

JEROEN TROMP

Academic Degrees

Ph.D., Princeton University, 1992

M.S., Princeton University, 1990

B.Sc., University of Utrecht, 1988

Positions Held

2017–present, Director, Princeton Institute for Computational Science & Engineering, Princeton University

2008–present, Blair Professor of Geology, Department of Geosciences, Princeton University

2008–present, Professor of Applied & Computational Mathematics, Program in Applied & Computational Mathematics, Princeton University

2020–present, Full Member, Rutgers Cancer Institute of New Jersey

2013–2019 Member of the Technology Advisory Council of British Petroleum

2013–2017, Associate Director, Princeton Institute for Computational Science & Engineering, Princeton University

2010–2014, Faculty Fellow, Princeton Institute for Theoretical Science, Princeton University

2009–2013, Director, Princeton Institute for Computational Science & Engineering, Princeton University

2008–2009 Distinguished Visiting Professor, Department of Civil Engineering, National University of Singapore

2003–2008, Director of the Seismological Laboratory, Division of Geological and Planetary Sciences, California Institute of Technology

2003–2008, Eleanor and John R. McMillan Professor of Geophysics, Division of Geological and Planetary Sciences, California Institute of Technology

2000–2002, Professor of Geophysics, Division of Geological and Planetary Sciences, California Institute of Technology

1997–2000, Professor of Geophysics, Department of Earth and Planetary Sciences, Harvard University

1998–1999, Visiting Professor of Geophysics, Division of Geological and Planetary Sciences, California Institute of Technology

1996–1997, John L. Loeb Associate Professor of the Natural Sciences, Department of Earth and Planetary Sciences, Harvard University

1992–1996, Assistant Professor of Geophysics, Department of Earth and Planetary Sciences, Harvard University

Honors and Awards

2013, Beno Gutenberg Medal, European Geosciences Union

2007, Corresponding Member, Royal Netherlands Academy of Sciences

2004, Medal of the Vening Meinesz Research School of Geophysics

2003, Gordon Bell Award, SuperComputing 2003 (SC2003)

1999, Fellow, American Geophysical Union

1999, James B. Macelwane Medal, American Geophysical Union

1997, Honorary Master's Degree, Harvard University

1994–1999, Packard Fellowship, David and Lucile Packard Foundation

1994, Doornbos Memorial Prize, International Association of Seismology and Physics of the Earth's Interior

1990 – 1992, Francis Robbins Upton Graduate Fellowship, Princeton University

1988, John von Neumann Prize in Supercomputing, Princeton University

Current Professional Activities & Service

Scientific Advisory Committee for the Leadership Class Computing Facility of the Texas Advanced Computing Center

Associate Editor, *Journal of Geophysical Research – Planets*

Professional Societies

American Geophysical Union

Royal Astronomical Society

European Geophysical Society

Seismological Society of America

Publications

Books

- [1] ROBERTSSON, J. O., BLANCH, J. O., NIHEI, K., AND TROMP, J. *Numerical modeling of seismic wave propagation: Gridded two-way wave-equation methods*. Society of Exploration Geophysicists, 2012
- [2] DAHLEN, F., AND TROMP, J. *Theoretical global seismology*. Princeton University Press, 1998

Reviewed Articles

- [179] BELLER, S., AND TROMP, J. On the importance of the Hessian in full waveform inversion. *Geophys. J. Int* (2021). Submitted
- [178] MAGNONI, F., CASAROTTI, E., KOMATITSCH, D., STEFANO, D., R., C., G., M., TAPE, C., MICHELINI, A., PIERSANTI, A., AND TROMP, J. Adjoint tomography of the Italian lithosphere. *Science Advances* (2021). Submitted
- [177] LIU, Q., BELLER, S., LEI, W., PETER, D., AND TROMP, J. Preconditioned BFGS-based uncertainty quantification in elastic full waveform inversion. *Geophys. J. Int* (2021). Submitted
- [176] SRIPANICH, Y., VASCONCELOS, I., TROMP, J., AND TRAMPERT, J. Stress-dependent elasticity and wave propagation — New insights & connections. *Geophysics* (2021). Submitted
- [175] GUALTIERI, L., BACHMANN, E., SIMONS, F., AND TROMP, J. Generation of secondary microseism Love waves: Effects of bathymetry, 3D structure, and source seasonality. *Geophys. J. Int* (2021). Accepted
- [174] KASHYAP, S. G., DAS, S. B., HANASOGE, S. M., WOODARD, M. F., AND TROMP, J. Inferring solar differential rotation through normal-mode coupling using Bayesian statistics. *Astrophys. J.* (2021). Accepted
- [173] GUALTIERI, L., BACHMANN, E., SIMONS, F., AND TROMP, J. The origin of secondary microseism Love waves. *Proceedings of the National Academy of Sciences of the United States of America* 117, 47 (2020), 29504–29511
- [172] LANGER, L., RAGON, T., SLADEN, A., AND TROMP, J. Impact of topography on earthquake static slip estimates. *Tectonophysics* 791 (2020)
- [171] LEI, W., RUAN, Y., BOZDAĞ, E., PETER, D., LEFEBVRE, M., KOMATITSCH, D., TROMP, J., HILL, J., PODHORSZKI, N., AND PUGMIRE, D. Global adjoint tomography — Model GLAD-M25. *Geophysical Journal International* 223, 1 (2020)

