

**Richard R. Forster**  
Associate Dean of Research  
College of Social and Behavioral Science  
Professor, Department of Geography  
University of Utah  
Gardner Commons  
Salt Lake City, Utah 84112

March 2021  
801-581-3611  
rick.forster@geog.utah.edu

## **I. GENERAL INFORMATION**

### **A. Education**

1997. Ph.D., Earth and Atmospheric Sciences, Cornell University. Major field - Geophysics (advisor: Bryan Isacks); Minor field – Remote Sensing, Concentration – Geomorphology.
1991. M.S., Electrical Engineering, University of Kansas. Major field – Radar Remote Sensing (advisor: Richard K. Moore).
1984. B.S., Electrical Engineering, Lafayette College, Easton, Pennsylvania. Concentration in electromagnetics.

### **B. Research and Teaching Interests**

Climate change, Remote sensing of the Cryosphere, Glaciology, Radar interferometry.

### **C. Professional Experience**

- 2014 – present. Associate Dean of Research, College of Social and Behavior Science University of Utah.
- 2018 Interim Director of NEXUS (iNterdisciplinary EXchange for Utah Science)
- 2013 – 2014. Interim Associate Dean, College of Social and Behavior Science University of Utah.
- 2010 – present. Professor, Department of Geography, University of Utah.
- 2004 – 2010. Associate Professor, Department of Geography, University of Utah.
- 1999 – 2004. Assistant Professor, Department of Geography, University of Utah.
- 1998 – 1999. Senior Research Associate, Byrd Polar Research Center, The Ohio State University.
- 1996 - 1997. Postdoctoral Research Fellow, Byrd Polar Research Center, The Ohio State University.
- 1991 – 1996. Graduate Research Assistant, Department of Geological Sciences, Cornell University.
- 1989 – 1991. Graduate Research Assistant, Department of Electrical Engineering, University of Kansas.

1984 – 1989. Field Engineer, The Hewlett Packard Company.

#### **D. Other Professional Activities**

2016 – present NASA Science Team for satellite mission: NASA/Indian Space Research Organization Synthetic Aperture Radar (NISAR), scheduled launch 2022.

2014 – 2016 NASA Standing Review Board member for the NISAR satellite mission representing the cryosphere

2012 – 2013 Academic Leadership training courses, University of Utah

2008 – 2011. Chair of the Advisory Board for NSF Science and Technology Center “Center for Remote Sensing of Ice Sheets (CRE SIS)” at University of Kansas

2007 Advisory Board for NSF Science and Technology Center CRE SIS

2005 – 2007 National Research Council – Space Studies Board, Earth Science and Applications from Space: A Community Assessment Strategy for the Future, Panel on Water Resources and the Global Hydrologic Cycle

2005 – 2007 Science Team Member for NASA project Glaciers and Ice Sheets Interferometric Radar

2005 – 2006 AAG chair and organizer of remote sensing of cryosphere sessions

2002 – 2004. Board of directors Cryosphere Specialty Group, American Association of Geographers (AAG)

1999 – 2004. Antarctic Mapping Advisory Group (AMAG), NASA.

1984. President, Eta Kappa Nu -Electrical Engineering Honor Society.

1983 – 1984. Selection Committee, National Presbyterian Scholarship.

#### **E. Professional Honors and Awards**

2018. Alta Sustainability Leadership Award: Sustainability Research

2012. College Superior Research Award

2009. Student Choice Teaching Award – selected by the Associated Students of the University of Utah (also nominated in 2004)

2002. NASA New Investigator, Career development award for tenure-track faculty

2000. Group Achievement Award to the Antarctic Mapping Mission Team, National Aeronautics and Space Administration

1996 – 1997. The Byrd Post-Doctoral Fellowship, The Ohio State University, Byrd Polar Research Center

1988. 110% Seller Award, The Hewlett Packard Company.

1983 – 1984. Eta Kappa Nu -Electrical Engineering Honor Society, president.

1983 – 1984 Tau Beta Pi - Engineering Honor Society

1981 – 1984. National Presbyterian Scholar, Lafayette College.

## **II. RESEARCH AND RELATED ACTIVITIES**

### **A. Research papers (published/accepted for publication) (70)**

(\* students or post-docs advised)

2021 Joughin, Ian, Rick Forster, Alex Gardner, Ben Holt, Eric Rignot, Bernd Scheuchl, Cryosphere Sciences with NISAR, *International Geoscience and Remote Sensing Symposium*, IGARSS 2021.

2021 Marshall, Hans-Peter, Elias Deeb, Rick Forster, Carrie Vuyovich, Kelly Elder, Chris Hiemstra, Jewell Lund\*, InSAR Depth Retrieval during the NASA SnowEx 2020 Campaign: Grand Mesa, Colorado, *International Geoscience and Remote Sensing Symposium*, IGARSS 2021.

- 2020 Montgomery, Lynn, Clément Miège, Julie Miller, Ted A. Scambos, Bruce Wallin, Olivia Miller, D. Kip Solomon, Richard Forster, Lora Koenig, Hydrologic Properties of a Highly Permeable Firn Aquifer in the Wilkins Ice Shelf, Antarctica, *Geophysical Research Letters*, <https://doi.org/10.1029/2020GL089552>
- 2020 Miller , Olivia D., Kip Solomon, Clément Miège, Lora Koenig, Richard Forster, Nicholas Schmerr, Stefan R. M. Ligtenberg, Anatoly Legchenko, Clifford I. Voss, Lynn Montgomery, Joseph R. McConnell, Hydrology of a Perennial Firn Aquifer in Southeast Greenland: An Overview Driven by Field Data, *Water Resources Research*, <https://doi.org/10.1029/2019WR026348>
- 2020 Pitcher, Lincoln, Laurence C. Smith, Colin J. Gleason, Clément Miège, Jonathan C. Ryan, Birgit Hagedorn, Dirk van As, Winnie Chu, Richard R. Forster, Direct Observation of Winter Meltwater Drainage From the Greenland Ice Sheet, *Geophysical Research Letters*, <https://doi.org/10.1029/2019GL086521>
- 2020 Keeler, D.G., Rupper, S., Forster, R.R., Miège, C., “A Probabilistic Automated Isochrone Picking Routine to Derive Annual Surface Mass Balance from Radar Echograms”, *IEEE Transactions on Geoscience and Remote Sensing*, <https://doi.org/10.1109/tgrs.2020.2989102>
- 2019 Lund, J.\*, R. Forster, S. Rupper, H.P. Marshall, E. Deeb, M. Hashmi, E. Burgess, (2019), Mapping snowmelt progression in the Upper Indus Basin with synthetic aperture radar, *Front. Earth Sci.*, doi: 10.3389/feart.2019.00318
- 2018 Anatoly Legchenko, Clément Miège\*, Lora S. Koenig, Richard R. Forster, Olivia Miller, D. Kip Solomon, Nicholas Schmerr, Lynn Montgomery, Stefan Ligtenberg, Ludovic Brucker, Investigating a firn aquifer near Helheim Glacier (South-Eastern Greenland) with magnetic-resonance soundings and ground-penetrating radar, *Near Surface Geophysics*, 16, 411–422, doi: 10.1002/nsg.12001
- 2018 Anatoly Legchenko, Clément Miège\*, Lora S. Koenig, Richard R. Forster, Olivia Miller, D. Kip Solomon, Nicholas Schmerr, Lynn Montgomery, Stefan Ligtenberg, Ludovic Brucker, Estimating water volume stored in the south-eastern Greenland firn aquifer using magnetic-resonance soundings, *Journal of Applied Geophysics*, 150, <https://doi.org/10.1016/j.jappgeo.2018.01.005>.
- 2017 Miller, O., Kip Solomon, D., Miège, C., Koenig, L., Forster, R., Schmerr, N., Montgomery, L., Direct evidence of meltwater flow within a firn aquifer in southeast Greenland. *Geophysical Research Letters*, 44. <https://doi.org/10.1002/2017GL075707>.
- 2017 Miller OL, Solomon DK, Miège C, Koenig LS, Forster RR, Montgomery LN, Schmerr N, Ligtenberg SRM, Legchenko A and Brucker L, Hydraulic Conductivity of a Firn Aquifer in Southeast Greenland. *Front. Earth Science* 5:38. doi: 10.3389/feart.2017.00038

- 2017 Christian R. Steger, Carleen H. Reijmer, Michiel R. Van Den Broeke, Nander Wever, Peter Kuipers Munneke, Stefan R. M. Ligtenberg, Clément Miège, Brice P. Y. Noel, Michael Lehning, Richard Robert Forster and Lora S. Koenig, “Firn meltwater retention on the Greenland ice sheet: a model comparison”, *Frontiers in Earth Science*, Jan. vol. 5, art. 3, doi: 10.3389/feart.2017.00003.
- 2017 Lynn Nicole Montgomery, Nicholas Schmerr, Scott Burdick, Richard Robert Forster, Lora Koenig, Stefan Ligtenberg, Clément Miège, Olivia Leigh Miller, Kip Solomon and Anatoly Legchenko, “Active Source Seismic Investigation of Firn Aquifer Structure in Southeastern Greenland”, *Frontiers in Earth Science*, Feb. vol. 5, art. 10, doi: 10.3389/feart.2017.00010.
- 2016 Clément Miège\*, Richard R. Forster, Ludovic Brucker, Lora S. Koenig, D. Kip Solomon, John D. Paden, Jason E. Box, Evan W. Burgess, Julie Z. Miller, Laura McNerney, Noah Brautigam, Robert S. Fausto and Sivaprasad Gogineni, “Spatial extent and temporal variability of the Greenland firn aquifer detected by ground and airborne radars”, *Journal of Geophysical Research*, V. 121, I. 12, pp 2381–2398, doi:10.1002/2016JF003869
- 2016 David J. Selkowitz\*, Richard R. Forster, “Automated Mapping of Persistent Ice and Snow Cover Across the Western U.S. with Landsat”, *ISPRS Journal of Photogrammetry and Remote Sensing*, 117, 126-140, doi:10.1016/j.isprsjprs.2016.04.001
- 2016 Gleason, C.J., Smith, L.C., Chu, V.W., Legleiter, C.J., Pitcher, L.H., Overstreet, B.T., Rennermalm, A.K., R.R. Forster, K. Yang, “Characterizing supraglacial meltwater channel hydraulics on the Greenland Ice Sheet from in situ observations”, *Earth Surface Processes and Landforms*, doi: 10.1002/esp.3977
- 2016 David Selkowitz\*, Richard R. Forster, “An Automated Approach for Mapping Persistent Ice and Snow Cover over High Latitude Regions”, *Remote Sensing*, 8(1); doi: 10.3390/rs8010016
- 2015 Lora S. Koenig, A. Ivanoff, P.M. Alexander, J. A. MacGregor, X. Fettweis, B. Panzer, J.D. Paden, R.R. Forster, I. Das, J. McConnell, C. Leuschen and P. Gogineni “Annual Greenland accumulation rates (2009-2012) from airborne Snow Radar”, *The Cryosphere*, 10, 1739-1752, doi:10.5194/tc-10-1739-2016.
- 2015 David Selkowitz\*, Richard R. Forster, and Megan K. Caldwell, “Prevalence of pure versus mixed snow cover pixels across spatial resolutions in alpine environments”, *Remote Sensing*, 6(12), 12478-12508; doi:10.3390/rs61212478
- 2015 Laurence C. Smith, Vena W. Chu, Kang Yang, Colin J. Gleason, Lincoln H. Pitcher, Asa K. Rennermalm, Carl J. Legleiter, Alberto E. Behar, Brandon T. Overstreet, Samiah E. Moustafa, Marco Tedesco, Richard R. Forster, Adam L. LeWinter, David C. Finnegan, Yongwei Sheng, and James Balog “Efficient meltwater drainage through supraglacial streams and rivers on the southwest

- Greenland ice sheet”, *PNAS*, 112(4), 1001-1006, doi: 10.1073/pnas.1413024112.
- 2015 Summer Rupper, William F. Christensen, Barry R. Bickmore, Landon Burgener, Lora S. Koenig, Michelle R. Koutnik, Clément Miège\*, Richard R. Forster, “The Effects of Dating Uncertainties on Net Accumulation Estimates from Firn Cores”, *Journal of Glaciology*, Vol. 61, No. 225, doi: 10.3189/2015JoG14J042
- 2014 Jamies B. Turrin\*, Richard R. Forster, J. Sauber, D.K. Hall, and R.L. Bruhn, “Effects of bedrock lithology and subglacial till on the motion of Ruth Glacier, Alaska, deduced from five pulses from 1973-2012”, *Journal of Glaciology*, 60(222), 771-781, 2014.
- 2014 Jamies B. Turrin\*, Richard R. Forster “A conceptual model of cyclical glacier flow in overdeepenings”, *The Cryosphere Discuss*, 8, 4463–4495, 2014.
- 2014 VanLooy\*, Jeffrey A., Clément Miège, Gregory S. Vandeberg, and Richard R. Forster, “Ice-volume estimation inferred from ice-thickness and surface measurements for Continental Glacier, Wind River Range, Wyoming, U.S.A”, *Journal of Glaciology*, Volume 60, Number 221, pp. 478-488(11).
- 2014 Cotton, M. M., R.L. Bruhn, J. Sauber, E. Burgess and R. R. Forster, “Ice surface morphology and flow on Malaspina Glacier, Alaska: Implications for regional tectonics in the Saint Elias Orogen”, *Tectonics*, Volume 33, Issue 4, pp. 581–595, DOI: 10.1002/2013TC003381
- 2014 P. Kuipers Munneke, S. R. M. Ligtenberg, Michiel R. van den Broeke, Jan H. van Angelen, Richard R. Forster, “Explaining the presence of perennial liquid water bodies in the firn of the Greenland Ice Sheet”, *Geophysical Research Letters*, doi: 10.1002/2013GL058389
- 2014 Lora S. Koenig\*, Clément Miège\*, Richard R. Forster and Ludovic Brucker, “Initial in situ measurements of perennial meltwater storage in the Greenland firn aquifer”, *Geophysical Research Letters*, vol. 41, iss. 1, 81-85, doi: 10.1002/2013GL058083
- 2014 Richard R. Forster, Jason E. Box, Michiel R. van den Broeke, Clément Miège\*, Evan W. Burgess\*, Jan H. van Angelen, Jan T. M. Lenaerts, Lora S. Koenig, John Paden, Cameron Lewis, S. Prasad Gogineni, Carl Leuschen, Joseph R. McConnell, “Extensive liquid meltwater storage in firn within the Greenland ice sheet”, *Nature Geoscience*, 22 Dec., 2013, doi: 10.1038/NGEO2043
- 2013 Evan W. Burgess\*, Christopher F. Larsen, Richard R. Forster, “Summer melt regulates winter glacier flow speeds throughout Alaska”, *Geophysical Research Letters*, 40, 23, pp 6160–6164, DOI: 10.1002/2013GL058228
- 2013 Evan W. Burgess\*, Richard R. Forster, Christopher F. Larsen “Flow Velocities of Alaska Glaciers” *Nature Communications*, 4:2146 doi: 10.1038/ncomms3146.

