Kasper van Wijk

CONTACT INFORMATION

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RESEARCH INTERESTS

Wave propagation in disordered media, near-surface geophysics, noncontacting (microwave and laser) geophysical sensor development, laser ultrasonics, physical and numerical modeling of issues related to exploration and global seismology, land mine detection, ice physics, and inverse theory

EDUCATION

Colorado School of Mines, Golden, Colorado USA

Ph.D. in Geophysics (Center for Wave Phenomena), 2003

- Dissertation title: Multiple scattering of surface waves
- Advisor: John A. Scales

Visiting scholar in 1996 and 1997, working on data uncertainty estimation for least squares optimization

Utrecht University, The Netherlands

M.S. in Geophysics, 1997

- Topic: Data and model uncertainty estimation for geophysical data
- Advisor: Kabir Roy-Chowdhury

APPOINTMENTS

◇ Assistant Professor and director of the Physical Acoustics Laboratory, Department of Geosciences, Boise State University (2006-)

◇ Research Assistant Professor and co-director of the Physical Acoustics Laboratory, Department of Geophysics, Colorado School of Mines (2004-2006)

◇ Postdoctoral Fellow at the Physical Acoustics Laboratory, Department of Geophysics, Colorado School of Mines (2003-2004)

◇ Instructor at Colorado Outdoor Education Center and certified high ropes course instructor (1998)

CURRENT/PAST ADVISORS AND SPONSORS

Russell Harmon (Army Research Office), John Scales (Colorado School of Mines), Ken Larner (Center for Wave Phenomena), Jerome R. McLain (Colorado Outdoor Education Center), Kabir Roy-Chowdhury (Utrecht University)

PROFESSIONAL AFFILIATIONS

American Geophysical Union, Society of Exploration Geophysicists, Acoustical Society of America

COURSES TAUGHT

◇ **Boise State University**: Field Methods (GEOPH486), Seeing the Unseen (GEOPH201), Processes and Properties of the Earth-II (GEOPH502), Mathematical Physics in Geoscience (GEOPH597), Electromagnetic and Seismic Wave Propagation (GEOPH540)

◇ **Colorado School of Mines**: Inverse Theory (GP605), Linear Systems (GP306), Mathematical Physics (PH311), and Field Methods (GP486)

Peer-reviewed publications

Observation and modeling of source effects in coda wave interferometry at Pavlof volcano, Alaska
Haney, M. M., van Wijk, K., Preston, L. A., and Aldridge, D. F.
to appear in **The Leading Edge**, 2009

Seismic wave attenuation in carbonates
L. Adam, M. Batzle, K. Lewallen and K. van Wijk
Journal of Geophysical Research 114, B06208, 2009

The virtual refraction: useful spurious energy in seismic interferometry
D. Mikesell, K. van Wijk, A. Calvert and M. M. Haney
Geophysics, 74(3), A13-A17, 2009

On estimating the impulse response between receivers in a controlled ultrasonic experiment
K. van Wijk
Seismic Interferometry: History and Present Status, SEG reprint series (26), 250-256, 2008

The cancellation of spurious arrivals in Green's function extraction and the generalized optical theorem
R. K. Snieder, K. van Wijk, M. M. Haney and R. Calvert
Physical Review E, 78(3),036606, 2008

Modified Kubelka-Munk equations for localized waves inside a layered medium
M. M. Haney and K. van Wijk
Physical Review E, 75(3), 036601, 2007

Physical modeling and analysis of P-wave attenuation anisotropy in transversely isotropic media
Y. Zhu, I. Tsvankin, P. Dewangan and K. van Wijk
Geophysics, 72(1), D1-D7, 2007

PS-wave moveout inversion for tilted TI media: A physical-modeling study
P. Dewangan, I. Tsvankin, M. Batzle, K. van Wijk and M. Haney
Geophysics, 71(4), D135-D143, 2006

On estimating the impulse response between receivers in a controlled ultrasonic experiment
K. van Wijk
Geophysics, 71(4), SI79-SI84, 2006

Toward noncontacting seismology
K. van Wijk, J. A. Scales, T. D. Mikesell and J. R. Peacock
Geophysical Research Letters, 42, L01308, 2005

Radiative transfer in 1D, and its connection to the O'Doherty-Anstey formula
M. M. Haney, K. van Wijk and R. K. Snieder
Geophysics, 70(1), T1-T11, 2005

