

Donata Giglio

Department of Atmospheric and Oceanic Sciences
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Academics

Research Interests Large Scale Ocean-Atmosphere Dynamics, Geophysical Fluid Dynamics, Data Science, Accessibility and Visualization.

Field of specialization Large scale ocean circulation and exchanges of heat and freshwater at the ocean-atmosphere interface. I use observations, reanalysis products, and process models.

Current Work

- **Air-sea interactions**
- **Diurnal variability in the tropical oceans**
- **Ocean heat and freshwater changes**

Education

Ph.D., 2014 Climate, Atmospheric Science and Physical Oceanography (CASPO) Division, Scripps Institution of Oceanography, UCSD

Field: Physical Oceanography

Research Supervisors: Prof. Dean Roemmich

Dissertation: *Large-scale ocean circulation, dynamics, and air-sea exchanges: Argo observations of the mean and time-varying ocean.*

Courses done: Data Analysis, Mathematical Methods for Differential Equations, Geophysical Fluid Dynamics, Ocean Waves, Climate Dynamics, Numerical Optimization.

M.S., 2008 Universita' Politecnica delle Marche - Italy

Field: Environmental Engineering

Research Supervisor: Prof. Maurizio Brocchini

Dissertation: *Analysis of the Lateral Boundary Conditions in a NLSWE model.*

B.S., 2005 Universita' Politecnica delle Marche - Italy

Field: Environmental Engineering.

Professional Experience

U. Colorado, 2019–present : Assistant Professor at University of Colorado Boulder, Dept. of Atmospheric and Oceanic Sciences

U. California, 2016–2018 : Postdoctoral Scholar at Scripps Institution of Oceanography, Univ. of California San Diego

U. Oxford, 2016–2017 : Visiting Scientist at University of Oxford, UK

U. Washington, 2014–2016 : Joint Institute for the Study of the Atmosphere and Ocean (JISAO) Postdoctoral Research Fellow at Univ. of Washington, Seattle

U. California, 2008–2014 : Research Assistant, Climate, Atmospheric Science and Physical Oceanography (CASPO) Division at Scripps Institution of Oceanography, Univ. of California San Diego

U. California, SIO : 2 week cruise to measure Internal Tides in the Santa Cruz Basin.

CMCC : Internship at Centro Euro-Mediterraneo per i Cambiamenti Climatici (CMCC), Bologna

Mentoring

Graduate students : Jacopo Sala (2020-present, CU Boulder; Ph.D. advisor)
Giovanni Seijo (2020-present, CU Boulder; Ph.D. advisor)
Marissa Sandoval (Summer 2021, CU Boulder; REU research mentor)

Danni Du (2021-present, CU; member of Ph.D. committee)
Sam Mogen (2022-present, CU; member of Ph.D. committee)
Lauren Hoffman (2020-present, SIO/UCSD; member of Ph.D. committee)
Thea Sukianto (2021-present, CMU; member of Masters committee)
Julia Walchessen (2020-2021, CMU; member of Masters committee)
Siddhaarth Sarkar (2020-2021, CMU; member of Masters committee)
Beomjo Park (2019-2020, CMU; member of Masters committee)
Addison Hu (2019-2020, CMU; member of Masters committee)

Postdoc : Dr. Natalie Freeman (2020-2021, CU Boulder)
Software engineer : William Mills (Professional Research Assistant, 2021-present)
Tyler Tucker (Professional Research Assistant, 2019-2020; Temporary Researcher, 2020-2021)

Teaching

CU Boulder : ATOC 1060-001 Our Changing Environment(S2019, S2020)
ATOC 4500-002: Data Science Laboratory (S2021, S2023)
ATOC-GEOL 3070-001 Introduction to Oceanography(F2020, F2022)

Other Training

CU Boulder : FTEP Workshop; Teaching Large Classes (Feb 2019); Learning by Design (F2020); Faculty Development Program (2020-2021); Engaging Students and LAs in Lecture Contexts (Jan 2020); ASSETT-CDW-2020 (June 2020); Thriving as a Mentor: Resources to Support Students (Feb 2021); ATOC REU Mentoring Workshop (May 2021).

