ROBERT L. NOWACK
Department of Earth, Atmospheric and Planetary Sciences
Purdue University
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EDUCATION:

Massachusetts Institute of Technology (Cambridge, Massachusetts)
Ph.D. Geophysics, 1985. Advisor: Keiiti Aki

Stanford University (Stanford, California)
M.S. Geophysics, 1977.

Beloit College (Beloit, Wisconsin)
B.A. Physics, with Honors, 1975.

PROFESSIONAL EXPERIENCE:

1998-Present	Purdue University, West Lafayette, IN Professor of Geophysics
1990-1998	Purdue University, West Lafayette, IN Associate Professor of Geophysics
1985-1990	Purdue University, West Lafayette, IN Assistant Professor of Geophysics
1985	Earth Resources Laboratory, MIT, Cambridge, MA Post-Doctoral Research Scientist
1978-1980	U.S. Geological Survey, Menlo Park, CA Seismologist
1977-78	Woodward Clyde Geotechnical Consultants (URS/AECOM), San Francisco, CA, Engineering Seismologist

PROFESSIONAL SOCIETIES:

American Geophysical Union (AGU)
Society of Exploration Geophysicists (SEG)
Seismological Society of America (SSA)
Insitute of Physics (IOP) London

PROFESSIONAL ACTIVITIES:

2012-2016 –Editor-in-Chief for the Journal of Geophysical Research-Solid Earth

2009-2012 – Co-Chief Editor for the Journal of Geophysical Research-Solid Earth

2012 Panel Member for DOE (Airforce Research Laboratory and National Nuclear Security Administration, NNSA).

2010 – External Academic Review Committee, Dept. of Geology and Geophysics, Texas A&M University.

2009 Panel Member for DOE (Airforce Research Laboratory and National Nuclear Security Administration, NNSA).

2008 Panel Member for DOE (Airforce Research Laboratory and National NuclearSecurity Administration, NNSA).

2007 Panel Member for NEHRP (National Earthquake Hazard Reduction Program).

2005-2009 – Associate Editor, Journal of Geophysical Research-Solid Earth.

2004-2011 – Associate Editor, Journal of Geophysics and Engineering.

1999-2009 – Associate Editor for Studia Geophysica et Geodaetica.

1995-2009 – Associate Editor for the Bulletin of the Seismological Society of America.

2006 Panel Member for DOE (Airforce Research Laboratory and National Nuclear Security Administration, NNSA).

1998 Technical Program Committee Member, for Meeting on Signal Recovery and Synthesis, Optical Society of America, Kailua-Kona, Hawaii.

1997 Panel Member for DSWA (Special Defense Weapons Agency) Program on CTBT.

1992 Panel member of the USGS National Earthquake Hazards Reduction Program (NEHRP).

Reviewer for the Journal of Geophysical Research, Geophysical Journal International, Pure and Applied Geophysics, Geophysics, Geophysical Prospecting, Geophysical Research Letters.

2004-present – Reviewer of Extended Abstracts for the Society of Exploration Geophysicists (SEG) Annual Meeting

Reviewer of proposals for the National Science Foundation, Department of Energy, and the U.S. Geological Survey.

AWARDS:

2020 Outstanding Reviewer Award, 2020, Geophysical Journal International
2018 AGU Oustanding Reviewer Award of 2018

2004-pres. Fellow, Institute of Physics (IOP), London
1986-88 Geology Faculty Award - Union Oil Foundation of California
1980 U.S. Geological Survey Merit Award

RESEARCH:

Visiting Research Appointments:

01/01/12-03/10/12 – Visiting Research Scientist
Scripps Intitution of Oceanography, University of California, San Diego

03/15/12-06/10/12 – Visiting Research Scientist
Dept. of Earth, Ocean and Atmos. Sci., University of British Columbia, Vancouver, Canada

06/03/03-06/29/03 – Visiting Research Scientist
Dept. of Earth and Planetary Sci., University of California, Santa Cruz

05/01/02-05/25/02 – Visiting Research Scientist
Department of Geological Sciences, Queen's University, Kingston, Ontario, Canada

02/01/02-04/01/02 – Visiting Research Scientist
Institute for Geophysics, University of Texas, Austin, TX

01/15/92-06/01/92 - Visiting Research Scientist
Department of Theoretical Geophysics, University of Utrecht, The Netherlands

05/15/89-08/01/89 - Visiting Research Scientist
Seismology Laboratory of the Institut de Physique de Globe, Universite Paris VI, Paris, France

05/15/86-08/15/86 - Visiting Research Scientist
The Earth Resources Laboratory, Massachusetts Institute of Technology, Cambridge, MA

Invited Lectures:

Session Chairman for session on Tomography, American Geophysical Union Meeting, San Francisco, CA, Fall 1983.

Invited lecture given at the Institut de Physique du Globe Universite Paris VI, June, 1985.

Invited lecture given at Czech. National Academy of Sciences, June, 1985.

Invited lecture at the Exxon Research Center, Annandale, New Jersey, 1985.

Invited talk at Acoustical Society of America Annual Meeting, May, 1986.

Session Chairman for session on Wave Propagation, American Geophysical Union Meeting, San Francisco, CA, Fall 1987.

Invited lecture given at Northwestern University, February, 1988.

Invited talk at the Incorporated Research Institutions for Seismology (IRIS) Workshop, Alta, UT, September, 1988.

Invited lecture at the Amoco Research Center, Tulsa, OK, September, 1988.

Session Chairman for session on Anisotropy, American Geophysical Union Meeting, San Francisco, CA, Fall 1988.

Invited talk at the Geotechnology Research Institute (HARC) workshop on Seismic Exploration of Continental Margins, Houston, TX, 1989.

Invited talk at the Second IMACS Symposium on Computational Acoustics, Princeton, NJ, 1989.

Invited talk in the session on Seismic Imaging at the American Geophysical Union Meeting, San Francisco, CA, Fall 1989.

Session Chairman for session on Seismic Theory and Processing at the American Geophysical Union Meeting, Baltimore, MD, Spring 1990.

Invited talk at the Second International SIAM Conference on Applied Mathematics, Washington, DC, July, 1991.

Invited lecture given at University of Utrecht, The Netherlands, February, 1992.

