Samantha E. Hansen

George Lindahl III Endowed Professor

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PROFESSIONAL PREPARATION

The University of California, Santa Cruz Earth and Planetary Sciences *Advisors:* Drs. Susan Schwartz and Arthur Rodgers	Ph.D.	2007
The University of Wisconsin, Madison Geosciences *Advisor:* Dr. Clifford Thurber	M.S.	2002
The University of Wisconsin, Madison Geological Engineering and Geosciences	B.S.	2000

APPOINTMENTS

George Lindahl III Endowed Professor	University of Alabama	2020-present
George Lindahl III Endowed Assoc. Prof.	University of Alabama	2019-2020
Associate Professor	University of Alabama	2015-2019
Assistant Professor	University of Alabama	2010-2015
NSF Postdoctoral Research Fellow	Pennsylvania State University	2009-2010
AfricaArray Postdoctoral Researcher	Pennsylvania State University	2008-2009
Graduate Student Research Fellow	Lawrence Livermore National Lab	2005-2007

TEACHING EXPERIENCE

Professional Teaching, The University of Alabama

The Dynamic Earth	Introduction Geophysics	Geodynamics
Seismology	Graduate Seminar in Geology	

Postdoctoral Teaching, Pennsylvania State University

The African Continent	AfricaArray Summer Field School

Teaching Assistant, University of California, Santa Cruz and University of Wisconsin, Madison

Evolution of the Earth	Introduction to Applied Geophysics
Geologic Principles	Field methods in Applied and Engineering Geophysics
Geology of National Parks	Gems and Precious Stones

REFEREED PUBLICATIONS († indicates student author under my supervision)

Ho, L.M.†, J.I. Walter, **S.E. Hansen**, J.L. Sánchez Roldán, and Z. Peng (2024). Evaluating Automated Seismic Event Detection Approaches: An Application to Victoria Land, East Antarctica, *J. Geophys. Res. Machine Learn. Comp*., *1*, doi: 10.1029/2024JH000185.

Agboola, K.J.†, **S.E. Hansen**, E.J. Garnero, S. Rost, M. Li, and S.-H. Shim (2024). Ultra-low

Velocity Zones beneath the Southern Hemisphere imaged with Double-Array Stacking of PcP Waveforms, *J. Geophys. Res. Solid Earth, 129*, doi: 10.1029/2023JB028170.

Saeidi, H.†, **S.E. Hansen**, A.A. Nyblade, and R. Haag† (2024). Mantle Structure beneath the Damara Belt in south-central Africa Imaged using Adaptively Parameterized P-wave Tomography, *J. Geophys. Res*. *Solid Earth*, *129*, doi: 10.1029/2023JB027965.

Hansen, S.E., E.J. Garnero, M. Li, S.-H. Shim, and S. Rost (2023). Globally Distributed Subducted Materials along the Earth's Core-Mantle Boundary: Implications for Ultra-low Velocity Zones, *Science Adv.*, *9*, doi: 10.1126/sciadv.add4838.

Saeidi, H.†, **S.E. Hansen**, and A.A. Nyblade (2023). Deep Mantle Influence on the Cameroon Volcanic Line, *Geochem. Geophys. Geosyst.*, *24*, doi: 10.1029/2022GC010621.

Hansen, S.E., E.J. Garnero, and S. Rost (2021). Historical Interstation Pattern Referencing (HIPR): an application to PcP waves recorded in Antarctica for ULVZ imaging, *J. Geophys. Res. Solid Earth*, *126*, doi: 10.1029/2021JB022741.

Emry, E.L., A.A. Nyblade, A. Horton, **S.E. Hansen**, J. Julia, R.C. Aster, A.D. Huerta, J.P. Winberry, D.A. Wiens, and T.J. Wilson (2020). Prominent thermal anomalies in the mantle transition zone beneath the Transantarctic Mountains, *Geology*, *48*, doi: 10.1130/G47346.1.

Hansen, S.E., S.E. Carson†, E.J. Garnero, S. Rost, and S. Yu (2020). Investigating Ultra-low Velocity Zones in the Southern Hemisphere using an Antarctic Dataset, *Earth Planet. Sci. Lett., 536*, doi: 10.1016/j.epsl.2020.116142.

