Kristen Krumhardt - Curriculum Vitae

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Education

- Ph.D. in Environmental Studies, University of Colorado at Boulder, 2018.
- Master of Science in Biology, University of Southern Maine, 2007.
- Bachelor's of Art in Biological/Pre-medical Illustration, with distinction, Iowa State University, 2003.
  - Phi Beta Kappa

Professional Experiences

- Project Scientist I, National Center for Atmospheric Research, Boulder, Colorado, U.S.A. 2023-present.
- Associate Scientist II, National Center for Atmospheric Research, Boulder, Colorado, U.S.A. 2020-2023.
- Post-doctoral Researcher, National Center for Atmospheric Research, Boulder, Colorado, U.S.A. 2018-2020.
- Doctoral Research Assistant at University of Colorado Boulder, Boulder, Colorado, U.S.A. 2014-2018.
- Research Assistant, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland and University of Geneva, Geneva, Switzerland, 2008-2014.
- Laboratory Research Assistant at University of Southern Maine, Portland, Maine, U.S.A. 2005-2007.

Peer-reviewed publications

- **Krumhardt, K. M.**, M. C. Long, C. M. Petrik, M. Levy, F. Castruccio, K. Lindsay, E. Romashkova, R. Denechere, Z. Chen, L. Landrum, A.-L. Deppenmeier, G. Danabasoglu, P. Chang. "From nutrients to fish: A novel, high resolution Community Earth System Model simulation linked to a fisheries model." *Progress in Oceanography* (2024). doi:10.1016/j.pocean.2024.103314
- Sun, R, R. Fay, F. Ventura, B. Şen, C. Barbraud, K. Delord, **K. M. Krumhardt**, S. Jenouvrier**.** **"**Climate change impacts pair-bond dynamics in a long-lived monogamous species." Submitted to *Ecology Letters*.
- Oliver, H., D. J. McGillicuddy, Jr., **K. M. Krumhardt**, M. C. Long, N. R. Bates, B. C. Bowler, D. T. Drapeau, W. M. Balch. "Environmental drivers of coccolithophore growth in the Pacific sector of the Southern Ocean." *Global Biogeochemical Cycles* (2023). doi:10.1029/2023GB007751
- Elsworth, G. W., N. S. Lovenduski, **K. M. Krumhardt**, T. M. Marchitto, S. Schlunegger. "Anthropogenic climate change drives non-stationary phytoplankton variance." *Biogeosciences* (2023). doi: /10.5194/bg-20-4477-2023
- DuVivier, A., M. J. Molina, M. M. Holland, L. Landrum, **K. M. Krumhardt**, S. Jenouvrier. "Projections of winter polynyas and their biophysical impacts in the Ross Sea." *Climate Dynamics* (**2023**). doi:10.1007/s00382-023-06951-z
- Bourreau, L., E. Pauthenet, L. Le Ster, B. Picard, E. Portela, J.-B. Sallée, C. Reginald McMahon, R. Harcourt, M. Hindell, C. Guinet, S. Bestley, J.-B. Charrassin, A. DuVivier, Z. Sylvester, **K. M.**

Krumhardt, S. Jenouvrier and S. Labrousse "First description of in situ chlorophyll fluorescence signal within East Antarctic coastal polynyas during fall and winter." *Frontiers in Marine Science* (**2023**). doi:10.3389/fmars.2023.1186403

