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Momme Claus Hell

Education

2015–2020 | **Ph.D. in Physical Oceanography**, Scripps Institution of Oceanography.

2013–2015 | **MSc. in Atmospheric and Climate Science**, ETH Zürich.

2009–2012 | **BSc. in Physics of the Earth System**, GEOMAR, University of Kiel.

Research Experience and Expeditions

2021-PRESENT | **Postdoctoral Research Associate - Brown University**
Parameterization for wave-attenuation in sea ice as part of the Scale-Aware Sea Ice Project (SASIP). Advisors: Chris Horvat and Baylor Fox-Kemper

2020-2021 | **Postdoctoral Researcher - SIO**
Zonal-mean flows and the occurrence of blocking flow structures in idealized models. Advisor: Nick Lutsko

2015–2020 | **Graduate Student Researcher - SIO**
Dissertation title: *Atmosphere-Ocean Momentum Exchange by Extra-Tropical Storms.*
Advisors: Sarah Gille, Bruce Cornuelle, and Arthur Miller

2019 | **Visiting Graduate Research Student - Ifremer, Brest**
WaveWatch III school and development of a Lagrangian framework for swell generation.
Funding: Julia Brown research fund, Collaborators: Bertrand Chaperon and Alex Ayet

2016 | **Ross Ice Shelf Vibration Project - Expedition to Antarctica**
Maintaining seismic stations on the Ross Ice Shelf to facilitate continuous wave observations. PI: Peter Bromirski

2013–2015 | **Research Student and Master Student Researcher - ETH Zürich**
Thesis title: *High Arctic-Stratosphere-Feedback on Sub-Seasonal Scale.* Masters student and student Assistant.
Advisors: Tapio Schneider and Noel Keenlyside (UiB).

2013 | **Research Student Intern - Geophysical Institute, University of Bergen**
Studying feedback between Arctic sea ice and the Stratospheric Vortex.
Advisors: Noel Keenlyside and Martin King.

2012 | **Undergraduate Student Researcher - GEOMAR Kiel**
Bachelor Thesis: *Influence of the Atlantic Sea Surface Temperature on rainfall in the Sahel and India in Kiel Climate Model.*
Advisors: Mojib Latif and Claus Böning

Fellowships and Awards

2019 | **Julia Brown Prize** – For establishing collaborative research with Ifremer Brest

2015 - 2016 | **UC Regents Fellow** – Graduate Student Fellow from the Regents of the University of California

2015 | **Thesis with Distinction** – Awarded by ETH Zürich for excellent thesis work

2010 - 2015 | **Fellow of the German National Academic Foundation** – Awarded by the German Nation Academic foundation based on students' excellence

Teaching and Mentoring

Fall 2022 | **Sheridan Teaching Seminar at Brown University** – to improve inclusive teaching through a reflective exploration of the teachers' own practices and beliefs about teaching.

2021-2022 | **Mentor** – Ding Ding Wei (Computer Science, Brown University)
Analysing ICESat-2 data and other Sea Ice products.

Spring 2020 | **Guest Lecturer** – SIOC 217C *Atmospheric and Climate Sciences III: Held and Hou, 1980*, UC San Diego (remote).

Summer 2019 | **Mentor** – for summer intern Laure Baratgin (École normale supérieure, Paris, now graduate student at LMD and CIRED, Paris).
Triangulations with swell observations.

Summer 2019 | **SURF-Mentor** – for Amir Rashidi (Computer Science, UCSD).
Analysing infra-gravity waves in seismic data.

Winter 2019 | **Guest Lecturer** – SIO 292 Master of Advanced Studies in Climate Science & Policy Orientation: *Ocean Surface Waves in Climate*, UC San Diego.

Spring 2017 | **Teaching Assistant** – SIOC 20 *The Atmosphere*, UC San Diego.

Summer 2013 | **Co-Instructor** – *The complexity of the climate system*
Summer school for climate change and sustainability, Youth education for society and science in cooperation with the National German Academic Foundation, Papenburg, Germany.

2013 | **Teaching Assistant** – *"Wetterbesprechung" (Applied Weather Prediction)*
Undergrad course at GEOMAR, Kiel, Germany.

