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Education

2009	PhD in Physical Oceanography ('magna cum laude')
2005 – 2008	PhD-studies in the *Biogeochemical Modelling* group of Andreas Oschlies GEOMAR, Kiel, Germany
2004	German Diplom (equivalent to MSc) in Physical Oceanography ('A') GEOMAR, Kiel, Germany
1999 – 2004	Studies of Physical Oceanography (major) and Physics/Math (minors) at University of Kiel, Kiel, Germany

Professional Experience

August 2018 –	Scientific Ocean Modeler, University of Hawai'i, Honolulu, HI, USA
August 2014 –	Lecturer, Kapi'olani CC, University of Hawai'i, Honolulu, HI, USA
January 2013 –	Affiliate Researcher, University of Hawai'i, Honolulu, HI, USA
2008 – 2018	Postdoctoral Fellow, University of Hawai'i, Honolulu, HI, USA
2005 – 2008	Research Assistant at GEOMAR, Kiel, Germany
2002 – 2008	Climbing teacher at University of Kiel sports center, Germany
2003 – 2004	Student Assistant at GEOMAR, Kiel, Germany

Peer-reviewed Publications

Stein, K., A. Timmermann, E. Y. Kwon, and **T. Friedrich** (2020), Timing and magnitude of Southern Ocean sea ice/carbon cycle feedbacks, *Proceedings of the National Academy of Sciences*, 117 (9), 4498–4504, doi: 10.1073/pnas.1908670117.

Menviel, L. C., P. Spence, L. C. Skinner, K. Tachikawa, **T. Friedrich**, L. Missiaen, and J. Yu (2020), Enhanced Mid-depth Southward Transport in the Northeast Atlantic at the Last Glacial Maximum Despite a Weaker AMOC, *Paleoceanography and Paleoclimatology*, 35, doi:10.1029/2019PA003793.

Friedrich, T., and A. Timmermann (2019), Using Late Pleistocene sea surface temperature reconstructions to constrain future greenhouse warming, *Earth and Planetary Science Letters*, 530, doi: 10.1016/j.epsl.2019.115911.

Saltré, F., J. Chadoeuf, K. J. Peters, M. C. McDowell, **T. Friedrich**, A. Timmermann, S. Ulm, and C. J. A. Bradshaw (2019), Climate-human interaction associated with southeast Aus-

tralian megafauna-extinction patterns, *Nature Communications*, doi: 10.1038/s41467-019-13277-0.

Peters, K. J., F. Saltré, **T. Friedrich**, Z. Jacobs, R. Wood, M. McDowell, S. Ulm, and C. J. A. Bradshaw (2019), FosSahul 2.0, an updated database for the Late Quaternary fossil records of Sahul, *Scientific Data*, 6, 272, doi: 10.1038/s41597-019-0267-3.

Tigchelaar, M., A. Timmermann, **T. Friedrich**, M. Heinemann, and D. Pollard (2019), Nonlinear response of the Antarctic Ice Sheet to late Quaternary sea level and climate forcing, *The Cryosphere*, 13, 2615–2631, doi: 10.5194/tc-13-2615-2019.

Wagner, B., H. Vogel, A. Francke, **T. Friedrich**, et al. (2019), Mediterranean winter rainfall in phase with African monsoons during past 1.36 million years, *Nature*, 573, 256–260, doi: 10.1038/s41586-019-1529-0.

Schloesser, F., **T. Friedrich**, A. Timmermann, R. M. DeConto, and D. Pollard (2019), Impact of Future Antarctic Ice Sheet Discharge on Southern Hemisphere Climate, *Nature Climate Change*, 9, 672–677, doi: 10.1038/s41558-019-0546-1.

Bradshaw, C. J. A., S. Ulm, A. N. Williams, M. I. Bird, R. G. Roberts, Z. Jacobs, F. Lavianoa, L. S. Weyrich, **T. Friedrich**, K. Norman, and F. Saltré (2019), Minimum founding populations for the first peopling of Sahul, *Nature Ecology & Evolution*, 3, 1057–1063, doi: 10.1038/s41559-019-0902-6.