- Planchat, A., L. Kwiatkowski, L. Bopp, O. Torres, J. R. Christian, M. Butenschön, T. Lovato, R. Séférian, M. A. Chamberlain, O. Aumont, M. Watanabe, A. Yamamoto, A. Yool, T. Ilyina, H. Tsujino, **K. M. Krumhardt**, J. Schwinger, J. Tjiputra, J. P. Dunne, C. Stock. "The representation of alkalinity and the carbonate pump from CMIP5 and CIMP6 Earth system models and implications for the carbon cycle." *Biogeosciences* (**2023**). doi:10.5194/bg-20-1195-2023.
- Şen, B., C. Che-Castaldo, **K. M. Krumhardt**, L. Landrum, M. M. Holland, M. A. LaRue, M. C. Long, S. Jenouvrier, H. J. Lynch. "Spatio-temporal transferability of environmentally-dependent population models: Insights from the intrinsic predictabilities of Adélie penguin abundance time series." *Ecological Indicators* (**2023**). doi:10.1016/j.ecolind.2023.110239
- Talis, E. M., C. Che-Castaldo, B. Sen, **K. M. Krumhardt**, H. J. Lynch. "Variability, skipped breeding and heavy-tailed dynamics in an Antarctic seabird." *Journal of Animal Ecology* (**2022**). doi:/10.1111/1365-2656.13827
- Yeager, S. G., N. Rosenbloom, A. A. Glanville, X. Wu, I. Simpson, H. Li, M. J. Molina, **K. M. Krumhardt**, et al., "The Seasonal-to-Multiyear Large Ensemble (SMYLE) prediction system using the Community Earth System Model version 2." *Geoscientific Model Development*. (**2022**). doi:/10.5194/gmd-15-6451-2022
- **Krumhardt, K. M.**, M. C. Long, Z. T. Sylvester, C. M. Petrik. "Climate drivers of Southern Ocean phytoplankton community composition and potential impacts on higher trophic levels." *Frontiers in Marine Science* (**2022**). doi:/10.3389/fmars.2022.916140
- Long, M. C., J. K. Moore, K. Lindsay, M. Levy, S. C. Doney, J. Y. Luo, **K. M. Krumhardt**, R. T. Letscher, M. Grover, Z. T. Sylvester. "Simulations with the Marine Biogeochemistry Library (MARBL)." *Journal of Advances in Modeling Earth Systems (JAMES)* (**2021**). doi:/10.1029/2021MS002647
- Harrison, C. S., J. Y. Luo, N. F. Putman, Q. Li, P. Sheevam, **K. M. Krumhardt**, J. Stevens, M. C. Long. "Identifying global favourable habitat for early juvenile loggerhead sea turtles." *Journal of the Royal Society Interface* (**2021**). doi:/10.1098/rsif.2020.0799
- **Krumhardt, K. M.**, M. C. Long, K. Lindsay, M.N. Levy. "Southern Ocean calcification controls the global distribution of alkalinity." *Global Biogeochemical Cycles* (**2020**). doi:/10.1029/2020GB006727
- Hernández-Almeida, I., **K. M. Krumhardt**, H. Zhang, H. M. Stoll. "Estimation of physiological factors controlling carbon isotope fractionation in coccolithophores in photic zone and core-top samples." *Geochemistry, Geophysics, Geosystems* (**2020**). doi:10.1029/2020GC009272
- Crawford, A. D., **K. M. Krumhardt**, N. S. Lovenduski, G. L. van Dijken, K. R. Arrigo. Summer high-wind events and phytoplankton productivity in the Arctic Ocean. *Journal of Geophysical Research: Oceans* (**2020**). doi: e2020JC016565.
- **Krumhardt, K. M**., N. S. Lovenduski, M. C. Long, J. Y. Luo, K. Lindsay, S. Yeager, C. Harrison. Potential predictability of net primary production in the ocean. *Global Biogeochemical Cycles* (**2020**). doi:10.1029/2020GB006531.
- Elsworth, Geneviève W., N. S. Lovenduski, K. A. McKinnon, **K. M. Krumhardt**, Riley X. Brady. Finding the Fingerprint of Anthropogenic Climate Change in Marine Phytoplankton

Abundance. *Current Climate Change Reports* (**2020**). doi:10.1007/s40641-020-00156-w.