- 2013 Clément Miège\*, Richard R. Forster, Jason E. Box, Evan W. Burgess, Joseph R. McConnell, Daniel R. Pasteris, and Vandy B. Spikes, “Southeast Greenland high accumulation rates derived from firn cores and ground-penetrating radar”, *Annals of Glaciology*, 54(63), pp. 322-332, doi:10.3189/2013AoG63A358.
- 2013 Jamies B. Turrin\*, Richard R. Forster, Christopher F. Larsen “The propagation of a surge front on Bering Glacier, Alaska, 2001–2011”, *Annals of Glaciology* 54(63) doi:10.3189/2013AoJ63A341.
- 2013 Asa K. Rennermalm, L. C. Smith, V. W. Chu, J. E. Box, R. R. Forster, and M. van den Broeke, “Evidence of meltwater retention within the Greenland ice sheet”, *The Cryosphere*, 7(5), 1433–1445, doi:10.5194/tc-7-1433-2013.
- 2013 Box, J.E., N. Cressie, D.H. Bromwich, J. Jung, M. van den Broeke, J.H. van Angelen, R.R. Forster, C. Miège, E. Mosley-Thompson, B. Vinther, J.R. McConnell. Greenland ice sheet mass balance reconstruction. Part I: net snow accumulation (1600-2009). *J. Climate*, 26, 3919–3934. doi:10.1175/JCLI-D-12-00373.1.
- 2013 Burgener, L.K., S. Rupper, L.S. Koenig, R.R. Forster, W. Christensen, J. Williams, M. Koutnik, C. Miede, and E. Steig, An observed negative trend in West Antarctic accumulation rates from 1975 to 2010 evidence from new observed and simulated records. *Journal of Geophysical Research*, (2012JD018579).
- 2013 Asa K. Rennermalm, S. E. Moustafa, J. Mioduszewski, V. W. Chu, R. R. Forster, B. Hagedorn, J. T. Harper, T. L. Mote, D. A. Robinson, C.A. Shuman, L. C. Smith M. Tedesco, “Understanding Greenland ice sheet hydrology using an integrated multi-scale approach” *Environmental Research Letters*, 8, 015017 doi:10.1088/1748-9326/8/1/015017.
- 2012 Evan W. Burgess\*, Richard R. Forster, Christopher F. Larsen, and M. Braun, “Surge dynamics on Bering Glacier, Alaska, in 2008–2011”, *The Cryosphere*, 6, 1251–1262, doi:10.5194/tc-6-1251-2012.
- 2012 Ronald L. Bruhn, Jeanne Sauber, Michelle M. Cotton, Terry L. Pavlis, Evan Burgess, Natalia Ruppert, and Richard R. Forster, “Plate margin deformation and active tectonics along the northern edge of the Yakutat Terrane in the Saint Elias Orogen, Alaska, and Yukon, Canada”, *Geosphere*, v. 8, p. 1384-1407, doi:10.1130/GES00807.1.
- 2012 Chu V. W., Smith L. C., Rennermalm A. K., Forster R. R., Box J. E. (2012) Hydrologic Controls on Coastal Suspended Sediment Plumes around the Greenland Ice Sheet. *The Cryosphere*, 6(1), 1-19, doi:10.5194/tc-6-1-2012
- 2012 Asa K Rennermalm, Smith, L. C., Chu, V. W., Forster, R. R., Box, J. E., and Hagedorn, B.: “Proglacial river stage, discharge, and temperature datasets from the Akuliarusiarsuup Kuua River northern tributary, Southwest Greenland, 2008–2011”, *Earth Syst. Sci. Data*, 4, 1-12, doi:10.5194/essd-4-1-

2012

- 2012 Jeffrey A. VanLooy\*, Richard R. Forster, David Barta, and James Turrin “Spatially variable surface elevation changes and estimated melt water contribution of Continental Glacier in the Wind River Range, Wyoming, USA: 1966 - 2011”, *Geocarto International*, 1-16, doi:10.1080/10106049.2012.665500
- 2011 Vena W. Chu, Lawrence C. Smith, Asa K. Rennermalm, Richard R. Forster, and Jason E. Box, “Hydrologic controls on coastal suspended sediment plumes around the Greenland ice sheet”, *The Cryosphere*, 6, 1–19, doi:10.5194/tc-6-1-2012.
- 2011 Jeffrey A. VanLooy\* and Richard R. Forster, “Use of historical elevation data to calculate surface elevation and volume changes of Ha-Iltzuk Icefield, southwest British Columbia, 1970 to mid1980s,” *Annals of Glaciology*, Vol. 52, No. 59, 109-115.
- 2011 Elias J. Deeb \*, Richard R. Forster, and Douglas L. Kane, “Monitoring Snowpack Evolution Using Interferometric Synthetic Aperture Radar (InSAR) on the North Slope of Alaska, USA”, *International Journal of Remote Sensing*, Vol. 32, No. 14, 3985-4003, doi: 10.1080/01431161003801351.
- 2011 Joo-Yup Han\*, Richard R. Forster, D.E. Moser, A.L.J. Ford, J.Ramirez-Hernandez, K.F. Tiampo, “The spatial and temporal subsidence variability of the East Mesa Geothermal Field, CA, USA and its potential impact on the All American Canal System”, *International Journal of Remote Sensing*, Vol. 32, No. 12, 3427-3449, doi: 10.1080/01431161003749444.
- 2010 Evan W. Burgess\*, Richard R. Forster, Jason E. Box, Ellen Mossley-Thompson, David H. Bromwich, Roger C. Bales, Laurence C. Smith, “A Spatially Calibrated Model of Annual Accumulation Rate on the Greenland Ice Sheet (1958-2007)”, *Journal of Geophysical Research – Earth Surface*, 115, F02004, doi:10.1029/2009JF001293..
- 2009 Vena W. Chu, Laurence C. Smith, Asa K. Rennermalm, Richard R. Forster, Jason E. Box, Niels Reeh, “Sediment plume response to surface melting and supraglacial lake drainages on the Greenland ice sheet”, *Journal of Glaciology*, Vol. 55, No. 194, 1072-1082.
- 2008 Jeffery VanLooy\*, and Richard. Forster, “Glacial changes of five southwest British Columbia icefields, Canada, mid-1980s to 1999,” *Journal of Glaciology*, Vol. 54, No. 186, 469-478.
- 2008 Robert E Davis, Thomas Painter, Don Cline, Richard Armstrong, Terry Haran, Kyle McDonald, Richard. Forster, and Kelly Elder, “NASA Cold Land Experiment (CLPX 2002/03): Spaceborne remote sensing,” *Journal of Hydrometeorology*, Vol. 9, 1427-1433.

- 2006 Jeffery VanLooy\*, Richard. Forster, and Andrew Ford, “Accelerating thinning of Kenai Peninsula glaciers, Alaska”, *Geophysical Research Letters*, vol. 33, L21307, doi:10.1029/2006GL028060.
- 2005 Hans-Peter Marshall, Gary Koh, and Richard R. Forster, “Estimating alpine snowpack properties using FMCW radar”, *Annals of Glaciology*, vol. 40. Num. 1, 157-162.
- 2004 Hans-Peter Marshall, Gary Koh, and Richard R. Forster, “Ground-based frequency-modulated continuous wave radar measurements in wet and dry snowpacks, Colorado, USA: an analysis and summary of the 2002-03 NASA CLPX data”, *Hydrological Processes*. Vol.18, Issue 18, 3609–3622.
- 2004 Lora Koenig\* and Richard R. Forster, “Evaluation of Passive Microwave Snow Water Equivalent Algorithms in the depth hoar dominated snowpack of the Kuparuk River Watershed, Alaska, USA”, *Remote Sensing of Environment*, vol. 93(4) pp 511-527.
- 2003 Richard R. Forster, Kenneth C. Jezek, Lora Koenig\*, and Elias Deeb\*, “Measurement of glacier geophysical properties from InSAR wrapped phase”, *IEEE Transactions on Geoscience and Remote Sensing* vol. 41, No. 11, 2595-2604.
- 2003 Laurence C. Smith, Yongwei Sheng, Richard R. Forster, Konrad Steffen, Karen E. Frey and Douglas E. Alsdorf, “Melting of small Arctic ice caps observed from ERS scatterometer time-series”, *Geophysical Research Letters*, vol. 30, no. 20, 2034, doi:10.1029/2003 GL017641.
- 2003 Andrew L.J. Ford\*, Richard R. Forster, and Ronald Bruhn, “Ice surface velocity patterns on the Seward Glacier, Alaska/Yukon and their implications for regional tectonics in the St. Elias Mountains”, *Annals of Glaciology*, vol. 36, 21-28.
- 2003 Che-Ming Chen, George F. Hepner and Richard R. Forster, “Fusion of hyperspectral and radar data using the IHS transformation to enhance urban surface features”, *ISPRS Journal of Photogrammetry and Remote Sensing*, vol 58, 19 - 30.
- 2003 Jens Munk, Kenneth C. Jezek, Richard R. Forster and S. Prasad Gogineni, “An accumulation map for the Greenland dry-snow zone derived from spaceborne radar”, *Journal of Geophysical Research*, vol. 108, No. D9, 4280.
- 2001 Richard R. Forster, David G. Long, Kenneth C. Jezek, Sheldon D. Drobot and Mark R. Anderson, “The Onset of Arctic Sea-Ice Snowmelt as Detected with Passive and Active Microwave Remote Sensing”, *Annals of Glaciology*, vol. 33, 85-93.
- 2000 Laurence C. Smith, Glen A. MacDonald, Karen E. Frey, Andrei Velichko, Konstantine Kremenetski, Olga Borisova and Richard R. Forster, “Sensitivity of Siberian peatlands to past and present climate”, *EOS transactions*, vol. 81, no. 43, pp. 497, 503-504.



- 1999 Richard R. Forster, Eric Rignot, Bryan L. Isacks and Kenneth Jezek, “Interferometric radar observations of Glaciares Europa and Penguin, Hielo Patagonico Sur, Chile”, *Journal of Glaciology*, 45(150), 325-337.
- 1999 Richard R. Forster, Kenneth Jezek, John Bolzan, Francois Baumgartner and S. Prasad Gogineni, “Relationships between radar backscatter and accumulation rate on the Greenland Ice Sheet”, *International Journal of Remote Sensing*, 20(15&16), 3131-3147.
1997. Richard R. Forster, Laurence C. Smith and Bryan L. Isacks, “Effects of weather events on X-SAR returns from icefields: A case study of the Hielo Patagonico Sur”, *Annals of Glaciology*, 24, 367-374.
1997. Laurence C. Smith, Richard R. Forster, Bryan L. Isacks and Dorothy K. Hall, “Seasonal climatic forcings on alpine glaciers revealed using orbital synthetic aperture radar”, *Journal of Glaciology*, 43(137), 480-488.
1996. Richard R. Forster, Bryan L. Isacks and Sarah. Das, “Shuttle imaging radar (SIR-C/X-SAR) reveals near-surface properties of the South Patagonian Icefield”, *Journal of Geophysical Research*, 101(E10) 23,169-23,180.
1996. Eric Rignot, Richard R. Forster and Bryan L. Isacks, “Interferometric radar observations of Glaciar San Rafael, Chile”, *Journal of Glaciology*, 42(141), 279-291.
1996. Eric Rignot, Richard R. Forster and Bryan L. Isacks, “Mapping of glacial motion and surface topography of Hielo Patagonico Norte, Chile, using satellite SAR L-band interferometry data”, *Annals of Glaciology*, 23, 209-216.
1995. Laurence C. Smith, Bryan L Isacks, Richard R. Forster, Arthur L. Bloom, and I. Preuss, “Estimation of discharge from braided glacial rivers using ERS-1 SAR: First results”, *Water Resources Research*, 31(5), 1325-1329.
1991. Richard R. Forster, Curtis .H. Davis, Timothy Rand and Richard K. Moore, “Snow Stratification Investigation on an Antarctic Ice Stream with an X-Band Radar System”, *Journal of Glaciology*, 37(127), 323-325.
1990. Paul E. Racette, Richard R. Forster and Richard K. Moore, “Limitation of the Luneburg Lens as a Calibration Target for a Dual-Antenna Radar System”, *IEEE Transactions on Geoscience and Remote Sensing*, 29(1), 179-180.

#### **B. Journal articles in Review**

Elias J. Deeb\*, Richard R. Forster, and Hans Peter Marshall, Estimating snow water equivalent (SWE) using L-Band interferometric synthetic aperture radar (InSAR), under revision, *Remote Sensing of Environment*.

Olivia Miller, Clifford I. Voss, D. Kip Solomon, Clément Miège\*, Lora Koenig, Richard Forster, Numerical Hydrologic Modeling of a Perennial Firn Aquifer in Southeast Greenland, under revision, *Water Resources Research*.