Partridge, D., **T. Friedrich**, and Brian S. Powell (2019), Reanalysis of the PacIOOS Hawaiian Island Ocean Forecast System, an implementation of the Regional Ocean Modeling System v3.6, *Geosci. Model Dev.*, 12, 195–213, doi:10.5194/gmd-12-195-2019.

Gallego, M. A., A. Timmermann, **T. Friedrich**, and R. E. Zeebe (2018), Drivers of future seasonal cycle changes of oceanic pCO_2, *Biogeosciences*, 15, 5315-5327 doi: 10.5194/bg-15-5315-2018

Tigchelaar, M., A. Timmermann, D. Pollard, **T. Friedrich**, and M. Heinemann (2018), Local insolation changes enhance Antarctic interglacials: Insights from an 800,000-year ice sheet simulation with transient climate forcing, *Earth and Planetary Science Letters*, 495, 69–78, doi:10.1016/j.epsl.2018.05.004.

Lo, L., S.T. Belt, J. Lattaud, **T. Friedrich**, C. Zeeden, S. Schouten, L. Smik, A. Timmermann, P. Cabedo-Sanz, J.-J. Huang, L. Zhou, T.-H. Ou, Y.-P. Chang, L.-C. Wang, Y.-M. Chou, C.-C. Shen, M.-T. Chen, K.-Y. Wei, S.-R. Song, T.-H. Fang, S.A. Gorbarenko, W.-L. Wang, T.-Q. Lee, H. Elderfield, and D.A. Hodell (2018), Precession and atmospheric CO_2 modulated variability of sea ice in the central Okhotsk Sea since 130,000 years ago, *Earth and Planetary Science Letters*, 488, 36–45, doi:10.1016/j.epsl.2018.02.005.

Friedrich, T., A. Timmermann, M. Tigchelaar, O. Elison Timm, and A. Ganopolski (2016), Nonlinear climate sensitivity and its implications for future Greenhouse warming, *Science Advances*, 2, e1501923, doi: 10.1126/sciadv.1501923.

Timmermann, A., and **T. Friedrich** (2016), Late Pleistocene climate drivers of early human

migration, *Nature*, 538, 92–95, doi:10.1038/nature19365.

Weldeab, S., **T. Friedrich**, A. Timmermann, and R. Schneider (2016), Strong mid-depth warming and weak radiocarbon imprints in the equatorial Atlantic during Heinrich 1 and Younger Dryas, *Paleoceanography*, 31, doi: 10.1002/2016PA002957.

Stockhecke, M., A. Timmermann, G. S. Haug, O. Kwiecien, R. Kipfer, **T. Friedrich**, L. Menviel, T. Litt, N. Pickarski, and F. S. Anselmetti (2016), Millennial to orbital-scale modulation of drought intensity in the Eastern Mediterranean during the past 360 ka, *Quaternary Science Reviews*, 133, 77–95, doi:10.1016/j.quascirev.2015.12.016.

Hauri, C., **T. Friedrich**, A. Timmermann (2015), Abrupt onset and prolongation of aragonite undersaturation events in the Southern Ocean, *Nature Climate Change*, doi:10.1038/nclimate2844.

Freeman, E., L. Skinner, A. Tisserand, T. Dokken, A. Timmermann, L. Menviel and **T. Friedrich** (2015), An Atlantic-Pacific ventilation seesaw across the last deglaciation, *Earth and Planetary Science Letters*, 424, 237–244, doi:10.1016/j.epsl.2015.05.032.

Friedrich T., A. Timmermann, T. Stichel, and K. Pahnke (2014), Reconstructing large-scale ocean circulation changes from the seawater neodymium isotopic composition, *Paleoceanography*, 29, doi:10.1002/2014PA002658.

Weber, M. E., P. U. Clark, G. Kuhn, A. Timmermann, D. Sprenk, R. Gladstone, X. Zhang, G. Lohmann, L. Menviel, M. O. Chikamoto, **T. Friedrich** and C. Ohlwein(2014), Millennial-scale variability of the Antarctic Ice Sheet throughout the last deglaciation, *Nature*, 510, 134–138, doi:10.1038/nature13397.

