extensional Regime with Mantle Flow, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract T31A-1274, 2004.
- Flesch, L.M.**, W.E. Holt, P.G. Silver, and M. Stephenson, Constraining the Vertical Coherence of Deformation in Central Asia Using GPS, Geologic, and Shear-Wave Splitting Data, EOS Transactions, AGU, Fall Meeting Supplement, 2003.
- Shen-Tu, B., **L.M. Flesch**, W.E. Holt, and M. Mahdyiar, Deformation Kinematics and Dynamics in the Phillipine Sea-Eurasia Plate Collision Zone in the Taiwan Island Determined from Recent GPS Data, EOS Transactions, AGU, Fall Meeting Supplement, 2003.
- Klein, E.C., **L.M. Flesch**, W.E. Holt, and L. Wen, Stress Magnitudes in Asia and North America: Implications for Strength Profiles, EOS Transactions, AGU, Fall Meeting Supplement, 2003.
- Holt, W.E., C. Kreemer, **L.M. Flesch**, and A.J. Haines, R.J. Bennett, The Resolving Power of the Current State of GPS Information in North America: Implications for PBO Planning, EOS Transactions, AGU, Fall Meeting Supplement, 2003.
- Ozeran, S., W.E. Holt, A.J. Haines, and **L.M. Flesch**, Dynamics of the Central Mediterranean Region, EOS Transactions, AGU, Fall Meeting Supplement, 2003.
- Flesch, L.M.**, W.E. Holt, L. Wen, A.J. Haines, E.C. Klien, and B. Shen-Tu, Understanding the Driving Forces of Western North America Deformation using Geodesy, Seismology, and Geology, UNAVCO Annual Meeting, Fish Camp, CA, June, 2003.
- Holt, W.E., R. Bennett, G. Blweitt, J. Davis, **L.M. Flesch**, A.J. Haines, C. Kreemer, B. Shen-Tu, The Resolving Power of the Current State of GPS Information in North America: Implications for EarthScope Planning, UNAVCO Annual Meeting, Fish Camp, CA, June, 2003.
- Flesch, L.M.**, W.E. Holt, L. Wen, and A.J. Haines, Dynamics of India Eurasia Collision Zone: Investigating the Role of Lithosphere-Mantle Coupling, Gordon Research Conference, Mount Holyoke College, South Hadley, MA, June, 2003.
- Klein, E.C., **L.M. Flesch**, W.E. Holt, L. Wen, and A.J. Haines, Assessment of the Driving Forces of Western North America Deformation to Investigate the Level of Lithosphere-Mantle Interaction Utilizing Geodesy, Seismology, and Geology, Gordon Research Conference, Mount Holyoke College, South Hadley, MA, June, 2003.
- Flesch, L.M.**, W.E. Holt, and A.J. Haines, Using Geophysical Observations to Constrain Large-Scale Continental Deformation in Central Asia, EGS/AGU Annual Meeting, Nice France, April, 2003.
- Flesch, L.M.**, W.E. Holt, L. Wen, and A.J. Haines, Integrating Three-Dimensional Mantle Convection Models with Lithospheric Dynamic Models, EOS Transactions, AGU, 83(47), Fall Meeting Supplement, 2002.
- Klein, E.C., **L.M. Flesch**, W.E. Holt, A.J. Haines, and L. Wen, An Integrated Approach to Understanding the Driving Forces of Deforming Western North America, EOS Transactions, AGU, 83(47), Fall Meeting Supplement, 2002.
- Flesch, L.M.**, W.E. Holt, A.J. Haines, and B. Shen-Tu, Dynamics of the Western North American Plate Boundary Zone, AGU Western Pacific Meeting, Wellington, New Zealand, July, 2002. - INVITED