Lloyd, A.J., D.A. Wiens, H. Zhu, J. Tromp, A.A. Nyblade, R.C. Aster, **S.E. Hansen**, I.W.D. Dalziel, T.J. Wilson, E.R. Ivins, and J.P. O'Donnell (2020). Seismic Structure of the Antarctic Upper Mantle based on Adjoint Tomography, *J. Geophys. Res. Solid Earth*, *124*, doi: 10.1029/2019JB017823.

Hansen, S.E., C.P. Evangelidis, and G.A. Papadopoulos (2019). Imaging Slab Detachment within the Western Hellenic Subduction Zone, *Geochem. Geophys. Geosyst.*, *20*, 895-912, doi: 10.1029/2018GC007810.

White-Gaynor, A.L., A.A. Nyblade, R.C. Aster, D.A. Wiens, P.D. Bromirski, P. Gerstoft, R.A. Stephen, **S.E. Hansen**, T. Wilson, I.W. Dalziel, A.D. Huerta, J.P. Winberry, and S. Anandakrishnan (2019). Heterogeneous upper mantle structure beneath the Ross Sea Embayment and Marie Byrd Land, West Antarctica, revealed by P-wave tomography, *Earth Planet. Sci. Lett.*, *513*, *40-50*, doi: 10.1016/j.epsl.2019.02.013.

Shen, W., D.A. Wiens, S. Anandakrishnan, R.C. Aster, P. Gerstoft, P.D. Bromirski, **S.E. Hansen**, I.W.D. Dalziel, D.S. Heeszel, A.D. Huerta, A.A. Nyblade, R. Stephen, T.J. Wilson, and J.P. Winberry (2018). The crustal and upper mantle structure of Central and West Antarctica from Bayesian inversion of Rayleigh wave and receiver function data, *J. Geophys. Res. Solid Earth*, *123*, 7824-7849, doi: 10.1029/2017JB015346.

Shen, W., D.A. Wiens, T. Stern, S. Anandakrishnan, R.C. Aster, I. Dalziel, **S.E. Hansen**, D.S. Heeszel, A. Huerta, A. Nyblade, T.J. Wilson, and J.P. Winberry (2017). Seismic evidence for lithospheric foundering beneath the southern Transantarctic Mountains, Antarctica, *Geology*, *46*, 71-74, doi: 10.1130/G39555.1.

Zhang, Y., H. Sun, H.H. Stowell, M. Zayernouri, and **S.E. Hansen** (2017). A review of applications of fractional calculus in Earth system dynamics, *Chaos, Solitons & Fractals*, *102,* 29-46, doi: 10.1016/j.chaos.2017.03.051.

Brenn, G.R.†, **S.E. Hansen**, and Y. Park (2017). Variable thermal loading and uplift along the Transantarctic Mountains, Antarctica, *Geology*, *45*, 463-466, doi: 10.1130/G38784.1.

Graw, J.H.†, **S.E. Hansen**, C. Langston, B. Young, A. Mostafanejad, and Y. Park (2017). Assessment of Crustal and Upper Mantle Velocity Structure by Removing the Effect of an Ice Layer on the P-wave Response: An Application to Antarctic Seismic Studies, *Bull. Seis. Soc. Am.*, *107,* 639-651*,* doi: 10.1785/0120160262.

Graw, J.H.† and **S.E. Hansen** (2017). Upper Mantle Seismic Anisotropy beneath the Northern Transantarctic Mountains, Antarctica from PKS, SKS, and SKKS Splitting Analysis, *Geochem. Geophys. Geosys.*, *18*, 544-557, doi: 10.1002/2016GC006729.

Graw, J.H.†, A.N. Adams, **S.E. Hansen**, D.A. Wiens, L. Hackworth†, and Y. Park (2016). Upper mantle shear wave velocity structure beneath northern Victoria Land, Antarctica: Volcanism and uplift in the northern Transantarctic Mountains, *Earth Plant. Sci. Lett., 449,* 48-60, doi: 10.1016/j.epsl.2016.05.026.

