

# CURRICULUM VITAE THOMAS FRÖLICHER

Born September, 11, 1979  
Civil status married, two children  
Citizenship Swiss  
ORCID 0000-0003-2348-7854  
Web of Science ResearcherID E-5137-2015  
Google Scholar ID <https://scholar.google.com/citations?user=zCAQrkEAAAAJ&hl=en>

## SHORT PORTRAIT

Thomas Frölicher is currently a SNSF Assistant Professor at the Climate and Environmental Physics Division of the University of Bern and the head of the ocean modelling group. He is interested in marine ecosystem-carbon-climate interactions with focus on ocean extreme events and their impacts on marine organisms and ecosystem services. He studied environmental sciences at ETH Zürich and graduated in Physics with summa cum laude at the University of Bern. He worked 2 ½ years as a postdoctoral fellow at Princeton University and 4 years as a senior researcher at ETH Zürich. He is the recipient of the 2019 Theodor Kocher Prize of the University of Bern. Thomas authored or co-authored 75 peer-reviewed publications, including work on marine heatwaves (e.g. Frölicher et al. 2018, Nature). He currently co-leads the WP2 of the H2020 project COMFORT (ocean extreme and tipping points) and the WP3 the H2020 project 4C (global carbon cycle). He is also the PI in the AtlantECO H2020 consortium on Atlantic Ocean microbiomes and in the PROVIDE H2020 consortium on overshoot scenarios. He was the lead author of chapter six on Extremes, Abrupt Changes and Managing Risks of the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, including the summary for policy makers, and contributed to the fifth and sixth assessment report of working group I and II of the IPCC.

## CURRENT POSITION

8/17 – 7/23 SNSF Assistant Professor (non-tenure track)  
Climate and Environmental Physics, Physics Institute  
University of Bern, CH-3012 Bern, Switzerland  
Tel.: ++41 31 631 86 64  
Email: [thomas.froelicher@climate.unibe.ch](mailto:thomas.froelicher@climate.unibe.ch), web: [www.tfroelicher.com](http://www.tfroelicher.com)

## EDUCATION

04/09 **PhD, Climate and Environmental Physics, University of Bern, Switzerland**  
Thesis: Ensemble modeling of the coupled carbon cycle-climate system  
Passed with summa cum laude.  
Advisor: Prof. Fortunat Joos. Referees: Prof. Thomas Stocker, Prof. Christoph Heinze

11/04 **Diploma, Environmental Sciences, ETH Zürich, Switzerland**  
Major: Atmosphere and Physics.  
Advisors: Dr. Cornelia Schwierz, Prof. Huw Davies

## PAST POSITIONS AND AFFILIATIONS

5/16 – 7/17 Senior Researcher, Environmental Physics, ETH Zürich, Switzerland

5/13 – 4/16	SNSF Ambizione Fellow, Environmental Physics, ETH Zürich, Switzerland
9/12 – 4/13	Senior Nereus Fellow, AOS Program, Princeton University, USA
9/10 – 8/12	SNSF Postdoc, AOS Program, Princeton University, USA
5/09 – 8/10	Postdoc, Climate and Environmental Physics, University of Bern, Switzerland
5/05 – 4/09	PhD candidate, Climate and Environmental Physics, University of Bern, Switzerland
2/05 – 8/05	Research scientist, Meteoswiss, Switzerland, 20%

### PRIZES, AWARDS, RECOGNITIONS

12/19	<b>Theodor Kocher Prize</b> (Award for best Junior Faculty), University of Bern (CHF 50'000)
05/16	Named as one of the most promising young scientists by <i>Die Zeit</i> (German weekly newspaper).
04/14	Best Paper Award, Carbon Mitigation Initiative, Princeton University (\$5'000)
03/11	Nomination by Princeton University for AXA Postdoctoral Fellowship
01/10	Best Paper Award, CARBOOCEAN (\$1'000)