Timmermann, A., **T. Friedrich**, O. Elison Timm, M. O. Chikamoto, A. Abe-Ouchi, and A. Ganopolski (2014), Modeling obliquity and CO_2 effects on Southern Hemisphere Climate during the past 408 ka, *Journal of Climate*, 27, 1863–1875, doi:10.1175/JCLI-D-13-00311.1.

Menviel, L., A. Timmermann, **T. Friedrich**, M. H. England (2014), Fingerprinting Heinrich and Dansgaard-Oeschger variability during MIS3, *Climate of the Past*, 10, 63–77, doi:10.5194/cp-10-63-2014.

Kienast, S. S., **T. Friedrich**, N. Dubois, P. S. Hill, A. Timmermann, A. C. Mix, M. Kienast (2013), Near-collapse of the meridional SST gradient in the Eastern Equatorial Pacific during the Heinrich Stadial 1, *Paleoceanography*, 28, doi:10.1002/2013PA002499.

Joos, F., R. Roth, J. S. Fuglestvedt, G. P. Peters, I. G. Enting, W. von Bloh, V. Brovkin, E. J. Burke, M. Eby, N. R. Edwards, **T. Friedrich**, T. L. Frölicher, P. R. Halloran, P. B. Holden, C. Jones, T. Kleinen, F. Mackenzie, K. Matsumoto, M. Meinshausen, G.-K. Plattner, A. Reisinger, J. Segschneider, G. Shaffer, M. Steinacher, K. Strassmann, K. Tanaka, A. Timmermann, and A. J. Weaver (2013), Carbon dioxide and climate impulse response functions for the computation of greenhouse gas metrics: A multi-model analysis, *Atmospheric Chemistry and Physics*, 13, 2793–2825.

Friedrich T., and A. Timmermann, (2012), Millennial-scale glacial meltwater pulses and their effect on the spatio-temporal benthic δ^{18}O variability, *Paleoceanography*, 27, PA3215,

doi:10.1029/2012PA002330.

Friedrich T., A. Timmermann, A. Abe-Ouchi, N. R. Bates, M. O. Chikamoto, M. J. Church, J. E. Dore, D. K. Gledhill, M. González-Dávila, M. Heinemann, T. Ilyina, J. H. Jungclaus, E. McLeod, A. Mouchet, and J. M. Santana-Casiano (2012), Detecting regional anthropogenic trends in ocean acidification against natural variability, *Nature Climate Change*, 2 167–171, doi:10.1038/nclimate1372.

Friedrich T., A. Timmermann, T. Decloedt, D. S. Luther, and A. Mouchet (2011), The effect of topography-enhanced diapycnal mixing on ocean and atmospheric circulation and marine biogeochemistry, *Ocean Modelling*, 3-4, doi:10.1016/j.ocemod.2011.04.012.

Timmermann, A., J. Knies, O. Elison Timm, A. Abe-Ouchi, and **T. Friedrich** (2010), Precessionally paced Northern Hemispheric meltwater pulses promote build-up of glacial ice-sheets 60–115 ka B.P., *Paleoceanography*, 25, PA4208, doi:10.1029/2010PA001933.

Friedrich, T., A. Timmermann, L. Menviel, O. Elison Timm, A. Mouchet, and D. M. Roche (2010), The mechanism behind internally generated centennial-to-millennial scale climate variability in an earth system model of intermediate complexity, *Geosci. Model Dev.*, 3, 377–389, doi:10.5194/gmd-3-377-2010.

Steinhoff, T., **T. Friedrich**, S. E. Hartmann, A. Oschlies, D. W. R. Wallace, and A. Körtzinger (2010), Estimating mixed layer nitrate in the North Atlantic Ocean, *Biogeosciences*, 7, 795–807, doi:10.5194/bg-7-795-2010.

Watson, A. J., U. Schuster, D. C. E. Bakker, N. R. Bates, A. Corbière, M. González-Dávila, **T. Friedrich**, C. Heinze, T. Johannessen, A. Körtzinger, N. Metz, J. Olafsson, A. Olsen, A. Oschlies, B. Pfeil, J. M. Santana-Casiano, T. Steinhoff, M. Telszewski. A. F. Rios, D. W. R. Wallace, and R. Wanninkhof (2009), Tracking the variable North Atlantic sink for atmospheric CO_2, *Science*, 326, 1391–1393, doi:10.1126/science.117739.

