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Education

March 2011, Ph.D., Specialty: Climate Science, Department of Earth and Planetary Science, School of Letters and Sciences, University of California, Berkeley, California
May 2000, B.A., Major: Computer Science / Science of Earth Systems (concentration in Atmospheric Sciences)
Minor: Concentration in French Area Studies, School of Arts and Sciences, Cornell University, Ithaca, NY

Experience

Dr. Schlegel has over 15 years of experience in software development of thermo-mechanical ice sheet models, including the design of experiments for the quantification of uncertainties in simulated ice sheet dynamics and regional climate. She has significant experience with the development of the Ice-sheet and Sea-level System Model (ISSM), with the application of ISSM to the modeling of surface climate and continental ice flow in Antarctica and Greenland, and with the integration of the Glacier and Energy Mass Balance (GEMB) surface radiation balance model into the ISSM framework.

Research Experience

10/2019 – present, Scientist III, NASA Jet Propulsion Laboratory, Pasadena, CA

7/2016 – present, Assistant Researcher III, JIFRESSE, University of California Los Angeles, Los Angeles, CA

7/2017 – 10/2019, Scientist II, NASA Jet Propulsion Laboratory, Pasadena, CA

- *Expert in the JPL-UCI Ice Sheet System Model (ISSM) software, specifically for use in scientific research of ice sheet response to changes in climate and other boundary conditions/forcing, with a strong focus on utilization of uncertainty quantification tools to understand ice sheet sensitivity and error propagation in ice flow models.*
- *Main research goals include the use of NASA observations (i.e., GRACE/ICESat) to better constrain uncertainty in model simulations and ultimately, to determine the mechanisms, physical processes, and timescales most responsible for current changes in ice sheet dynamics and total/regional mass balance.*

7/2014 – 7/2016, Assistant Researcher II, University of California Los Angeles, Los Angeles, CA

- *Uncertainty quantification of ice sheet model simulation / model sensitivity to climate and boundary conditions*
- 5/2011 – 7/2014, Caltech Postdoctoral Scholar, NASA Jet Propulsion Laboratory, Pasadena, CA, advisor: Eric Larour (NASA JPL)

- *Ice Sheet System Model (ISSM) developer, enhancement and testing of ISSM (C/C++, Matlab platform)*
- *Research focus on sensitivities of ice sheets to external forcings/boundary conditions (atmosphere/ocean)*

9/2003 – 5/2011, Graduate Student Researcher/Instructor, Department of Earth and Planetary Science, School of Letters and Sciences, University of California, Berkeley, CA

- *Enhancement of the University of British Columbia three-dimensional thermo-mechanical ice sheet model to investigate the sensitivity of the Greenland Ice Sheet to modern day climate variability and projected future climatic trends (FORTRAN90/95, Matlab)*
- *Force Polar version of the NCAR/Penn State Mesoscale Model (PMM5) with various ice sheet topographies calculated from the ice sheet model (FORTRAN90/95, C/C++)*

5/2004 – 5/2011, Visiting Graduate Student Researcher, Climate Science Department, Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA

- *Climate model simulation and analysis: Running of various climate models (NCAR/Penn State Mesoscale Model [MM5], Weather Research and Forecasting Model [WRF]) and analysis of output from multiple high-resolution Mesoscale simulations (C++, FORTRAN90/95, NetCDF, GRIB, Matlab)*
- *Statistical Climatic downscaling of AOGCM model output (i.e. PCM, GFDL, HadCM3, CCSM) with observational and reanalysis data (ECMWF, NCEP, PRISM)*
- *Development of algorithms to capture the historical and projected frequencies of synoptic scale patterns currently believed to drive California mesoscale weather events (eg. Santa Ana Winds, coastal fog)*

5/2002 – 8/2003, Team Lead for Training Simulation Program, National Air and Space Model (NASM) for the Joint Simulation (JSIMS) Project, Raytheon Company, Sudbury, MA

9/2000 – 8/2003, Software Engineer, National Air and Space Model (NASM) for the Joint Simulation (JSIMS) Project, Raytheon Company, Sudbury, MA

- *Software design, development, and testing for Air force portion of a US armed forces joint simulation for officer training (UML, OOC/C++)*

8/1999 – 9/2000, Member of Robotic Soccer (Robocup) Research and Development Team, Artificial Intelligence, Department of Mechanical Engineering, Cornell University, Ithaca, NY

- *Software design for robotic soccer team artificial intelligence development (C/C++, Java)*
- *Software code development for simulation games and robot artificial intelligence (C++, Matlab)*