### FUNDING HISTORY (AS PI)

#### Total awarded funds: 4.3 Million Swiss Francs

08/21 – 07/23	Assistant Professorship prolongation, Swiss National Science Foundation (CHF 793'589)
06/21 – 05/24	H2020-LC-CLA-2020-2, PROVIDE: Paris Agreement Overshooting – Reversibility, Climate Impacts and Adaptation Needs (€ 241'069 or CHF 265'176)
10/20	David and Lucile Packard Foundation, The Impact of Climate Change on Indonesian Fisheries and Coastal Communities (\$11'500 or CHF 10'180)
09/20 – 08/24	H2020-BG-2018-2020, AtlantECO: Atlantic Ecosystems assessment, forecasting & sustainability (€ 145'813 or CHF 160'394)
09/19 – 08/23	H2020-LC-CLA-2018-2, COMFORT: Our common future ocean in the Earth system (€ 215'000 or CHF 236'500)
06/19 – 05/23	H2020-LC-CLA-2018-2, 4C: Climate-carbon interactions in the coming century (€ 376'875 or CHF 414'563)
02/19	Bretscher Fonds PhD position, Oeschger Centre for Climate Change Research (CHF 200'000)
02/19	Supplementary Grant for visiting researcher, Oeschger Centre for Climate Change Research (CHF 6'000)
02/19	Supplementary Grant for visiting researcher, Hans Siegrist Foundation (CHF 4'000)
04/18	Supplementary grant for workshop on 'Carbon feedbacks in the climate system', World Climate Research Program (CHF 10'000)
04/18	Supplementary grant for workshop on 'Carbon feedbacks in the climate system', Oeschger Centre for Climate Change Research (CHF 4'000)
08/17 – 07/21	Assistant Professorship, Swiss National Science Foundation (CHF 1'587'895)
08/17	Starting Grant, Oeschger Centre for Climate Change Research (CHF 25'000)
04/16	Nereus Program Expansion Fund (\$135'000 or CHF 119'506)
08/12 – 7/15	Ambizione Fellowship, Swiss National Science Foundation (CHF 384'034)
07/15	ReCoVER Feasibility Fund (Co-PI), UK (£5'876 or CHF 7'117)
07/12	Travel grant, Scientific Committee on Antarctic Research (\$1'000 or CHF 885)
03/12	Travel grant, World Climate Research Program (\$800 or CHF 708)
02/10 – 1/11	Postdoc fellowship, Swiss National Science Foundation (CHF 62'300)

## APPROVED SUPERCOMPUTING PROJECTS (AS PI)

09/18 – 08/21 Large Production Project, Swiss National Supercomputing Centre, 300'000 node hours  
03/18 Small Production Project, Swiss National Supercomputing Centre, 36'000 node hours

## SUPERVISION (AS MAIN ADVISOR) AND JURY MEMBER

### *PhD students*

08/19 - Natacha Le Grix, University of Bern  
02/19 - Mathias Aschwanden, University of Bern  
12/17 - 11/20 Sandra Striegel, University of Bern  
12/17 - Friedrich Burger, University of Bern

### *Postdocs and research staff*

04/21 - Ethienne Pauthenet, Postdoc, University of Bern  
03/21 - Anne Morée, Postdoc, University of Bern  
08/19 - Jens Terhaar, Postdoc, University of Bern  
12/17 – 08/18 Charlotte Laufkötter, Postdoc, University of Bern  
11/17 – 04/18 Emma Velterop, Researcher, University of Bern  
03/15 – 08/15 Lukas von Känel, Researcher, ETH Zürich

### *Master students, bachelor students, interns*

02/21 Donat Hess, Master thesis, University of Bern  
07/20 - Linus Vogt, Master thesis, University of Bern  
03/20 – 08/20 Damien Guignet, Bachelor thesis, University of Bern  
03/20 – 07/20 Severin Kaderli, Bachelor thesis, University of Bern  
09/19 – 02/20 Alexandra Borkowski, Bachelor thesis, University of Bern  
02/19 – 05/19 Donat Hess, Bachelor thesis, University of Bern  
07/18 – 09/19 Luca Ramseyer, Master thesis, University of Bern  
03/16 – 02/19 Noé Lahiguera Vizoso, Bachelor thesis, ETH Zürich  
10/17 – 03/18 Mathias Aschwanden, Master thesis, University of Bern  
02/16 – 06/16 David Kessler, Master thesis, ETH Zürich  
09/15 – 02/16 David Kessler, Bachelor thesis, ETH Zürich  
09/14 – 02/15 Lukas von Känel, Master thesis, ETH Zürich  
05/14 – 09/14 Ronny Meyer, Bachelor thesis, ETH Zürich  
05/14 – 08/14 Jonathan Lin, Summer Intern, Princeton University  
06/12 – 12/12 Alex Do, Summer Intern, Princeton University  
06/11 – 09/11 Jonathan Moch, Summer Intern, Princeton University

