

AGU 2020 Fall Meeting – Online Conference

S008/S012/S014

Observation of Rotation, Strain, and Translation in Seismology:
Applications, Instrumentation, and Theory

Tuesday, 8 December 2020

Recent advances in seismic instrumentation have made direct observation of the complete seismic wave field possible, including rotation, strain and the spatial gradients of the wave field. This is opening new applications in various disciplines such as seismic exploration, strong motion, volcano seismology, ocean bottom seismology, earthquake engineering and planetary exploration.

Collocated observations of translation, strain and rotation have shown great potential in, for example, retrieving information on wave propagation directions and subsurface velocity, separating seismic phases, and retrieving static displacements and rotations.

We invite contributions on any recent development in the fields of applications, instrumentation, and theory for observing seismic ground rotation, strain and translation. These may include - but are not restricted to - alternative technologies for seismometers (e.g., optical technologies), fiber-optic technologies, such as fiber-optic gyroscopes or distributed acoustic sensing, high-frequency GPS, and array based methods. We strongly encourage contributions on data analysis techniques, instrument performance testing and experimental field studies.

Presentations:

- S008-01
[Quantification of Distributed Acoustic Sensing Data Fidelity \(Invited\)](#)
Pascal Edme¹, Patrick Paitz¹, Ana Nap¹, Vincent Perron², Cedric Schmelzbach¹, Andreas Fichtner¹ and Johan O A Robertsson¹, (1)ETH Zurich, Department of Earth Sciences, Institute of Geophysics, Zurich, Switzerland, (2)ETH Zurich, Swiss Seismological Service, Zurich, Switzerland
- S008-02
[Understanding sensitivity of distributed acoustic sensing integrated with velocity data \(Invited\)](#)
Eileen Rose Martin, Virginia Polytechnic Institute and State University, Department of Mathematics & CMDA Division, Blacksburg, VA, United States, Nathaniel J Lindsey, Lawrence Berkeley National Laboratory, Berkeley, CA, United States, Biondo Leonardo Biondi, Stanford University, Geophysics, Stanford, CA, United States and Jonathan Blair Ajo-Franklin, Rice University, Earth, Environmental and Planetary Sciences Department, Houston, TX, United States
- S008-03
[Comparing Earthquake Strain Records from Borehole Strainmeters and Fiber-Optic Array \(Invited\)](#)
Noha Farghal, U.S. Geological Survey, Menlo Park, CA, United States

- S008-04
[Improving the Resolution of the Isotropic Moment Tensor Component using Rotational Ground Motions \(Invited\)](#)
Stefanie Donner¹, Peter Gaebler², Thomas Plenefisch¹, Frank Krüger³, Mustač Marija⁴, Babak Hejrani⁵, Hrvoje Tkalčić⁶ and Heiner Igel⁷, (1)BGR Federal Institute for Geosciences and Natural Resources, Hannover, Germany, (2)Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Germany, (3)University of Potsdam, Potsdam, Germany, (4)University of Zagreb, Department of Geophysics, Zagreb, Croatia, (5)Geoscience Australia, Symonston, ACT, Australia, (6)Australian National University, Research School of Earth Sciences, Canberra, ACT, Australia, (7)Ludwig Maximilians University of Munich, Munich, Germany
- S008-05
[Ambient seismic noise interferometry using rotational ground motion \(Invited\)](#)
Celine Hadziioannou¹, Paul Neumann¹, Joachim M Wassermann², Ulrich Schreiber³ and Heiner Igel⁴, (1)University of Hamburg, Hamburg, Germany, (2)Section Geophysics, Munich, Germany, (3)Technical University of Munich, Munich, Germany, (4)Ludwig Maximilians University of Munich, Munich, Germany
- S008-06
[High Resolution Sagnac Interferometry for the Geosciences \(Invited\)](#)
Karl Ulrich Schreiber, Technical University of Munich, FESG - Geodetic Observatory Wettzell, Bad Koetting, Germany, Heiner Igel, Ludwig Maximilians University of Munich, Munich, Germany, Jan Kodet, Technical University of Munich, Munich, Germany, Joachim M Wassermann, Section Geophysics, Munich, Germany and Jon-Paul Renee Wells, University of Canterbury, School of Physical and Chemical Sciences, Christchurch, New Zealand
- S014-01
[Mixed-Component Ambient Noise Cross-Correlations using Distributed Acoustic Sensing Arrays and Single Point Inertial Seismic Sensors](#)
Avinash Nayak¹, Verónica Rodríguez Tribaldos², Nathaniel J Lindsey¹, Inder Monga¹, Chris Tracy¹, Patrick F Dobson³ and Jonathan Ajo-Franklin⁴, (1)Lawrence Berkeley National Laboratory, Berkeley, CA, United States, (2)Lawrence Berkeley National Laboratory, Earth and Environmental Sciences Area, Berkeley, CA, United States, (3)Lawrence Berkeley Nat Lab, Berkeley, CA, United States, (4)Rice University, Houston, United States
- S014-02
[Distributed acoustic sensing for wireline borehole acquisition: noise sources and suppression methods](#)
Evgeniia Martuganova¹, Manfred Stiller¹, Klaus Bauer¹, Jan Henniges¹ and Charlotte M Krawczyk^{1,2}, (1)Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Potsdam, Germany, (2)Technical University Berlin, Berlin, Germany