Friedrich, T., and A. Oschlies (2009), Basinscale pCO_2 maps estimated from ARGO float data – a model study, *J. Geophys. Res.*, 114, C10012, doi:10.1029/2009JC005322.

Friedrich, T., and A. Oschlies (2009), Neural-network based estimates of North Atlantic surface pCO_2 from satellite data – a methodological study, *J. Geophys. Res.*, 114, C03020, doi:10.1029/2007JC004646.

Friedrich, T., A. Oschlies, and C. Eden (2006), Role of wind stress and heat fluxes in generating interannual-to-decadal variability of air-sea CO_2 and O_2 fluxes in a North Atlantic model, *Geophys. Res. Lett.*, 33, LS21S04, doi:10.1029/2006GL026538.

Other Publications

Friedrich, T., and A. Timmermann (2015), Effects of Sea-Ice and Ocean-Circulation Changes on Deglacial Deep-Ocean Radiocarbon Trends, *Nova Acta Leopoldina*, 121 (408), 65–69.

Timmermann, A., and **T. Friedrich** (2015), Deglacial CO_2/Climate Feedbacks: Models, Myth,

and Misconceptions, *Nova Acta Leopoldina*, 121 (408), 235–239.

Friedrich, T., U. Schuster, and T. Steinhoff (2014), CO_2 in the North Atlantic Ocean, section 5.2.3 of *Ocean-Atmosphere Interactions of Gases and Particles*, *Springer Earth System Sciences*, doi: 10.1007/978-3-642-25643-1_5.

Friedrich, T., PhD-thesis (2009), Dynamical interpolation of surface pCO_2 between lines of observation in the North Atlantic Ocean.

Friedrich, T., German *Diplom* thesis (2004), Biophysical driving mechanisms of seasonal and interannual-to-decadal variability of CO_2- and O_2-fluxes in a North Atlantic model.

Publication Metrics

- Citations: 1453
- h-index: 17
- i10-index: 22

(source: Google Scholar, Mar 13, 2020)

Grants

Pending:

- *Future Climate Impacts on the Pelagic and Coastal Fisheries of Hawai'i*, submitted to NOAA as Co-PI, amount: $509,864.

Significant Contributions to Grants as postdoctoral fellow:

- *Understanding large-scale patterns of future Ocean Acidification*, NSF: CRI-OA, #1314209, amount: $427,412.
- *Hindcasting the ocean radiocarbon history of the past 25,000 years*, NSF: #1400914, amount: $168,705.

Teaching Experience

- Oceanography 201: Instructor* (Spring 2015–2019; Fall 2014, 2015, 2017, 2018, 2019), University of Hawai'i
- Oceanography 310: Discussion group facilitator (Spring 2015–2017; Fall 2015–2018), University of Hawai'i
- Climbing teacher: 2002 – 2008, Athletic Department, University of Kiel, Germany

*My instructor's evaluations can be accessed at:
https://www.hawaii.edu/ces/search-published.html?campus=5&course=&instructor=Friedrich&website=

Reviews for Journals etc.

- US National Science Foundation
- Geophysical Research Letters
- Climate of the Past
- Ocean Dynamics
- Nature
- Biogeosciences
- Progress in Oceanography
- PLoS ONE
- J. of Climate
- J. of Geophysical Research
- Climate Dynamics
- Nature Geoscience

Sea-going Experience

05/2005	Poseidon (PI T.J. Müller)
	Las Palmas (Gran Canaria) → Funchal (Madeira)
02/2005	Spanish Navy Vessel
	Las Palmas (Gran Canaria) ↔ European Station for Time series in the ocean (ESTOC)
08/2002	Poseidon (PI T.J. Müller)
	Reykjavík (Iceland) ↔ Reykjavík (Iceland)
02/2002	L'Atalante (PI U. Send)
	Pointe á Pitre (Guadeloupe) ↔ Pointe á Pitre (Guadeloupe)

Miscellaneous

- U.S. permanent resident (*National Interest Waiver*)
- Member of Mensa high IQ society