### *External jury member of PhD theses*

tbd Eike Köhn, ETH Zürich, Examining committee PhD thesis

06/19	Fabrice Lacroix, MPI-M Hamburg, Examining committee PhD thesis
05/18	Ana Franco, ETH Zürich, Examining committee PhD thesis
05/17	Dominic Clement, ETH Zürich, Examining committee PhD thesis
01/17	Maria Rugenstein, ETH Zürich, Examining committee PhD thesis

#### TEACHING ACTIVITIES

Since 2017	Lecturer (6 hours per year), <b>Introduction to Climate and Environmental Physics</b> , Masters in Climate Science or Physics, University of Bern
Since 2017	Lecturer (1 semester every two years), <b>Carbon cycle</b> , Masters in Climate Science or Physics, University of Bern
Since 2014	Lecturer (1 semester every year), <b>Introduction to Physical Oceanography</b> , Bachelor in Environmental Sciences, ETH Zürich
Since 2016	Lecturer (1 day ever two years), <b>Oceans and marine resources</b> , ETH Zürich
09/15 – 11/15	Tutorial Leader, <b>Seminar Course in Biogeochemistry</b> , ETH Zürich
11/14	Lecturer (1 lecture), System Analysis, <b>Bachelor in Environmental Sciences</b> , ETH Zürich
04/14	Lecturer (1 lecture), <b>Global Biogeochemical Cycles and Climate</b> , Climate Science Master, ETH Zürich
05/05 – 04/09	Tutor (2 semester every year), <b>Physics Laboratory</b> , Masters in Physics, University of Bern

#### COMMUNITY LEADERSHIP, ACADEMIC ACTIVITIES AND SERVICES

Editorial board	Frontiers in Climate Prediction and Projections
IPCC	Lead author, Chapter 6: Extremes, abrupt changes and managing risks, IPCC Special Report on the Ocean and Cryosphere in a changing climate Contributing author, Chapter 9: Ocean, cryosphere, and sea level change, IPCC WGI AR6 Contributing author, Chapter 3: Ocean and coastal ecosystems and their services, IPCC WGII AR6 Invited review author, Chapter 5: Global carbon and other biogeochemical cycles and feedbacks, IPCC WGI AR6 Contributing author, Chapter 6: Ocean systems, IPCC WGII AR5
International projects	Work package leader “Dynamics, extremes, early warning indicators, and reversibility” in H2020-LC-CLA-2018-2 project “Our common future ocean in the Earth system” (lead-PI: Prof. Christoph Heinze) Work package leader “Projecting the required mitigation effort over the 21 <sup>st</sup> century” in H2020-LC-CLA-2018-2 project “Climate-carbon interactions in the coming century” (lead-PI: Prof. Pierre Friedlingstein) PI in H2020-LC-CLA-2020-2 project “Paris Agreement Overshooting: Reversibility, Climate Impacts and Adaptation Needs” (lead-PI: Dr. Carl-Friedrich Schleussner) PI in H2020-BG-2018-2020 project “Atlantic ecosystems assessment, forecasting & sustainability” (lead-PI: Prof. Daniele Iudicone)
Workshop organizer	“Extending the climate-carbon cycle feedback framework”. WCRP Grand Challenge on Carbon feedbacks in the climate system. 2018, University of Bern, Switzerland
Session convener	“Marine heatwaves and ocean biogeochemical extremes”. Ocean Sciences Meeting 2020, San Diego, USA.