- S014-03
Analysis of Shallow Wave Propagation Using Distributed Acoustic Sensing Beneath Bern, Switzerland
Krystyna T Smolinski¹, Patrick Paitz¹, Daniel C Bowden¹, Pascal Edme¹, Felix Kugler² and Andreas Fichtner¹, (1)ETH Zurich, Department of Earth Sciences, Institute of Geophysics, Zurich, Switzerland, (2)SWITCH, Zurich, Switzerland
- S014-04
Comparing Single-station 6C Measurements and Array Measurements for Seismic Microzonation
Sabrina Keil¹, Alexander Wilczek², Joachim M Wassermann¹ and Heiner Igel¹, (1)Ludwig Maximilians University of Munich, Munich, Germany, (2)DMT GmbH & Co KG, Essen, Germany
- S014-05
From Strain to Rotation: Connecting Waveform Gradients
Patrick Paitz¹, Pascal Edme², Cedric Schmelzbach², David Sollberger³, Felix Bernauer⁴, Heiner Igel⁵ and Andreas Fichtner², (1)Department of Earth Sciences, Institute of Geophysics, Zürich, Switzerland, (2)ETH Zurich, Department of Earth Sciences, Institute of Geophysics, Zurich, Switzerland, (3)ETH Zurich, Zurich, Switzerland, (4)LMU Munich, Munich, Germany, (5)Ludwig Maximilians University of Munich, Munich, Germany
- S014-06
[Array-derived rotational motion provides local wave propagation properties of earthquakes induced by the 2018 geothermal stimulation experiment in Finland](#)
George Taylor, **Gregor Hillers** and Tommi A. T. Vuorinen, University of Helsinki, Institute of Seismology, Helsinki, Finland
- S014-07
Analyses of Seismicity at Etna Volcano, Italy, using Rotational Sensor Data
Martina Roskopf¹, Eva P. S. Eibl¹, Gilda Maria Currenti², Philippe Jousset³, Joachim M Wassermann⁴, Daniel Vollmer¹, Graziano LaroCCA², Daniele Pellegrino², Mario Pulviventì² and Danilo Contrafatto², (1)University of Potsdam, Potsdam, Germany, (2)National Institute of Geophysics and Volcanology, Sezione di Catania, Rome, Italy, (3)Helmholtz Center GFZ, Potsdam, Germany, (4)Ludwig Maximilians University of Munich, Munich, Germany
- S014-08
Anisotropic Elastic Tensor Estimation from Joint Analysis of Translation and Rotation
Sebastian Noe¹, Shihao Yuan² and Heiner Igel¹, (1)Ludwig Maximilians University of Munich, Munich, Germany, (2)Ludwig Maximilians University of Munich, Department of Earth and Environmental Sciences, Munich, Germany

Posters:

- S012-0001
Optomechanical calibration for absolute seismic acceleration references
Jon R Pratt¹, Stephan Schlamminger², Frank Seifert² and David Newell³, (1)National Institute of Standards and Technology Gaithersburg, Gaithersburg, MD, United States, (2)National Institute of Standards and Technology, Gaithersburg, United States, (3)NIST, Gaithersburg, MD, United States
- S012-0002
Bias Compensation of Low-cost Accelerometers Using GNSS for Ground Deformation Monitoring
Seung-Woo Lee, Pusan National University, Busan, Korea, Republic of (South) and Sung-Hyo Yun, Pusan Natl Univ, Busan, Korea, Republic of (South)
- S012-0003
Testing of a Six Degree of Freedom Sensor for Seismic Building Monitoring.
Louisa Murray-Bergquist¹, Heiner Igel¹, Felix Bernauer² and Joachim M Wassermann³, (1)Ludwig Maximilians University of Munich, Munich, Germany, (2)LMU Munich, Munich, Germany, (3)Section Geophysics, Munich, Germany
- S012-0004
Assessing a 6C Kalman Filter using Experimental Datasets from an Industrial Robot
Yara Rossi¹, Konstantinos Tassis², Konstantin Arbogast¹, Mudathir Awadaljeed¹, Eleni Chatzi², Markus Rothacher³ and John F Clinton⁴, (1)ETH Swiss Federal Institute of Technology Zurich, Institute of Geodesy and Photogrammetry, Zurich, Switzerland, (2)ETH Swiss Federal Institute of Technology Zurich, Institute of Structural Engineering, Zurich, Switzerland, (3)ETH Zurich, Institute of Geodesy and Photogrammetry, Zurich, Switzerland, (4)ETH Swiss Federal Institute of Technology Zurich, Swiss Seismological Service (SED), Zurich, Switzerland
- S012-0005
A Huddle Test with Multiple 6C Rotational and Translational Instruments in Fürstentfeldbruck, Germany
Gizem Izgi¹, Stefanie Donner², Felix Bernauer³, Katrin Behnen⁴, Daniel Vollmer¹, Klaus Stammler², Mathias Hoffmann² and Eva P. S. Eibl¹, (1)University of Potsdam, Potsdam, Germany, (2)BGR Federal Institute for Geosciences and Natural Resources, Hannover, Germany, (3)LMU Munich, Munich, Germany, (4)Ludwig Maximilians University of Munich, Munich, Germany

- S012-0006
[Performance Testing of Rotation Sensors in Seismology With an Active Source Experiment](#)
Kathrin Behnen¹, Felix Bernauer², Joachim M Wassermann³, Heiner Igel¹, Stefanie Donner⁴, Eva P. S. Eibl⁵, Raphael F. Garcia⁶, Frederic Guattari⁷, Klaus Stammler⁴ and Mathias Hoffmann⁴, (1)Ludwig Maximilians University of Munich, Munich, Germany, (2)LMU Munich, Munich, Germany, (3)Section Geophysics, Munich, Germany, (4)BGR Federal Institute for Geosciences and Natural Resources, Hannover, Germany, (5)University of Potsdam, Potsdam, Germany, (6)Institut Supérieur de l'Aéronautique et de l'Espace, DEOS/SSPA, Toulouse Cedex 04, France, (7)iXblue, Saint-Germain-en-Laye, France
- S012-0007
[Towards Multi-Component Observations of Seismic Rotation, Strain and Translation](#)
Felix Bernauer¹, Joachim M Wassermann², Heiner Igel³, Stefanie Donner⁴, Klaus Stammler⁴, Mathias Hoffmann⁴, Patrick Paitz⁵, David Sollberger⁶, Pascal Edme⁷, Cedric Schmelzbach⁷ and Eva P. S. Eibl⁸, (1)Ludwig Maximilians University of Munich, Earth- and Environmental Sciences, Munich, Germany, (2)Section Geophysics, Munich, Germany, (3)Ludwig Maximilians University of Munich, Munich, Germany, (4)BGR Federal Institute for Geosciences and Natural Resources, Hannover, Germany, (5)Department of Earth Sciences, Institute of Geophysics, Zürich, Switzerland, (6)ETH Zurich, Zurich, Switzerland, (7)ETH Zurich, Department of Earth Sciences, Institute of Geophysics, Zurich, Switzerland, (8)University of Potsdam, Potsdam, Germany
- S012-0008
[ROMY: Data Analysis](#)
Andreas Brotzer¹, Heiner Igel¹ and Ulrich Schreiber², (1)Ludwig Maximilians University of Munich, Munich, Germany, (2)Technical University of Munich, Munich, Germany
- S012-0009
[True-North Alignment on the Field: From a Compass to an Optical Gyrocompass](#)
Frederic Guattari, Pierrick Auregan, Elliot De Toldi, Théo Laudat, Laurent Mattio and Sebastien Boisgontier, iXblue, Saint-Germain-en-Laye, France
- S012-0010
[Numerical Modelling based on Asymmetric Elastic Wave Equations with High-speed Train Seismic Source over the Bridge](#)
Chaopu Chen¹, Zhiyang Wang¹, Duli Yu¹, Youming Li² and Wenlei Bai¹, (1)Beijing University of Chemical Technology, Beijing, China, (2)Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China