### C. Peer-reviewed Book chapters

- 2013 Lora Koenig, Richard Forster, Ludovic Brucker and Julie Miller\*, *Remote Sensing of Accumulation over the Greenland and Antarctic Ice Sheets*, in *Remote Sensing of the Cryosphere* ed. Marco Tedesco, Wiley – Blackwell in press.
- 2010 Ronald L. Bruhn, Richard R. Forster, Andrew L.J. Ford\*, Terry L. Pavlis, and Michael Vorkink, “Structural geology and glacier dynamics, Bering and Steller Glaciers, Alaska”, in *Geological Society of America Monograph Bering Glacier: Interdisciplinary Studies of Earth’s Largest Temperate Surging Glacier*, SPE462 eds. Robert A. Shuchman and Edward G. Josberger, ISBN: 978-0-8137-2462-1
- 2009 Jeffery VanLooy\*, Richard. Forster, and Andrew Ford, “Accelerating thinning of Kenai Peninsula glaciers, Alaska”, in *State of the Cryosphere: Glaciers and Ice Sheets*, ed. Hamish Pritchard, AGU Special Publications Volume 60, SP0607314, ISBN: 978-0-87590-731-4.

### D. Externally Funded Research Grants (Total PI and Co-I \$14,271,403)

#### 1. Principal Investigator

##### a. Funded (Total \$4,480,112)

- 2020 – 2023 “InSAR snow water equivalent estimation and SAR snow wetness determination”, NASA, \$128,668
- 2019 – 2022 “Mountain Glacier Ice Dynamics and Cryosphere Applications of NISAR”, Science Team member for the NISAR mission, NASA, \$348,759.
- 2016 – 2019 “Monitoring glacier ice dynamics and assessment of velocity variability using spaceborne SAR data in preparation for NISAR”, NASA, \$342,267.
- 2014 – 2018 “Collaborative Research: The Greenland firn aquifer impacts on ice sheet hydrology: characterizing volume, flow, and discharge”, NSF – Arctic Natural Sciences, \$725,137
- 2013 – 2015 “An initial investigation of the Greenland perennial firn aquifer”, NSF EAGER– Arctic Natural Sciences, \$213,598
- 2013 – 2018 “Characterizing the perennial firn aquifer within the Greenland Ice Sheet”, NASA, Cryospheric Sciences, \$242,009
- 2011 – 2014 “Southeast Greenland snow accumulation and perennial firn aquifer investigation over the last decades using ground-penetrating radar, airborne NASA IceBridge radars and firn-core data”, NASA Graduate Student Fellowship, awarded to Clement Miede (PhD student), Forster is PI on the grant, \$90,000.
- 2009 – 2013 “Collaborative Research: Greenland Ice Sheet Snow Accumulation Variability: Filling Knowledge and Data Voids”, NSF – Arctic Natural Sciences, total amount \$653,745, Utah portion \$369,779

- 2009 – 2012 “Mechanisms of Alaskan glacier motion through observation of surface velocities and ice thickness”, NASA Graduate Student Fellowship, awarded to Evan Burgess (PhD student), Forster is PI on the grant, \$90,000.
- 2008 – 2013 “Alaska glacier velocities: Implications for large-scale glacier thinning/recession”, NASA, Cryospheric Sciences, \$543,722.
- 2006 – 2009 “Measuring Snow Water Equivalent Using Interferometric Synthetic Aperture Radar (InSAR)”, NASA Graduate Student Fellowship, awarded to Elias Deeb (PhD student), Forster is PI on the grant, \$72,000.
- 2005 – 2008 “Understanding ice-sheet surface elevation change: How much goes to the ocean?”, NASA, Cryospheric Sciences, \$122,200.
- 2005 – 2006 “Satellite and surface measurements of the hydrologic and economic impacts of All American Canal groundwater seepage to the Mexicali Valley/ Sand Hills”, Environmental Protection Agency, \$25,804.
- 2002 – 2005 “A Multi-Sensor (Multi-Scale) Approach to Snowmelt Detection Using Active and Passive Microwave Remote Sensing”, NASA – New Investigator Program, \$229,854
- 1999 – 2003 “The glacier dynamics and mass flux of Antarctic ice streams from Radarsat InSAR”, NASA - Polar Programs, \$146,060.
- 1998 – 2002 “The spatial and temporal characteristics of high latitude seasonal snow melt as detected by passive and active microwave sensors”, NASA – Earth Observing Systems, \$206,738.
- 1997 – 1999 “Determining Greenland Ice Sheet accumulation rates from radar remote sensing”, NASA - Polar Programs, \$299,55
- b. Pending*
- 2019 – 2022 “NISAR Science Team: Mountain glacier ice dynamics and cryosphere applications of NISAR”, NASA \$348,759.
- 2019 – 2022 “A path to space for global Snow Water Equivalent estimation fusing Radar and Lidar”, NASA \$429,945.

## **2. Co-Principal Investigator/ Co- Investigator**

### *a. Funded (Total: \$9,791,291 Utah portion \$2,061,086)*

- 2019 – 2022 “Quantifying the contributions of mountain glaciers to sea level rise-past and future”, NSF GSS and CLD, PI: Summer Rupper, total amount \$422,732.
- 2010 – 2013 “Deployment of a radar instrumentation suite to monitor land and sea ice in support of Operation ICE Bridge”, NASA Cryospheric Sciences, PI: Carl Leuschen, Univ. Kansas, total amount \$3,434,875, Utah portion \$61,346.
- 2010 – 2013 “Collaborative research: Annual satellite era accumulation patterns over Wais Divide: A study using shallow ice cores, radars and satellites”, NSF – Antarctic

- Glaciology Program, PI: Summer Rupper, BYU, total amount \$525,850, Utah portion \$230,148.
- 2008 – 2013 “Geodetic Imaging of Glacio-Seismotectonic Processes in Southern Alaska”, NASA Solid Earth, Co-I, (PI – Jeanne Sauber, NASA Goddard), Total \$752,000, Utah portion: \$312,852.
- 2005 – 2009 “Investigation of Spatial and Temporal Variation in Snowpack Properties and Their Microwave Radiative Response Using High Resolution Broadband (2-18-GHz) Active Microwave Radar Measurements”, NASA Terrestrial Hydrology, Co-PI, (PI – Hans-Peter Marshall, Univ. CO, Boulder), Total \$474,074, Utah portion \$40,949.
- 2005 “An Integrated Field-based System for Fusion of Hyperspectral and Interferometric Radar Data to Support Feature Detection, Surface Characterization, and Change Detection”, Department of Defense, Co-PI, (PI – George Hepner, Univ. of Utah), \$197,391.
- 2003 – 2005 “Radar satellite (InSAR) monitoring of groundwater dynamics near the All-American canal (Calexico/Mexicali region)”, Environmental Protection Agency, Co-PI, (PI – Desmond Moser) \$74,946.
- 2000 – 2002 “SAR analysis of the Western Saint Elias Orogen, Alaska”, NASA, PI Ronald Bruhn, Univ. Utah, Geology and Geophysics, \$182,256 over three years (returned overhead split 50% to Geography, 50% to G.G.)
- 2000 – 2003 “Western Transportation Analysis Consortium”, Department of Transportation, Co-PI, University of Utah portion \$630,107 other Utah Investigators: Hepner, Miller, Cova, (Lead PI: Stan Morain, University of New Mexico, total award \$3,015,948).
- 1999 – 2002 “Sensitivity of the West Siberian Lowland to past and present climate”, NSF – Office of Polar Programs, University of Utah portion \$31,037 (PI: L. Smith, UCLA, total award \$711,219).

### **3. Data Grants Approved**

- 2019 – 2021 “Snow Hydrology applications with PALSAR-2”, Japan Aerospace Exploration Agency (JAXA)
- 2016 – 2019 “Monitoring glacier ice dynamics and assessment of velocity variability in the Himalaya-Karakorum using PALSAR-2”, Japan Aerospace Exploration Agency (JAXA)
- 2008 – indefinite “The Spatial and Temporal Characteristics of Seasonal Snow Melt as detected by Terra SAR X in Mountainous Terrain”, German Aerospace Center (DLR).
- 2008 – 2012 “Measuring Snow Wetness using Radarsat-2”, Canadian Space Agency

- 2004 – indefinite. “Ice surface elevation changes on the Patagonian Icefields”, European Space Agency – CryoSat Satellite Mission.
- 2000 – 2011. “The Spatial and Temporal Characteristics of the Arctic Seasonal Snow Melt as detected by ALOS PALSAR and other microwave sensors”, National Space Development Agency of Japan.
- 1999 – 2002 “Changes in the Antarctic Peninsula ice margin and their effects on the upstream glacier dynamics”, European Space Agency – European Remote-sensing Satellite Mission.
- 1999 – indefinite. “The spatial and temporal characteristics of the Arctic seasonal snow melt as detected by Envisat ASAR and other microwave sensors”, European Space Agency – Envisat Mission.
- 1999 - 2005 “The Alaskan SAR Facility Radarsat Interferometric SAR Working Group: An assessment of R1 InSAR”, NASA – Alaskan SAR Facility.
- 2000 – 2004. “Flooding and ice break-up dynamics of large arctic river systems”, CoI, L. Smith UCLA PI, National Space Development Agency of Japan.

#### **F. Papers and Posters Presented at Professional Conferences (150)**

- 2020 Lynn Montgomery, Clément Miège, Julie Miller, Ted A Scambos, Bruce Wallin, Olivia Miller, Douglas Kip Solomon, Richard R Forster, and Lora Koenig, “Hydrologic Properties of a Highly Permeable Firn Aquifer in the Wilkins Ice Shelf, Antarctica”, C026-06, AGU, Dec. 9.
- 2020 Emma Marshall, Summer Rupper and Richard R Forster, “Investigating Recent Surface Velocity Responses to Glacier Thickness Changes in High Mountain Asia, 2013-2019”, C029-0002, AGU, Dec. 10.
- 2020 Jewell Lund, Richard R Forster, Summer Rupper, McKenzie Skiles, Hans-Peter Marshall, Elias J Deeb, “Snowpack ripening and melt-freeze cycles on Grand Mesa, Colorado from field measurements and synthetic aperture radar”, C047-0005, Dec. 14.
- 2020 Morgan McDonnell, Summer Rupper, Richard R Forster and Josh Maurer, “Quantifying geodetic mass balance for South American glaciers since the 1970s using KH-9 Hexagon imagery and ASTER DEMs”, GC026-0006, Dec. 8.
- 2019 Richard R Forster, Olivia Leigh Miller, Douglas Kip Solomon, Clément Miège, Lora Koenig, Ludovic Brucker, Nicholas C Schmerr and Lynn Montgomery, “The Greenland firn aquifer: Discovery and subsequent interdisciplinary field measurements”, C13C-1308, AGU San Francisco, Dec. 9-13.
- 2019 Durban G Keeler, Summer Rupper, Philip A White, Clément Miège and Richard R Forster, “Integrated Trends in Annual Accumulation Across West

- Antarctica from Operation IceBridge Snow Radar”, C31C-1561, AGU San Francisco, Dec. 9-13.
- 2019 Elias J Deeb, Hans-Peter Marshall, Zoe Courville, Jim Lever, Richard R Forster and Sally A Shoop, “Remote Snow Strength Detection Using Multi-frequency/Multi-polarization Radar”, C41B-04, AGU San Francisco, Dec. 9-13.
- 2019 Hans-Peter Marshall, Elias J Deeb, Marco Lavelle, Kelly Elder, Ludovic Brucker, Christopher A Hiemstra, Kathryn J Bormann, Thomas H Painter, Richard R Forster and Cathleen Jones, “Airborne snow accumulation estimates from L-Band InSAR during the NASA SnowEx 2017 campaign and validation with airborne LiDAR and in-situ observations”, C42B-08, AGU San Francisco, Dec. 9-13.
- 2019 Lincoln H Pitcher, Laurence C Smith, Colin J Gleason, Clément Miège, Johnny Ryan, Birgit Hagedorn, Dirk van As, Winnie Chu and Richard R Forster, “Meltwater export from the Greenland Ice Sheet observed during winter”, C11A-05, AGU San Francisco, Dec. 9-13.
- 2018 Richard R Forster, Elias J Deeb, Hans-Peter Marshall, Jewell Lund\*, “InSAR coherence variability under changing snow conditions at L-band”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Warren Scott\* and Richard R Forster, “Sentinel-1 SAR Observations of Greenland Perennial Firn Aquifer Regions”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Jewell Lund\*, Richard R Forster, and Muhammed Zia Hashmi, “Spatial and Temporal Variability of High Mountain Asia Snowmelt From Synthetic Aperture Radar”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Durban Keeler\*, Summer Rupper, Richard R Forster, Clément Miège\*, Lora Koenig “Estimates of annual surface mass balance from radar for the West Antarctic Divide using an automated layer picker”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Clément Miège\*, Richard R Forster, Anatoly Legchenko, Nicholas C Schmerr, Lynn Nicole Montgomery, Olivia Leigh Miller, Lora Koenig, Douglas Kip Solomon, Stefan Ligtenberg, “Combined near-surface geophysical measurements to characterize a firn aquifer in the southeastern part of the Greenland ice sheet (**Invited**)”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Elias J Deeb, Hans-Peter Marshall, Richard R Forster, Cathleen E. Jones, Marco Lavelle, “Polarimetric and interferometric analysis of L-Band airborne data over Western United States during the NASA SnowEx 2017 field campaign”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.