2012 | **Teaching Assistant** – *Climate Physics*
Undergrad course at GEOMAR, Kiel, Germany.

Funding

Pending Competitive Grants

NSF AGS Climate and Large-Scale Dyanmics, Co-PI. Nicholas Lutsko, **Momme Hell**, and Ian Eisenman: *Collaborative Research: GLOW Transient Eddies on Tidally-Locked Planets*, 2023-2026, $100,000

NASA ROSES-2022 - Studies with ICESat-2, PI. **Momme Hell** and Chris Horvat, *Observing the marginal ice zone with ICESat-2: Improving estimates of sea ice freeboard and storm impacts*, 2023 - 2026, $440,000

NASA ROSES-2022 - Ocean Vector Winds Science Team, Co-I. Sarah Gille, Donata Giglio, and **Momme Hell**, *Characterizing extremes in ocean vector winds: Impact on air–sea exchange and sea surface temperature*, 2023 - 2027, $260,000

Service and Engagement

2021-PRESENT | **Diversity & Inclusion Action Committee** – Participant
Department of Earth, Environmental, and Planetary Sciences

2020 | **Session convener** – Convener of "*Mechanisms of Low-Frequency Ocean-Atmosphere Variability and Implications for Earth's Energy Budget*" at the American Geophysical Union Fall Meeting 2018, Washington, DC.

2019 | **Student committee member** – Member of the student committee for the *hydrology and climate faculty search* at Scripps Institution of Oceanography at UC San Diego.

2017-PRESENT | **Ad-hoc referee for scientific journals**
Reviewer for the Journal of Atmospheric Sciences, the Journal of Physical Oceanography, the Journal of Climate, the Journal of Geophysical Research - Oceans.

2019 - 2020 | **Scripps Graduate Student Council**
Representative for the Physical Oceanography curriculum group at SIO

2018 - 2019 | **Scripps Climate Student Journal Club**
Hosting weekly journal club series with a quarterly external keynote speaker to facilitate discussions among students and faculty

2008 - 2015 | **Students Helping Life Association**
Member of the board and campaign management
Non-governmental organization that raises funds and awareness for students in the states of former Yugoslavia and Syrian refugees (gab year, member of the board and the foundation council, and project manager)

Publications

In Preparation

Hell, M. and Baylor Fox-Kemper. A an efficient point-static representation of surface wave growth and propagation for coupled climate models. *Journal of Advances in Modeling Earth Systems*

Under Review

Hell, M. and Laurence Armi. Atmospheric zonal flows from the perspective of Rossby-beta hydraulics. *Quarterly Journal of the Royal Meteorological Society*

Hell, M. and C. Horvat. Directional Surface Wave Spectra And Sea Ice Structure from ICEsat-2 Altimeter. *The Cryosphere*

Accepted

Tim Woollings, Li Camille, M Drouard, Etienne Dunn-Sigouin, K Elmestekawy, Brian **Hell, M.** and Hoskins, Cheikh Mbengue, M Patterson, and Thomas Spengler. The role of Rossby waves in polar weather and climate. *EGU Weather and Climate Dynamics*, 2022

Peer-Reviewed Articles

Nicholas J. Lutsko and **Hell, M.** Moisture and the Persistence of Annular Modes. *J. Atmospheric Sci.*, 78:3951–3964, December 2021. doi: 10.1175/JAS-D-21-0055.1

Hell, M., Alex Ayet, and Bertrand Chapron. Swell Generation Under Extra-Tropical Storms. *J. Geophys. Res. Oceans*, 126, 2021a. doi: 10.1029/2021JC017637

Hell, M., Bruce D. Cornuelle, Sarah T. Gille, and Nicholas J. Lutsko. Time-Varying Empirical Probability Densities of Southern Ocean Surface Winds: Linking the Leading Mode to SAM and Quantifying Wind Product Differences. *J. Clim.*, 34:5497–5522, July 2021b. doi: 10.1175/JCLI-D-20-0629.1

Hell, M., Tapio Schneider, and Camille Li. Atmospheric Circulation Response to Short-Term Arctic Warming in an Idealized Model. *J. Atmos. Sci.*, 77:531–549, February 2020b. doi: 10.1175/JAS-D-19-0133.1