Surface-wave inversion limitations from laser-Doppler physical modeling
L. Bodet, K. van Wijk, A. Bitri, O. Abraham, P. Côte, G. Grandjean and D. Leparoux
Journal of Environmental and Engineering Geophysics, 10(1), 13-24, 2005

Imaging and suppressing near-receiver scattered surface waves
X. A. Campman, K. van Wijk, J. A. Scales and G. C. Herman
Geophysics, 70(2), V21-V29, 2005

Imaging scattered seismic surface waves
X. Campman, K. van Wijk, C. D. Riyanti, J. A. Scales and G. Herman
Near Surface Geophysics 2(4),223-230, 2004

Surface wave dispersion from small vertical scatterers
K. van Wijk and A. L. Levshin
Geophysical Research Letters, 31, L20602, 2004

Analysis of strong scattering at the micro-scale
K. van Wijk, D. Komatitsch, J. A. Scales and J. Tromp
Journal of the Acoustical Society of America, 115(3), 1006-1011, 2004

1D energy transport in a strongly scattering laboratory model
K. van Wijk, M. Haney and J. A. Scales
Physical Review E, 69(3), 036611, 2004

Multiple scattering of surface waves
K. van Wijk
PhD Thesis, Department of Geophysics, Colorado School of Mines, 2003

Data uncertainty analysis and error estimation for linear inversion problems
K. van Wijk, J. A. Scales, W. Navidi and L. Tenorio
Geophysics Journal International, 149, 625-632, 2002

Tunable multiple-scattering system
J. A. Scales and K. van Wijk
Applied Physics Letters, 79(14), 2294-2296, 2001

Multiple scattering attenuation and anisotropy of ultrasonic surface waves
J. A. Scales and K. van Wijk
Applied Physics Letters, 74(25), 3899-3901, 1999

PAST, CURRENT AND PENDING FUNDING

- Co-PI with Liberty on Humanitarian geophysics: establishment of a new undergraduate subdiscipline at Boise State University (Boise State University International Program, 2009-2010)
- Co-PI with Liberty and Wood on Northern Thailand Environmental and Engineering Geophysics Field Camp (SEG Foundation, 2008-2010)
- Co-PI with Revil, Batzle and Liberty on Component Technologies R&D: Joint inversion of electrical and seismic data for Fracture characterization and Imaging of Fluid Flow in Geothermal Systems. (DOE, 2008-2010)
- PI on Suitability for Layered Basalt Deposits as Targets of Industrial Carbon Dioxide Sequestration (INL LDRD, 2007-2009)
- Donation from BossaNova Tech to Physical Acoustics Lab (2008)
- PI on Reservoir monitoring with multiply scattered seismic waves (ConocoPhillips, 2008-2013)
- PI on Geophysical Field Camp (SEG Foundation, 2007-2009)
- PI on Surface waves for exploration geophysics (GXT, 2007-2009)
- Donations from BHP, Shell and Talisman (2003-2005)
- Co-PI with Scales for Army Research Office: Acousto-optic landmine detection (2003-2005, 45480-EV)
- Co-PI with Scales and Squier for NSF: Imaging the Earth with multiple scattering speckle (2004-2006)
- Co-PI with Scales and Weiss for NSF: Millimeter-wave vector network analyzer: seismology without seismometers (2004-2006)
- Co-PI with Scales for NSF: Development of new instrumentation and techniques for real-time spatial interferometry of geophysical processes (2004-2006)
- Co-PI with Scales for Defense University Research Instrumentation Program: A system for high resolution remote sensing of the Earth's near-surface (2005-2006)

Past and current collaborations

Seismic Interferometry: Matt Haney, Roel Snieder, Alex Calvert

Surface wave scattering: Xander Campman (Shell), Ludovic Bodet (University of Le Mans), Anatoli Levshin (University of Colorado, Boulder)

Numerical modeling of multiple scattering in seismics: Dimitri Komatitsch (University of Pau) and Jeroen Tromp (Caltech)

Land-mine detection: John Scales (CSM) and Martin Smith (New England Research)

Physical modeling: Don Sherlock (Chevron)

Imaging snow and ice: Andrei Kurbatov and Paul Mayewski (Climate Change Institute, University of Maine)

Development of a three-component vibrometer: Bruno Pouet (Bossa Nova Technology)