Hansen, S.E., L.M. Kenyon†, J.H. Graw†, Y. Park, and A.A. Nyblade (2016). Crustal structure beneath the Northern Transantarctic Mountains and Wilkes Subglacial Basin: Implications for Tectonic Origins, *J. Geophys. Res. Solid Earth*, *121*, 812-825, doi:10.1002/2015/JB012325.

Ramirez, C., A.A. Nyblade, **S.E. Hansen**, D.A. Wiens, S. Anandakrishnan, R.C. Aster, A.D. Huerta, P.J. Shore, and T. Wilson (2016). Crustal and Upper Mantle Structure beneath Ice-Covered Regions in Antarctica from S-wave Receiver Functions and Implications for Heat Flow, *Geophys. J. Int.*, *204*, 1636-1648, doi: 10.1093/gji/ggv542.

Hansen, S.E., A. Reusch, T. Parker, D. Bloomquist, P. Carpenter, J.H. Graw†, and G.R. Brenn† (2015). The Transantarctic Mountains Northern Network (TAMNNET): Deployment and Performance of a Seismic Array in Antarctica, *Seism. Res. Lett.*, *86*, 1636-1644, doi: 10.1785/0220150117.

Hansen, S.E., J.H. Graw†, L.M. Kenyon†, A.A. Nyblade, D.A. Wiens, R.C. Aster, A.D. Huerta, S. Anandakrishnan, and T. Wilson (2014). Imaging the Antarctic mantle using adaptively parameterized P-wave tomography: Evidence for heterogeneous structure beneath West Antarctica, *Earth Planet. Sci. Lett.*, *408*, 66-78, doi: 10.1016/j.epsl.2014.09.043.

Hansen, S.E., H.R. DeShon, M.M. Driskell, and A.M.S. Al-Amri (2013) Investigating the P-wave Velocity Structure beneath Harrat Lunayyir, northwestern Saudi Arabia, using Double-Difference Tomography and Earthquakes from the 2009 Seismic Swarm, *J. Geophys. Res. Solid Earth*, *118*, 4814-4826, doi: 10.1002/jgrb.50286.

Hansen, S.E. and A.A. Nyblade (2013) The Deep Seismic Structure of the Ethiopia/Afar Hotspot and the African Superplume, *Geol. J. Int.*, *194*, 118-124, doi: 10.1093/gji/ggt116.

Heeszel, D.S., D.A. Wiens, A.A. Nyblade, **S.E. Hansen**, M. Kanao, M. An, and Y. Zhao (2013). Rayleigh wave constraints on the structure and tectonic history of the Gamburtsev Subglacial Mountains, East Antarctica, *J. Geophys. Res. Solid Earth*, *118*, 2138-2153, doi: 10.1002/jgrb.50171.

Lloyd, A.J., A.A. Nyblade, D.A. Wiens, P.J. Shore, **S.E. Hansen**, M. Kanao, and D. Zhao (2013). Upper mantle seismic structure beneath central East Antarctica from body wave tomography: Implications for the origin of the Gamburtsev Subglacial Mountains, *Geochem. Geophys. Geosys.*, *14*, 902-920, doi: 10.1002/ggge.20098.

Kanao, M., **S.E. Hansen**, K. Kamiyama, D. Wiens, T. Higashi, A.A. Nyblade, and A. Watanabe (2012). Crustal structure from the Lützow-Holm Bay to the inland plateau of East Antarctica, based on gravity surveys and broadband seismic deployments, *Tectonphys.*, *572-573*, 100-110, doi: 10.1016/j.tecto.2012.01.014.

Hansen, S.E., A.A. Nyblade, and M.H. Benoit (2012). Mantle structure beneath Africa and Arabia from adaptively parameterized P-wave tomography: Implications for the origin of Cenozoic Afro-Arabian tectonism, *Earth Planet. Sci. Lett.*, *319-320*, 23-34, doi: 10.1016/j.epsl.2011.12.023.

Hansen, S.E., A.A. Nyblade, D. Heeszel, D.A. Wiens, P. Shore, and M. Kanao (2010). Crustal Structure of the Gamburtsev Mountains, East Antarctica, from S-wave Receiver Functions and Rayleigh Wave Phase Velocities, *Earth Planet. Sci. Lett.*, *300*, 395-401, doi: 10.1016/j.epsl.2010.10.022.