Hell, M., Sarah T. Gille, Bruce D. Cornuelle, Arthur J. Miller, Peter D. Bromirski, and Alex D. Crawford. Estimating Southern Ocean Storm Positions With Seismic Observations. *J. Geophys. Res. Oceans*, 125, 2020a. doi: 10.1029/2019JC015898

Ana B. Villas Bôas and others including **M. Hell**. Integrated Observations of Global Surface Winds, Currents, and Waves: Requirements and Challenges for the Next Decade. *Front. Mar. Sci.*, 6, 2019. doi: 10.3389/fmars.2019.00425

Hell, M., Bruce D. Cornuelle, Sarah T. Gille, Arthur J. Miller, and Peter D. Bromirski. Identifying Ocean Swell Generation Events from Ross Ice Shelf Seismic Data. *J. Atmos. Oceanic Technol.*, 36:2171–2189, October 2019. doi: 10.1175/JTECH-D-19-0093.1

Martin P. King, **Hell, M.**, and Noel Keenlyside. Investigation of the atmospheric mechanisms related to the autumn sea ice and winter circulation link in the Northern Hemisphere. *Clim Dyn*, pages 1–11, May 2015. doi: 10.1007/s00382-015-2639-5

White Papers

William J. Merryfield and others including **Hell, M.** Current and Emerging Developments in Subseasonal to Decadal Prediction. *Bull. Am. Meteorol. Soc.*, 101:E869–E896, June 2020. doi: 10.1175/BAMS-D-19-0037.1

J. Cohen and others including **M. Hell**. Arctic change and possible influence on mid-latitude climate and weather. *US CLIVAR Rep*, March 2018. doi: 10.5065/D6TH8KGW

Data and Software

Momme C. Hell. Source code for: "Identifying ocean swell generation events from ross ice shelf seismic data". https://doi.org/10.5281/zenodo.5778295, 2021b

Momme C. Hell. Source code for: "Swell generation under extra-tropical storms". https://doi.org/10.5281/zenodo.5201953, 2021c

Momme C. Hell. Angular momentum budget in spherical pressure coordinates from reanalysis datasets. https://doi.org/10.5281/zenodo.5808433, 2021a

Invited Talks

Momme C. Hell, Alex Ayet, and B. Chapron. Swell generation under extra-tropical storms. AMS 2023 Session on Extreme Maritime Weather, Denver, 2023-01-10

Momme C. Hell. Towards data-driven parameterizations with directional surface wave spectra from icesat-2 altimetry. IMSI Remote Sensing for Climate Analysis - Chicago, US, 2022-12-01

Momme C. Hell. Southern ocean surface winds - how annular modes are linked to surface wave events and wind-driven mixing. NOAA Earth System Research Laboratories in Boulder, Colorado, 2022-11-02

Momme C. Hell and Chris Horvat. Directional surface wave spectra and sea ice structure from ICESat-2 altimeter. SASIP Meeting 2022 - Grenoble, France, 2022-06-21

Momme C. Hell. How annular modes are linked surface wave events and wind-driven mixing. Atmosphere Ocean Science Colloquium, NYU, New York, 2022-03-30

Momme C. Hell and Chris Horvat. Directional surface wave spectra and sea ice structure from ICESat-2 altimeter. ICESat-2 Science Team - Sea Ice Group, virtual, 2022-03-17

Momme C. Hell, Bruce D. Cornuelle, S. T. Gille, and Nicholas J. Lutsko. Time-varying empirical probability densities of Southern Ocean surface winds: Leading modes linked to SAM, the annual cycle, and product differences. PO Seminar, Woods Hole, MA, 2022-01-18

Momme C. Hell, Alex Ayet, and B. Chapron. Swell generation under extra-tropical storms. MIT, virtual, 2021-10-06

Conference Presentations

Momme C. Hell and Chris Horvat. Directional surface wave spectra and sea ice structure from ICESat-2 (poster). Gordon Research Conferences - Ocean Mixing, Mount Holyoke College, MA, USA, 2022-06-06

Momme C. Hell and Chris Horvart. Constraining frequency dependent wave attenuation in sea ice using ICESat-2 photon heights (talk). Ocean Sciences Meeting, virtual, 2022-02-24