- 2018 Jonathan Guandique, Nicholas C Schmerr, Chao Gao, Lynn Nicole Montgomery, Scott Burdick, Richard R Forster, Lora Koenig, Anatoly Legchenko, Stefan Ligtenberg, Clément Miège\*, Olivia Leigh Miller, Douglas Kip Solomon, “Characterizing Meltwater Within a Firm Aquifer on the Greenland Ice Sheet using Active Source Seismology”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2018 Lincoln H. Pitcher, Laurence C. Smith, Colin J. Gleason, Clément Miège , Brigit Hagedorn, Johnny Ryan, Dirk van As, Richard R Forster, “Subglacial meltwater export from the Greenland Ice Sheet observed during winter”, American Geophysical Union Annual meeting, Washington D.C., Dec. 10-14.
- 2017 Richard R Forster, Clément Miège\*, Lora Koenig, Douglas Kip Solomon, Nicholas C Schmerr, Olivia Leigh Miller, Stefan Ligtenberg, Lynn Nicole Montgomery, Ludovic Brucker, Julie Miller\*, Anatoly Legchenko, “Remotely-sensed and in-situ observations of Greenland firm aquifers”, American Geophysical Union Annual meeting, New Orleans, Dec. 11-16.
- 2017 Lora Koenig, Richard R Forster, Olivia Leigh Miller, Douglas Kip Solomon, Clément Miège\*, Nicholas C Schmerr, Lynn Nicole Montgomery, Anatoly Legchenko, “A half-decade of field research on the Greenland firm aquifers - major advances and looming questions”, American Geophysical Union Annual meeting, New Orleans, Dec. 11-16.
- 2017 Jewell Lund\*, Richard R Forster, Evan Burgess\*, “Glacier and snow hydrology investigation in the Upper Indus Basin using Synthetic Aperture Radar”, American Geophysical Union Annual meeting, New Orleans, Dec. 11-16.
- 2017 Kate Baustian\*, Summer Rupper, Richard R Forster, “Seasonal and Spatial Distribution of Wet Snow in Western Washington State Mapped with Synthetic Aperture Radar (SAR) Data”, American Geophysical Union Annual meeting, New Orleans, Dec. 11-16.
- 2017 Durban Keeler\*, Summer Rupper, Richard R Forster, Clément Miège\*, Simon Brewer, Lora Koenig “Spatio-Temporal Variability of Recent Snow Accumulation Across the West Antarctic Ice Sheet Divide Using Ultra-High Frequency Radar and Shallow Firm Cores”, American Geophysical Union Annual meeting, New Orleans, Dec. 11-16.
- 2017 Jewell Lund\* and Richard Forster, “Spatiotemporal variations of radar glacier zones in the Karakoram Mountains”, Geophysical Research Abstracts, Vol. 19, EGU2017-11733, 2017, EGU General Assembly.
- 2016 Richard R Forster, Clément Miège\*, Olivia Leigh Miller, Douglas Kip Solomon, Nicholas C Schmerr, Anatoly Legchenko, Lora Koenig, Noah Brautigam\*, Laura McNerney\*, Julie Miller\*, “Greenland firm aquifer investigations from remote sensing, geophysics, and in situ measurements”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.

- 2016 Elias J Deeb\*, Hans-Peter Marshall, Thomas H Painter, Danny G Marks, Andrew R Hedrick, Scott Havens, Richard R Forster and Paul Siqueira “Comparison of PALSAR-2 Interferometric Estimates of Snow Water Equivalent, Airborne Snow Observatory Snow Depths, and Results from a Distributed Energy Balance Snow Model (iSnobal)”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2016 Olivia Leigh Miller, Douglas Kip Solomon, Clément Miège\*, Clifford I Voss, Lora Koenig, Richard R Forster, Nicholas C Schmerr, Lynn Nicole Montgomery, Anatoly Legchenko, Stefan Ligtenberg, “Field Measurements and Modeling of the Southeast Greenland Firn Aquifer”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2016 Summer Rupper, Eric Scott Johnson, Kathleen M Huybers, William F Christensen, Shane Reese, Zachary White, and Richard R Forster, “High Mountain Asia Glacier Area and Meltwater Flux Changes Under Future Climate Scenarios”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2016 Lora Koenig, Derrick Julius Lampkin, Twila A Moon, Clément Miège, Richard R Forster, “Spatial velocity response of Helheim Glacier to the presence of a firn aquifer”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2016 Nicholas C Schmerr, Lynn Nicole Montgomery, Scott Burdick, Chao Gao, Lora Koenig, Anatoly Legchenko, Clément Miège\*, Olivia Leigh Miller, Douglas Kip Solomon and Richard R Forster, “Active Source Seismic Investigation of Firn Aquifer Structure in Southeastern Greenland”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2016 Michelle Meadows, Summer Rupper, Richard R Forster, Gregory T Carling, Durban G Keeler and Joerg M Schaefer, “High frequency variability in glacier meltwater patterns in the Rhone Watershed, Switzerland”, American Geophysical Union Annual meeting, San Francisco, Dec. 12-16.
- 2015 Richard R Forster, Clément Miège\*, Douglas Kip Solomon, Lora Koenig, Olivia Leigh Miller, Nicholas C Schmerr, Lynn Nicole Montgomery “Investigations of Liquid Water Retention in the Greenland Firn Aquifer (**Invited**)”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Richard R Forster, Clément Miège\*, Lora Koenig, Noah Brautigam\*, “The Greenland Firn Aquifer Temporal Variability and Spatial Extent from Airborne Radar. (**Invited**)”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Julie Miller\*, Ted Scambos, Richard R Forster, David G Long, Stefan Ligtenberg, Michiel van den Broeke, David Glyn Vaughan, “Is the Wilkins Ice Shelf a Firn Aquifer? Spaceborne Observation of Subsurface Winter Season Liquid Meltwater Storage on the Antarctic Peninsula using Multi-



- Frequency Active and Passive Microwave Remote Sensing”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Elias J Deeb, Hans-Peter Marshall, Richard R Forster, Steven A Arcone, Paul Siqueira, Blaine F Morriss, “The present and future of using InSAR to estimate SWE (Invited)”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Clément Miège\*, Lora Koenig, Richard R Forster, Olivia Leigh Miller, Douglas Kip Solomon, Anatoly Legchenko, Nicholas C Schmerr, Lynn Nicole Montgomery, Ludovic Brucker, “Investigating the Greenland firn aquifer near Helheim Glacier based on geophysical noninvasive methods and in situ measurements (Invited)”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Olivia Leigh Miller, Douglas Kip Solomon, Clément Miège\*, Lora Koenig, Nicholas C Schmerr, Lynn Nicole Montgomery, Anatoly Legchenko, Richard R Forster, “Initial In-situ Hydrologic Measurements of the Greenland Perennial Firn Aquifer”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2015 Lynn Montgomery, Nicholas C Schmerr, Lora Koenig, Anatoly Legchenko, Olivia Leigh Miller, Douglas Kip Solomon, Richard R Forster, “Using In-Situ Seismic Measurements to Model the Velocity Structure of Subsurface Aquifers in Southeast Greenland”, American Geophysical Union Annual meeting, San Francisco, Dec. 14-18.
- 2014 Miller, J Z\*, Forster, R R, Long, D G, Scambos, T A, Kuipers Munneke, P, van den Broeke, M R, Utrecht, “Satellite observation of winter season liquid meltwater storage within Greenland’s firn aquifer: 1992-2014”, American Geophysical Union Annual meeting, San Francisco, Dec. 15-19.
- 2014 Chu, V W, Smith, L C, Yang, K, Gleason, C J, Rennermalm, A K, Pitcher, L H, Legleiter, C J, Forster, R R, “Remote Estimation of Greenland Ice Sheet Supraglacial River Discharge using GIS Modeling and WorldView-2 Satellite Imagery”, AGU Annual meeting, San Francisco, Dec. 15-19.
- 2014 Forster, R R, Miller, J Z\*, Miège, C\*, Brucker, L, Koenig, L, Solomon, D K, Schmerr, N C, Burgess, E W, Box, J E, “Recent results on the Greenland Aquifer from remote sensing and in situ measurements”, AGU Annual meeting, San Francisco, Dec. 15-19.
- 2014 Miège, C\*, Forster, R R, Koenig, L, Brucker, L, Box, J E, Burgess, E W, Solomon, D K, “Temporal and spatial variability of the Greenland firn aquifer revealed by ground and airborne radar data”, AGU Annual meeting, San Francisco, Dec. 15-19.
- 2013 Carpenter, M, Rupper, S, Williams, J, Burgener, L K, Koenig, L, Forster, R R, Koutnik, M R, Skinner, R, Miège, C\*, Brucker, L, “Temporal trends in West Antarctic surface mass balance: do large scale modes of climate contribute to observed records?”, AGU Annual meeting, San Francisco, Dec. 9-13.

- 2013 Chu, V\*, Smith, L C, Yang, K, Legleiter, C J, Rennermalm, A K, Forster, R R, Gleason, C J, Pitcher, L H, Moustafa, S, “Greenland Ice Sheet supraglacial stream morphology and dynamics”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Forster, R R, Miège, C\*, Koenig, L, Brucker, L, “Thermal insights of the Greenland ice sheet perennial firn aquifer”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Selkowitz, D\*, Forster, R R, “Fine Scale Variability in Snow Cover Duration From In Situ Sensor Arrays at Subalpine Forest and Meadow Sites Across the Western United States”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Burgess, E W\*, Forster, R R, Larsen, C F, “Summer melt regulates winter glacier flow speeds throughout Alaska (Invited)”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Smith, L C\*, Chu, V, Yang, K, Rennermalm, A K, Legleiter, C J, Department of Geography, University of Wyoming, Laramie, WY, USA Pitcher, L H, Moustafa, S, Overstreet, B T, Behar, A, Tedesco, M, Forster, R R, “Supraglacial meltwater runoff from the Greenland ice sheet”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Koenig, L, Miège, C\*, Forster, R R, Brucker, L, “Water volume estimates of the Greenland Perennial Firn Aquifer from in situ measurements”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Miège, C\*, Geography, Forster, R R, Koenig, L, Brucker, L, Box, J E, Burgess, E W, “The Greenland ice sheet perennial firn aquifer: characteristics, extent and evolution obtained from airborne remote sensing”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2013 Miller, J Z\*, Forster, R R, Long, D G, Brewer, S, “Satellite observation of winter season subsurface liquid melt water retention on the Greenland ice sheet using spectroradiometer and scatterometer data”, AGU Annual meeting, San Francisco, Dec. 9-13.
- 2012 Richard R. Forster; Jason E. Box; Clement Mieke; Evan W. Burgess; Joseph R. McConnell “Measurements of snow accumulation rates and depth to the perennial firn aquifer in south east Greenland from the Arctic Circle Traverse 2010 and 2011”. (Invited), American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Richard R. Forster; Jason E. Box; Michiel R. van den Broeke; Clement Mieke; Evan W. Burgess; Jan van Angelen; Jan Lenaerts; Lora Koenig “The perennial firn aquifer as a storage mechanism on the Greenland Ice Sheet”, (Invited), American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Evan W. Burgess\* Richard R. Forster; Christopher F. Larsen “Patterns in Alaska glacier flow velocities” (Invited), American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.

- 2012 Julie Miller\*; Richard R. Forster; Jason E. Box; David G. Long, “Multi-frequency characterization of radar backscatter and the formation of ice layers in the southeast percolation area of the Greenland ice sheet” American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Asa K. Rennermalm; Laurence C. Smith; Vena W. Chu; Jason E. Box; Richard R. Forster; Michiel R. van den Broeke, “Evidence of Meltwater Retention within the Greenland Ice Sheet” (Invited), American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Lora Koenig; Vincent Onana; Richard R. Forster; Clement Miege; Summer Rupper; Landon K. Burgener; Aqsa E. Patel; Joseph A. MacGregor, “A comparison of age-depth scales derived from shallow ice cores and an FMCW radar in West Antarctica”, American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Jessica Williams; Summer Rupper; Landon K. Burgener; Qinghua Ding; Eric J. Steig; William F. Christensen; Lora Koenig; Clement Miege; Michelle R. Koutnik; Ludovic Brucker; Richard R. Forster; McLean Carpenter; Michelle Meadows; Laura Riley; Ryan Smith; Durban Keeler; Jon Wagner; Michael Jensen; Preston Cook, “Spatial and temporal isotopic patterns across the West Antarctic Ice Sheet Divide from new snowpits and firn cores”, American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Landon K. Burgener; Summer Rupper; Lora Koenig; Richard R. Forster; William F. Christensen; Jessica Williams; Michelle R. Koutnik; Clement Miege; Eric J. Steig; Laura Riley; Durban Keeler, “An observed negative trend in West Antarctic accumulation rates from 1975 to 2010: evidence from new observed and simulated records”, American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Laurence C. Smith; Asa K. Rennermalm; Carl J. Legleiter; Alberto E. Behar; Vena W. Chu; Richard R. Forster; Colin J. Gleason; Samiah Moustafa; Brandon T. Overstreet; Lincoln H. Pitcher; Marco Tedesco; Kang Yang “Greenland supraglacial rivers and the extreme 2012 melt season”, American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Vena W. Chu; Laurence C. Smith; Asa K. Rennermalm; Richard R. Forster; Colin J. Gleason; Lincoln H. Pitcher; Samiah Moustafa; Brandon T. Overstreet; Carl J. Legleiter; Alberto E. Behar; Marco Tedesco; Kang Yang, “Hydraulic geometry of Greenland Ice Sheet supraglacial streams”, American Geophysical Union Annual meeting, San Francisco, Dec. 3-7.
- 2012 Richard R. Forster, Jason E. Box, Michiel R. van den Broeke, Clément Miège, Evan W. Burgess, Jan H. van Angelen, Jan T. M. Lenaerts, Lora S. Koenig “Near surface water layer within the Greenland Ice Sheet found during winter conditions from firn cores, ground based radar, and NASA airborne radar”, International Glaciological Society meeting, Fairbanks, AK, June 24-29.

- 2012 Evan W. Burgess\*, Richard R. Forster, Christopher F. Larsen, “Glacier Dynamics in the Wrangell St. Elias Mountains, Alaska”, International Glaciological Society meeting, Fairbanks, AK, June 24-29.
- 2012 Clément Miège\*, Richard R. Forster, Jason E. Box, Evan W. Burgess, Joseph R. McConnell, Daniel R. Pasteris, and Vandy B. Spikes, “Southeast Greenland high accumulation rates derived from firn cores and ground-penetrating radar”, International Glaciological Society meeting, Fairbanks, AK, June 24-29.
- 2012 Jamies B. Turrin\*, Richard R. Forster, Christopher F. Larsen “Kinematic wave properties of a surge front on Bering Glacier, Alaska, 2001-2011”, International Glaciological Society meeting, Fairbanks, AK, June 24-29.
- 2011 Richard R. Forster; Jason E. Box; Clement Miede; Evan W. Burgess; Lora Koenig; John D. Paden; Prasad S. Gogineni, “Near-surface water layer discovered within the Greenland Ice Sheet during winter conditions from firn cores, ground based radar, and Operation IceBridge radars” , American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 Evan W. Burgess; Richard R. Forster; Christopher F. Larsen; Matthias Braun, “Ice Dynamics on a 2008 - 2011 surge of the Bering Glacier, AK”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 James B. Turrin\*; Richard R. Forster; Ronald L. Bruhn; Jeanne M. Sauber, “Velocity, slope change, and structural control of the 2008-2011 surge of Bering Glacier, Alaska, from a time-series of Landsat-7 ETM+ imagery”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 Julie Miller\*; Richard R. Forster; David G. Long; Ronny Schröder; Kyle C. McDonald; Jason E. Box, “Snow accumulation rate retrieval across the Greenland ice facies using SeaWinds on QuikSCAT”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 Vena W. Chu; Laurence C. Smith; Asa K. Rennermalm; Richard R. Forster; Jason E. Box, “Hydrologic controls on coastal suspended sediment plumes around the Greenland Ice Sheet”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 Landon K. Burgener; Summer Rupper; Jessica Williams; Rachel Marker; William F. Christensen; Lora Koenig; Clement Miede; Michelle R. Koutnik; Richard R. Forster, “West Antarctic Ice Sheet temporal and spatial accumulation variability from five new snowpits and firn cores”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.
- 2011 Asa K. Rennermalm; Laurence C. Smith; Vena W. Chu; Richard R. Forster; Birgit Hagedorn; Jason E. Box; Michiel R. van den Broeke, “Controls on Greenland Ice Sheet Runoff from a Land Terminating Glacier”, American Geophysical Union Annual meeting, San Francisco, Dec. 5-9.