Invited speaker at the IMA Workshop on Inverse Problems in Wave Propagation at the Institute for Mathematics and its Applications of the University of Minnesota, March 5-17, 1995.

Invited speaker at the SIAM Symposium on Geophysical Applications of Inverse Problems, Yosemite, California, December 16-20, 1995.

Invited lecture at Imperial College, London, England, June, 1997.

Invited lecture at Cambridge University, Cambridge, England, June, 1997.

Invited lecture at Indiana University/Purdue University-Fort Wayne, Fort Wayne, Indiana, October, 1997.

Session Chairman for session on Seismic Modeling in Heterogeneous Media at the Society of Exploration Geophysics Annual Meeting, Dallas, Tx, November 3-7, 1997.

Session Chairman, Structure of Volcanoes and Geothermal Fields at the American Geophysical Union Fall Annual Meeting, San Francisco, CA, December 6-10, 1998.

Session Chairman, Seismology section, American Geophysical Union Fall Annual Meeting, San Francisco, CA, 1999.

Invited talk at a symposium in honor of Keiiti Aki, University of Southern California, March 16-18, 2000.

Presentation at a conference on Seismic Wave Propagation in Prague, Czech Republic, June 5-9, 2000.

Invited lecture given at University of Illinois-Urbana, September 21, 2001.

Invited lecture given at Workshop on Seismic Attenuation, sponsored by the Department of Energy, Berkeley, CA, December 6, 2001.

Invited lecture given at University of Texas-Austin, February 8, 2002.

Invited talk at University of California-Santa Cruz, June 21, 2003.

Invited lecture given at the Houston Geophysical Society, Houston, TX, November 21, 2003.

Invited lecture given at Northwestern University, February 27, 2004.

Invited lecture at Beijing American Geophysical Union Western Pacific Meeting, July 25, 2006.

Invited Lecture at IGPP, Scripps, University of California San Diego, Jan 25, 2012.

Session Chair at the Fall Annual Meeting, AGU, San Francisco, Dec. 3-7, 2012.

Invited Lecture at KAUST, Saudi Arabia, Nov. 19, 2013

Invited Lecture Course given at National Autonomous University (UNAM), Mexico City, Gaussian Beams – Theory and Practice, April 27-30, 2016

Session Chair at the Fall Annual Meeting, Society of Exploration Geophysicists (SEG), Dallas, TX, Oct. 16-21, 2016.

Invited Lecture given at the University of California Santa Cruz, WTOPI Modeling and Imaging Project Annual Meeting, July 17-18. 2018.

Invited Lecture given at Rice University, Houston TX, Sept. 20, 2018.

PUBLICATIONS:

Thesis:

Nowack, R.L. (1985) Wave propagation in laterally varying media and iterative inversion for velocity, Ph.D., MIT, 225 p.

Refereed Publications:

(Google Scholar: h-index 22, i10-index 42; ResearchGate: RG Score 31.92)

Nowack, R.L. and K. Aki (1984) The 2-D Gaussian beam synthetic method: Testing and Application, J. Geophys. Res., 89, 7797-7819.

Nowack, R.L. and K. Aki (1986) Iterative inversion for velocity using waveform data, Geophys. J.R. astr. Soc., 87, 701-730.

Nowack, R.L. and W.J. Lutter (1988) Linearized rays, amplitude and inversion, Pure and Applied Geophysics, 128, 401-421.

Nowack, R.L. and W.J. Lutter (1988) A note on the calculation of covariance and resolution, Geophys. J. Int., 95, 205-207.

Daudt, C.R., L.W. Braile, R.L. Nowack and C.S. Chiang (1989) A comparison of finite difference and Fourier method calculations of synthetic seismograms, Bull. Seism. Soc. Am., 79, 1210-1230.

Nowack, R.L. and W. Lutter (1989) Linearized rays, amplitude and inversion, in Scattering and Attenuation of Seismic Waves, Eds. Wu, R.S. and K. Aki, Birkhauser Boston.

Nowack, R.L. and J. Lyslo (1989) Frechet derivatives for curved interfaces in the ray approximation, Geophys. J. Int., 97, 497-509.

Lutter, W.J., R.L. Nowack and L.W. Braile (1990) Seismic imaging of upper crustal structure using travel-times from the PASSCAL Ourachita Experiment, J. Geophys. Res., 95, 4621-4631.

Daudt, C.R., L.W. Braile, R.L. Nowack and C.S. Chiang (1990) Reply to J. Vidale's "comment on 'a comparison of finite-difference and Fourier calculations of synthetic seismograms'", Bull. Seism. Soc. Am., 80, 496-497.

Lyslo, J.A. and R.L. Nowack (1990) Slant stack analysis of shot point 16 from the 1986 PASSCAL Ouachita Experiment, J. Geophys. Res., 95, 4647-4656.

Nowack, R.L. (1990) Tomography and the Herglotz-Wiechert Formulation, Pure and Applied Geophysics, 133, 305-315.

Lutter, W.J. and R.L. Nowack (1990) Inversion for crustal structure using reflections from the PASSCAL Ouachita Experiment, J. Geophys. Res., 95, 4621-4631.

Nowack, R.L. (1990) Perturbation methods for rays and beams, in Second IMACS Symposium on Computational Acoustics, Ed. Lee, D., North Holland Press, 167-180.

Nowack, R.L. (1990) Book review of "Geophysical Data Analysis: Discrete Inverse Theory" by W. Menke, Pure and Applied Geophysics, 140-142.

Nowack, R.L. and I. Psencik (1991) Perturbation from isotropic to anisotropic media in the ray approximation, Geophys. J. Int., 106, 1-10.

Nowack, R.L. (1992) Wavefronts and solutions of the Eikonal equation, Geophys. J. Int., 110, 55-62.

Nowack, R.L. and L.W. Braile (1993) Refraction and wide-angle reflection tomography: theory and results, in Seismic Tomography: Theory and Practice, Eds. Iyer, H.M. and K. Hirahara, Chapman and Hall Publ., London, pp. 733-763.

Lutter, W.J., A.M. Trehu and R.L. Nowack (1993) Application of 2-D travel-time inversion of seismic refraction data to the mid-continent rift beneath Lake Superior, Geophys. Res. Lett., 20, 615-618.