- [170] DAS, S., CHAKRABORTY, T., HANASOGE, S., AND TROMP, J. Sensitivity kernels for inferring Lorentz stresses from normal-mode frequency splittings in the Sun. *Astrophysical Journal* 897, 1 (2020)
- [169] BACHMANN, E., AND TROMP, J. Source encoding for viscoacoustic ultrasound computed tomography. *The Journal of the Acoustical Society of America* 147, 5 (2020), 3221
- [168] LOGNONNÉ, P. *et al.* Constraints on the shallow elastic and anelastic structure of Mars from InSight seismic data. *Nature Geoscience* 13, 3 (2020), 213–220
- [167] BANERDT, W. *et al.* Initial results from the InSight mission on Mars. *Nature Geoscience* 13, 3 (2020), 183–189
- [166] TROMP, J. Seismic wavefield imaging of Earth’s interior across scales. *Nature Reviews Earth & Environment* 1, 1 (2020), 40–53
- [165] LLOYD, A., WIENS, D., ZHU, H., TROMP, J., NYBLADE, A., ASTER, R., HANSEN, S., DALZIEL, I., WILSON, T., IVINS, E., AND O’DONNELL, J. Seismic structure of the Antarctic upper mantle imaged with adjoint tomography. *Journal of Geophysical Research: Solid Earth* 125, 3 (2020)
- [164] BORISOV, D., GAO, F., WILLIAMSON, P., AND TROMP, J. Application of 2D full-waveform inversion on exploration land data. *Geophysics* 85, 2 (2020), R75–R86
- [163] RUAN, Y., LEI, W., MODRAK, R., ÖRSVURAN, R., BOZDAĞ, E., AND TROMP, J. Balancing unevenly distributed data in seismic tomography: A global adjoint tomography example. *Geophysical Journal International* 219, 2 (2019), 1225–1236
- [162] RUAN, Y., LEI, W., LEFEBVRE, M., MODRAK, R., SMITH, J., ÖRSVURAN, R., BOZDAĞ, E., HILL, J., PODHORSZKI, N., PUGMIRE, D., AND TROMP, J. A new generation of Earth mantle model from global adjoint tomography. *Acta Geologica Sinica* 93, S1 (2019), 140
- [161] TROMP, J., AND BACHMANN, E. Source encoding for adjoint tomography. *Geophysical Journal International* 218, 3 (2019), 2019–2044
- [160] WANG, Y., MILLER, R., PETERIE, S., SLOAN, S., MORAN, M., CUDNEY, H., SMITH, J., BORISOV, D., MODRAK, R., AND TROMP, J. Tunnel detection at Yuma Proving Ground, Arizona, USA — Part 1: 2D full-waveform inversion experiment. *Geophysics* 84, 1 (2019), B109–B119
- [159] SMITH, J., BORISOV, D., CUDNEY, H., MILLER, R., MODRAK, R., MORAN, M., PETERIE, S., SLOAN, S., TROMP, J., AND WANG, Y. Tunnel detection at Yuma Proving Ground, Arizona, USA — Part 2: 3D full-waveform inversion experiments. *Geophysics* 84, 1 (2019), B95–B108