- 2010 Richard R. Forster, Clement Miege\*, Jason E. Box, Joe McConnell, V. Blue Spikes, and Evan Burgess\*, “The Arctic Circle Traverse 2010”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Evan Burgess\*, Richard R. Forster, Jeanne Sauber, Ronald Bruhn, and Michele Cotton, “Tectonic implication of ice surface velocity in the St. Elias Range, Alaska, USA, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Evan Burgess\*, Richard R. Forster, and Dorothy Hall, “Alaskan glacier velocity maps from spaceborne SAR data”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Jeanne Sauber, Ronald Bruhn, Richard R. Forster, Michelle Cotton, and Evan Burgess, “DesDlyn in Alaska”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Julie Miller\*, Richard R. Forster, Kyle McDonald, “Snow accumulation estimates from microwave satellite data”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Jamie Turin\*, and Richard R. Forster, “Ice surface velocity measurements of Alaskan glaciers from optical satellite data”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2010 Asa Rennermalm, Laurence C. Smith, Vena W. Chu, Richard R. Forster, Jason Box, and Bridgit Hagedorn, “Controls on proglacial river discharge in Southwest Greenland”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2009 Evan Burgess\*, Richard R. Forster, and Dorothy Hall, “Changes in Alaskan glacier surface velocities observed from SAR offset tracking”, American Geophysical Union Annual meeting, San Francisco, Dec. 14 – 18.
- 2009 Asa K Rennermalm, Laurence Smith, Vena Chu, Rick Forster, Jason Box, “Melt water export from the Greenland inland ice investigated with stream observation and a linear reservoir network model”. American Geophysical Union Annual meeting, San Francisco, Dec. 14 – 18.
- 2009 Vena W. Chu, Laurence C. Smith, Asa K. Rennermalm, Richard R. Forster, Jason E. Box, Niels Reeh, “Estuary sediment plume response to surface melting and supraglacial lake drainages on the Greenland Ice Sheet”, American Geophysical Union Annual meeting, San Francisco, Dec. 14 – 18.
- 2008 Richard R. Forster, Jeanne Sauber, and Dorothy Hall, “Alaska Glacier velocities from L-band InSAR: A basis for change detection”, American Geophysical Union Annual meeting, San Francisco, Dec. 15 – 19.
- 2008 Elias J. Deeb\* and Richard R. Forster, “Examples of C- and L-Band InSAR to Monitor Snow Water Equivalent (SWE) of Dry Snowpacks”, American Geophysical Union Annual meeting, San Francisco, Dec. 15 – 19

- 2008 Vena Chu, Laurence Smith, Asa Rennermalm, Richard R. Forster, Jason Box, and Niels Reeh, “Rapid Response of Sediment Plumes to Greenland Ice-Sheet Surface Melt”, American Geophysical Union Annual meeting, San Francisco, Dec. 15 – 19.
- 2008 Jeanne Sauber, Ronald Bruhn, Richard R. Forster, and Michelle Hofton, “Geodetic Imaging of Glacio-Seismotectonic Processes in Southern Alaska”, American Geophysical Union Annual meeting, San Francisco, Dec. 15 – 19.
- 2008 Evan Burgess\*, Richard R. Forster, Jason E. Box, Laurence C. Smith, David Bromwich, “Greenland Ice Sheet Annually-resolved Accumulation Rates (1958-2007), a Spatially Calibrated Model”, American Geophysical Union Annual meeting, San Francisco, Dec. 15 – 19.
- 2008 Richard R. Forster and Jeanne Sauber, “Alaska Glacier Velocities from L-band InSAR”, Association of American Geographers Annual Meeting, Boston, April 15-19.
- 2008 Elias J. Deeb\*, Richard R. Forster H.P. Marshall, Nick Rutter, “Ground-Based Radar Measurements of Northern Colorado Snowpack at CLPXII”, Association of American Geographers Annual Meeting, Boston, April 15-19.
- 2008 Evan Burgess\*, Richard R. Forster, Laurence C. Smith, Jason E. Box, “Improving estimates of spatiotemporal patterns in annual Greenland accumulation rates”, Association of American Geographers Annual Meeting, Boston, April 15-19.
- 2008 Jeffery VanLooy\* and Richard R. Forster, “Comparison of two techniques for calculating surface elevation changes of mountain glaciers”, Association of American Geographers Annual Meeting, Boston, April 15-19.
- 2007 Richard R. Forster and Jeanne Sauber, “Alaska Glacier Observations with L-band InSAR and Lidar”, American Geophysical Union Annual meeting, San Francisco, Dec. 10 – 14.
- 2007 Evan Burgess\*, Richard R. Forster, Laurence C. Smith, Niels Reeh, Jason E. Box, “Toward estimating sea level rise contribution from the observed Greenland Ice Sheet volume changes”, American Geophysical Union Annual meeting, San Francisco, Dec. 10 – 14.
- 2007 Elias J. Deeb\*, Richard R. Forster, H.P. Marshall, Nick Rutter, “Ground-Based Radar Measurements of the Northern Colorado Snowpack at CLPX-II”, American Geophysical Union Annual meeting, San Francisco, Dec. 10 – 14.
- 2007 Elias J. Deeb\* and Richard R. Forster, “Time Series of Snow Water Equivalent (SWE) Evolution Derived Using Radar Remote Sensing”, Association of American Geographers Annual Meeting, San Francisco, April 17-21.

- 2007 Jeffery VanLooy\* and Richard R. Forster, “Determining Recent Melt Rates and Potential Sea Level Rise Contribution of Five Southwest British Columbia Icefields”, Association of American Geographers Annual Meeting, San Francisco, April 17-21.
- 2006 Richard R. Forster, Laurence C. Smith, Jason E. Box, Niels Reeh, “Greenland Ice Sheet melt observed with ERS and QuikScat scatterometers”, American Geophysical Union Annual meeting, San Francisco, Dec. 11 – 15..
- 2006 Elias J. Deeb\* and Richard R. Forster, “Time Series of Snow Water Equivalent (SWE) Evolution Derived Using Interferometric Synthetic Aperture Radar (InSAR)”, American Geophysical Union Annual meeting, San Francisco, Dec. 11 – 15..
- 2006 Richard R. Forster, Andrew L.J. Ford\*, Ronald L Bruhn ,Jeanne Sauber, “Surface elevation changes on the Bering Glacier, Alaska”, Association of American Geographers Annual Meeting, Chicago, March 7-11.
- 2006 Jeffery VanLooy\*, Richard R. Forster and Andrew L.J. Ford, “Surface elevation change on the Harding Icefield, Alaska”, Association of American Geographers Annual Meeting, Chicago, March 7-11.
- 2005 Forster, R.R. Jezek, K., E. Rodriguez, S. Gogineni, A. Freeman, J. Curlander, X. Wu, C. Allen, P. Kanagaratnam, J. Sonntag, W. Krabill, "Global Ice Sheet Mapping Orbiter" , FRINGE 2005 Workshop, Advances in SAR Interferometry from ENVISAT and ERS missions”, European Space Agency, ESRIN Frascati, Italy 28 November - 2 December 2005.
- 2005 Elias Deeb\* and Richard R. Forster, “Monitoring Alaskan snow pack with InSAR”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2005 Joo-Yup Han\*, Richard R. Forster, Desmond E. Moser and Andrew L.J. Ford, “Land Deformation Patterns due to groundwater changes near the All-American Canal System (U.S./Mexico Border) observed with InSAR”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2005 Elias Deeb\* and Richard R. Forster, “Monitoring Changes in Snow Water Equivalent using Interferometric Synthetic Aperture Radar”, Association of American Geographers Annual Meeting, Denver, April 5-9. (**Student paper award**)
- 2005 Jeffery VanLooy\*, Richard R. Forster and Andrew L. J. Ford, “Monitoring glacial changes on the Harding Icefield, Alaska using Remote Sensing techniques”, Association of American Geographers Annual Meeting, Denver, April 5-9.
- 2005 Richard R. Forster, Andrew L.J. Ford\*, Ronald Bruhn, “Measuring Alaskan Glacier Velocities from Space”, Association of American Geographers Annual Meeting, Denver, April 5-9.

- 2005 Deanna H. Halseth\*, Richard R. Forster, Katrina A. Moser, M.D. Luers and J. Miller, “Reconstruction of East Canyon Reservoir Environmental Conditions”, Association of American Geographers Annual Meeting, Denver, April 5-9.
- 2005 Richard R. Forster, “Microwave Remote Sensing On-line Course”, ASPRS Baltimore, MD, March 9-11.
- 2004 Richard R. Forster, Elias Deeb\*, Angira Baruah\*, Lora Koenig\*, and Lynne M. Baumgras\* “Mapping Snowmelt and Snow Water Equivalent in Arctic Alaska using Microwave Remote Sensing”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2004 Ronald Bruhn, Andrew J. Ford\*, and Richard R. Forster, “Applications of Synthetic Aperture Radar Images to Map Geologic Structures and Geomorphology: Saint Elias Mountains, Alaska”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2004 Desmond E. Moser, Andrew J. Ford, Joo-Yop Han\*, Richard R. Forster, and E. Sanchez, “Radar Satellite (InSAR) Assessment of Hydrodynamics Near the All-American Canal (Calexico/Mexicali Region, Rio Colorado)”, American Geophysical Union Annual meeting, San Francisco, Dec. 13 – 17.
- 2004 Richard R. Forster, “Snow and ice measurements using microwave remote sensing”, Earth System Scholars Network symposium, University of Maryland, Sept. 27-29.
- 2004 Richard R. Forster and Lynne M. Baumgras\*, “Mapping Arctic snowmelt progression with microwave remote sensing”, ASPRS Annual Conference, Denver, CO, May 23-28.
- 2004 Richard R. Forster and Lynne M. Baumgras\*, “Observation of snowmelt progression in Northern Alaska with spaceborne active microwave remote sensing”, Association of American Geographers Annual Meeting, Philadelphia, PA March 15-19.
- 2003 Richard R. Forster, Ronald L. Bruhn, and Andrew J. Ford\*, “Glaciological Field Measurements on the Bering Glacier, Alaska Summer 2003”, American Geophysical Union Annual meeting, San Francisco, Dec. 7 - 11.
- 2003 Andrew J. Ford\* and Richard R. Forster, “InSAR observations of Ice Stream A: dispensing with the surface parallel flow assumption”, American Geophysical Union Annual meeting, San Francisco, Dec. 7 - 11.
- 2003 Hans-Peter Marshall, Gary Koh, and Richard R. Forster, “Ground-Based FMCW radar measurements: a summary of the NASA CLPX data”, American Geophysical Union Annual meeting, San Francisco, Dec. 7 - 11.
- 2003 Laurence C. Smith, Yongwei Sheng, Richard R. Forster, Konrad Steffen, Karen E. Frey and Douglas E. Alsdorf, “Melting of small Arctic ice caps



- observed from ERS scatterometer time series”, American Geophysical Union Annual meeting, San Francisco, Dec. 7 - 11.
- 2003 Richard R. Forster and Andrew J. Ford\*, “Evolution of snowpack conditions monitored with high-temporal resolution InSAR”, European Space Agency – Fringe 2003, Fascati, Italy, Dec. 1-5.
- 2003 Andrew J. Ford\* and Richard R. Forster, “Using multiple crossing orbits to dispense with the assumption of surface parallel ice flow”, European Space Agency – Fringe 2003, Fascati, Italy, Dec. 1-5.
- 2003 Andrew J. Ford\*, Desmond Moser, Joo-Yup Han, and Richard R. Forster, “InSAR monitoring of ground subsidence near the All-American Cannal, Calexico/Mexicali”, European Space Agency – Fringe 2003, Fascati, Italy, Dec. 1-5.
- 2002 Richard R. Forster and Lynne M. Baumgras\*, “Spaceborne Active Microwave Observation of Snowmelt Progression in Northern Alaska”, American Geophysical Union Annual meeting, San Francisco, Dec. 6 - 10.
- 2002 Ronald Bruhn, Richard R. Forster, Andrew J. Ford\* and Terry L. Pavlis “Applications of Remote Sensing to Tectonics and Glacial Processes in the Saint Elias Orogen”, American Geophysical Union Annual meeting, San Francisco, Dec. 6 - 10.
- 2002 Andrew J. Ford\* and Richard R. Forster, “Three-dimensional Ice Velocities Derived from Multiple Look Direction InSAR: An Example from Ice Stream A, West Antarctica”, American Geophysical Union Annual meeting, San Francisco, Dec. 6 - 10.
- 2002 Andrew J. Ford\*, Ronald Bruhn and Richard R. Forster, “InSAR Measurements of Surface Deformation in the Epicentral Region of the Nenana Mountain and Denali Fault Earthquakes of Oct.23 & Nov. 3, 2002”, American Geophysical Union Annual meeting, San Francisco, Dec. 6 - 10.
- 2002 Andrew J. Ford\*, Richard R. Forster, Ronald Bruhn, “Ice surface velocity patterns on the Seward Glacier, Alaska/Yukon and their implications for regional tectonics in the St. Elias Mountains”, presented at the International Glaciological Society meeting, Yakutat, AK, June10-14, 2002.
- 2002 Richard R. Forster and Lynne M. Baumgras\*, “Spaceborne Active Microwave observation of snowmelt on Alaska’s North Slope”, Association of American Geographers Annual Meeting, Los Angeles, CA, March 18-23.
- 2001 Lynne M. Baumgras\*, Richard R. Forster, “Initiation of Snow Melt on the North Slope of Alaska as Observed with Spaceborne Passive Microwave Data”, American Geophysical Union Annual meeting, San Francisco, Dec. 10-14.
- 2001 Richard R. Forster and Lynne M. Baumgras\*, “Melt and Freeze Processes on the North Slope of Alaska Detected with Satellite Microwave Remote