- Negrete-García, G. N. S. Lovenduski, C. Hauri, **K. M. Krumhardt**, S. K. Lauvset. Sudden emergence of a shallow aragonite saturation horizon in the Southern Ocean. *Nature Climate Change* (**2019**). doi:10.1038/s41558-019-0418-8.
- **Krumhardt, K. M.**, N. S. Lovenduski, M. C. Long, M. Levy, K. Lindsay, J. K. Moore, C. Nissen. Coccolithophore growth and calcification in an acidified ocean: Insights from Community Earth System Model simulations. *Journal of Advances in Modeling Earth Systems (JAMES)* (**2019**). doi:10.1029/2018MS001483.
- Freeman, N. M., N. S. Lovenduski, D. R. Munro, **K. M. Krumhardt**, K. Lindsay, M. C. Long, M. Maclennan. The variable and changing Southern Ocean Silicate Front: Insights from the CESM Large Ensemble. *Global Biogeochemical Cycles.* (**2018**). doi:10.1029/2017GB005816
- **Krumhardt, K. M.**, N. S. Lovenduski, M. D. Iglesias-Rodriguez, J. A. Kleypas. Coccolithophore growth and calcification in a changing ocean. *Progress in Oceanography* (**2017**). doi:10.1016/j.pocean.2017.10.007
- **Krumhardt, K. M.**, N. S. Lovenduski, M. C. Long, K. Lindsay. Avoidable impacts of ocean warming on marine primary production: Insights from the CESM ensembles. *Global Biogeochemical Cycles* (**2017**). doi:10.1002/2016GB005528.
- Kaplan, J.O., **K.M. Krumhardt**, M.J. Gaillard, et al. Constraining the Deforestation History of Europe: Evaluation of Historical Land Use Scenarios with Pollen-Based Land Cover Reconstructions. *Land* (**2017**). doi:10.3390/land6040091
- **Krumhardt, K. M.**, N. S. Lovenduski, N. M. Freeman, N. R. Bates. Apparent increase in coccolithophore abundance in the subtropical North Atlantic from 1990 to 2014. *Biogeosciences* (**2016**). doi:10.5194/bg-13-1163-2016
- He, F., S. J. Vavrus, J. E. Kutzbach, W. F. Ruddiman, J. O. Kaplan, **K. M. Krumhardt**. Simulating global and local surface temperature changes due to Holocene anthropogenic land cover change. *Geophysical Research Letters* (**2014**). doi:10.1002/2013GL058085.
- **Krumhardt, K. M.**, K. Callnan, K. Roache-Johnson, T. Sweet, D. Robinson, E. Nahas Reistetter, J. K. Saunders, G. Rocap, L. R. Moore. Effects of phosphorus starvation versus limitation on the marine cyanobacterium *Prochlorococcus* MED4 I: uptake physiology. *Environmental Microbiology* (**2013**). doi:10.1111/1462-2920.12079
- Nahas Reistetter, E., **K. M. Krumhardt**, K. Callnan, K. Roache-Johnson, J. K. Saunders, L. R. Moore, G. Rocap. Effects of phosphorus starvation vs. limitation on the marine cyanobacterium *Prochlorococcus* MED4 II: gene expression. *Environmental Microbiology* (**2013**). doi:10.1111/1462-2920.12129
- Kaplan, J. O., **K. M. Krumhardt**, N. E. Zimmermann. The effects of land use and climate change on the carbon cycle of Europe over the past 500 years. *Global Change Biology* (**2012**). doi:10.1111/j.1365-2486.2011.02580.x
- Sapart, C. J., G. Monteil, M. Prokopiou, R. S. W. van de Wal, J. O. Kaplan, P. Sperlich, **K. M. Krumhardt**, C. van der Veen, S. Houweling, M. C. Krol, T. Blunier, T. Sowers, P. Martinerie, E. Witrant, D. Dahl-Jensen, T. Röckmann. Natural and anthropogenic variations in methane sources during the past two millennia. *Nature* (**2012**). doi:10.1038/nature11461
- Kaplan, J. O., **K. M. Krumhardt**, E. C. Ellis, W. F. Ruddiman, C. Lemmen, K. K. Goldewijk. Holocene carbon emissions as a result of anthropogenic land cover change. *The Holocene* (**2011**). doi:10.1177/0959683610386983

• Kaplan, J. O., **K. M. Krumhardt**, N. Zimmerman. The prehistoric and preindustrial deforestation of Europe. *Quaternary Science Reviews* (**2009**). doi:10.1016/j.quascirev.2009.09.028

Additional Activities and Outreach

- Community Earth System Model (CESM) Biogeochemistry Working Group internal co-chair.
- Member of the Scientific Steering Committee for Ocean Carbon & Biogeochemistry (OCB).
- Scientific illustrator, *Biological Oceanography*, by Susanne Menden-Deuer. Publisher: Elsevier, London, 2021-2024.
- Science mentor for high school science students, Science Research Seminar Course 2019/2020, 2020/2021, 2021/2022, 2022/2023, Boulder Valley School District.
- Co-mentor for undergraduate/graduate students in summer research internship programs (SOARS, RESESS, SIParCS), 2017/2018/2023/2024.
- Invited guest lecturer for Spatial Statistics and Analysis, Environmental Studies, Oceanography, and Climate Change courses (2011-2022).

Funded research grants

• NOAA, *Pulse of the planet: A climate data decision-support dashboard for National Marine Sanctuary management and participatory adaptation planning.* Period of performance: 9/1/2022 to 8/31/2025. Lead PI: Dr. Kelly Dunning (Auburn University), Co-PIs: Deepak Cherian (NCAR), **Kristen Krumhardt** (NCAR). Amount awarded to NCAR: $254,814

• NOAA, *mCDR 2023: Multiscale observing system simulation experiments for iron fertilization in the Southern Ocean, Equatorial Pacific, and Northeast Pacific*. Period of performance: 9/1/2023 to 8/31/2026. Lead PI: Dennis McGillicuddy (Woods Hole Oceanographic Institution); Co-PIs: Ken Buesseler (WHOI), Gordon Zhang (WHOI), Matthew Long (NCAR), **Kristen Krumhardt** (NCAR), John Dunne (GFDL), Charles Stock (GFDL). Amount awarded to NCAR: $554,619

• NOAA, mCDR 2023: *Biotic calcification impacts on marine carbon dioxide removal additionality*. Period of performance: 9/1/2023 to 8/31/2027. Lead-PI: Kelly Kearney (Univ. of Washington); Co-PIs: Brenden Carter (Univ. of Washington), Darren Pilcher (Univ. of Washington), **Kristen Krumhardt** (NCAR). Amount awarded to NCAR: $291,343