Other : Early Career Geoscience Faculty Workshop Program (July 2020)

Funded grants

- **Co-PI for KAUST Grant:** Arabian Peninsula land-based and marine heatwaves variability, drivers, trends, and predictability up to sub-seasonal scales (2022 - 2025)
- **Recipient of Thrive Grant** at Univ. of Colorado Boulder (Fall 2022)
- **Lead PI for NOAA grant (funded under NOAA-OAR-CPO-2021-2006389):** Gridded data products with uncertainties for 21st century in-situ oceanographic observations. (2021-2024)
- **Lead PI for NASA grant (Award No. 20-PO20-0028):** Variability, trends, and spatial distribution of Pacific Ocean heat content from large-scale satellite and in situ observations. (2021-2024)
- **Lead (on behalf of EarthCube TAC) for NSF funds:** Developing EarthCube-related notebook-construction workshops/hackathons. (2021)
- **Lead (on behalf of EarthCube TAC) for NSF funds:** Developing standardized notebooks that leverage EarthCube projects. (2021)
- **Lead PI for NSF grant (Award No. 2026954):** Collaborative Research: EarthCube Data Capabilities: Rapid response to existing community demand through next generation web infrastructure to integrate Argo and GO-SHIP. (2020-2023)
- **Lead PI for NSF grant (Award No. 1928305):** EarthCube Data Capabilities: Argovis 2.0: A Next Generation Platform for co-located Oceanic and Atmospheric Data to Accelerate Climate Science Workflows. (2019-2022)
- **Co-I for NASA grant (Award No. 17-OVWST-17-0010):** Diurnal and High-Frequency Wind Variability. (2018-2022)

Academic Honours

- Joint Institute for the Study of the Atmosphere and Ocean (JISAO) Postdoctoral Research Fellowship, under NOAA Cooperative Agreement NA10OAR4320148 (2014)

- Folsom Graduate Fellowship at Scripps Institution of Oceanography (2008)
- M.S. with honors (110/110 summa cum laude)
- B.S. with honors (110/110 magna cum laude)
- Università Politecnica delle Marche full tuition scholarship for merit (2003-2004)
- AFS Intercultural Program scholarship (1999)

Travel Grant Awards

- ONR/NSF/DOE/NOAA/NASA, to attend the Pattullo Conference, Warrenton, VA (2015)
- NSF/NOAA, to attend PODS VIII, Lihue, Kauai, HI (2014)
- Scripps Institution of Oceanography, to attend Ocean Sciences Meeting, Honolulu, HI (2014)
- AGU, to attend AGU Fall Meeting, San Francisco, CA (2012)
- WMO, to attend WCRP OSC, Denver, CO (2011)

Academic Services

Panel NSF Physical Oceanography Program

Committees Co-Chair of Earthcube Technology and Architecture Committee (2020-2022); member of the AMS Committee on Air-Sea Interaction (2021-2023); member of committee organizing notebook session at NSF EarthCube Meeting (2021-2022); member of scientific organizing committee for NCAR ASP Summer School program (2021, 2022);

Working Group Member of US CLIVAR Working Group on Ocean Uncertainty Quantification (2020-2023)

Workshops Chair of Organizing Committee for the STATMOS-SIO Workshop “Argo Data Statistics” 2017, Univ. of California San Diego; Co-lead for the Ocean Uncertainty Quantification Session at the Ocean Best Practices System Workshop IV (2020); member of the Scientific Committee for the 7th Argo Science Workshop 2022, Belgium.

OSM Sessions Chair of session on “Visualization, Statistics, and Model Validation of Big Data for Oceanography”, 2018, Portland; Co-Chair of session on “Data Science for Modern Oceanography: Statistics, Machine Learning, Visualization, and More”, 2020, San Diego; Chair of session on “Advances in Data Science for Ocean Uncertainty Quantification”, 2022 (virtual meeting).

AMS Session Chair of “Session 8 Air-Sea Interaction at the Meso and Synoptic Scales”, 2023, Denver.

Reviewer for:

- Geophysical Research Letters
- Journal of Physical Oceanography
- Journal of Climate
- Nature Geoscience
- Nature Communications
- Ocean Dynamics
- NSF

Other: Program Director of the Graduate Certificate in Oceanography at Univ. of Colorado Boulder, ATOC (2022-2023); Lead organizer of the Argovis hackathon in May 2022.