- Sensing”, *International Glaciological Society* meeting, College Park MD, June 4-8.
- 2001 Richard R. Forster, Kenneth C. Jezek, Laurence Gray and Karim E. Matter, “Measurement of glacier strain rates from radar interferometry using wrapped phase”, annual ASPRS meeting, St. Louis, MO, April 23-27.
- 2001 Richard R. Forster and Lynne M. Baumgras\*, “Detecting Arctic Melt and Freeze Processes with Microwave Remote Sensing”, Association of American Geographers Annual Meeting, New York, NY, February 27 – March 3.
- 2000 Richard R. Forster, Elias J. Deeb\*, Kenneth Jezek and Zhiyuan Zhao “Radarsat Interferometry Investigations of East Antarctic Ice Streams”, *American Geophysical Union Annual Meeting*, San Francisco, CA, December 15-19.
- 2000 Lynne Baumgras\* and Richard R. Forster, “Snowmelt Onset Detection on the North Slope of Alaska Using Spaceborne Passive Microwave Data”, *American Geophysical Union Annual Meeting*, San Francisco, CA, December 15-19.
2000. Laurence C. Smith, Glen A. MacDonald, Karen E. Frey, Andrei Velichko, Konstantine Kremenetski, Olga Borisova and Richard R. Forster “Sensitivity of West Siberian peatlands to past and present climate”, *American Geophysical Union Annual Meeting*, San Francisco, CA, December 15-19.
2000. Zhiyuan Zhao, Kenneth Jezek, Laurence Gray, and Richard Forster, “East Antarctic Ice Streams”, *American Geophysical Union Annual Meeting*, San Francisco, CA, December 15-19.
- 2000 Elias J. Deeb\* and Richard R. Forster, “Interferometric Analysis of Antarctic Ice Streams Using RADARSAT InSar Data”, Association of American Geographers Regional Meeting, Provo, UT, Sept. 28-30.
- 2000 Richard R. Forster and Lynne M. Baumgras\*, “Arctic Snowmelt Onset Dates Determined by Remote Sensing Data and Field Measurements”, Association of American Geographers Annual Meeting, Pittsburgh, PA, April 4-8.
- 2000 Richard R. Forster, David G. Long, Kenneth Jezek, Sheldon D. Drobot and Mark R. Anderson, “The Onset of Arctic Sea-Ice Melt as Detected with Passive and Active Microwave Remote Sensing”, *International Symposium on Sea Ice and its Interactions with the Ocean, Atmosphere and Biosphere*, Fairbanks, Alaska, June 19-23.
- 1999 Richard R. Forster, Kenneth C. Jezek, Hong Gyoo Sohn, Hongxing Liu A. Laurence Gray and Karim E. Matter, “Measurement of Glacier Dynamics from Radar Interferometry Using Wrapped Phase”, *Eos, Transactions, American Geophysical Union*, v. 80.
- 1997 Richard R. Forster, Kenneth C. Jezek and Laurence Gray “Interferometric SAR observations of Antarctica from the RADARSAT Antarctic Mapping Mission”, North Central GSA Meeting, Columbus OH, March.

- 1997 Richard R. Forster, Kenneth C. Jezek, Ingrid Zabel, and S. Prasad Gogineni, “The relationship between microwave backscatter and glaciological properties of the Greenland glacier facies”, *Eos, Transactions, American Geophysical Union*, v. 78 (46), p. F16.
- 1996 Richard R. Forster Eric Rignot and Bryan L. Isacks, “South Patagonian glacier velocities determined by radar interferometry”, *Eos, Transactions, American Geophysical Union*, v. 77 (46), p. F52.
- 1996 Laurence C. Smith, Richard R. Forster and Bryan L Isacks, “Dynamic melt patterns on alpine glaciers revealed using temporal ERS-1 SAR”, *Eos, Transactions, American Geophysical Union*, v. 77 (46), p. F52.
1995. Richard R. Forster Bryan L. Isacks and Andrew G. Klein, “Spaceborne imaging radar (SIR-C/X-SAR) glaciological observations of the Patagonian Icefields”, *Eos, Transactions, American Geophysical Union*, v. 76 (46), 193.
- 1995 Richard R. Forster Bryan L. Isacks and Andrew G. Klein, “Shuttle imaging radar (SIR-C/X-SAR) observations of the Patagonian Icefield response to weather change”, *Eos, Transactions, American Geophysical Union*, v. 76 (17), 196, invited.
- 1995 Eric Rignot Richard R. Forster and Bryan L Isacks, “SIR-C/X-SAR repeat-pass interferometry applications to the Patagonian outlet glaciers” *Eos, Transactions, American Geophysical Union*, v. 76 (17), 196.
- 1994 Richard R. Forster and Bryan L. Isacks, “The Patagonian Icefields revealed by space shuttle synthetic aperture radar (SIR-C/X-SAR)”, *Eos, Transactions, American Geophysical Union*, v. 75 (14), 266.
- 1994 Richard R. Forster, Andrew G. Klein and Bryan L. Isacks, “Modern and LGM glaciation of the Bolivian and Patagonian Andes”, *Geological Society of America, Abstracts with Programs*, v. 26(7) 129.
- 1994 Laurence C. Smith, Richard R. Forster and Bryan L Isacks, “Observations of glacial runoff using ERS-1 SAR”, *Third Circumpolar Symposium on Remote Sensing of Arctic Environments*, Fairbanks, Alaska, 16-20 May.
- 1992 Richard R. Forster, Andrew N. Fox and Bryan L. Isacks, “Relative Age Determination of Walker Valley Moraines in the Eastern Sierra Nevada using Airborne Polarimetric SAR”, *Eos, Transactions, American Geophysical Union*, 73 (14), 186.
- 1990 Richard R. Forster, Paul E. Racette and Richard K. Moore, “Relative Contribution of Leaves and Leaf Moisture Content to Radar Backscatter at X-Band”, *URSI International Commission F Symposium*, Hyannis, MA, 15-17, May.

#### **G. Papers in Conference Proceedings (11)**

- 2008 Adam Naisbitt\*, Richard Forster, Karl W. Birkeland, and William L. Harrison, "Avalanche frequency and magnitude: Using power-law exponents to investigate snow avalanche size proportions through time and space", *Proceedings of the International Snow Science Workshop 2008*, 21-27 Sept.
- 2008 Richard R. Forster, Ryo Michishita, Jeffery VanLooy\*, and Dorothy Hall, "Alaskan Glaciology from Space", *International Geoscience and Remote Sensing Symposium*, 2008. IGARSS 2008. IEEE International, 7-11 July 2008 Vol. 4, pp. 37 – 40, DOI 10.1109/IGARSS.2008.4779650.
- 2008 Ken Jezek, Prasad Gogineni, Xiaoqing Wu, Ernesto Rodriguez, Tony Freeman, Fernando Rodriguez-Morales, Anthony Hoch, John Sonntag, Richard Forster, "Global Ice Sheet Mapping Orbiter Concept: Airborne Experiments", *7th European Conference on Synthetic Aperture Radar*, June 2-5, 2008, Friedrichshafen, Germany, Volume 2, pp. 99-102.
- 2000 Jens Munk, Francois Baumgartner, Kenneth Jezek, Prasad Gogineni, Richard Forster and Ingrid Zabel, "Estimating a volumetric backscatter coefficient from in-situ measurements on the Greenland Ice Sheet," *IEEE International Geoscience and Remote Sensing Symposium* (IGARSS '00), Honolulu, HI, July 24-28.
- 1999 Francois Baumgartner, Kenneth Jezek, Richard R. Forster, S. Prasad Gogineni, and Ingrid H.H. Zabel, "Spectral and angular ground-based radar backscatter measurements of Greenland snow facies", *IEEE Proceedings International Geoscience and Remote Sensing Symposium* (IGARSS '99), Hamburg, Germany, June.
- 1999 Hong-Gyoo Sohn, Kenneth Jezek, Francois Baumgartner, Richard R. Forster, and Ellen Mosely-Thompson, "Radar backscatter measurements from Radarsat SAR imagery of South Pole Station, Antarctica", *International Geoscience and Remote Sensing Symposium* (IGARSS '99), Hamburg, Germany, June.
- 1998 Richard R. Forster, Kenneth Jezek, Laurence Gray and Karim Matter, "Analysis of glacier flow dynamics from preliminary RADARSAT InSAR data of the Antarctic Mapping Mission", *International Geoscience and Remote Sensing Symposium* (IGARSS '98), Seattle WA, July.
- 1997 Richard R. Forster, "Synthetic aperture radar applications to calving glaciers", in *Calving Glaciers: Report of a Workshop*, BPRC Report No. 15, The Ohio State University, Columbus OH, Feb., Van der Veen, C.J. (ed.), pp. 71-76.
- 1991 Richard R. Forster, Paul E. Racette and Richard K. Moore, "Estimation of Extinction Coefficient Dependence on Tree Canopy Condition", *IEEE Proceedings International Geoscience and Remote Sensing Symposium* (IGARSS '98), Espo, Finland, v. 3, pp. 1515-1517.
- 1991 Richard R. Forster Craig Martin and Richard K. Moore, "RADAR Backscatter Correlation with Leaf Water Potential of Water-Stressed Tomato Canopies",

*IEEE Proceedings International Geoscience and Remote Sensing Symposium (IGARSS '98)*, Espo, Finland, v. 4, pp. 2269-2272.

- 1990 Paul E. Racette, Richard R. Forster, and Richard K. Moore, "Experimental Study of the Multiple Bounces in Radar Scattering from Trees", *IEEE Proceedings International Geoscience and Remote Sensing Symposium*, (IGARSS '90), College Park, MD, 153-156.

#### **H. Field-based Research Activities**

- 2021 Salt Lake City, UT: As part of the NASA SnowEx campaign conducted ground-based radar experiments to measure snow water equivalent (SWE) from a car and a stationary location. Jan. to March.
- 2020 Boise, ID: Ground-based radar experiments to measure snow water equivalent (SWE) from a moving snowmobile and car and a stationary location. March 9-13.
- 2017 Greenland Ice Sheet: measurements of melt processes from ice cores and subsurface water flow in the ablation zone of SW Greenland from an ice base camp in collaboration with UCLA and Rutgers University. July 18-August 1.
- 2016 Greenland Ice Sheet: Lead a six person team on a helicopter assisted field camp to the southeast Greenland ice sheet to collect firn aquifer data using groundwater techniques, GPR, seismic refraction, magnetic resonance sounding, and self potential. Drilled three cores, measured density and water content. Installed a data logger with daily satellite uplink of borehole water pressure. July 17 – August 10.
- 2014 Greenland Ice Sheet: Lead a three person team on a helicopter assisted field camp to the southeast Greenland ice sheet to service in situ instruments with daily satellite uplink and test aquifer sampling techniques. March 21 – April 13.
- 2014 Utah: Time domain reflectivity (TDR) measurements of snow pack properties during spring snowmelt progression coincident with snow pit measurements at the Guard Station Alta, Utah. April-May.
- 2013 Greenland Ice Sheet: Lead a five person team on a helicopter assisted field camp to the southeast Greenland ice sheet to acquire data of the Greenland aquifer we discovered in 2011. Drilled two cores, measured density and water content. Installed a data logger with daily satellite uplink of borehole temperatures. March 25 – April 12.
- 2012 Wind River Range, Wyoming: Measured glacier ice thickness on Continental Glacier using surface-based profiling radar and ice surface elevations with GPS and laser range finder in collaboration with University of North Dakota. August 4-19.
- 2012 Greenland Ice Sheet: discharge measurements of supra glacial stream networks in the ablation zone of SW Greenland from an ice base camp in collaboration with UCLA and Rutgers University. July 13-27.

- 2011 Wind River Range, Wyoming: Measured glacier ice thickness on Continental Glacier using surface-based depth sounding radar and ice surface elevations with GPS and laser range finder in collaboration with University of North Dakota. July 31 – August 11.
- 2010 Greenland Ice Sheet: Lead a five person field team on a 500 km snowmobile traverse of the Greenland ice sheet. Three 50 m firn cores were extracted and 235 km of ice penetrating radar profiles collected. April 5 – May 13.
- 2009 Greenland: Hydrological and remote sensing field work near Kangerlussuaq, Greenland (surveyed topographic profiles and surface roughness across stream channels in support of a JPL airborne InSAR derived DEM, and measured discharge in ice marginal streams) May 26 – June 6.
- 2008 Utah: Ground based radar measurements of snow pack properties coincident with surface wetness and snow pit measurements at the guard station Alta, Utah. May 13.
- 2008 Greenland: Hydrological and remote sensing field work near Kangerlussuaq, Greenland (measured spectral reflectance and suspended sediment concentrations in fjord and lakes, installed pressure transducers in ice marginal streams to record stage, measured discharge in ice marginal streams) June 1-10.
- 2007 Colorado: Cold Land Process Experiment part two (CLPX-II) – NASA snow experiment, conducted field-based radar experiments of snow pack properties coincident with surface wetness and snow pit measurements at several sites in and around Steamboat Springs, CO. Feb. 22 – 27.
- 2004 Alaska: Glaciological field work on the Matanuska Glacier, Alaska (measured ice velocity and ice thickness) – Flew onboard the NASA/JPL DC-8 while acquiring AirSAR data of Alaskan glaciers, Sept. 20-24.
2003. Alaska: Glaciological field work on the Bering, Sheridan and Childs Glaciers, Alaska (measured ice velocity and ice thickness)– supported by NASA project “SAR analysis of the Western Saint Elias Orogen, Alaska”, Sept. 29-Aug. 9.
- 2003 Alaska: Field work on the North Slope of Alaska, measuring snow properties at snow pits and comparing with ground-based and spaceborne remote sensing data, May 6-21, 2003.
- 2003 Colorado: Cold Land Process Experiment (CLPX) – NASA snow experiment, conducted field-based remote sensing experiments at Fraser Experimental Forest, Walden and Buffalo Pass, CO, March 25-30.
- 2003 Colorado: Cold Land Process Experiment (CLPX) – NASA snow experiment, conducted field-based remote sensing experiments at Fraser Experimental Forest, Walden and Buffalo Pass, CO, February 17-24.