Erdogan, N. and R.L. Nowack (1993) Slant stack analysis for one dimensional upper mantle structure using short period data from MAJO, Pure and Applied Geophysics, 141, 1-24.

Nowack, R.L. (1994) Development of the FFT and Applications in geophysics, Proceedings of the International Lanczos Centenary Conference, Eds. Plemmons, R.J. and J.W. York, SIAM, Philadelphia, PA, 395-397.

van Heijst, H.J., R. Snieder and R.L. Nowack (1994) Resolving a low velocity zone with surface wave data, Geophys. J. Int., 118, 333-343.

Matheney, M.P. and R.L. Nowack (1995) Seismic attenuation values obtained from instantaneous frequency matching and spectral ratios, Geophys. J. Int., 123, 1-15.

Nowack, R.L. and M.P. Matheney (1997) Inversion of body-wave attributes derived from seismic refraction data, in Inverse Problems in Geophysical Applications, Eds., H.W. Engl, A.K. Louis, W. Rundell, SIAM Press, 51-64.

Nowack, R.L. and M.P. Matheney (1997) Inversion of seismic attributes for velocity and attenuation, Geophys. J. Int., 178, 689-700.

Matheney, M.P. and R.L. Nowack (1997) Seismic attribute inversion for velocity and attenuation structure using data from the Glimpce Lake Superior experiment, J. Geophys. Res., 102, 9949-9960.

Brudzinski, M.R., W.-P. Chen, R.L. Nowack and B. Huang (1997) Variations of P-wave speeds in the mantle transition zone beneath the Northern Philippine Sea, J. Geophys. Res., 102, 11,815-11,827.

Nowack, R.L. (1997) Applications of inverse problems to the analysis of refraction and wide-angle seismic data, in Inverse Problems and Wave Propagation, Eds., G. Chavent, G. Papanicolaou, P. Sacks and W. Symes, IMA, 90, 395-417.

Gasparini, P., and the TomoVes Working Group (with R.L. Nowack and others) (1998) Looking inside Mt. Vesuvius, EOS, 79, 229-232.

Matheney, M.P. and R.L. Nowack (1998) Seismic attenuation computed from reflection data and comparison with refraction results, Pure and Applied Geophysics, 153, 537-559.

Nowack, R.L. (1998) Applications of generalized inversion in geophysics, in Cornelius Lanczos Collected Published Papers with Commentaries, vol. V, General Editor, W.R. Davis; Editors, M.T. Chu, P.Dolan, J.R. McConnell, L.K. Norris, E. Ortiz, R.J. Plemmons, D. Ridgway, B.K.P. Scaife, W.J. Stewart, and J.W. York, Jr.; Associate Editors, W.O. Doggett, B.M. Gellai, and AA. Gsponer, Consulting Editor, A. Prioli, North Carolina State University, Raleigh, NC, 3-206—3-211.

Nowack, R.L. (1998) Applications of the FFT in Geophysics, in Cornelius Lanczos Collected Published Papers with Commentaries, vol. VI, General Editor, W.R. Davis; Editors, M.T. Chu, P.Dolan, J.R. McConnell, L.K. Norris, E. Ortiz, R.J. Plemmons, D. Ridgway, B.K.P. Scaife, W.J. Stewart, and J.W. York, Jr.; Associate Editors, W.O. Doggett, B.M. Gellai, and AA. Gsponer, Consulting Editor, A. Prioli, North Carolina State University, Raleigh, NC, 3-511—3-515.

Nowack, R.L., E. Ay, W.-P. Chen and B. Huang (1999) A seismic profile of the upper mantle along the southwestern edge of the Philippine Sea Plate using short-period array data, Geophys. J. Int., 136, 171-179.

Nowack, R.L. and W-P. Chen (1999) Souce-receiver reciprocity and empirical Green's function from chemical blasts, Bull. Seism. Soc. Am., 89, 538-543.

Tomfohrde, D.A. and R.L. Nowack (2000) Crustal structure beneath Taiwan using frequency-based inversion of receiver function waveforms, Pure and Applied Geophysics, 157, 737-764.

Nowack, R.L. and S. Stacy (2002) Synthetic seismograms and wide-angle seismograms attributes from the Gaussian beam and reflectivity methods for models with interfaces and gradients, Pure and Applied Geophysics, 159, 1447-1464.

Stacy, S. and R.L. Nowack (2002) Modeling of wide-angle seismic attributes from shot gather 11 of the Sarex Experiment, Studia Geophysica et Geodetica, 46, 667-690.

Nowack, R.L., C. Li and J. Virieux (2002) Inversion of seismic attributes from the 1996 3-D tomography experiment at Mt. Vesuvius, Italy, in The TomoVes Project: Looking Inside Mt. Vesuvius, P. Gasparini and A. Zollo (eds.), Naples, Italy, http://people.na.infn.it/~bobb10/CD-TomoVes.zip.

Nowack, R.L. (2003) Calculation of synthetics seismograms with Gaussian beams, Pure and Applied Geophysics, 160, 487-507.

Pride, S.R., (and DOE Working group including R.L. Nowack) (2003) Permeability dependence of seismic amplitudes, The Leading Edge, 518-523.

Li, C. and R.L. Nowack (2004) Application of autoregressive extrapolation to seismic tomography, Bull. Seism. Soc. Am., 94, 1465-1466.

Haase, J., R.L. Nowack, C.H. Park, A. Hunyar, J. Hill and M. Hamburger (2004) Evaluation of seismic hazard for Indiana, FHWA/IN/JRTP02004/3, Joint transportation Research Program, Indiana Department of Transportation, Indianapolis.

Nowack, R.L. (2005) Review of "Fundamentals of Seismic Wave Propagation" by C.H. Chapman, Siam Review, 47, 616-618, Society of Industrial and Applied Mathematics, Philadelphia.

Li, C. and R.L. Nowack (2005) Seismic tomography using travel-time surfaces for experiments in the laboratory, J. Geophysics and Engineering, 2, 231-237.

Nowack, R.L. and C. Li (2006) Application of autoregressive extrapolation to the cross-borehole tomography, Studia Geophysica et Geodetica, 50, 337-348.

Nowack R.L., S. Dasgupta, G.T. Schuster, and J.M. Sheng (2006) Correlation migration using Gaussian beams of scattered teleseismic body waves, Bull. Seism. Soc. Am., 96, 1-10.