6/1999 – 8/1999, Summer Institute Student Scholar, Land Data Assimilation Scheme (LDAS) Student Intern, NASA Goddard Space Flight Center, Greenbelt, MD

- *Scripting for automatic download and visualization of satellite data (UNIX shell)*
- *Developed real-time website visualization for validation of LDAS model's earth temperature prediction output (FORTRAN, GrADS)*
- *Web page modification and creation (HTML, Java)*

Teaching-Mentoring Experience

2012 – Present, Mentor of JPL/ISSM student interns from local high schools and U.S/foreign Universities

2011 – 2021, Instructor/co-organizer of Ice-sheet and Sea-level System Model workshops (12/2011: 2 day workshop in Pasadena, CA; 12/2012: 3 day workshop in Irvine, CA; 6/2014: 3 day workshop in Bergen, Norway; 6/2016: 3 day workshop in La Jolla, CA; 5/2021: 3 day virtual workshop Hampton University)

2018 – 2020, Thesis committee of now Dr. Silje Smith-Johnsen, of University of Bergen, Norway, who modeled the basal conditions of the Northeast Greenland Ice Stream.

2014 – 2019, Co-advisor of Dr. Josh Cuzzone, as a JPL/UCI postdoctoral scholar focusing on Greenland Ice Sheet Paleo-climate simulations

9/2004 – 5/2011, Graduate Student Instructor, Department of Earth and Planetary Science, School of Letters and Sciences, University of California, Berkeley, California

- *Run labs/discussion sections, hold office hours, run review sessions, maintain class web site, in collaboration with professors and other graduate student instructors: develop and grade assignments, exams, and class field trips, serve as substitute lecturer*

Courses taught:

- *The Planet Earth (EPS 50): Introduction to earth science, Spring 2011 (head graduate student instructor for Chi-Yuen Wang) and Fall 2004; Introduction to Oceans (EPS 82): Fall 2005 and Fall 2007; The Planets (EPS 12): Introduction to the Solar System, Spring 2006; Freshman/Sophomore Seminar (EPS 39): Introductory field trip to the Northern California Sierras, Fall 2004 (Lead by Chi-Yuen Wang)*

1/1999 – 12/1999, Student Consultant for Introduction to Computer Science (CS 100), Department of Computer Science, School of Engineering, Cornell University, Ithaca, NY

- *Oversee computer laboratory and provide support for students working on coding assignment, grade assignments and exams*

8/1997 – 5/2000, Student Private Tutor, Athletic Department, Cornell University, Ithaca, NY

8/1997 – 5/2000, Student Grader, Department of Mathematics, School of Arts and Sciences, Cornell University, Ithaca, NY

- *Grade weekly assignments for and work with graduate student instructors for upper level undergraduate mathematics courses*

Awards

NASA 2020 Early Career Public Achievement Medal: In “Advancing our Understanding of Atmosphere/Cryosphere interaction via novel uses of NASA Earth Science missions and Uncertainty Quantification”

NASA Group Achievement Award for the Ice Sheet System Model, 2019

JPL Bonus Award, Team Award for winning the “NASA Earth Ventures Instrument mission PREFIRE”, 2018

NASA 2013 Cryosphere Science, “Modeling the dynamic evolution of the Greenland Ice Sheet under different scenarios of Atmospheric Forcings, using ISSM.” Co-I., 1/2014-12/2016

NASA Graduate Student Fellowships in Earth System Sciences, “Determining Greenland Ice Sheet sensitivity to regional climate change: Coupling of a 3-D thermo-mechanical ice model with a mesoscale climate model”, 9/2005-9/2007

Scholastic Grant for Santa Ana Wind Research, Earth Sciences Division, Lawrence Berkeley National Laboratory, 7/2005

World Championship Robotic Soccer Competition, Robocup 2000, First Place, Melbourne, Australia, 9/2000

Scholastic Grant received from Cornell University Mechanical Engineering Department for Robocup Artificial Intelligence Research and Travel to Robocup Competition, Melbourne, Australia, 5/2000-9/2000

Award of Degree with Distinction in all Subjects, Cornell University, 5/2000

Professional Societies

American Geophysical Union, Society for Industrial and Applied Mathematics, American Association for the Advancement of Science

Science Teams

NASA: GRACE, ICESat-2, PREFIRE, Sea Level Change Team (N-SLCT)

Working Groups

IMBIE2/3, ISMIP6, NSIDC User Working Group, Geodesy for Climate Research Cryosphere Subgroup