	<p>“Extreme ocean events and their impacts on marine ecosystems”. 4<sup>th</sup> International Symposium on the Effects of Climate Change on the World’s Oceans 2018, Washington, USA.</p> <p>“Ensemble modeling approaches in physical and biogeochemical oceanography”. Ocean Sciences Meeting 2018, Portland, USA.</p> <p>“The role of the ocean in climate: Heat and carbon uptake, storage, and transport.” Ocean Sciences Meeting 2016, New Orleans, USA.</p>
Summer Schools	<p>Invited lecturer at the Swiss Climate Summer School on ‘Extreme weather and climate: From atmospheric processes to impacts on ecosystems and society’, August 2020, Switzerland. Postponed to 2022 due to COVID-19.</p> <p>Invited lecturer at SFB 754 Early Career Scientist Retreat on ‘Climate-biogeochemistry interactions in the tropical ocean’, November 2016, Germany.</p>
Review panelist	<p>NOAA Climate variability and predictability program, June 2020</p> <p>NOAA, Ocean acidification, January 2015</p>
Review activities	<p>Biogeosciences, Climate Dynamics, Deep Sea Research Part I, Earth’s Future, Environmental Research Letters, Environmental Science &amp; Technology, ERC Starting Grants, Geophysical Research Letters, Geoscientific Model Development, Global Biogeochemical Cycles, Global Change Biology, IPCC SROCC, IPCC AR5 WG1, IPCC AR6 WG2, Journal of Geophysical Research: Atmosphere, Journal of Geophysical Research: Ocean, Journal of Climate, KAUST Research proposal, Leverhulme Trust, Marine Biology, Nature, Nature Climate Change, Nature Communications, Nature Geoscience, Nature Reviews Earth &amp; Environment, Ocean Circulation and Climate (Book), Progress in Oceanography, Science, Scientific Reports, Scripps Promotion Evaluation, The Holocene, US NOAA, US NSF, UK NERC, UKRI Future Leaders Fellowship</p>
Media	<p>Actively communicate research findings through national and international media including TV, press and internet, e.g. ArsTechnica, Atlantico, Axios, BBC, Blick, Carbonbrief, Correio Brasiliense, Deutsche Welle, Die Zeit, Earther, EOS, FAZ, IISD, Klimareporter, Kommersant, Le Parisien, Luzerner Zeitung Nature podcast, NY-TIMES, Oceana, Phys.org, Radio Télévision Suisse, Süddeutsche Zeitung, Swiss Radio Echo der Zeit, Swiss Radio Wissenschaftsmagazin, Swiss Television Tagesschau, Tagesanzeiger, Watson, Welt, WDR Quarks, 20 Minuten.</p> <p>More information on media coverage under: <a href="https://www.tfroelicher.com/media-coverage/">https://www.tfroelicher.com/media-coverage/</a></p>

#### SELECTED INVITED PRESENTATIONS (LAST THREE YEARS)

07/21	Keynote talk, RoSES / ORCHESTRA Annual Science Meeting, University of East Anglia, UK
04/21	Invited seminar, Oceanography Seminar, University of Hawaii, Hawaii
04/21	Invited speaker, Session OS1.6: Drivers and impacts of the Southern Ocean exchange, export and storage of heat and carbon under past, present and future climates, EGU General Assembly, Vienna, Austria
02/21	Invited speaker, Plenary Meeting of the Oeschger Centre for Climate Change Research, Bern, Switzerland
10/20	Invited seminar, Ocean and Fisheries Seminars, University of British Columbia, Canada
09/20	Invited speaker, Annual meeting of the H2020-COMFORT project
06/20	Invited speaker, Annual meeting of the H2020-4C project
02/20	Invited speaker, IPCC SROCC, Ocean Sciences Meeting, San Diego, USA
12/19	Invited speaker at high-level segment, COP21 Barcelona Convention, Naples, Italy
10/19	Invited speaker, High-level IPCC SROCC presentation, Innsbruck, Austria
10/19	Invited speaker, Kick-off meeting, H2020-COMFORT project, Bergen, Norway