Dasgupta, S. and R.L. Nowack (2006) Deconvolution of 3-component teleseismic P-waves using the autocorrelation of the P to SV scattered waves, Bull. Seism. Soc. Am., 96, 1827-1835.

Chen, R., V.P. Drnevich, X. Yu, and R. Nowack (2007) Water content measurements with Time Domain Reflectrometry in highly conductive soils using reflections from the soil surface, J. Geotechnical and Geoenvironmental Engineering, ASCE, 133, 1597-1608.

Nowack, R.L., W.P. Chen, U. Kruse,and S. Dasgupta (2007) Imaging offsets in the Moho: Synthetic tests using Gaussian Beams with teleseismic waves, Pure and Applied Geophysics, 164, 1921-1936.

Dasgupta, S. and R.L. Nowack (2008) Frequency extrapolation to enhance the deconvolution of transmitted seismic waves, J. Geophys. and Eng., 5, 118-127.

Nowack, R.L. and C. Li (2009) Methods and Applications of Seismic Tomography, in Handbook of Signal Processing in Acoustics (eds. D. Havelock, M. Vorlander and S. Kuwano), Springer-Verlag, pp. 1635-1653.

Dasgupta, S., R.L. Nowack, and S. Mitra (2009) Deconvolution of three-component teleseismic data from Southern Tibet using the SVA technique, Bull. Seism. Soc. Am., 99, 1973-1983.

Nowack, R. L., T. Parsons and A. Revil (2009) Exploring New Frontiers with JGR-Solid Earth, J. Geophys. Res., 114, B10, doi:10.1029/2009JB006977.

Tseng, T.L., W.P. Chen and R.L. Nowack (2009) Northward thinning of Tibetan crust revealed by virtual seismic profiles, Geophys. Res. Lett., 36, 14, doi:10.1029/2009GL038252.

Nowack, R.L., W.P. Chen and T.L. Tseng (2010) Application of Gaussian beam migration to multi-scale imaging of the lithosphere beneath the Hi-CLIMB array in Tibet, Bull. Seism. Soc. Am., 100, 1743-1754.

Chen, W.P., M. Martin, T.L. Tseng, R.L. Nowack, S.H. Hung and B.H. Huang (2010) Shear-wave birefringence and current configuration of converging lithosphere under Tibet, Earth Planet. Sci. Lett., 295, 297-304.

Nowack, R.L. (2010) Seismic interferometry using Gaussian beams, Earthquake Science, 23, 417-424.

Nowack, R.L. and S.M. Kainkaryam (2011) The Gouy phase anomaly for harmonic and time-domain paraxial Gaussian beams, Geophys. J. Int., 184, 965-973.

Haase, J.S. and R.L. Nowack, R.L. (2011) Earthquake scenario ground motions for the urban area of Evansville, Seismological Res. Lett., 82, 177-187.

Nowack, R.L. (2011) Dynamically focused Gaussian beams for seismic imaging, Int. J. Geophys., Vol. 2011, Art. No. 316581, doi: 10.1155/2011/316581.

Haase, J.S., Y.S. Choi and R.L. Nowack (2011) Liquefaction hazard near the Ohio Riverf from Midwestern scenario earthquakes, Environmental and Engineering Geoscience, 17, 165-181..

Griffin, J. D., R. L. Nowack, W.P. Chen and T.L. Tseng (2011) Velocity structure of the Tibetan lithosphere: Constraints from P-wave travel times of regional earthquakes, Bull. Seism. Soc. Am., 1201, 1938-1947, doi: 1785/0120100229.

Haase, J.S., Y.Y. Choi, T. Bowling and R.L. Nowack (2011) Probabilistic seismic-hazard assessment including site effects for Evansville Indiana and the surrounding region, Bull. Seism., Soc. Am., 101, 1039-1054.

Chen, W.P., S.H. Hung, T.L. Tseng, M. Brudzinski, Z. Yang, and R.L. Nowack (2012) Rheology of the continental lithosphere: progress and new perspectives with special reference to project Hi-CLIMB, Gondwana Research, 21, 4-18.

Nowack, R.L. (2012) A tale of two beams: an elementary overview of Gaussian beams and Bessel beams, Studia Geophys. et Geod., 56, doi: 10.1007/ s11200-011-9054-0.

Bakir, A.C. and Nowack, R.L. (2012) Modeling seismic attributes of Pn waves using the spectral element method, Pure and Applied Geophys., doi:10.1007/s00024-011-0414-z.

Bakir, A.C. and Nowack, R.L. (2012) Velocity and attenuation structure of the Tibetan lithosphere beneath the Hi-CLIMB array from the modeling of Pn attributes, Pure and Applied Geophys., doi:10.1007/s00024-012-0482-8.

Nowack, R.L. and M.G. Bostock (2013) Scattered waves from low-frequency earthquakes and plate boundary structure in northern Cascadia, Geophys. Res. Lett., 40, doi: 10.1002/grl.50826.

Revil, A., P. Tregoning, M. Walter and R.L. Nowack (2015) An Appreciation to the Peer Reviewers for JGR Solid Earth in 2014, J. Geophys. Res., 120, doi: 10.1002/2015JB012308.

Oren, C. and R.L. Nowack (2017) Seismic body-wave interferometry using noise autocorrelation for crustal structure, Geophys. J. Int., 208, 321-332, doi:10.1093/gji/ggw394.

Oren, C. and R.L. Nowack (2018) An overview of reproducible 3D seismic data processing and inversion with Madagascar, Geophysics, 83, F9-F20, doi: 10.1190/GEO2016-0603.1.

Nowack, R. L. and M. S. R. Kiraz (2018) Virtual Green's functions using seismic interferometry and Marchenko Redatuming, Seism. Res. Letters, 89, 613-619 doi: 10.1785/0220170211.

Kiraz, M. S. R. (2018) Marchenko redatuming and imaging with application to the Frio carbon sequestration experiment, Geophys. J. Int., 215, 1633-1643. doi: 10.1093/gji/ggy356.

Ergun Erhan and R.L. Nowack (2020) Application of non-stationary iterative time-domain deconvolution, Studia Geophysica et Geod., 64, 76-99, doi: 10.1007/s11200-019-1165z, online first.