Reviewer

NSF, NASA, Swiss National Supercomputing Center, GRL, JGR, Cryosphere, Earth System Dynamics, Geoscientific Model Development, J. Glac., Ann. Glac., Nature, Nat. Clim. Chg., Nat. Comm. Earth & Environment, Physics, IPCC, JAMES

Publications

- Larour, E., Caron, L., Morlighem, M., Adhikari, S., Frederikse, T., **Schlegel, N.-J.**, Ivins, E., Hamlington, B., Kopp, R., and Nowicki, S., 2020, ISSM-SLPS: geodetically compliant Sea-Level Projection System for the Ice-sheet and Sea-level System Model v4.17, *Geosci. Model Dev.*, 13, 4925–4941, <https://doi.org/10.5194/gmd-13-4925-2020>.
- Briner, J.P., Cuzzone, J.K., Badgeley, J.A., Young, N.E., Steig, E.J., Morlighem, M., **Schlegel, N.J.**, Hakim, G.J., Schaefer, J., Johnson, J.V., Lesnek, A.J., Thomas, E.K., Allan, E., Bennike, O., Cluett, A.A., Csatho, B., de Vernal, A., Downs, J., Larour, E., and Nowicki, S., 2020, Rate of mass loss from the Greenland Ice Sheet will exceed Holocene values this century, *Nature*, 586, 70–74, <https://doi.org/10.1038/s41586-020-2742-6>.
- Goelzer, H., Nowicki, S., Payne, A., Larour, E., Seroussi, H., Lipscomb, W. H., Gregory, J., Abe-Ouchi, A., Shepherd, A., Simon, E., ... **Schlegel, N.-J.**, et al., 2020, The future sea-level contribution of the Greenland ice sheet: a multi-model ensemble study of ISMIP6, *The Cryosphere*, 14, 3071–3096, <https://doi.org/10.5194/tc-14-3071-2020>.
- Seroussi, H., Nowicki, S., Payne, A. J., Goelzer, H., Lipscomb, W. H., ... **Schlegel, N.-J.**, et al., 2020, ISMIP6 Antarctica: a multi-model ensemble of the Antarctic ice sheet evolution over the 21st century, *The Cryosphere*, 14, 3033–3070, <https://doi.org/10.5194/tc-14-3033-2020>.
- Brown, A.J., Videen, G., Zubko, E., Heavens, N., **Schlegel, N.-J.**, et al., 2020, The case for a multi-channel polarization sensitive LIDAR for investigation of insolation-driven ices and atmospheres Planetary Science Decadal Survey White Paper, *Earth and Space Science Open Archive*, doi: 10.1002/essoar.10503720.1
- Smith-Johnsen, S., de Fleurian, B., **Schlegel, N.**, Seroussi, H., and Nisancioglu, K., 2020, Exceptionally high heat flux needed to sustain the Northeast Greenland Ice Stream, *The Cryosphere*, 14, 841–854, <https://doi.org/10.5194/tc-14-841-2020>.
- Smith-Johnsen, S., **Schlegel, N.-J.**, de Fleurian, B., and Nisancioglu, K. H., 2020, Sensitivity of the Northeast Greenland Ice Stream to geothermal heat, *Journal of Geophysical Research: Earth Surface*, 125, e2019JF005252. <https://doi.org/10.1029/2019JF005252>.
- Shepherd, A., Ivins, E., Rignot, E., Smith, B., van den Broeke, M., Velicogna, I., Whitehouse, P., Briggs, K., Joughin, I., Krinner, G., Nowicki, S., Payne, T., Scambos, T., **Schlegel, N.**, et al., 2020, Mass balance of the Greenland Ice Sheet from 1992 to 2018. *Nature*, 579, 233–239. <https://doi.org/10.1038/s41586-019-1855-2>.
- Hamlington, B. D., Gardner, A. S., Ivins, E., Lenaerts, J. T. M., Reager, J. T., Trossman, D. S., ... **Schlegel, N.-J.**, et al., 2020, Understanding of contemporary regional sea-level change and the implications for the future. *Reviews of Geophysics*, 58, e2019RG000672. <https://doi.org/10.1029/2019RG000672>
- Levermann, A., Winkelmann, R., Albrecht, T., Goelzer, H., ... **Schlegel, N.-J.**, et al., 2020, Projecting Antarctica's contribution to future sea level rise from basal ice shelf melt using linear response functions of 16 ice sheet models (LARMIP-2), *Earth Syst. Dynam.*, 11, 35–76, <https://doi.org/10.5194/esd-11-35-2020>.