- S012-0011
Rupture and traffic tracking with six degree-of-freedom ground motion observations: a proof of concept
Shihao Yuan¹, Alice-Agnes Gabriel², Dave May³, Joachim M Wassermann² and Heiner Igel², (1)Ludwig Maximilians University of Munich, Department of Earth and Environmental Sciences, Munich, Germany, (2)Ludwig Maximilians University of Munich, Munich, Germany, (3)University of Oxford, Department of Earth Sciences, Oxford, United Kingdom
- S012-0012
Determination of Short-term SSE Slip Extent by Small BSM Observations
Satoshi Itaba, GSJ, AIST, Tsukuba, Ibaraki, Japan
- S012-0013
A Unified Wavefield-Partitioning Approach for Distributed Acoustic Sensing
James Atterholt, Zhongwen Zhan, Zhichao Shen and Zefeng Li, California Institute of Technology, Pasadena, CA, United States
- S012-0014
High-resolution foreshock evolution of the 2020 Mw5.8 Owens Lake earthquake illuminated with Olancha DAS array
 – > **ABSTRACT WITHDRAWN (Cancelled)**
- S012-0015
Can Seismic Event Size (Mw) be Measured with Distributed Acoustic Sensing (DAS)?
Rengin Gok¹, Robert J Mellors¹, Chris Minto² and Martin Karrenbach³, (1)Lawrence Livermore National Laboratory, Livermore, CA, United States, (2)OptaSense Inc., London, United Kingdom, (3)OptaSense Inc., Brea, CA, United States
- S012-0016
Microearthquake Monitoring of the Sacramento Basin Using Dark Fiber and Distributed Acoustic Sensing (DAS)
Dennise C Templeton, Lawrence Livermore National Laboratory, Livermore, CA, United States, Christina Morency, Lawrence Livermore National Laboratory, Atmospheric, Earth and Energy Division, Livermore, CA, United States, Eric Matzel, LLNL, Livermore, CA, United States, Emily Maher, Lawrence Livermore National Laboratory, Livermore, United States and Jonathan Ajo-Franklin, Rice University, Houston, United States
- S012-0017
Use of Multiple DAS Fiber-Optic Arrays for Microseismic Monitoring and Event Location
Steve Cole¹, Martin Karrenbach², Victor Yartsev¹, Jon Furlong³ and Melissa Emuh⁴, (1)OptaSense, Inc, Brea, CA, United States, (2)OptaSense Inc., Brea, CA, United States, (3)OptaSense, Calgary, Canada, (4)OptaSense Inc, Brea, United States

- S012-0018
Seismic monitoring with downhole DAS – examples from the FORGE Enhanced Geothermal System project
Ariel Lellouch¹, Ryan Schultz², Nathaniel J Lindsey³, Biondo Leonardo Biondi² and William L Ellsworth⁴, (1)Stanford Earth Sciences, Stanford, CA, United States, (2)Stanford University, Geophysics, Stanford, CA, United States, (3)Stanford University, Dept. of Geophysics, Stanford, CA, United States, (4)Stanford University, Department of Geophysics, Stanford, CA, United States
- S012-0019
Distributed Acoustic Sensing for the Exploration of the Mount Meager Volcanic Complex, British Columbia, Canada.
Sara Klaasen¹, Andreas Fichtner¹, Patrick Paitz¹ and Jan Dettmer², (1)ETH Zurich, Department of Earth Sciences, Institute of Geophysics, Zurich, Switzerland, (2)University of Calgary, Department of Geoscience, Calgary, AB, Canada
- S012-0020
Volcano monitoring and structural investigation with Distributed Acoustic Sensing at Mount Etna, Italy.
Philippe GM Jousset¹, Gilda Maria Currenti², Athena Chalari³, Luciano Zuccarello⁴, Rosalba Napoli⁵, Thomas Reinsch¹ and Charlotte M Krawczyk^{1,6}, (1)Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Potsdam, Germany, (2)National Institute of Geophysics and Volcanology, Sezione di Catania, Rome, Italy, (3)Silixa Ltd., Hertfordshire, United Kingdom, (4)Istituto Nazionale di Geofisica e Vulcanologia, Catania, Italy, (5)Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania, Catania, Italy, (6)Technical University Berlin, Berlin, Germany