Huang, J. and R.L. Nowack (2020) Machine Learning using U-Net Convolutional Neural Networks for the Imaging of Sparse Seismic Data, Pure and Applied Geophysics, 177, (6) 2685-2700, doi.org/10.1007/s00024-019-02412-z.

Zeng, Qicheng and R.L. Nowack (2020) Anlysis of Local Seismic Events Near a Large-N Array for Moho Reflections, doi.org/10.1785/0220200087.

Articles in Refereed Proceedings:

Patwardhan, A.D., D.D. Tillson and R.L. Nowack (1978) Zonation for critical facilities based on two-level earthquakes, International Earthquake Engineering and Microzonation Conference Proceedings, 485-496.

Nowack, R.L., M.K. Sen, and P.L. Stoffa (2003) Gaussian beam migration for sparse common-shot data, Society of Exploration Geophysics, Expanded Abstracts, 73rd Annual Meeting, Tulsa, OK.

Nowack, R.L. and C. Li (2005) Autoregressive extrapolation applied to tomography in the cross-borehole geometry, Society of Exploration Geophysicists, Expanded Abstracts, 75th Meeting, Houston, 2562-2566.

Yu, X., V.P. Drnevich, and R.L. Nowack (2005) Statistical comparison of models for the dielectric spectrum of soil mixtures, Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP), Atlanta, 215-225.

Yu, X., V.P. Drnevich, and R.L. Nowack (2005) Comprehensive evaluation of near surface soil properties by combining electromagnetic wave and seismic wave method, Proceedings of the 16th International Conference on Soil Mechanics and Geotechnical Engineering (ICSMGE), Osaka, Japan, September.

Drnevich, V.P., X. Yu, C. Zambrano, and R. Nowack (2006) Refined one-step TDR method for water content and density, Proceedings, ASCE GeoCongress, Atlanta, GA, February.

Yu, X., V.P. Drnevich, and R.L. Nowack (2006) Soil property variation by time domain reflectometry, Proceedings, UNSAT2006, The 4th International Conference on Unsaturated Soils, Phoenix, AZ, April.

Zambrano, C.E., V.P. Drnevich, X. Yu, and R. Nowack (2006) Soil texture characterization from TDR waveform analysis, Proceedings TDR 2006, Purdue University, West Lafayette, USA, Sept. Paper ID 1, 21 p., https://engineering.purdue.edu/TDR/Papers.

Yu, X., V.P. Drnevich, and R.L. Nowack (2006) Improvements of soil dielectric mixing model for inversion analysis of time domain reflectometry measurements, Proceedings TDR 2006, Purdue University, West Lafayette, USA, Sept., Paper ID 4, 19 p., https://engineering.purdue.edu/TDR/Papers.

Dasgupta, S. and R.L. Nowack (2006) Autoregressive extrapolation in the frequency domain for the enhanced deconvolution of transmitted seismic waves, International Exposition and 76th annual meeting, New Orleans, Society of Exploration Geophysics, Tulsa.

Nowack, R.L. (2008) Focused Gaussian beams for seismic imaging, in Expanded Abstracts, 78th Annual Meeting of the Society of Exploration Geophysicists, Las Vegas, p. 2376-2380.

Nowack, R.L., W.P. Chen, and T.L. Tseng (2008) Frequency-dependent nature of Pn in Western China: Gaussian beam modeling of data from the Hi-CLIMB experiment, 30th Annual Monitoring Research Review, NNSA/Air Force Research Laboratory, Volume 1, p. 180-189.

Nowack, R.L. (2008) Frame-based Gaussian beam summation and seismic head waves, Proceedings of the Project Review, Geo-Mathematical Imaging Group (Purdue University, West Lafayette, IN), p. 113-119.

Nowack, R.L. (2008) Gaussian beam imaging for converted and surface reflected waves, Proceedings of the Project Review, Geo-Mathematical Imaging Group (Purdue University, West Lafayette, IN), p. 121-128.

Nowack, R.L. (2008) Focused Gaussian beams for seismic imaging, Proceedings of the Project Review, Geo-Mathematical Imaging Group (Purdue University, West Lafayette, IN), p. 129-139.

Nowack, R.L. (2009) A tale of two beams: Gaussian beams and Bessel beams, Proceedings of the Project Review, Geo-Mathematical Imaging Group, Vol. 2, (Purdue University, West Lafayette, IN), pp. 49-58.

Nowack, R.L. (2009) Dynamically focused Gaussian beams for seismic imaging, Proceedings of the Project Review, Geo-Mathematical Imaging Group, Vol. 2, (Purdue Unversity, West Lafayette, IN), pp. 59-70.

Nowack, R.L., W.P. Chen and T.L. Tseng (2009) Frequency-dependent nature of Pn in Western China, 31st. Annual Monitoring Research Review, NNSA, Air Force Research Laboratory, pp. 166-175.

Nowack, R.L, W.P. Chen, J.D. Griffin, A. Bakir and T.L. Tseng (2010) The Propagation of Pn in western China, 2010, 32-nd Monitoring Research Review, NNSA, Air Force Research Laboratory.

Abstracts and Papers Presented at Meetings:

Ellsworth, W.L., W.H.K. Lee and R.L. Nowack (1979) Toward a kinematic model of the San Andreas system in central California, Earthquake Notes, 49, p. 98.

Nowack, R.L. and W.L. Ellsworth (1979) Crustal velocity structure in central California from earthquake and explosion travel-times, Earthquake Notes, 49, p. 99.

Nowack, R.L. and I. Wong (1980) Inversion for velocity structure beneath the Sierran foothills, central California, Earthquake Notes, 50, p. 68.

Nowack, R.L. and K. Aki (1982) The Gaussian beam synthetic seismograms for 2-D inhomogeneous media, Trans. AGU, EOS, 63, p. 1042.

Nowack, R.L. and K. Aki (1983) Testing the range of validity of Gaussian beam seismograms, Trans. AGU, EOS, 64, p. 775.

Nowack, R.L. and K. Aki (1984) Iterative inversion for structure using complete waveforms, Trans. AGU, EOS, 65, p. 237.

Nowack, R.L. (1985) Gaussian beam synthesis, Earthquake Notes, 55, p. 3.