Hansen, S.E., A.A. Nyblade, and J. Julià (2009c). Estimates of Crustal and Lithospheric Thickness in Sub-Saharan Africa from S-wave Receiver Functions, *S. African J. Geol.*, *112*, 89-100, doi: 10.2113/gssajg.112.3-4.229.

Hansen, S.E., J. Julià, A.A. Nyblade, M.L. Pyle, D.A. Wiens, and S. Anandakrishnan (2009b). Using S wave receiver functions to estimate crustal structure beneath ice sheets: An application to the Transantarctic Mountains and East Antarctic craton, *Geochem. Geophys. Geosyst.*, *10*, Q08014, doi: 10.1029/2009GC002576.

Hansen, S.E., A.A. Nyblade, J. Julià, P.H.G.M. Dirks, and R. J. Durrheim (2009a). Upper Mantle low-velocity zone structure beneath the Kaapvaal Craton from S-wave receiver functions, *Geophys. J. Int.*, *178*, 1021-1027, doi: 10.1111/j.1365-246X.2009.04178.x.

Hansen, S.E., J.B. Gaherty, S.Y. Schwartz, A.J. Rodgers, and A.M.S. Al-Amri (2008). Seismic velocity structure and depth-dependence of anisotropy in the Red Sea and Arabian Shield from surface wave analysis, *J. Geophys. Res. Solid Earth*, *113*, B10307, doi:10.1029/2007JB005335.

Hansen, S.E., A.J. Rodgers, S.Y. Schwartz, and A. Al-Amri (2007). Imaging Ruptured Lithosphere beneath the Red Sea and Arabian Peninsula, *Earth Planet. Sci. Lett.*, *259*, 256-265, doi: 10.1016/j.epsl.2007.04.035, 2007.

Hansen, S.E., S.Y. Schwartz, A. Al-Amri, and A.J. Rodgers (2006b). Combined Plate Motion and Density Driven Flow in the Asthenosphere beneath Saudi Arabia: Evidence from Shear-wave Splitting and Seismic Anisotropy, *Geology*, *34*, 869-872, doi: 10.1130/G22713.1.

Hansen, S.E., S.Y. Schwartz, H.R. DeShon, and V. Gonzalez (2006a). Earthquake Relocation and Focal Mechanism Determination using Waveform Cross-Correlation, Nicoya Peninsula, Costa Rica, *Bull. Seis. Soc. Am.*, *96*, 1003-1011, doi: 10.1785/0120050129.

Hansen, S.E., C.H. Thurber, M. Mandernach, F. Haslinger, and C. Doran (2004). Seismic Velocity and Attenuation Structure of the East Rift Zone and South Flank of Kilauea Volcano, Hawaii, *Bull. Seis. Soc. Am.*, *94*, 1430-1440, doi: 10.1078/012003154.

PUBLICATIONS IN REVIEW OR IN PREP († indicates student author under my supervision)

Hansen, S.E. and E.L. Emry (*in review*). The Role of East Antarctic Tectonic Basin Structure in Future Global Sea-level Rise.

Saeidi, H.†, **S.E. Hansen**, and A.A. Nyblade (*in prep*). Exploring Seismic Discontinuities in the Mid-Mantle beneath Sub-Saharan Africa.

RECENT FIRST-AUTHORED MEETING ABSTRACTS

Hansen, S.E. and E.L. Emry, Seismic Heterogeneity in East Antarctica imaged with Full-Waveform Ambient Noise Tomography, *AGU*, San Francisco, CA, December 2023.

Hansen, S.E., E.J. Garnero, M. Li, S.-H. Shim, and S. Rost, A Global Veneer of Subducted Materials along the Earth's Core-Mantle Boundary, *AGU*, Chicago, IL, December 2022.

Hansen, S.E., E. Garnero, S. Rost, M. Li, and S.-H. Shim, Ultra-low Velocity Zone Structure at Southern Latitudes based on PcP Waveforms and Historical Interstation Pattern Referencing, *AGU*, New Orleans, LA, December 2021.