Professional Societies

- Member of AGU

Datasets

- Kuusela, Mikael and **Donata Giglio** (2023) Global Ocean Heat Content Anomalies based on Argo data (2.0.0) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.7562281>

- Kuusela, Mikael and **Donata Giglio** (2022) Global Ocean Heat Content Anomalies based on Argo data (1.0.0) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.6131625>

Publications

22. Hoffman Lauren, Matthew R. Mazloff, Sarah T. Gille, **Donata Giglio**, Cecilia M Bitz; Patrick Heimbach: Machine learning for daily forecasts of Arctic sea-ice motion: an attribution assessment of model predictive skill. *Artificial Intelligence for the Earth Systems, sub judice*
21. von Schuckmann, K., Minère, A., Gues, F., Cuesta-Valero, F. J., Kirchengast, G., Adusumilli, S., Straneo, F., Allan, R., Barker, P. M., Beltrami, H., Boyer, T., Cheng, L., Church, J., Desbruyeres, D., Dolman, H., Domingues, C. M., García-García, A., **Giglio, D.**, Gilson, J. E., Gorfer, M., Haimberger, L., Hendricks, S., Hosoda, S., Johnson, G. C., Killick, R., King, B., Kolodziejczyk, N., Korosov, A., Krinner, G., Kuusela, M., Langer, M., Lavergne, T., Lawrence, I., Li, Y., Lyman, J., Marzeion, B., Mayer, M., MacDougall, A. H., McDougall, T., Monselesan, D. P., Nitzbon, J., Otosaka, I., Peng, J., Purkey, S., Roemmich, D., Sato, K., Sato, K., Savita, A., Schweiger, A., Shepherd, A., Seneviratne, S. I., Simons, L., Slater, D. A., Slater, T., Smith, N., Steiner, A., Suga, T., Szekely, T., Thiery, W., Timmermans, M.-L., Vanderkelen, I., Wjiffels, S. E., Wu, T., Zemp, M., 2022: Heat stored in the Earth system 1960–2020: Where does the energy go? *Earth System Science Data Discussions, sub judice*, <https://essd.copernicus.org/preprints/essd-2022-239/>
20. Addison J. Hu, Mikael Kuusela, Ann B. Lee, **Donata Giglio**, Kimberly M. Wood: Spatio-temporal methods for estimating subsurface ocean thermal response to tropical cyclones. <https://arxiv.org/abs/2012.15130>
19. Park Beomjo, Mikael Kuusela, **Donata Giglio**, Alison Gray, 2023: Spatio-temporal Local Interpolation of Global Ocean Heat Transport using Argo Floats: A Debiased Latent Gaussian Process Approach. To appear in *The Annals of Applied Statistics*, [mbox-https://arxiv.org/abs/2105.09707](https://arxiv.org/abs/2105.09707)
18. Seijo-Ellis Giovanni, **Donata Giglio** and Haydee Salmun, 2023: Intrusions of Amazon river waters in the Virgin Islands basin during 2007 to 2017. *Journal of Geophysical Research: Oceans* 128, e2022JC018709 <https://doi.org/10.1029/2022JC018709>
17. Simmonds Emily G., Kwaku Peprah Adjei, Christoffer Wold Andersen, Janne Cathrin Aspheim Hetle, Claudia Battistin, Nicola Bulso, Hannah M. Christensen, Benjamin Cretois, Ryan Cubero, Iván A. Davidovich, Lisa Dickel, Benjamin Dunn, Etienne Dunn-Sigouin, Karin Dyrstad, Sigurd Einum, **Giglio, Donata** and Gjerløw, Haakon and Godefroidt, Amélie and González-Gil, Ricardo and Gonzalo Cogno, Soledad and Große, Fabian and Halloran, Paul and Jensen, Mari F. and Kennedy, John James and Langsæther, Peter Egge and Laverick, Jack H. and Lederberger, Debora and Li, Camille and Mandeville, Elizabeth G. and Mandeville, Caitlin and Moe, Espen and Navarro Schröder, Tobias and Nunan, David and Sicacha-Parada, Jorge and Simpson, Melanie Rae and Skarstein, Emma Sofie and Spensberger, Clemens and Stevens, Richard and Subramanian, Aneesh C. and Svendsen, Lea and Theisen, Ole Magnus and Watret, Connor and O’Hara, Robert B., 2022: Insights into the quantification and reporting of model-related uncertainty across different disciplines. *iScience* 25 (12), 105512 <https://doi.org/10.1016/j.isci.2022.105512>
16. Karnauskas, Kristopher B. and **Donata Giglio**, 2022: Argo reveals the scales and provenance of equatorial island upwelling systems. *Geophysical Research Letters* 49, e2022GL098744. <https://doi.org/10.1029/2022GL098744>
15. *Contributed to:* State of the Global Climate 2021, WMO-No. 1290, World Meteorological Organization, 2022
14. Lauren Hoffman, Matthew R. Mazloff, Sarah T. Gille, **Donata Giglio**, Aniruddh Varadara-jan, 2022: Ocean Surface Salinity Response to Atmospheric River Precipitation in the California Current System. *Journal of Physical Oceanography* 52(8), 1867-1885
13. **Donata Giglio**, Sarah T Gille, Bruce D Cornuelle, Aneesh C Subramanian, Francis Joseph Turk, Svetla Hristova-Veleva, Devon Northcott, 2022: Annual Modulation of Diurnal Winds in the Tropical Oceans. *Remote Sens.* 14, 459