Momme C. Hell and Laurence Armi. Atmospheric zonal flows and blocks from the perspective of Rossby-beta hydraulics (talk). Atmospheric Blocking Virtual Workshop, virtual, 2021-09-27. URL `https://blocking-workshop-2021.wavestoweather.de/program/index.html`

Momme C. Hell, Bruce D. Cornuelle, and Sarah T Gille. Leading modes and biases of Southern Ocean Surface Wind from time-varying Distributions (talk). SOCCOM Annual Meeting, virtual, 2021-06

Momme C. Hell, Bruce D. Cornuelle, S. T. Gille, and Nicholas J. Lutsko. Time-varying empirical probability densities of Southern Ocean surface winds: Leading modes linked to SAM, the annual cycle, and product differences (talk). IOVWST Meeting, virtual, 2021-02-24. URL `https://www.youtube.com/watch?v=qE3398GFsvY`

Natalie M Freeman, Donata Giglio, Sarah T Gille, and **Momme C. Hell**. On the impact of high-frequency wind variability on upper ocean stratification (poster). AGU Fall Meeting (virtual), 2020-12-04. URL `https://mdc.coaps.fsu.edu/scatterometry/meeting/docs/2021/FREEMAN_AMS21_POSTER.pdf`

Momme C. Hell, Tapio Schneider, and Camille Li. Atmospheric Circulation Response to Short-Term Arctic Warming in an Idealized Model (talk). 22th Atmosphere and Ocean Fluid Dynamics Meeting, Portland, Main, 2019-06

Momme C. Hell, Cornuelle, B. D., S. T. Gille, Arthur J. Miller, Peter D. Bromirski, and Alex D. Crawford. Southern Ocean Storm positions and wave attenuation under sea ice estimated with seismic observations in the Ross Ice Shelf (talk). ACDC 10-Year Anniversary Conference, Rondanau, Norway, 2019-03

Momme C. Hell, Martin P. King, and Noel Keenlyside. Investigation of the atmospheric mechanisms related to the autumn sea ice and winter circulation link in the Northern Hemisphere (talk). EGU Meeting, Vienna, Austria, 2015-05

Selected Graphics

National Academies of Sciences, Engineering, and Medicine. *Earth System Predictability Research and Development: Proceedings of a Workshop–in Brief*. July 2020. doi: 10.17226/25861, **Figure 2**

Tapio Schneider, João Teixeira, Christopher S. Bretherton, Florent Brient, Kyle G. Pressel, Christoph Schär, and A. Pier Siebesma. Climate goals and computing the future of clouds. *Nature Climate Change*, 7:3–5, 2017b, **Figure 3**

Tapio Schneider, Tobias Bischoff, and Gerald H. Haug. Migrations and dynamics of the intertropical convergence zone. *Nature*, 513:45–53, September 2014. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature13636 **Figure 4**

Tapio Schneider, Colleen M. Kaul, and Kyle G. Pressel. Possible climate transitions from breakup of stratocumulus decks under greenhouse warming. *Nature Geoscience*, 12:163–167, March 2019. ISSN 1752-0908. doi: 10.1038/s41561-019-0310-1 **Figure 1**

Tapio Schneider, Shiwei Lan, Andrew Stuart, and João Teixeira. Earth System Modeling 2.0: A Blueprint for Models That Learn From Observations and Targeted High-Resolution Simulations. *Geophysical Research Letters*, page 2017GL076101, 2017a. ISSN 1944-8007. doi: 10.1002/2017GL076101 **Figure 3**

Computational Skills

Operating Systems	Unix-based operating systems and high-performance computing (HPC) environments (ETH - Euler, Cheyenne - NCAR, OSCAR - Brown, and small clusters at SIO).
Programming Languages	Python, Julia, Latex, Bash, Shell-Script, Fortran, MatLab, and R.
Tools and Software	Jupyter kernels, workflow management with Makefile, version control systems like git, slurm, cdo, Adobe Creative Suite, typo3, html5.
Numerical Modeling	The flexible Modeling system (FMS), Finite difference models, WaveWatchIII, and Particle-in-Cell

Languages

German	Native language
English	Full proficiency

Status November 2022