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- Schlegel, N.-J.**, and Larour, E.Y., 2019, Quantification of surface forcing requirements for a Greenland Ice Sheet model using uncertainty analyses. *Geophysical Research Letters*, 46. <https://doi.org/10.1029/2019GL083532>.
- Larour, E., Seroussi, H., Adhikari, S., Ivins, E., Caron, L., Morlighem, M., and **Schlegel, N.**, 2019, Slowdown in Antarctic mass loss from solid Earth and sea-level feedbacks, *Science*, doi:10.1126/science.aav7908.
- Cuzzone, J. K., **Schlegel, N.-J.**, Morlighem, M., Larour, E., Briner, J. P., Seroussi, H., and Caron, L., 2019, The impact of model resolution on the simulated Holocene retreat of the southwestern Greenland ice sheet using the Ice Sheet System Model (ISSM), *The Cryosphere*, 13, 879–893, <https://doi.org/10.5194/tc-13-879-2019>.
- Seroussi, H., Nowicki, S., Simon, E., Abe-Ouchi, A., Albrecht, T., Brondex, J., Cornford, S., Dumas, C., Gillet-Chaulet, F., Goelzer, H., Gollledge, N. R., Gregory, J. M., Greve, R., Hoffman, M. J., Humbert, A., Huybrechts, P., Kleiner, T., Larour, E., Leguy, G., Lipscomb, W. H., Lowry, D., Mengel, M., Morlighem, M., Pattyn, F., Payne, A. J., Pollard, D., Price, S. F., Quiquet, A., Reerink, T. J., Reese, R., Rodehacke, C. B., **Schlegel, N.-J.**, Shepherd, A., Sun, S., Sutter, J., Van Breedam, J., van de Wal, R. S. W., Winkelmann, R., and Zhang, T.: initMIP-Antarctica: an ice sheet model initialization experiment of ISMIP6, *The Cryosphere*, 13, 1441-1471, <https://doi.org/10.5194/tc-13-1441-2019>, 2019.
- Schlegel, N.-J.**, Seroussi, H., Schodlok, M.P., Larour, E.Y., Boening, C., Limonadi, D., Watkins, M.M., Morlighem, M., and van den Broeke, M.R., 2018, Exploration of Antarctic Ice Sheet 100-year contribution to sea level rise and associated model uncertainties using the ISSM framework, *The Cryosphere*, 12, 3511-3534, <https://doi.org/10.5194/tc-12-3511-2018>.
- Shepherd, A., Ivins, E., Rignot, E., Smith, B., van den Broeke, M., Velicogna, I., Whitehouse, P., Briggs, K., Joughin, I., Krinner, G., Nowicki, S., Payne, T., Scambos, T., **Schlegel, N.**, et al., 2018, Mass balance of the Antarctic Ice Sheet from 1992 to 2017. *Nature*, 558, 219–222. <https://doi.org/10.1038/s41586-018-0179-y>
- Cuzzone, J.K., Morlighem, M., Larour, E., **Schlegel, N.**, and Seroussi, H., 2018, Implementation of higher-order vertical finite elements in ISSM v4.13 for improved ice sheet flow modeling over paleoclimate timescales, *Geosci. Model Dev.*, 11, 1683-1694, <https://doi.org/10.5194/gmd-11-1683-2018>.
- Haubner, K., Box, J.E., **Schlegel, N.J.**, Larour, E.Y., Morlighem, M., Solgaard, A.M., Kjeldsen, K.K., Larsen, S.H., Rignot, E., Dupont, T.K., and Kjær, K.H., 2018, Simulating ice thickness and velocity evolution of Upernavik Isstrøm 1849–2012 by forcing prescribed terminus positions in ISSM, *The Cryosphere*, 12, 1511-1522, <https://doi.org/10.5194/tc-12-1511-2018>.
- Goelzer, H., Nowicki, S., Edwards, T., Beckley, M., Abe-Ouchi, A., Aschwanden, A., Calov, R., Gagliardini, O., Gillet-Chaulet, F., Gollledge, N.R., Gregory, J., Greve, R., Humbert, A., Huybrechts, P., Kennedy, J.H., Larour, E., Lipscomb, W.H., Le clec'h, S., Lee, V., Morlighem, M., Pattyn, F., Payne, A.J., Rodehacke, C., Rückamp, M., Saito, F., **Schlegel, N.**, Seroussi, H., Shepherd, A., Sun, S., van de Wal, R. and Ziemen, F.A., 2018, Design and results of the ice sheet model initialisation initMIP-Greenland: an ISMIP6 intercomparison, *The Cryosphere*, 12, 1433-1460, <https://doi.org/10.5194/tc-12-1433-2018>.