Nowack, R.L. and V.F. Cormier (1985) Computed amplitudes using ray and beam methods for known 3-D structures, Trans. AGU, EOS, 66, p. 980.

Nowack, R.L. (1986) Gaussian beam synthetic seismograms, J. Acoustical Soc. Am., 79, S14.

Nowack, R.L. and W.J. Lutter (1986) Linearized rays, amplitude and inversion, Trans. AGU, EOS, 67, p. 1098.

Lutter, W.J., R.L. Nowack and L.W. Braile (1987) The application of travel time inversion to the imaging of upper crustal sedimentary rocks for the Ouachita PASSCAL experiment, Trans. AGU, EOS, 68, p. 348.

Nowack, R.L. (1987) Seismic inversion based on amplitude and travel-time, Trans. AGU, EOS, 68, p. 352.

Nowack, R.L. and J. Lyslo (1987) Frechet derivatives for curved interfaces within the ray approximation, Trans. AGU, EOS, 68, p. 1371.

Lutter, W.J., R.L. Nowack and L.W. Braile (1988) Inversion for crustal structure using primary and secondary arrivals from the 1986 PASSCAL Ouachita experiment, Trans. AGU, EOS, 69, p. 405.

Nowack, R.L. (1988) Sensitivity operators for curved interfaces within the ray approximation, Conference on Seismic Waves in Laterally Heterogeneous Media, Liblice, Czechoslovakia.

Lutter, W.J. and R.L. Nowack (1988) Inversion for attenuation using amplitudes from the 1986 PASSCAL Ouachita experiment, Trans. AGU, EOS, 69.

Nowack, R.L. and I. Psencik (1988) Perturbation of travel time ray path for anisotropic media, Trans. AGU, EOS, 69.

Lutter, W.J., A.M. Trehu, R.L. Nowack and J.T. Shay (1989) Inversion for crustal structure using first arrivals from the 1986 Lake Superior GLIMPCE experiment, Trans. AGU, EOS, 70, p. 274.

Nowack, R.L. and A.M. Trehu (1989) Simultaneous inversion for focusing and attenuation, Trans. AGU, EOS, 71.

Nowack, R.L. (1990) Wavefronts and solutions of the Eikonal equation, Trans. AGU, EOS, 72, p. 567.

Nowack, R.L. (1991) The inversion of wide-angle reflection and refraction data, 2nd International SIAM Conference on Applied Mathematics, Washington, DC, July, 1991.

Erdogan, N. and R.L. Nowack (1992) Slant stack velocity analysis for upper mantle structure using short period data from GDSN Station MAJO, Trans. AGU, EOS, San Francisco, December 1992.

Matheney, M.P. and R.L. Nowack (1993) Comparison of crustal seismic attenuation values obtained from instantaneous frequency and spectral ratios, Trans. AGU, EOS, 73, 393.

Nowack, R.L. and M.P. Matheney (1993) The inversion of seismic body wave attributes for elastic and anelastic structure, Trans. AGU, EOS, 74, 393.

Chen, W.P. and R.L. Nowack (1993) A broad band seismic section of the mantle transition zone beneath the Philipine Sea Plate, Trans. AGU, EOS, 74, 440.

Nowack, R.L. (1993) Development of the FFT with recent applications in geophysics, Cornelius Lanczos International Centenary Conference, Rayleigh, NC.

Chen, W.P. and R.L. Nowack (1994) Constraining anomalous P-wave speeds in the mantle transition zone: Results from the Pre-Poseidon broad-band array, Trans. AGU, EOS, 75, 477-478.

Nowack, R.L. and P.A. Peeders (1994) Comparison of seismic imaging techniques for the determination of shallow site structure, Trans. AGU, EOS, 75, 456.

Brudzinski, M.R., B.S. Huang, R.L. Nowack and W.P. Chen (1995) Variations in P-wave speeds beneath the Western Pacific Margin, Trans. AGU, EOS, 76, F401.

Nowack, R.L., E. Ay, W.P. Chen and B.S. Huang (1995) Seismic profile of the upper mantle along the Luzon Arc-Philippine Sea Trench, Trans. AGU, EOS, 76, F402.

Nowack, R.L., E. Ay, W.-P. Chen and B. Huang (1996) Two seismic profiles of the upper mantle along the western edge of the Philipppine Sea Plate using short-period seismic data from Taiwan, Trans. AGU, EOS, 77, F473-F474.

Brudzinski, M., W.-P. Chen, and R.L. Nowack (1996) Vertical seismic profiling for mantle and lithospheric structures beneath back-arc basins in the Tonga Arc, Trans. AGU, EOS, F478.

Nowack, R.L. and M.P. Matheney (1997) Extraction of seismic attributes from wide-angle synthetic data derived from models with interfaces, Trans. AGU, EOS, 78.

Brudzinski, M.R., W.-P. Chen and R.L. Nowack (1997) Variations of P wave speeds in the upper mantle near the Tonga subduction zone, Trans. AGU, EOS, 78.

Tomfohrde, D.A. and R.L. Nowack (1997) Variations in crustal thickness beneath selected stations in Taiwan from receiver function modeling, Trans. AGU, EOS, 78.

Zollo, A., P. Gasparini, et al. (1997) TomoVes: A project for seismic investigation of Mt. Vesuvius Volcano, Southern Italy, Trans. AGU, EOS, 78.

Auger, E., J. Virieux, A. Zollo, A. Ribodetti and R.L. Nowack (1997) Small features obtained by asymptotic waveform inversion using 3-component seismograms for an irregular acquisition geometry: Application to Mt. Vesuvius, Trans. AGU, EOS, 78.

Nowack, R.L. (1998) Variable damping in seismic tomography based on ray coverage, Meeting on Signal Recovery and Synthesis, Optical Society of America, Kailua-Kona, Hawaii, July 8-12.

Nowack, R.L. (1998) Source-receiver reciprocity and empirical Green's function, Trans. AGU, EOS, 79.

Li, C., R.L. Nowack and J. Virieux (1998) Preliminary attenuation estimates from the 1996 seismic tomography experiment at Mt. Vesuvius, Italy, Trans. AGU, EOS, 79.

Nowack, R.L. and J.C. Li (1999) Variable damping in seismic tomography, Trans. AGU, EOS, 80.