- 1995 Chile: Glaciological measurements of the San Rafael Glacier, North Patagonia Icefield, Chilea for ground truth of previously acquired NASA SIR-C/X-SAR radar data. December 10 – Jan 10.
- 1994 Bolivia: Glacier characterization for simultaneous overflight of NASA Space Shuttle Endeavor with SIR-C/X-SAR radar onboard. Measured ice roughness, snow density, wetness, grain size, temperature. Measured snow depth along transects and mapped transient snowline. near LaPaz, Bolivia: April 9 – 20
- 1993 Bolivia: Glacier and moraine characterization for simultaneous overflight of NASA/JPL AirSAR. Measured ice roughness, snow density, wetness, grain size and temperature. Collected moraine rock samples for cosmogenic exposure dating. Built and installed radar calibration targets on glaciers. near LaPaz, Bolivia: May 28 – June 13.
- 1989 Antarctica: Mapped ice thickness and bottom roughness of Ice Stream B with ice penetrating radar deployed with a snow cat. Measured radar reflection from annual accumulation layers in the snow/firn with a ground-based X-band radar. November – January

## **I. Outreach**

**Media** (based on Forster et al., 2013 *Nature Geoscience*)

- BBC News <http://www.bbc.co.uk/news/science-environment-25463647>
- Time magazine <http://science.time.com/2013/12/27/newly-discovered-underground-aquifer-greenland/>
- National Public Radio <http://kuer.org/post/university-utah-researchers-surprised-discovery-perennial-aquifer-greenland>
- Fox News <http://www.foxnews.com/science/2013/12/23/greenland-snow-hides-100-billion-tons-water/>
- The Economist <http://www.economist.com/news/science-and-technology/21595405-little-known-mixture-ice-and-water-may-have-big-effect-sea>

400+ national and international media outlets

## **Invited Lectures, Presentations and Participation**

- 2019 invited Dean’s Distinguished Lectureship Social and Behavioral Sciences Rutgers University, “Discovery and exploration of a new meltwater reservoir within the Greenland ice sheet”, February 22.
- 2019 invited participant National Academy of Sciences Workshop on Evolving the Geodetic Infrastructure, Beckman Center, Irvine, CA, February 11-12.
- 2018 invited participant Launch Conference Islamabad National University, Islamabad, Pakistan, December 21-22.
- 2017 invited talk at National Science Foundation workshop “How Stable is the Greenland Ice Sheet?” hosted by the University of Buffalo, Buffalo, NY, September 11-12.
- 2016 invited talk at workshop hosted by Geological Survey of Denmark and Greenland (GEUS), “Observing and modelling meltwater retention processes in snow and firn on ice sheets and glaciers” Copenhagen, DK, June 1-3.

- 2016 invited talk at the “3<sup>rd</sup> Chinese Academy of Science-NASA Workshop on the Use of Earth Observations to Address Glacier Change and Associated Hazards in High Mountain Asia”, Sanya, China, March 14-16.
- 2016 invited talk at National Geospatial Intelligence Agency, Springfield, VA, “Remote sensing and field measurements on the Greenland Ice Sheet”, Jan 19.
- 2015 invited talk at the “2<sup>nd</sup> Chinese Academy of Science-NASA Workshop on Snow and Glacier Change and Related Natural Disasters in High Mountain Asia”, Mammoth, CA, September 9-11.
- 2015 invited talk at the “International Glacier Symposium: How much do we know about the glaciers of the high Himalayas?”, Bumthang, Bhutan, April 13-19.
- 2015 invited talk at Intermountain Healthcare Sustainability Conference, “Society, Water, and Climate”, with Andrea Brunelle, Park City UT, Nov 3.
- 2015 invited talk at the “Chinese Academy of Science-NASA Workshop on the Use of Earth Observations to Address Glacier Change and Associated Hazards in the Hindu Kush-Himalayas”, Kathmandu, Nepal, January 20-23, 2015.
- 2013 invited talk Cornell University, Earth and Atmospheric Sciences, “Extensive Liquid Meltwater Storage Discovered within the Greenland Ice Sheet Firn”, Nov. 1.
- 2013 invited talk Guy F. Atkinson Distinguished Lecture Series, Geology and Geophysics, Univ. of Utah, “Extensive Liquid Meltwater Storage Discovered Within the Greenland Ice Sheet Firn”, Sept. 5.
- 2013 Invited talk at the National Centre for Meteorological Research, Snow Research Centre, Grenoble, France, Jan 30.
- 2012 invited talk BYU Geology “Greenland Ice Sheet snow accumulation rates from field measurements and remote sensing”, Provo, UT, Feb. 9, 2012
- 2012 presentation at NASA Greenland meeting “Near-surface water layer discovered within the Greenland Ice Sheet during winter conditions from firn cores, ground based radar, and Operation IceBridge radars” NASA Goddard, Jan. 25-26.
- 2011 presentation at NASA Greenland meeting “Arctic Circle Traverse 2010 and 2011(ACT-10/11):South East Greenland snow accumulation variability from firn coring and ice sounding radar” NASA Goddard, Jan. 19-20.
- 2011 invited talk to West High School environmental science class, “Greenland ice sheet and climate change”, Jan. 9.
- 2010 invited talk for Utah Museum of Natural History, Science Movie Night at the Salt Lake City downtown library, “A Greenland ice sheet snowmobile traverse to measure snow accumulation”, Oct. 5
- 2010 invited talk at NASA Goddard Space Flight Facility “Alaska glacier velocity variability and a field campaign to measure SE Greenland accumulation coincident with IceBridge” Aug. 30.
- 2010 external reader for PhD dissertation defense, Randall Scharien, “Physical and polarimetric C-band microwave scattering properties of first-year sea ice during advanced melt”, University of Calgary, Canada, Aug. 2-3.
- 2010 invited talk to Skyline High School environmental science class, “Greenland ice sheet and climate change”, May. 28.
- 2009 invited plenary talk, “Geodetic imaging of the cryosphere: Recent advances and future directions”, UNAVCO Long-Range Science Goals for Geodesy Community Workshop, Salt Lake City, UT, Oct. 5-6.
- 2009 presentation, “The Southeast Greenland Traverse and Alaska Glacier Velocities”, NASA Greenland meeting, Seattle WA, Nov. 30-Oct. 1.



- 2009 Undergraduate Research Presentations with Julie Miller\*, “Estimating snow accumulation on the Greenland Ice Sheet with satellite data” University of Utah, March 31.
- 2009 NSF site visit for Science and Technology Center “CReSIS”, representing the Advisory Board as Chair, Lawrence, Kansas, February 9-11.
- 2008 NSF site visit for Science and Technology Center “CReSIS”, representing the Advisory Board as Chair, Lawrence, Kansas, March 24-25.
- 2008 Advisory Board (Chair) meeting for NSF Science and Technology Center “CReSIS”, Lawrence, Kansas, March 5-7.
- 2008 Invited talk at NASA Goddard “Surface elevation change using SRTM and ice velocity measured with L-band InSAR on example North American glaciers”, Greenbelt, MD, February 14.
- 2008 NASA Ice Sheet meeting, Boulder, CO, Feb. 3-5.
- 2007 NASA Science Workshop “Deformation, Ecosystem Structure, and Dynamics of Ice (DESDynI)” invited participant, Orlando, FL, July 16-19.
- 2007 Spring Runoff Conference, Logan Utah, April 5-6.
- 2007 Advisory Board meeting for NSF Science and Technology Center “CReSIS”, Lawrence, Kansas, February 19-20.
- 2007 NASA Ice Sheet meeting, Jet Propulsion Lab, Pasadena, CA, January. 28-30.
- 2006 Symposium in Honor of Bryan Isacks (PhD Advisor), presented “Alaskan Glaciology from Space”, Ithaca, NY, October 8-10.
- 2006 Collaborative visit to NASA Goddard, host Jeanne Sauber, April 10.
- 2006 Science Team Meeting for NASA project Glaciers and Ice Sheets Interferometric Radar, Columbus, OH, April 2-3.
- 2006 Spring Runoff Conference, Logan Utah, March 27-28.
- 2005 National Research Council meeting, Seattle, WA, November 13-16.
- 2005 NASA Ice Sheet meeting, Baltimore, MD, October. 23-26.
- 2005 West Antarctic Workshop (WAIS) workshop, NASA/NSF, Sterling, VA, September 28-30.
- 2005 Science Team Meeting for NASA project Glaciers and Ice Sheets Interferometric Radar, Sterling, VA, September 26-27.
- 2005 Collaborative visit to NASA Goddard, host Jeanne Sauber, September 21-24
- 2005 National Research Council meeting, Irvine, CA, August 27-31.
- 2005 National Research Council meeting, Boulder, CO, May 8-11.
- 2005 NASA Cold Lands Process Workshop, Seattle, WA, March 22-24.
- 2004 NASA/NSF InSAR workshop, invited participant, Oxnard, CA, October 20-22.
- 2004 IGARSS, Anchorage, AK, September 22.
- 2004 invited presentation NASA Earth System Scholars, “Snow and Ice Measurements Using Microwave Remote Sensing”, College Park, MD, September, 26-29.
- 2004 Plenary Presentation at Tenth Biennial USDA Forest Service Remote Sensing Applications Conference, “Remote sensing and GIS at the University of Utah”, Salt lake City, UT, April 5.
- 2004 Cold Land Process Workshop –Specification of a NASA satellite mission for measurement of snow properties Steamboat Springs, CO, March 3-5.
- 2003 National Science Foundation - Study of Environmental Arctic Change (SEARCH) Open Science Meeting, Seattle, WA, Oct. 27-29.
- 2003 Cold Land Process Experiment Workshop – Review of data sets and definition of a NASA satellite mission for measurement of snow properties Boulder, CO, May 28-29.

- 2002 Geospatial Workforce course Creation Fellows Workshop, Gulfport, MS, July 26-28.
- 2002 Geospatial Workforce Development Workshop, University of Mississippi, Oxford, MS, June 4-5.
- 2002 Cold Land Process Experiment (CLPX) – NASA snow experiment, conducted field-based remote sensing experiments at Fraser, CO, March 25-28
- 2001 Workshop for Cold Land Process Experiment (CLPX) – NASA snow experiment, Boulder, CO, November 6-9
- 2001 Antarctic Mapping Advisory Group (NASA) meeting / InSAR Applications to Glaciology Workshop, Vexcel Inc., Boulder CO, May 3-4, 2001.
- 2001 Department of Transportation Remote Sensing meeting, University of Florida, Gainesville, FL, March 20-22.
- 2000 ASPRS Intermountain Region Fall Technical Meeting, Utah State University September 29.
- 2000 ASPRS Intermountain Region Spring Technical Meeting, presentation: “Interferometric Radar: What is it used for and how does it work?”, University of Utah, April 17.
- 2000 Antarctic Mapping Advisory Group (NASA) meeting, The University of Washington, Seattle, WA, January 20 – 21.
- 1999 “Interferometric Synthetic Aperture Radar (InSAR) Theory and Application to Glacier Dynamics and Other Ground Displacement Phenomena”, Distinguished Lecture Series, Geology and Geophysics, University of Utah, November 18.
- 1999 Workshop on Applications of Remotely Sensed Data to Transportation, Center for Mapping, The Ohio State University, Columbus, OH, August 12-13.
- 1999 “Relationships between radar backscatter and accumulation rate on the Greenland Ice Sheet”, BYU Department of Electrical Engineering, February 9, host David Long.
- 1997 “Synthetic aperture radar applications to calving glaciers”, *International Workshop on Calving Glaciers*, The Ohio State University, Columbus OH, Feb. 28 - Mar. 2.
- 1997 “Accumulation rate variability in Central Greenland from microwave remote sensing”, *Remote Sensing of Ices Workshop*, Flagstaff AZ, June.
- 1996 “SIR-C interferometry of the South Patagonian Icefield”, *Alaskan SAR Facility InSAR Meeting*, Fairbanks, AK, July 31-August 2.
- 1993 “Glaciological Studies in the Central Andes using AIRSAR/TOPSAR”, *Summaries of the Forth Annual JPL Airborne Geosciences Workshop*, JPL:93-26, 13-15.
1992. “Preliminary Results of Polarization Signatures for Glacial Moraines in the Mono Basin, Eastern Sierra, Nevada”, *Summaries of the Third Annual JPL Airborne Geosciences Workshop*, JPL:92-14, v. 3, 40-42.