- Schlegel, N.-J.**, Wiese, D.N., Larour, E., Watkins, M.M., Box, J.E., Fettweis, X., and van den Broeke, M.R., 2016, Application of GRACE to the evaluation of an ice flow model of the Greenland Ice Sheet, *The Cryosphere*, 10, 1965-1989, doi:10.5194/tc-10-1965-2016.
- Larour, E., and **Schlegel, N.**, 2016, ISSM in the Cloud: how to improve uncertainty quantification of ice-sheet mass balance projections, *Comput. Geosci.*, 96, doi:10.1016/j.cageo.2016.08.007.
- Briggs, K. H., Shepherd, A., Hogg, A.E., Ivins, E.R., **Schlegel, N.**, and 12 others, 2016, Charting ice sheet contributions to global sea level rise, *Eos*, 97, doi:10.1029/2016EO055719. Published on 18 July 2016.
- Alexander, P.M, Tedesco, M., **Schlegel N.-J.**, Luthcke, S.B., Fettweis, X., and Larour, E., 2016, Greenland Ice Sheet seasonal and spatial mass variability from model simulations and GRACE (2003–2012), *The Cryosphere*, 10, 1259-1277, doi:10.5194/tc-10-1259-2016.
- Schlegel, N.-J.**, Larour, E., Seroussi, H., Morlighem, M., and Box, J.E., 2015, Ice discharge uncertainties in Northeast Greenland from boundary conditions and climate forcing of an ice flow model, *J. Geophys. Res. - Earth Surf.*, 120, 29–54, doi:10.1002/2014JF003359.
- Larour, E., Utke, J., Csatho, B., Schenk, A., Seroussi, H., Morlighem, M., Rignot, E., **Schlegel, N.**, and Khazendar, A., 2014, Inferred basal friction and surface mass balance of the Northeast Greenland Ice Stream using data assimilation of ICESat (Ice Cloud and land Elevation Satellite) surface altimetry and ISSM (Ice Sheet System Model), *The Cryosphere*, 8, 2335-2351, doi:10.5194/tc-8-2335-2014.
- Larour, E., **Schlegel, N.**, and Morlighem, M., 2014, Modeling the Evolution of Polar Ice Sheets, *Eos Trans. AGU*, 95(45), 411, doi:10.1002/2014EO450005.
- Schlegel, N.J.**, Larour, E., Seroussi, H., Morlighem, M., and Box, J.E., 2013, Decadal-scale sensitivity of northeast Greenland ice flow to errors in surface mass balance using ISSM, *J. Geophys. Res. - Earth Surf.*, 118, doi: 10.1002/jgrf.20062.
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- Jin, J., Miller, N.L., **Schlegel, N.J.**, 2010, Sensitivity Study of Four Land Surface Schemes in the WRF Model, *Advances in Meteorology*, vol. 2010, Article ID 167436, doi:10.1155/2010/167436.
- Hayhoe, K., VanDorn, J., Croley, T., **Schlegel, N.**, Wuebbles, D., 2010, Regional climate change projections for Chicago and the US Great Lakes, *Journal of Great Lakes Research*, v. 36, i. 2, pp. 7 – 21, <https://doi.org/10.1016/j.jglr.2010.03.012>
- Xu, P., Huang, Y., Miller, N.L., and **Schlegel, N.J.**. 2009. Effects of global climate change on building energy consumption and its implications on building energy codes and policy in California, CEC-500-2009-006. Available from <http://www.energy.ca.gov/publications/>.
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- Harmsen, E.W., Miller, N.L., **Schlegel, N.J.**, and Gonzalez, J.E., 2009, Seasonal climate change impacts on evapotranspiration, precipitation deficit and crop yield in Puerto Rico, *Agricultural Water Management*, v. 96, i. 7, <https://doi.org/10.1016/j.agwat.2009.02.006>
- Hayhoe, K. ... **Schlegel, N.J.**, et al., 2007, Climate Change and Chicago: Projections and Potential Impact, Chicago Climate Action Plan, Chapter 2: Climate. Available from <https://www.chicago.gov/city/en/progs/env/climateaction.html> (Contributing Author)
- Miller, N.L. and **Schlegel, N.J.**, 2006. Climate change projected fire weather sensitivity: California Santa Ana wind occurrence. *Geophysical Research Letters*. 33, L15711, doi:10.1029/2006GL025808.
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