Hansen, S.E., A. Nyblade, D. Wiens, R. Aster, and S. Anandakrishnan, The History, Challenges, and Achievements of Passive Broadband Seismic Investigations in Antarctica, *AGU*, San Francisco, CA, December 2019.

RECENT INVITED TALKS AND INTERVIEWS

Nature Geoscience, Interview for Q&A article (doi: 10.1038/s41561-024-01415-3), April 2024, "Ultralow velocity zones in the deep Earth."

Interviews related to *Science Advances* publication (doi: 10.1126/sciadv.add4838), which were published in 134 different news outlets globally, April 2023; article in the top 5% of all research outputs score by Altmetric (https://scienceadvances.altmetric.com/details/145066329).

Zhejiang University, Virtual Presentation, October 2023, "Imaging ULVZs beneath Antarctica and the Southern Hemisphere with core-reflected PcP waveforms."

SCAR Workshop: The future of geodetic-geophysical observational networks in Antarctica, Fort Collins, Colorado, September-October 2022, "A Global Veneer of Subducted Materials along the Earth's Core-Mantle Boundary."

New Mexico Institute of Mining and Technology, Socorro, New Mexico, February 2019, "Imaging Slab Detachment within the Western Hellenic Subduction Zone."

Indiana University, Bloomington, Indiana, April 2018, "Exploring Uplift Mechanisms for the Northern Transantarctic Mountains."

National Observatory of Athens, Greece, November 2017, "Adaptively Parameterized Tomography: Examples and Application to the Hellenic Arc."

AWARDED GRANTS

05/01/24-09/30/25, "Developing Robust Seismic Event Catalogs for Antarctica with Fine-Tuned Deep Learning Models", University of Alabama-College Academy of Research, Scholarship, and Creative Activity, Total Award: $4,864. PI: S.E. Hansen.

08/15/20-12/31/23 "Collaborative Research: Resolving Earth Structure Influence on Ice-Sheet Stability in the Wilkes Subglacial Basin (RESISSt)", National Science Foundation Office of Polar Programs, Total Award: $566,916; UA award: $136,657. PIs: J.P. Winberry, S.E. Hansen, T.W. Becker, and A. Aschwanden.

03/01/17-08/31/20 "Collaborative Research: Imaging Seismic Heterogeneity within the Antarctic Mantle with Full Waveform Ambient Noise Tomography", National Science Foundation Office of Polar Programs, Total Award: $307,661; UA award: $71,929. PIs: E.L. Emry and S.E. Hansen.

03/01/17-02/28/20 "Collaborative Research: Antarctic Seismic Investigations of ULVZ Structure", National Science Foundation Office of Polar Programs, Total Award: $180,923; UA award: $108,311. PIs: S.E. Hansen and E.J. Garnero.

06/01/12-06/30/19 "CAREER: Deciphering the Tectonic History of the Transantarctic Mountains and the Wilkes Subglacial Basin", National Science Foundation Office of Polar Programs, Total Award: $714,584. PI: S.E. Hansen.

01/01/12-06/30/14 "New Approach to Investigate the Seismic Velocity Structure beneath Antarctica", National Science Foundation Office of Polar Programs, Total Award: $70,408. PI: S.E. Hansen.

06/01/11-06/01/13 "Seismic Velocity Structure of Harrat Lunayyir, northwestern Saudi Arabia", King Saud University Seismic Studies Center, Total Award: $25,569. PIs: S.E. Hansen and A.M.S. Al-Amri.

05/15/11-05/14/13 "Investigating the Upper Mantle Structure Beneath Antarctica", University of Alabama-Research Grants Committee, Total Award: $5,000. PI: S.E. Hansen.

12/08/10-12/07/12 "Recovery Act: Site Characterization for CO_2 Storage from Coal-fired Power Facilities in the Black Warrior Basin of Alabama", Department of Energy-National Energy Technology Laboratory, Total Award: $5,000,000. PI: P.E. Clark, co-PIs: E. Carlson, A. Goodliffe, and S.E. Hansen.