- 10/19 Invited speaker, Workshop on ‘Estimating the impact of climate change on Living Marine Resources’, Bergen, Norway
- 09/19 Invited speaker, Nereus Open Science Conference, Princeton, USA
- 05/19 Invited seminar, Department of Zoology, University of Basel, Switzerland
- 05/19 Invited speaker, Kick-off meeting, H2020-4C project, Paris, France
- 04/19 Invited speaker, Session OS1.1: Open Session on Ocean Circulation and Climate, EGU General Assembly, Vienna, Austria
- 03/19 Invited seminar, Physik am Freitag, University of Bern, Switzerland
- 01/19 Invited speaker, Workshop on remaining carbon budget, Vancouver, Canada
- 01/19 Invited seminar, Institute for the Oceans and Fisheries, University of British Columbia, Canada
- 01/19 Invited speaker, Session 13C: El Nino-Southern Oscillation (ENSO) Dynamics, Diversity, Prediction, and Impacts, American Meteorological Society Annual Meeting, Phoenix, USA
- 11/18 Invited seminar, OneNOAA Science Seminars, Webinar
- 09/18 Speaker, Ocean deoxygenation conference, Kiel, Germany
- 06/18 Invited speaker, Nereus annual meeting, University of Washington, USA
- 06/18 Invited speaker, Symposium on the effects of climate change on the World’s oceans, Washington, USA
- 06/18 Invited seminar, School of Environmental Sciences, University of Liverpool, UK
- 05/18 Invited seminar, Institute of Geography, University of Bern, Switzerland
- 04/18 Invited speaker, Carbon cycle climate feedback workshop, University of Bern, Switzerland
- 11/17 Invited seminar, Climate and Environmental Physics, University of Bern, Bern, Switzerland
- 09/17 Invited speaker, Plenary Meeting of the Oeschger Centre for Climate Change Research, Bern, Switzerland
- 08/17 Speaker, ICDC10, Interlaken, Switzerland

#### OUTREACH TALKS (LAST THREE YEARS)

- 02/21 MOSAIC Science after Noon, Switzerland (Virtual Talk)
- 09/20 Klimastreik, Köniz, Switzerland
- 09/20 Ökumenische Erwachsenenbildung Zofingen, Switzerland
- 03/20 Zurich Actuarial Society (Virtual talk)
- 02/20 Kulturgesellschaft Ebikon, Ebikon, Switzerland
- 11/19 Event on ‘Sustainability and city development’, Zürich, Switzerland
- 10/19 Biology Department, East Carolina University (Virtual Talk)
- 10/19 Unic AG, Bern, Switzerland
- 09/19 Rendez-vous Science, Bern, Switzerland
- 07/19 Innolab, Bern, Switzerland
- 05/19 Business lunch, Solothurn, Switzerland
- 05/19 CVP annual meeting, Schlierbach, Switzerland
- 04/19 Event on ‘Sustainability and city development’, Bern, Switzerland
- 03/19 Swiss Engineering Society, Baden, Switzerland
- 01/19 Café Scientific, University of Basel, Switzerland (declined)
- 11/18 Berufsbildungszentrum, Olten, Switzerland

## PUBLICATION LIST

Full publication list with links to manuscripts: [www.tfroelicher.com/publications](http://www.tfroelicher.com/publications)

Bibliometrics (January 26, 2021):

No. of peer-reviewed publications: (total: 82, published: 75)

Web of Science: h-index: 32, citations: 4011

Google Scholar: h-index: 35, citations: 6119

## INTERNATIONAL ASSESSMENTS (IPCC & WOA)

4. **Drafting Author:** Garcia-Soto, C., D. Breitburg, M. Campillos, P. Castillo-Briceno, M. Collings, G. Esnaola, K. Evan, L. B. Firth, T. L. Frölicher, J. M. Hall-Spencer, D. Halpern, K. L. Hunter, G. Ibarra, S.-Y. Kim, R. M. Koll, K. McInnes, J. Saenz, B. Ward, T. Zielinski, 2021: **Pressures from Changes in Climate and Atmosphere**. In: *Second World Ocean Assessment*. In press.
3. **Drafting Author:** IPCC, 2019: **Summary for Policymakers**. In: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* [H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, N. Weyer (eds.)] In press.
2. **Lead Author:** Collins, M., M. Sutherland, L. Bouwer, S.-M. Cheung, T. L. Frölicher, H. Jacot Des Combes, M. Koll Roxy, I. Losada, K. McInnes, B. Ratter, E. Rivera-Arriaga, R. D. Susanto, D. Swingedouw, L. Tibig, 2019: **Extremes, Abrupt Changes and Managing Risks**. In: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* [H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, N. Weyer (eds.)] In press.
1. **Contributing Author:** Pörtner, H.-O., D. M. Karl, P. W. Boyd, W. W. L. Cheung, S. E. Lluch-Cota, Y. Nojiri, D. N. Schmidt, and P. O. Zavialov, 2014: **Ocean Systems**. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C. B., V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, and L. L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 411-484.