12. Turk, F. Joseph, Hristova-Veleva, Svetla, **Donata Giglio**, 2021: Examination of the Daily Cycle Wind Vector Modes of Variability from the Constellation of Microwave Scatterometers and Radiometers. *Remote Sens.* 13, 141
11. Tucker, Tyler, **Donata Giglio**, Megan Scanderbeg, and Samuel S.P. Shen, 2020: Argovis: A Web Application for Fast Delivery, Visualization, and Analysis of Argo Data. *Journal of Atmospheric and Oceanic Technology* 37 (3): 401–416
10. Meyssignac Benoit, Boyer Tim, Zhao Zhongxiang, Hakuba Maria Z., Landerer Felix W., Stammer Detlef, Köhl Armin, Kato Seiji, L’Ecuyer Tristan, Ablain Michael, Abraham John Patrick, Blazquez Alejandro, Cazenave Anny, Church John A., Cowley Rebecca, Cheng Lijing, Domingues Catia M., **Giglio Donata**, Gouretski Viktor, Ishii Masayoshi, Johnson Gregory C., Killick Rachel E., Legler David, Llovel William, Lyman John, Palmer Matthew Dudley, Piotrowicz Steve, Purkey Sarah G., Roemmich Dean, Roca Rémy, Savita Abhishek, Schuckmann Karina von, Speich Sabrina, Stephens Graeme, Wang Gongjie, Wijffels Susan Elisabeth, Zilberman Nathalie, 2019: Measuring Global Ocean Heat Content to Estimate the Earth Energy Imbalance. *Frontiers in Marine Science*, 6, 432 10.3389/fmars.2019.00432
9. Subramanian Aneesh C., Balmaseda Magdalena A., Centurioni Luca, Chattopadhyay Rajib, Cornuelle Bruce D., DeMott Charlotte, Flatau Maria, Fujii Yosuke, **Giglio Donata**, Gille Sarah T., Hamill Thomas M., Hendon Harry, Hoteit Ibrahim, Kumar Arun, Lee Jae-Hak, Lucas Andrew J., Mahadevan Amala, Matsueda Mio, Nam SungHyun, Paturi Shastri, Penny Stephen G., Rydbeck Adam, Sun Rui, Takaya Yuhei, Tandon Amit, Todd Robert E., Vitart Frederic, Yuan Dongliang, Zhang Chidong, 2019: Ocean Observations to Improve Our Understanding, Modeling, and Forecasting of Subseasonal-to-Seasonal Variability. *Frontiers in Marine Science*, 6, 427 10.3389/fmars.2019.00427
8. **Giglio, Donata**, Vyacheslav Lyubchich, and Matthew R. Mazloff, 2018: Estimating Oxygen in the Southern Ocean using Argo Temperature and Salinity. *Journal of Geophysical Research: Oceans*, 123, 4280–4297, <https://doi.org/10.1029/2017JC013404>
7. **Giglio, Donata**, Sarah T. Gille, Aneesh C. Subramanian and San Nugyen, 2017: The role of wind gusts in upper ocean diurnal variability. *Journal of Geophysical Research: Oceans*, 122 (9), 7751–7764, <http://dx.doi.org/10.1002/2017JC012794>
6. **Giglio, Donata** and Gregory C. Johnson, 2017: Middepth decadal warming and freshening in the South Atlantic. *Journal of Geophysical Research: Oceans* 122 (2), 973–979, <http://dx.doi.org/10.1002/2016JC012246>
5. **Giglio, Donata** and Gregory C. Johnson, 2016: Subantarctic and Polar fronts of the Antarctic Circumpolar Current and Southern Ocean heat and freshwater content variability: A view from Argo. *Journal of Physical Oceanography* 46 (3), 749–768, <https://doi.org/10.1175/JPO-D-15-0131.1>
4. Cerovecki, Ivana and **Donata Giglio**, 2016: North Pacific subtropical mode water volume decrease in 2006-09 estimated from Argo Observations: Influence of surface formation and basin-scale oceanic variability. *Journal of Climate* 29 (6), 2177–2199, <https://doi.org/10.1175/JCLI-D-15-0179.1>
3. **Giglio, Donata** and Dean Roemmich, 2014: Climatological monthly heat and freshwater flux estimates on a global scale from Argo. *Journal of Geophysical Research: Oceans* 119 (10), 6884–6899, <http://dx.doi.org/10.1002/2014JC010083>
2. **Giglio, Donata**, Dean Roemmich and Bruce Cornuelle, 2013: Understanding the annual cycle in global steric height. *Geophysical Research Letters* 40 (16): 4349–4354, <http://dx.doi.org/10.1002/grl.50774>
1. **Giglio, Donata**, Dean Roemmich and Sarah T. Gille, 2012: Wind-Driven Variability of the Subtropical North Pacific Ocean. *Journal of Physical Oceanography* 42 (12): 2089–2100, <https://doi.org/10.1175/JPO-D-12-029.1>