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- Flesch, L.M.**, B. Shen-Tu, W.E. Holt, and A.J. Haines, Using surface observations to constrain the dynamics of Western North America, EOS Transactions, AGU, 82(47), Fall Meeting Supplement, 2001.
- Kreemer, C., **L.M. Flesch**, and W.E. Holt, The dynamics and kinematics of the central Andes; Understanding strike-slip and extensional earthquakes in the high Andes, *Geophys. Res. Abstr.*, 3, 2001.
- Flesch, L.M.**, W.E. Holt, A.J. Haines, B. Shen-Tu, and M.W. Hamburger, Kinematic and Dynamic Models of western North America, EOS Transactions, AGU, 81(48), Fall Meeting Supplement, 2000. - INVITED
- Flesch, L.M.**, W.E. Holt, and A.J. Haines, Dynamic Models of Central and Southeast Asia, EOS Transactions, AGU, 81(48), Fall Meeting Supplement, 2000.
- Flesch, L.M.**, W.E. Holt, A.J. Haines, and B. Shen-Tu, Understanding the dynamics of the western United States using seismic, geologic, topographic, and geodetic data, Geological Society of America, A-243, 2000. – INVITED
- W.E. Holt, **L.M. Flesch**, A.J. Haines, B. Shen-Tu, Modeling of the Kinematics and Dynamics of Asia, International Geological Congress, Abstracts, August, 2000.
- W.E. Holt, **L.M. Flesch**, C. Kreemer, and J. Haines, Kinematic and Dynamic models of central and southeast Asia, AGU Western Pacific meeting 2000.
- Liebermann, R.C., **L.M. Flesch**, J. Liu, B. Li, G. Gwanmesia, G. Chen, Sound Velocities of Mantle Minerals from Simultaneous Ultrasonic Measurement and X-Ray Diffraction at High Pressure and High Temperature, Geological Society of America Annual Meeting, 31(7), 359, 1999.
- Flesch, L.M.**, W.E. Holt, A.J. Haines, and B. Shen-Tu, Stress and Rheology in the Lithosphere: Examples in Asia and the western United States, EOS Transactions, AGU, 81(19), Spring Meeting Supplement, 2000.
- Flesch, L.M.**, W.E. Holt, and A.J. Haines, The dynamics of the India-Eurasia collision zone, Eos Transactions, AGU, 79 (45), Fall Meeting Supplement, 204, 1998. - INVITED
- Holt, W. E., **L. M. Flesch**, B. Shen-Tu, and A. J. Haines, The kinematics and dynamics of the western US inferred from Quaternary fault data, GPS and VLBI velocities, and topography and Geoid data, Eos Transactions, AGU, 79 (45), Fall Meeting Supplement, 1998.
- Flesch, L.M.**, B. Li, and R.C. Liebermann, Sound velocities of polycrystalline MgSiO₃-orthopyroxene to 11 GPa at room temperature, Eos, Transactions, AGU, 78 (17) 312, Spring Meeting Supplement, 1997.

INVITED SEMINARS

- Department of Earth Sciences, University of Southern California, November, 2008.
- Department of ????, Virginia Tech, September, 2008.
- Department of Earth Sciences, Indiana University Purdue University Indianapolis, October 2007.
- Earth and Atmospheric Sciences 40th Anniversary, Purdue University, April 2007.
- Women In Sciences at Purdue, Purdue University, January 2007.
- Department of Geological Sciences, Indiana University, April 2006.
- Department of Geology, University of Illinois-Urbain-Champaign, March 2006.
- Department of Earth and Environmental Sciences, University of Illinois-Chicago, March 2006.
- Department of Geosciences, Princeton University, April 2005.
- Department of Geosciences, Penn State University, March 2004.

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Department of Earth and Atmospheric Sciences, Purdue University, March 2004.
Department of Geology, University of Oregon, March 2004.
Department of Geosciences, University of Arizona, March 2004.
Department of Geology, Miami University, February 2004.
Department of Geological Sciences, University of California-Santa Barbara, February 2004.
Department of Geological Sciences, University of Southern California, February 2004.
Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, March 2003.
Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, March 2002.
Department of Earth Sciences, University of Cambridge, February 2002.
Department of Geophysical Sciences, University of Chicago, February 2002.
Department of Geophysics, Stanford University, January 2002.
Department of Geology and Geophysics, Yale University, January 2001.

TEACHING AND CURRICULUM DEVELOPMENT

EAS 116 – Earthquakes and Volcanoes
EAS 391 – Introduction to Plate Tectonics
EAS 591C – Mountain Building and Plateau Growth
EAS 591R – Kinematic and Dynamic Models of Continental Lithosphere

UNIVERSITY SERVICE

Graduate Committee, Purdue University, 2005-present.
Executive Committee, Purdue University, 2007-present.
Graduate Student Recruiting Committee, Purdue University, 2005-2007
GAT Search Committee, Purdue University, 2007.
Grade Appeals Alternative, Purdue University, 2006-2007.
Undergraduate Research Symposium Judge, Purdue University, 2006.