## PUBLICATIONS WITH PEER-REVIEW

Publications indicated with a plus <sup>+</sup> sign are papers from Postdocs, PhD or master students that I have supervised.

*In review*

78. <sup>+</sup>Le Grix, J. Zscheischler, C. Laufkötter, C. S. Rousseaux, T. L. Frölicher, Compound high temperature and low chlorophyll extremes in the ocean over the satellite period. *Biogeosciences Discussion*. In revision.
77. Gruber N., T. L. Frölicher, P. W. Boyd, Ocean extremes: From marine heatwaves to compound events and their threats to ocean life. *Nature*. In revision.
76. Klein, S. G., N. R. Geraldi, A. Anton, S. Schmidt-Roach, M. Ziegler, M. J. Cziesielski, C. Martin, N. Rädicker, T. L. Frölicher, P. J. Mumby, J. M. Pandolfi, D. J. Suggett, C. R. Voolstra, M. Aranda, C. M. Duarte, Projecting coral responses to intensifying marine heatwaves under ocean acidification. *Nature Ecology & Evolution*.
75. Cheung, W. W. L., T. L. Frölicher, V. W. Y. Lam, M. Oyinlola, G. Reygondeau, U. R. Somalia, T. Tai, L. Teh, C. Wabnitz, Marine heatwaves amplify the impacts of climate change on fish and fisheries. *Science*. Under review (2<sup>nd</sup> round).
74. <sup>+</sup>Terhaar, J., T. L. Frölicher, F. Joos, Emergent constraint on the Southern Ocean anthropogenic carbon sink. *Science Advances*. Under review (2<sup>nd</sup> round).
73. Gloege, L., G. A. McKinley, P. Landschützer, A. R. Fay, T. L. Frölicher, J. C. Fife, T. Ilyina, S. Jones, N. S. Lovenduski, C. Rödenbeck, K. Rodgers, S. Schlunegger, Y. Takano. Quantifying errors in observationally-based estimates of ocean carbon sink variability. *Global Biogeochemical Cycles*.

72. Clarke, T., C. Wabnitz, S. Striegel, T. L. Frölicher, G. Reygondeau, W. W. Cheung, A new metabolic index to understand the impacts of ocean warming and deoxygenation on global marine biodiversity. *Progress in Oceanography*.