10/01/09-09/30/11 "Developing Regionalized Models of Lithospheric Thickness and Velocity Structure across Eurasia and the Middle East from Jointly Inverting P-wave and S-wave Receiver Functions with Rayleigh wave Group and Phase Velocities", Department of Energy-National Nuclear Security Administration, Total Award: $352,810; PSU award: $194,036. PI: A.A. Nyblade, co-PIs: J. Julià, A.J. Rodgers, E. Matzel, and S.E. Hansen.

06/01/09-05/31/11 "Evaluating Tectonic Models for Antarctica", National Science Foundation Office of Polar Programs, Total Award: $140,000. PI: S.E. Hansen.

GRADUATE STUDENT ADVISING

Current Graduate Students

Ho, Long (Ph.D.), Dissertation: "Understanding Tectonic-Cryospheric Interactions in Antarctica using Broadband Seismic Data"

Saeidi, Hesam (Ph.D.), Dissertation: "Investigating Lithosphere-Asthenosphere Interactions and African Tectonic Structures with Seismic Tomography and Receiver Functions"

Prior Graduate Students

Agboola, Kayode, M.S., 2023, Thesis: "Double-Array Stacking of PcP Waveforms: An Application to the Investigation of Ultra-low Velocity Zones (ULVZs) in the Southern Hemisphere"

Kumar, Ashish, M.S., 2021, Thesis: "Investigating Tectonic Structures in East Antarctica using Full Waveform Ambient Noise Tomography"

Carson, Sarah, M.S., 2018, Thesis: "Investigating Ultra-low Velocity Zones at the Core-Mantle Boundary beneath the Southern Hemisphere using an Antarctic Dataset"

Graw, Jordan, Ph.D., 2017, Dissertation: "Seismic Investigations of the Northern Transantarctic Mountains"

Brenn, Gregory, M.S., 2016, Thesis: "Determining the Upper Mantle Seismic Structure beneath the Northern Transantarctic Mountains, Antarctica, from Regional P- and S-wave Tomography"

Kenyon, Lindsey, M.S., 2014, Thesis: "Determining Crustal Thickness beneath the Transantarctic Mountains and the Wilkes Subglacial Basin using S-wave Receiver Functions"

HONORS AND AWARDS

George Lindahl III Endowed Professorship (2019-present)
J. William Fulbright Foreign Scholarship (Greece; 2017)
Kavli Fellow, National Academy of Sciences (2016)
The University of Alabama President's Faculty Research Award (2015)
State of Alabama House of Representatives Resolution (2014)
The University of Alabama Leadership Board Faculty Fellow (2014-2017)
2012 Presidential Early Career Award for Scientists and Engineers (awarded in 2014)
Antarctic Service Medal (2011)
Student Employee Graduate Research Fellowship (2005-2007)
University Education Partnership Program Fellowship (2005)
CSIDE Travel Award (2004, 2007)
Dean's Honor List at UW-Madison (1995-2002)
Recipient of the Paull Undergraduate Scholarship in Geology and Geophysics (2000)
Awarded IRIS summer internship (1999)
Recipient of the Harry M. Clarke Scholarship (1998)

FIELD EXPERIENCE

Alaska Amphibious Community Seismic Experiment (AACSE) OBS deployment (2018)
Six seasons of Antarctic fieldwork (2008, 2009, 2012-2015)

PROFESSIONAL SERVICE

Chair, EarthScope PI Instrumentation Advisory Committee (2023-present)
Member, SSA Reid Award Committee (2023-present)
Chair, IRIS/PASSCAL Standing Committee (2022)
Assistant Department Chair, UA Geological Sciences Dept. (2021-2022)
Member, U.S. Delegation of the Scientific Committee on Antarctic Research (2016-present)
Coordinator, AGU Outstanding Student Presentation Award, Seismology Section (2019-2020)
Member, AGU Keiiti Aki Young Scientist Award Committee (2018-2021)
Undergraduate Program Director, UA Geological Sciences Dept. (2018-2020)
Member, IRIS Board of Directors (2018-2020)
Chair, Geological Society of America Geophysics Division (2013-2015)
Member, IRIS-PASSCAL Standing Committee (2013-2016)
Member, IRIS Polar Network Science Committee (2012-2017)
Vice-chair, Geological Society of America Geophysics Division (2011-2013)