(Invited) presentations

- Invited Speaker on Exploiting multiply scattered waves with Seismic Interferometry and Modified Radiative Transfer Theory, MIT, 2009
- Invited speaker at the national teach-in Climate Change, the Energy Challenge and what does Geophysics at BSU have to do with it? Boise State University, 2009
- Invited Speaker on New and Continuing Opportunities in Near-Surface Geophysics, CSM, 2008
- Invited speaker in the session Passive Imaging and Monitoring Using Random Wavefields, at the 153rd meeting of the Acoustical Society of America in Salt Lake City, 2007
- Invited Speaker on Wave and Energy propagation in disordered media in the department of Mathematics at Boise State University, 11/03/2006
- Invited speaker at the Jackson School of Geosciences, University of Texas, 11/31/2006
- Invited speaker at Shell Research, 11/16/2006
- Invited speaker at ExxonMobil Upstream Research Company, 11/17/2006
- Invited speaker in the near-surface session The target-in-Earth Signal-to-Noise problem at the combined Spring meeting in for the American Geophysical Union and the Society of Exploration Geophysicists Baltimore, 2006
- Invited speaker at Golden's Lions Club, 2006
- Presenter of Radiative Transfer Theory for Low-Dimensional Multiple Scattering Systems
  K. van Wijk and M. M. Haney
  Annual meeting of the European Geophysical Society, Vienna 2006
- Invited speaker at the Physics department of the University of Alberta, 2003 and 2006
- Invited speaker at the Mile High Chapter of the Association of Information Technology Professionals, 2005
- Keynote speaker at the Gates Science Fair at Graland Country Day School, 2004
- Multiple scattering of Rayleigh waves
  K. van Wijk and J. A. Scales
  Poster presented at the NATO summer school on *Wave scattering in complex media, from theory to applications*, 2002
- Multiple scattering in the laboratory
  K. van Wijk and J. A. Scales
  presented at the Brazilian Geophysical Society meeting, 2001

Other accomplishments

- Associate Editor for Geophysics, first Near-Surface, now Letters section (2009-)
- Organizer and presenter at the 2008 annual meeting of the Society of Exploration Geophysicists of the technical session Innovations in Geophysics: a tribute to Rodney Calvert
- Organizer at the American Geophysical Union's Fall 2007 Meeting of two sessions titled Multiple wave scattering across length scales in the Earth
- Modification of Radiative Transfer Theory to Include Wave Interference
  K. van Wijk and M. M. Haney
  Fall meeting of the American Geophysical Union, 2007
- Spurious arrivals in seismic interferometry
  R. Snieder, K. van Wijk and M. Haney
  Fall meeting of the American Geophysical Union, 2007
- Exploring the possibilities of passive seismic interferometry to image temperate glaciers
  T. D. Mikesell, J. Bradford, K. van Wijk, and T. Raza
  Fall meeting of the American Geophysical Union, 2007
- Organizer at the AGU Fall 2006 Meeting of two sessions titled Someone's Noise is another person's signal
- Co-author on Ice core tomography with laser ultrasonics
  T. D. Mikesell and K. van Wijk
  abstract and poster for the annual Fall meeting of the American Geophysical Union, 2006
- Advising graduate and undergraduate students:
  - chair committee: Murari Khatiwada (MS, 2009), Dylan Mikesell (PhD), Andrew Lamb (PhD), Thomas Blum (PhD) and Deborah Fagan (PhD)
  - committee member: Troy Brosten (PhD, 2008), Joel Brown (PhD), Josh Nichols (PhD), and Emily Hinz (PhD), Paul van Susante (PhD, CSM)
  - past advisor for: Jared Peacock and Niran Tasdemir (MS), Dylan Mikesell and Nathan Cockrell (CSM undergraduates)
  - former mentor for: Jason Fletcher (senior design project, CSM), Justin Modroo (nondestructive testing study on skis, CSM)
  - past committees: Mahendra Kusuma, Donnie Keighley, Eldar Guliyev, Amy Hinkle (MS CSM)
- Presenter and panel member in Society of Exploration Geophysics workshop Seismic Interferometry, Daylight Imaging and Time Reversal, 2005
- Both publications Dispersion of surface waves from small vertical scatterers and Toward noncontacting seismology were released to the press as American Geophysics Union Highlights. The resulting publicity has led to a featured articles in Livescience.com and on the radio program Science Update from the American Association for the Advancement of Science
- Imaging and predicting near-field scattered surface waves received honors as a Geophysics Bright Spot by the Society of Exploration Geophysicists
- Author of a collection of answers to the problems in Electrodynamics is posted by Samizdat Press and receives between 3000 and 4000 hits per month: Solutions to problems from Jackson's classical electrodynamics
- Author of Matlab package to invert for P-wave speed in Vertical Seismic Profiling, available at http://acoustics.mines.edu/contrib
- Co-author on draft Introduction to Linear Inverse Problems, with John Scales, Martin Smith and Sven Treitel
- Short-course instructor at the Brazilian Geophysical Society meeting (2001) for Seismic Unix (SU), a free seismic data processing package, developed at CSM