Peer Reviewed Notebooks

- William, Mills, **Donata Giglio**, Megan Scanderbeg, and Tucker, Tyler, 2022: Intro to Argovis’ API (capabilities of the upgraded Argovis’ API <https://doi.org/10.5281/zenodo.7087199>)

- Giovanni Seijo-Ellis, **Donata Giglio**, Sarah Purkey, Megan Scanderbeg, and Tyler Tucker, 2021: Investigating upper ocean variability during tropical cyclones and seasonal sea ice formation and melting: ArgoVis APIs exposed to co-locate oceanic and atmospheric datasets. <https://doi.org/10.5281/zenodo.5496351>
- Susanna Anil, Steve Diggs, Sarah Purkey, **Donata Giglio**, Megan Scanderbeg, and Tyler Tucker, 2021: Interactive Jupyter notebook for hydrographic ocean data exploration, retrieval and visualization via the ArgoVis API <https://doi.org/10.5281/zenodo.5496281>
- Tucker, Tyler, **Donata Giglio**, and Megan Scanderbeg, 2020: ArgoVis API exposed in a Python Jupyter notebook: an easy access to Argo profiles, weather events, and gridded products. <https://doi.org/10.1002/essoar.10504304.1>

Invited

- **Argo Data Management Team meeting** (December 2022, presentation)
- **EarthCube Retrospective Meeting** (November 2022, presentation)
- **Atmospheric River Reconnaissance 2022 Workshop** (October 2022, presentation)
- **Carnegie Mellon University Seminar** (September 2022, presentation)
- **NCAR ASP Summer Colloquium on S2S Science** (Summer 2022, presentation)
- **Argo Steering Team meeting** (March 2022, presentation)
- **2nd Ocean Observers Workshop** (November 2021, presentation)
- **Program on Machine Learning and the Physics of Climate at the Kavli Institute for Theoretical Physics, UCSB** (Fall 2021, presentation and program)
- **NCAR ASP Summer Colloquium on S2S Science** (Summer 2021, lecture)
- **Argo Data Management Team meeting** (December 2020, presentation)
- **Kick off meeting of the GEWEX assessment of the Earth Energy Imbalance** (May 2020, presentation)
- **CLIVAR Phenomena, Observations, and Synthesis Panel’s (POS)** (April 2020, presentation)