*In press or published*

71. Moore, C., J. Morley, B. Morrison, M. Kolian, E. Horsch, T. L. Frölicher, M. L. Pinsky, R. Griffis, Estimating the economic impacts of climate change on 16 major U.S. fisheries. *Climate Change Economics*. In press.
70. Matthews, H. D., K. B. Tokarska, Z. R. J. Nicholls, J. Rogelj, J. P. Canadell, P. Friedlingstein, T. L. Frölicher, P. M. Forster, N. P. Gillett, T. Ilyina, R. B. Jackson, C. D. Jones, C. Koven, R. Knutti, A. H. MacDougall, M. Meinshausen, N. Mengis, R. Séférian, K. Zickfeld, Opportunities and challenges in using carbon budgets to guide climate policy. *Nature Geosciences*. 13, 769-779.
69. Pinsky, M., L. A. Rogers, J. W. Morley, T. L. Frölicher. Ocean planning for species on the move provides substantial benefits and requires few tradeoffs. *Sciences Advances*. 6, eabb8428.
68. Rodgers, K. B., S. Schlunegger, R. D. Slater, M. Ishii, T. L. Frölicher, K. Toyama, Y. Plancherel, O. Aumont, A. J. Fassbender, Re-emergence of anthropogenic carbon into the ocean's mixed layer strongly amplifies transient climate sensitivity. *Geophysical Research Letters*. 47, e2020GL089275.
67. Collins, M., M. Barreiro, T. L. Frölicher, S. Kank, A. Karumuri, R. M. Koll, D. Singh, R. Goncalves Tedeschi, G. Wang, L. Wilcox, B. Wu, Frontiers in Climate Predictions and Projections. *Frontiers in Climate*. 2: 571245.
66. <sup>+</sup>Burger, F. A., T. L. Frölicher, J. John. Increase in ocean acidity variability and extremes under increasing atmospheric CO<sub>2</sub>. *Biogeosciences*. 17, 4633-4662. (featured as highlighted article from all EGU's open access journals).
65. Frölicher, T. L., M. T. Aschwanden, N. Gruber, S. Jaccard, J. Dunne, D. Paynter, Contrasting upper and deep ocean oxygen response to protracted global warming. *Global Biogeochemical Cycles*. 34, e2020GB006601.
64. Fernandes, J., T. L. Frölicher, L. A. Rutterford, M. Erauskin, W. W. L. Cheung, Changes of potential catches for North-East Atlantic small pelagic fisheries under climate change scenarios. *Regional Environmental Change*, 20, 116.
63. <sup>+</sup>Laufkötter, C., J. Zscheischler, T. L. Frölicher, High-impact marine heatwaves attributable to human-induced global warming. *Science*. 369, 1621-1625.
62. Reygondeau, G., W. W. L. Cheung, C. Wabnitz, V. Lam, T. L. Frölicher, O. Maury, Climate change-induced emergence of novel ocean biogeographic states. *Frontiers in Marine Sciences*. 7, 657.
61. Schlunegger, S., K. Rodgers, J. Sarmiento, T. Ilyina, J. P. Dunne, Y. Takano, J. Christian, M Long, T. L. Frölicher, R. Slater, F. Lehner, Time of emergence and large ensemble inter comparison for ocean biogeochemical trends. *Global Biogeochemical Cycles*. E2019GB006453.
60. Rodgers, K., M. Ishii, T. L. Frölicher, S. Schlunegger, O. Aumont, K. Toyama, R. Slater, Coupling of surface ocean heat and carbon perturbations over the subtropical cells under 21st century climate change. *Journal of Climate*. 33(23), 10321-10338.
59. Morley, J., T. L. Frölicher, M. Pinsky, 2020, Characterizing uncertainty in climate impact projections: A case study with seven marine species on the North American continental shelf. *ICES Journal of Marine Science*. 77(6), 2118-2133.
58. MacDougall, A. H., T. L. Frölicher, C. D. Jones, J. Rogelj, H. D. Matthews, K. Zickfeld, V. K. Arora, N. J. Barrett, V. Brovkin, F. A. Burger, M. Eby, A. V. Eliviseev, T. Hajima, P. B. Holden, A. Jeltsch-Thömmes, C. Koven, L. Menviel, M. Michou, I. I. Mokhov, A. Oka, J. Schwinger, R. Séférian, G. Shaffer, A. Sokolov, K. Tachiiri, J. Tjiputra, A. Wiltsire, T. Ziehn, 2020, Is there warming in the pipeline? A multi-model analysis of the Zero Emissions commitment from CO<sub>2</sub>. *Biogeosciences*. 17, 2987-3016. (featured as highlighted article from all EGU's open access journals).
57. Lam, V. W. Y., E. H. Allison, J. D. Bell, J. Blythe, W. W. L. Cheung, T. L. Frölicher, M. A. Gasalla, U. Rashid Sumalia, 2020, Climate Change, tropical fisheries and the prospect for sustainable development. *Nature Reviews Earth & Environment*. 1, 440-454.
56. Cheung, W. W. L., T. L. Frölicher, 2020, Marine heatwaves exacerbate climate change impact for fisheries in the northeast Pacific. *Scientific Reports*. 10, 6678.



55. Frölicher, T. L., L. Ramseyer, C. C. Raible, K. B. Rodgers, 2020, Potential predictability of marine ecosystem drivers. *Biogeosciences*. 17, 2061-2083.
54. Fernandes, J., L. Rutterford, S. Simpson, M. Butenschön, T. L. Frölicher, A. Yool, W. W. L. Cheung, A. Grant, 2020, Can we project changes in fish abundance and distribution in response to climate? *Global Change Biology*. 26, 3891-3905.
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