- Involvement in High/Middle School Outdoor Education led to writing of the curriculum used in a Mountaineering program, and to an active experimental physics outreach program at Graland Country Day School in Denver, Colorado
- Member of the Executive Vice President for Academic Affairs' Advisory Committee for the Arthur Lakes Library, 2005-2006
- Created and maintain a Colorado School of Mines and Boise State University graduate thesis template for LaTeX
- Presenter and panel member in Society of Exploration Geophysicists workshop Near-surface problems and solutions, 2003
- Reviewer for Society for Industrial and Applied Mathematics, National Science Foundation, American Geophysical Union, European Geophysical Society, Journal of Applied Geophysics and Society of Exploration Geophysicists

Selected other publications

◇ The Virtual Refraction for Noisy Data and Elastic Media
K. van Wijk, D. Mikesell and A. Calvert
71st EAGE Conference & Exhibition incorporating SPE EUROPEC, 2009

◇ The critical angle in seismic interferometry
K. van Wijk, A. Calvert, M. M. Haney, D. Mikesell and R. K. Snieder
Extended abstract for the 78rd Annual international meeting of the Society of Exploration Geophysicists, 2008

◇ Numerical modeling of time-lapse monitoring of CO2 sequestration in a layered basalt reservoir
M. Khatiwada, K. van Wijk and M. M. Haney
Extended abstract for the 78rd Annual international meeting of the Society of Exploration Geophysicists, 2008

◇ Dynamic aspects of apparent attenuation and wave localization in layered media
M. M. Haney and K. van Wijk
Extended abstract for the 78rd Annual international meeting of the Society of Exploration Geophysicists, 2008

◇ On the relationship between the Modied Kubelka-Munk equations and the Self-Consistent theory of Anderson localization in randomly layered media
M. M. Haney and K. van Wijk (In preparation, 2009)

◇ Ice Core Tomography with Laser Ultrasonics
T. D. Mikesell, K. van Wijk, A. V. Kurbatov and P. A. Mayewski
Extended abstract for the Environmental Sensing Symposium, 2007

◇ Towards a Noncontacting Multi-Component Laser-Ultrasonic System for Geophysical Applications
T. Blum, K. van Wijk, and B. Pouet
Extended abstract for the Environmental Sensing Symposium, 2007

◇ New developments toward noncontacting seismics
J. Peacock and K. van Wijk
Extended abstract for the Symposium on the Application of Geophysics to Engineering and Environmental Problems, 2006

◇ Radiative transfer in 1D, and the connection to the O'Doherty-Anstey formula
K. van Wijk, M. Haney, R. K. Snieder and J. A. Scales
Extended abstract for the 73rd Annual international meeting of the Society of Exploration Geophysicists, 1809-1812, 2003

◇ Multilevel 3D VSP traveltime inversion in VTI media, Weyburn Field, Canada
L. Adam, K. van Wijk and T. Davis
Extended abstract for the 73rd International meeting of the Society of Exploration Geophysicists, 753-756, 2003

◇ Unknowns in Multiple Scattering
K. van Wijk and J. A. Scales
Extended abstract for the 64th Meeting of the European Association of Geoscience Engineers, Session C-29, 2002

◇ Uncertainty estimation and error analysis for linear inversion problems
K. van Wijk, J. A. Scales and W. Navidi
Extended abstract for the 63rd Meeting of the European Association of Geoscience Engineers, Session: N-33, 2001

◇ Multiple scattering in the laboratory
K. van Wijk and J. A. Scales
Extended abstract for the Brazilian Geophysical Society meeting, 2001

◇ Multiple scattering attenuation and anisotropy of ultrasonic surface waves
J. A. Scales and K. van Wijk
Journal of the Acoustical Society of America 107, 2848 (2000)

◇ Answers to a selection of questions from Jackson's Classical Electrodynamics
K. van Wijk, Samizdat Press, 1999

◇ Mountaineering curriculum for Colorado Outdoor Education Center
K. van Wijk, Colorado Outdoor Education Center, 1998