Nowack, R.L., C. Li, and J. Vireaux (2000) Inversion of seismic attributes from the 1996 3-D tomography experiment at Mt. Vesuvius, Trans. AGU, EOS, 81.

Stacy, S. and R.L. Nowack (2001) Modeling of wide-angle seismic attributes from shot gather 11 of Sarex in Southern Alberta, Trans. AGU, EOS, 82.

Sheng, J., G. Schuster, and R.L. Nowack (2001) Imaging of crustal layers by teleseismic ghosts, Trans. AGU, EOS 82.

Sheng, J., G. Schuster, R.L. Nowack, and J. Pechman (2001) Correlogram migration of scattered teleseismic body waves, Earthscope Workshop, October 9-12, Snowbird, Utah.

Nowack, R.L., M.K. Sen, P.L. Stoffa and H. Ge (2002) Gaussian beam migration for sparse common-shot and common-receiver data, Trans AGU, EOS, F984.

Li, C., R.L. Nowack and L.J. Pyrak-Nolte (2002) Laboratory testing of acoustic tomography in rock samples using regularization of incomplete data, Trans. AGU, EOS, F1389.

Nowack, R., S. Dasgupta, G.T. Schuster, and Jian Ming Sheng (2003) Correlation migration of scattered teleseismic body waves with application to the 1993 Cascadia Experiment, Trans AGU, EOS, v. 84, F1064-1065.

Sheng, J.M., G.T. Schuster, K.L. Pankow, and R.L. Nowack (2003) Coherence-weighted wavepath migration of teleseismic data, Trans. AGU, EOS, v. 84, F991-992.

Li, C., R.L. Nowack, L.J. Pyrak-Nolte (2003) Autoregressive extrapolation for seismic tomography problems with application to soil and rock physics, Trans AGU, EOS, v. 84, F643.

Dasgupta, S. and R.L. Nowack (2004) Correlation migration of scattered teleseismic body waves, Trans AGU, EOS, v. 85 (Spring AGU meeting in Montreal).

Li, C. and R.L. Nowack (2004) Discrete frame-based Gaussiam bean methods for seismic modeling and imaging, Trans. AGU, EOS, v. 85, F1339.

Nowack, R.L., W.P. Chen, U. Kruse, and S. Dasgupta (2004) Imaging offsets in the Moho: Synthetic tests using Gaussian beams with teleseismic waves, Trans. AGU, EOS, v. 85, F1359.

Dasgupta, S. and R.L. Nowack (2005) Deconvolution of 3-component teleseismic P-waves using the autocorrelation of the P to SV scattered waves, Trans. AGU, EOS, v. 50, F1381.

Nowack, R.L. (2006) Deconvolution of teleseismic P-waves using the autocorrelation of P to SV scattered waves and autoregressive extrapolation in frequency, Western Pacific AGU meeting, July 24-27, Beijing, China.

Dasgupta, S., S. Mitra, and R.L. Nowack (2006) Deconvolution of 3-component teleseismic data from southern Tibet and Eastern india using the SVA technique, Trans. AGU, EOS, 87(52), Fall meeting supplement.

Tseng, T., W.P. Chen, and R.L. Nowack (2006) Imaging the Tibetan lithosphere: Gaussian beam migration of broadband data from the Hi-Climb Seismic Array, Trans. AGU, EOS, 87(52), Fall meeting supplement.

Chen, W.P., T.L. Tseng, R.L. Nowack, S.H. Hung, S.L. Chung, and B.S. Huang (2007) Mantle lithosphere beneath Tibet: A synthesis with special reference to results from Project Hi-CLIMB, Trans. AGU, EOS, 88, Fall meeting supplement.

Nowack, R.L., W.P. Chen, and T.L. Tseng (2007) Imaging the crust and upper mantle beneath the Hi-CLIMB seismic array in Tibet using Gaussian-Beam Migration of radial receiver functions, Trans. AGU, EOS, 88, Fall meeting supplement.

Roy, S. and R.L. Nowack (2008) Deconvolution of teleseismic P-waves using the SV autocorrelation method with application to the P-wave structure beneath the Hi-CLIMB array in Tibet, Trans. AGU, EOS, 89, Fall meeting supplement.

Nowack, R.L., W.P. Chen, and T.L. Tseng (2008) Frequency-dependent nature of Pn in Western China, Air Force Research Laboratory, June 17-18.

Roy, S. and R.L. Nowack (2008) Deconvolution of teleseismic P-waves for P-wave structure beneath the Hi-CLIMB array in Tibet, Workshop on Tectonics of Tibet, University of Illinois-Urbana, June 14-15.

Nowack, R.L., (2008) Imaging the Tibetan lithosphere using Gaussian-beam migration, Workshop on Tectonics of Tibet, University of Illinois-Urbana, June 14-15.

Tseng, T., W.P. Chen and R.L. Nowack (2009) Northwart thinning of Tibetan crust revealed by virtual seismic profiles, Trans. AGU, EOS, 90, Fall meeting supplement.

Bakir, A., R.L. Nowack and W.P. Chen (2009) Numerical modeling of frequency-dependent characteristics of Pn propagation with applications to data from project Hi-CLIMB in Tibet, Trans. AGU, EOS, 90, Fall meeting supplement.

Nowack, R.L., J.D. Griffin, T. Tseng and W.P. Chen (2009) Modeling wide-angle seismic data from the Hi-CLIMB experiment in Tibet, Trans. AGU, EOS, 90, Fall meeting supplement.

Chen, W.P., R.L. Nowack, T. Tseng and S. Hung (2009) Converging lithosphere beneath Tibet in 3D: Highlights from matching Hi-CLIMB data with new techniques, Trans. AGU, EOS, 90, Fall meeting supplement.

Nowack, R.L., A.C. Bakir, J. Griffin, W. P. Chen and T.L. Tseng (2010) Velocity and attenuation structure of the Tibetan lithosphere using seismic attributes of P-waves from earthquakes recorded by the Hi-CLIMB array, presented at the 2010 Fall Meeting, AGU, San Francisco, Calif., 12-17 Dec.