### **I. Membership in Professional Organizations**

- 2000 – present ASPRS
- 1999 – present. Association of American Geographers
- 1997 – present. International Glaciological Society
- 1996 – present. Institute of Electrical and Electronics Engineers
- 1992 – present. American Geophysical Union

### III. SERVICE

#### A. Professional and Community Service

##### 1. External Review of Retention, Promotion and Tenure (RPT)

8 cases

##### 2. Proposal Review Panels

Agency	Panel	Date	Program Manger
NSF	Glaciology	October 28,-29, 2019	Paul Culter
NASA	Planetary Mission		
NASA	Terrestrial Hydrology	November 2-3, 2017	Jared Entin
NASA	Cryospheric Sciences	August 27-29, 2014	Thomas Wagner
NASA	Sea Level Rise – Glaciology	November 4, 2013	Thomas Wagner
NSF	Arctic Natural Sciences	April 11-15, 2011	Henrietta Edmonds
NASA	Remote Sensing Theory	Feb. 14-16, 2011	Lucia Tsaoussi
NASA	Terra and Aqua Land Science	July 11-13, 2010	Diane Wickland
NOAA	Climate Change Data Sets	March 23-25, 2009	Jeff Privette
NASA	Cryospheric Sciences	February 3-5, 2008	Seelye Martin
NSF	Antarctic Geology and Geophysics	September 20-21, 2006	Thomas Wagner
NSF	Antarctic Glaciology	September 19-20, 2006	Julie Palais
NASA	New Investigator Program	April 11-13, 2006	Ming Ying Wei
NASA	Cryospheric Sciences	March 13-14, 2002	Waleed Abdalati
NASA	Polar Programs	May 18-19, 2000	Kim Partington

##### 3. Proposal Reviewer

Agency	Program
<i>NSF</i>	<i>CAREER</i>
<i>NSF</i>	<i>Antarctic Glaciology</i>
<i>NASA</i>	<i>Cryospheric Sciences</i>
<i>Netherland Organization for Scientific Research</i>	<i>Earth Observation Research</i>

##### 4. Scientific Reviewer

Journal	Service
<i>Science</i>	ongoing
<i>Nature</i>	ongoing
<i>Nature Geoscience</i>	ongoing
<i>IEEE Transactions on Geoscience and Remote Sensing</i>	ongoing
<i>IEEE Geoscience and Remote Sensing Letters</i>	ongoing
<i>Journal of Glaciology</i>	ongoing
<i>International Journal of Remote Sensing</i>	ongoing
<i>Geophysical Research Letters</i>	ongoing
<i>Annals of Glaciology</i>	ongoing
<i>Journal of Geophysical Research</i>	ongoing
<i>Hydrological Processes</i>	ongoing
<i>Global and Planetary Change</i>	ongoing
<i>Journal of Hydrometeorology</i>	ongoing
<i>Electronics and Telecommunications Res. Inst. Jour</i>	ongoing

### **5. Professional Committees**

- 2008 – 2011. Chair of the Advisory Board for NSF Science and Technology Center “Center for Remote Sensing of Ice Sheets (CReSIS)” at University of Kansas
- 2005 – 2007 National Research Council-Space Studies Board, Earth Science and Applications from Space: A Community Assessment Strategy for the future.
- 2002 – 2004 Board of directors Cryosphere Specialty Group, American Association of Geographers 2002-2004

### **B. Departmental Service**

- 2010 – 2012 RPT Committee Chair
- 2006 – 2007 Director of Geographic Information Sciences (GIS) Certificate Program
- 2004 – 2005 Director of Graduate Studies
- 2001 – 2005 Geographic Information Science Committee Chair, Department of Geography, University of Utah
- 2002 – present Graduate Student Selection Committee, Department of Geography, University of Utah
- 1999 – present. Geographic Information Science Committee, Department of Geography, University of Utah
- 1999 – 2004 Selected and graded a *general question* for the Masters qualifying exam

### **C. College Service**

- Associate Dean of Research, College of Social and Behavioral Science (2014 – present)
- Interim Associate Dean, College of Social and Behavioral Science (2013 – 2014)
- Dean search committee (2008-2009)
- Superior Research Award Committee (2002, 2008)
- Curriculum Committee (2007)
- Adjunct Faculty Review Committee (2008 – 2012)
- RPT Committee (2010 – 2013)

### **D. University Service**

- Reviewer for COVID-19 Seed Grants VPR and 3i Initiative (4/2020)
- Utah Informatics Initiative Committee (2019 – present)
- NEXUS Executive Committee (2018 – present)
- Celebrate U Task Force (2016 – present)
- One-U Advisory Board (2019 – present)
- Interim Director NEXUS (2018)
- Search Committee Chair for Director of Research Development (2017)
- Search Committee Chair for Manger of Research Development (2017)
- Research Instrumentation Fund (2016 – 2017)
- Graduate Student Support/Tuition Ad Hoc Committee (2015 – 2018)
- Eccles Fellowship Committee (2015 – present)
- Search committee for Vice President of Research (2015-2016)
- Steering Committee for new CSBS building (2015-2018)
- Graduate program review Department of Electrical Engineering (Nov. 2008)
- Academic Senate (2009 – 2012, elected by Social and Behavior Science faculty)
- Adjunct Faculty Review Committee (2009 – 2011)

#### IV. TEACHING

##### A. Courses 1999 - 2017

**GEOGR 3110 The Earth from Space: Remote Sensing of the Environment** (3 credit hours)

**GEOGR 5110/6110 Environmental Analysis Through Remote Sensing** (3)

**GEOGR 6000 Advanced Geospatial Statistics** (3)

**GEOGR 5130/6130 Advanced Remote Sensing Applications** (3)

**GEOGR 6960 Microwave Remote Sensing** - Graduate seminar (3)

**GEOGR 6960 Glaciology and Climate Change** - Graduate seminar (3)

**GEOGR 3292/5292 Snow and Ice** - (3)

**GEOGR 3290/5290 Water in Utah** - (3)

##### B. Graduate Committees

###### 1. Chaired Ph.D. committees

- 1999 – 2002 Baumgras, Lynne, “Initiation of snowmelt on the North Slope of Alaska as observed with spaceborne passive microwave data” **Recipient of a NASA Graduate Student Fellowship** 1999 – 2002. (AMEC Geomatrix)
- 1999 – 2003 Gluch, Renee, “Mapping the urban thermal pattern in the Salt Lake Valley using ATLAS remotely-sensed data” (Brigham Young University)
- 2003 – 2007 VanLooy, Jeffery, “Analyzing North American Glaciers and sea level rise using digital elevation models and synthetic aperture radar imagery” (Associate Professor, University of North Dakota)
- 2003 – 2008 Han, Joo-Yup, “InSAR analysis of surface deformation due to aquifer stress”
- 2010 – 2011 Jin, Zhenyu, “Mapping and spatial-temporal modeling of bromus Tectorum invasion in Central Utah”
- 2004 – 2012 Deeb, Elias, “Snow pack characterization with remote sensing” **Recipient of a NASA Graduate Student Fellowship** (Research Scientist, Cold Regions Research and Engineering Lab – CRREL, Hanover, NH)
- 2008 – 2013 Burgess, Evan, “Spatial and temporal variability in Alaska glacier velocities from synthetic aperture radar (SAR)”, **Recipient of a NASA Graduate Student Fellowship** (Geospatial Data Scientist - Air Sciences Inc.)
- 2009 – 2013 Bryant, Annie, “The effects of dust deposition on seasonal snowmelt”, **Recipient of a NASA Graduate Student Fellowship**
- 2010 – 2014 Turin, James, “Alaska glacier velocities from Landsat time series”
- 2010 – 2015 Miege, Clement, “Measuring ice sheet accumulation rates from firn cores, ground-based and airborne radars”, **Recipient of a NASA Graduate Student Fellowship**
- 2011 – 2017 Selkowitz, David, “Snowmelt pattern time series from Landsat and MODIS satellite data” **Recipient of a USGS SCEP (student career employment program) fellowship** (USGS, Carson City, NV)

2012 – 2017	Miller, Julie, “Greenland ice sheet snow accumulation rates from spaceborne microwave remote sensing”
2017 – 2018	Warren Scott
2018 – present	Jewell Lund

## 2. Membership on Ph.D. committees

1999 – 2001	Chen, Che-Ming, “Investigation of imaging spectroscopy for discriminating urban land covers and surface materials”
2001 – 2003	Hung, Ming-Chin, “Remote sensing and GIS for urban environmental modeling, monitoring and visualization”
2001 – 2004	Hernandez, Michael, “A procedural model for developing a GIS based multiple natural hazard assessment: Case study-Southern Davis County, Utah”
2001. – 2004	Shoukry, Nermin, “Using remote sensing and GIS for monitoring settlement growth expansion in the eastern part of the Nile Delta Governorates in Egypt (1975-1998)”
2002. – 2005	Beitler, Brenda (Department of Geology and Geophysics), “Sandstone bleaching and iron concentrations: An index to fluid pathways and diagenetic history in Jurassic Navajo Sandstone, Southern Utah”
2002 – 2005	Bloom, Amy, “Using diatoms to quantitatively infer past climate and environmental conditions on the Sierra Nevada, California, USA”
2002 – 2011	Hadley, Heidi, “Transit sources of salinity loading in the San Rafael River, Colorado River Basin, Utah”
2002 – 2008	McNeally, Phoebe, “Holistic geographic visualization of spatial data with applications in avalanche forecasting”
2004 – 2008	Willis, Julie (Department of Geology and Geophysics), “Subduction boundary controls on intracontinental deformation: Tectonic geomorphology and kinematic models of the interior southern Alaska tectonic block”
2005 – 2010	Shizuo Nishizawa
2009 – 2011	Morris, Jesse
2008 – 2009	Han, WooSuk (Department of Civil and Environmental Engineering), “Use of satellite rainfall data for global flood modeling in urban areas: Error assessment and development of Modeling advances”
2008 – 2014	Baskin, Robert, “Mapping and analysis of the occurrence and distribution of stromatolithic forms in the Great Salt Lake, Utah”
2008 – 2011	Michishita, Ryo,
2009 – 2011	Lundeen, Zachary
2009 – 2013	Yuan Zhang
2010 – 2014	Kristine Blickenstaff (Department of Civil and Environmental Engineering)
2012 – 2015	Yi Qi
2015 – 2016	Jessica Wempen (Department of Mining Engineering)
2016 – present	Durban Keeler
2016 – present	Eric Johnson
2016 – present	Matt Olson
2020 – present	Bailey Simmons (Department of Mining Engineering)

## 3. Chaired Master's committees

2000 – 2004	Deeb, Elias, “Identifying and Measuring Glacial Velocities of Tributary Ice Streams in Antarctica Using Interferometric Synthetic Aperture Radar”, Graduated August 2004 (PhD student University of Utah)
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1999 – 2008	Smith, Greg, “Extracting scientific meaning from physiographic datasets to develop a flash flood potential index”. (National Weather Service)
2001 – 2002	Koenig, Lora, “The evaluation and development of passive microwave snow water equivalent algorithms in the Kuparuk River watershed, Arctic Alaska, USA”, Graduated December 2002 (PhD student University of Washington)
2002 – 2004	Baruah, Angira, “An integration of active microwave remote sensing and a snowmelt runoff model for stream flow prediction in the Kuparuk watershed, Arctic Alaska”, Graduated Nov. 2004 (PhD student University of Maryland)
2003 – 2004	Kenney, Terry, “Cross-sectional progression of vertical streamflow velocity distributions, apparent bedload velocities, and channel geometry, Green River, Utah”, Graduated Nov. 2004 (USGS Hydrologist)
2004 – 2005	Taylor, Kathie, “Quantifying changes in cottonwood recruitment along the Truckee River in response to instream flow releases for riparian vegetation development”, Master of Science and Technology Program (Otis Bay Ecological Consultants)
2004 – 2007	Edgar, Timothy, “Analysis of radar glacier zones on the Southern Patagonia Icefield” (PhD student University of Utah)
2004 – 2008	Naisbitt, William Adam, “Avalanche frequency and magnitude: Using power-law exponents to investigate snow avalanche size proportions through time and space” (Utah Dept. of Transportation)
2005 – 2008	Bair, Andrea , “Spatial analysis of the forecast skill of the local three-month temperature outlook in the western United States” (National Weather Service)
2008 – 2009	Burgess, Evan, “A Spatially Calibrated Model of Annual Accumulation Rate on the Greenland Ice Sheet (1958-2007)” (PhD student University of Utah)
2008 – 2010	Turin, James, (PhD student University of Utah)
2005 – 2010	Halseth, Deanna (Energy Solutions)
2010 – 2012	Miller, Julie (PhD student University of Utah)
2011 – 2014	Gold, Brittany, “Seasonal snowpack characterization using time domain reflectometry (TDR)”
2014 – 2015	Laura McNerney, “Constraining the Greenland firn aquifer’s ability to hydro-fracture a crevasse to the bed of the ice sheet”.
2015 – 2018	Jewell Lund, “Synthetic Aperture Radar snow conditions: seasonal and diurnal signals in the Upper Indus Basin” (PhD student University of Utah)
2014 – 2017	Noah Brautigam

#### **4. Membership on Master's committees**

1999 - 2000	McNeally, Phoebe, “Avalanche slide path stability modeling using GIS”.
2002 – 2005	Hanson, Molly, A Pleistocene-Holocene transition in the Greater Owens River System and other basins within the Great basin, USA: Paleohydrologic patterns”
2004 – 2006	McDaniel, “An agent-based model of civil unrest”
2007	Edwards, Heidi, “Harnessing the wind for Daybreak”, Master of Science and Technology
2007 – 2008	Talbot, Nathan, (Department of Civil and Environmental Engineering) “Satellite-based study of potential water demand reduction from urban landscape modification in Salt Lake City, UT”
2007 – 2008	Graves, Scott, “Examining vegetation phenology of Ugandan dambos using spectral mixture modeling fractions”
2008 – 2009	Culpepper, John, “Analysis of terrestrial ground-based lidar datasets on active lava flow processes and the geomorphology of Pu’u O’o, Hawaii”
2006 – 2010	Beaty, Mark

2010 – 2011 Cotton, Michelle (Geology and Geophysics)  
2010 – 2013 Lebaron, Anthony (Mining Engineering)  
2015 – 2016 Michelle Meadows  
2018 – 2019 Collin Riley  
2018 – present Kate Baustian

**C. Post-doctoral Researchers**

2015 – 2018 Miede, Clement, supported by NSF grant, “Collaborative Research: The Greenland firn aquifer impacts on ice sheet hydrology: characterizing volume, flow, and discharge”  
2001 – 2004 Ford, Andrew, supported by the following grants, “The glacier dynamics and mass flux of Antarctic ice streams from Radarsat InSAR”, “SAR analysis of the Western Saint Elias Orogen, Alaska” and “Radar satellite (InSAR) monitoring of groundwater dynamics near the All-American canal (Calexico/Mexicali region)” (Faculty Bournemouth University).  
2009 – 2010 Han, Joo-Yup , supported with a NASA Goddard post doc grant to study snowmelt runoff with MODIS satellite data.