- [158] GHARTI, H., AND TROMP, J. Spectral-infinite-element simulations of magnetic anomalies. *Geophysical Journal International* 217, 3 (2019), 1656–1667
- [157] GHARTI, H., LANGER, L., AND TROMP, J. Spectral-infinite-element simulations of earthquake-induced gravity perturbations. *Geophysical Journal International* 217, 1 (2019), 451–468
- [156] LANGER, L., GHARTI, H., AND TROMP, J. Impact of topography and three-dimensional heterogeneity on coseismic deformation. *Geophysical Journal International* 217, 2 (2019), 866–878
- [155] TROMP, J., MARCONDES, M., WENTZCOVITCH, R., AND TRAMPERT, J. Effects of induced stress on seismic waves: Validation based on ab initio calculations. *Journal of Geophysical Research: Solid Earth* 124, 1 (2019), 729–741
- [154] LOGNONNÉ, P. *et al.* SEIS: InSight’s Seismic Experiment for Internal Structure of Mars. *Space Science Reviews* 215, 1 (2019)
- [153] LLOYD, S., JEONG, C., GHARTI, H., VIGNOLA, J., AND TROMP, J. Spectral-element simulations of acoustic waves induced by a moving underwater source. *Journal of Theoretical and Computational Acoustics* 27, 3 (2019)
- [152] VAALAND, U., GHARTI, H., AND TROMP, J. Simulations of seismic wave propagation using a spectral-element method in a Lagrangian framework with logarithmic strain. *Geophysical Journal International* 216, 3 (2019), 2148–2157
- [151] GHARTI, H., LANGER, L., AND TROMP, J. Spectral-infinite-element simulations of coseismic and post-earthquake deformation. *Geophysical Journal International* 216, 2 (2019), 1364–1393
- [150] GHARTI, H., TROMP, J., AND ZAMPINI, S. Spectral-infinite-element simulations of gravity anomalies. *Geophysical Journal International* 215, 2 (2018), 1098–1117
- [149] CRAWFORD, O., AL-ATTAR, D., TROMP, J., MITROVICA, J., AUSTERMANN, J., AND LAU, H. Quantifying the sensitivity of post-glacial sea level change to laterally varying viscosity. *Geophysical Journal International* 214, 2 (2018), 1324–1363
- [148] TROMP, J., AND TRAMPERT, J. Effects of induced stress on seismic forward modelling and inversion. *Geophysical Journal International* 213, 2 (2018), 851–867
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- [142] PANNING, M. *et al.* Planned products of the Mars Structure Service for the InSight mission to Mars. *Space Science Reviews* 211, 1–4 (2017), 611–650
- [141] KEDAR, S., ANDRADE, J., BANERDT, B., DELAGE, P., GOLOMBEK, M., GROTT, M., HUDSON, T., KIELY, A., KNAPMEYER, M., KNAPMEYER-ENDRUN, B., KRAUSE, C., KAWAMURA, T., LOGNONNÉ, P., PIKE, T., RUAN, Y., SPOHN, T., TEANBY, N., TROMP, J., AND WOOKEY, J. Analysis of regolith properties using seismic signals generated by InSight’s HP³ penetrator. *Space Science Reviews* 211, 1-4 (2017), 315–337
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- [139] ZHU, H., KOMATITSCH, D., AND TROMP, J. Radial anisotropy of the North American upper mantle based on adjoint tomography with USArray. *Geophysical Journal International* 211, 1 (2017), 349–377
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- [137] CHEN, M., NIU, F., TROMP, J., LENARDIC, A., LEE, C.-T., CAO, W., AND RIBEIRO, J. Lithospheric foundering and underthrusting imaged beneath Tibet. *Nature Communications* 8 (2017)

- [136] CRAWFORD, O., AL-ATTAR, D., TROMP, J., AND MITROVICA, J. Forward and inverse modelling of post-seismic deformation. *Geophysical Journal International* 208, 2 (2017), 845–876
- [135] LAU, H., MITROVICA, J., DAVIS, J., TROMP, J., YANG, H.-Y., AND AL-ATTAR, D. Tidal tomography constrains Earth’s deep-mantle buoyancy. *Nature* 551, 7680 (2017), 321–326
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- [122] BOXBERG, M., PRÉVOST, J., AND TROMP, J. Wave propagation in porous media saturated with two fluids: Is it feasible to detect leakage of a CO₂ storage site using seismic waves? *Transport in Porous Media* 107, 1 (2015), 49–63
- [121] TROMP, J. Forward modeling and synthetic seismograms, 3D numerical methods. In *Treatise on Geophysics: Second Edition*, B. Romanowicz and A. Dziewoński, Eds., vol. 1. Elsevier Inc., 2015, pp. 231–251
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- [118] HANASOGE, S., AND TROMP, J. Full waveform inversion for time-distance helioseismology. *Astrophysical Journal* 784, 1 (2014)
- [117] MAGNONI, F., CASAROTTI, E., MICHELINI, A., PIERSANTI, A., KOMATITSCH, D., PETER, D., AND TROMP, J. Spectral-element simulations of seismic waves generated by the 2009 L’Aquila earthquake. *Bulletin of the Seismological Society of America* 104, 1 (2014), 73–94
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- [113] ZHU, H., AND TROMP, J. Mapping tectonic deformation in the crust and upper mantle beneath Europe and the North Atlantic Ocean. *Science* 341, 6148 (2013), 871–875
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- [111] HANASOGE, S., BIRCH, A., GIZON, L., AND TROMP, J. Seismic probes of solar interior magnetic structure. *Physical Review Letters* 109, 10 (2012)
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