Nowack, R.L. and M.G. Bostock (2012) Interferometric redatuming and imaging of low frequency earthquakes for fine-scale subduction zone structure, presented at the 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

Bostock, M.G. and R.L. Nowack (2012) Modeling of scattered waveforms of low frequency earthquakes for fine scale structure and depth location, presented at the 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

Nowack, R.L. and M.G. Bostock (2013) Scattered Waveformsfrom Low Frequency Earthquakes for Fine-Scale Structure of the Northern Cascadia Subduction Zone, 2013 Annual Meeting of the Seismological Society of America, Salt Lake City, Utah, April 17-19.

Nowack, R.L. and M.G. Bostock (2013) Modeling and Interferometric redatuming of low frequency earthquakes for fine-scale subduction zone structure, International Workshop on Seismic Interferometry: Crust, Mantle and Core, KAUST, Saudi Arabia, Nov. 19-20.

Bostock, M.G., A.A. Royer and R.L. Nowack (2013) Studies of low frequency earthquakes in Northern Cascadia, presented at the 2013 Fall Meeting, AGU, San Francisco, Calif., Dec. 9-13.

Nowack, R.L. and M.L. Bostock (2014) Interferometric Redatuming with Application to Low Frequency Earthquakes in Northern Cascadia, Joint SEG/AGU Conference on "Advances in Active plus Passive Full-Wavefield Seismic Imaging: From Reservoirs to Plate Tectonics, July 22-24, Vancouver BC, Canada.

Nowack, R.L. and M.G. Bostock (2014) Applications and Limitations of Redatuming to Low Frequency Earthquakes in Northern Cascasdia, Annual Fall Meeting of the American Geophysical Union, San Francisco, Dec. 15-19.

Lopez-Comino, J.A., D. Stich, A.M.G. Ferriera, J. Morales, and R.L. Nowack (2015) Extended Fault Inversion Through Popperian Falsificaiton: Rupture Directivity Resolution and Spatial Comparison Tests, Annual Fall Meeting of the American Geophysical Union, San Francisco, Dec. 14-18.

Oren C. and R.L. Nowack (2015) Investigations of Passive Seismic Body-wave Interferometry Using Noise Auto-correlations for Crustal and Upper Mantle Structure, Annual Fall Meeting of the American Geophysical Union, San Francisco Dec. 14-18.

Oren, C. and R.L. Nowack (2016) Passive Seismic Body-wave Interferometry using Noise Auto-correlations for Crustal and Upper Mantle Structure, Annual Meeting of the Seismological Society of America, Reno Nevada, April 20-22.

Nowack, R.L. and O. Can (2016) Effects of Processing and the Ambient Noise Distribution on Seismic Interferometry using Auto-Correlation Stacks, Annual Fall Meeting of the American Geophysical Union, San Francisco, Dec. 12-16.

Kiraz, M. S. R. and R. L. Nowack (2017) Testing of Marchenko redatuming and imaging for carbon sequestration monitoring, Annual Fall Meeting of the American Geophysical Union, New Orleans, Dec. 11-15.

Nowack, R. L. and M. S. R. Kiraz (2017) Virtual vertical seismic profiling using seismic interferometry and Marchenko redatuming, Annual Fall Meeting of the American Geophysical Union, New Orleans, Dec. 11-15.

Nowack, R.L. and M.S.R. Kiraz (2018) An overview of Marchenko redatuming and imaging related to VSP Modeling, WTOPI Modeling and Imaging Project Annual Meeting, University of California Santa Cruz, July 17-18, Invited Talk.

Nowack, R.L. and M.S.R. Kiraz (2018) Virtual Green's functions using Marchenko redatuming with applications to subsurface imaging and carbon sequestration, Seismic-Wave Scattering, Imaging and Inversion International Workshop, July 19-21, University of California Santa Cruz, July 19-21.

Kiraz, M.S.R., and R.L. Nowack (2018) Comparison of Marchenko redatuming and imaging with conventional VSP processing applied to the Frio carbon sequestration experiment, Recent Advances and Applications in Borehole Geophysics SEG Research Workshop, Society of Exploration Geophysicists, Galveston TX, Aug. 27-31.

Erhan, E. and R. L. Nowack (2018) Enhancing The Resolution Of Near Surface Seismic Reflection Data Using Time-Variant Iterative Time-Domain Deconvolution, Annual Fall Meeting of the American Geophysical Union, Washington DC, Dec. 9-14.

Kiraz, M.S. R. and R. L. Nowack (2018) Application of Marchenko Redatuming and Imaging to Data from the Frio Carbon Sequestration Experiment, Annual Fall Meeting of the American Geophysical Union, Washington DC, Dec. 9-14.

Ergun Erhan and R. L. Nowack (2019) Increased resolution of shallow seismic data by non-stationary iterative time domain deconvolution, Annual Meeting/Symposium on the Application of Geophysics to Engineering and Environmental Problems, (SAGEEP), April 20-23, Portland Oregon.

Zeng, Q. and R.L. Nowack (2019) Crustal Structure from Correlation Analysis of the Coda of Local Seismicity Beneath a Large-N Array, Annual Meeting of the American Geophysical Union, San Francisco, Dec. 9-13 2019.

Huang, Y. and R.L. Nowack (2019) The Imaging of Sparse Seismic Data using Convolutional Neural Networks, Annual Meeting of the American Geophysical Union, San Francisco, Dec. 9-13 2019.

Zeng, J. and R.L. Nowack (2020) The Analysis of Coda from Local Seismicity at a Large-N Array for Crustal Structure, Annual Meeting of the Seismological Society of America, Seismological Research Letters, 91, (2B), 1303.

Huang, J. and R.L.Nowack (2020) Machine Learning for the Imaging of Sparse Seismic Data in Blocky Subsurface Models, Annual Meeting of the American Geophysical Union, San Francisco.

Xu, W. and R.L. Nowack (2020) Converting Smaller Seismic Arrays to Larger-N Synthetic Aperture Arrays using Deen Learning, Annual Meeting of the American Geohysical Union,San Fransciso.

Technical Reports:

Nowack, R.L. (1980) Users Manual for MAPLOT: An Interactive Hypocenter Plotting Program, U.S. Geological Survey, Open File Report.

Data Products:

Robert Nowack (2019) Autocorrelation of ambient noise and P-wave coda for crustal structure. International Federation of Digital Seismograph Networks. Dataset/Seismic Network. 10.7914/SN/7G_2019