Other presentations

- **Giglio, Donata, 2023: Atmospheric river impacts on the upper ocean: a study using Argo floats, AMS**, (January 2023)
- **Giglio, Donata, 2022: Atmospheric river impacts on the upper ocean: a study using Argo floats, 7th Argo Science Workshop**, (October 2022)
- **Giglio, Donata, 2022: Using ArgoVis to co-locate Oceanic and Atmospheric Data for Science Workflows, Education, Outreach, EarthCube Annual Meeting**, (June 2022)
- **Giglio, Donata, 2022: Annual Modulation of Diurnal Winds in the Tropical Oceans, 2022 IOVWST Meeting**, (May 2022)
- **Giglio, Donata, 2020: Seasonal to interannual variability of upper ocean temperature and salinity: the role of Atmospheric Rivers, AGU Meeting**, (December 2020)
- **Giglio, Donata, 2020: Seasonal to interannual variability of upper ocean temperature and salinity: the role of Atmospheric Rivers, Ocean Sciences Meeting**, San Diego, CA (February 2020)
- **Giglio, Donata, 2018: Modulation of diurnal winds in the tropical oceans, Bridging Sustained Observations & Data Assimilation for TPOS 2020**, Boulder, CO (May 2018)
- **Giglio, Donata, 2018: Estimating Oxygen in the Southern Ocean using Argo Temperature and Salinity, CLIM Transition Workshop**, Research Triangle Park, NC (May 2018)
- **Giglio, Donata, 2018: Modulation of diurnal winds in the tropical oceans, International Ocean Vector Winds Science Team Meeting**, Barcelona, Spain (April 2018)

- **Giglio, Donata**, 2018: **Estimating Oxygen in the Southern Ocean using Argo Temperature and Salinity**, *Ocean Sciences Meeting*, Portland, OR (February 2018)
- **Giglio, Donata**, 2018: **Modulation of diurnal winds in the tropical oceans**, *Ocean Sciences Meeting*, Portland, OR (February 2018)
- **Giglio, Donata**, Sarah T. Gille, Aneesh C. Subramanian and San Nugyen, 2016: **Modeling upper-ocean diurnal variability: the role of wind gusts.**, *AGU Fall Meeting*, San Francisco, CA (December 2016)
- **Giglio, Donata**, 2016: **Mid-depth decadal warming and freshening in the South Atlantic**, *Ocean Sciences Meeting*, New Orleans, LA (February 2016)
- **Giglio, Donata**, 2015: **The ACC Subantarctic and Polar fronts, and Southern Ocean heat and freshwater content variability: a view from Argo**, *GO-SHIP/Argo/IOCCP conference 2015*, Galway, Ireland (September 2015)
- **Giglio, Donata**, 2014: **Large-scale ocean circulation, dynamics, and air-sea exchanges: Argo observations of the mean and time-varying ocean on basin to global scale**, *Physical Oceanography Dissertation Symposium (PODS) VIII*, Lihue, HI (October 2014)
- **Giglio, Donata**, Dean Roemmich, 2014: **Annual heat and freshwater flux estimates on a global scale from Argo**, *Ocean Sciences Meeting*, Honolulu, HI (February 2014)
- **Giglio, Donata**, Dean Roemmich, Sutton, Philip, 2012: **Understanding the annual cycle of subsurface ocean temperature and salinity using Argo’s first million profiles**, *AGU Fall Meeting*, San Francisco, CA (December 2012)
- **Giglio, Donata**, Dean Roemmich, Sutton, Philip, 2012: **Understanding the annual cycle in sea surface height**, *Argo Science Workshop*, Venice, Italy (September 2012)
- **Giglio, Donata**, Dean Roemmich, Sutton, Philip, 2012: **Understanding the annual cycle in sea surface height**, *20 Years of progress in radar altimetry*, Venice, Italy (September 2012)
- **Giglio, Donata**, Dean Roemmich, Sarah T. Gille, 2012: **Wind-driven Variability of the Subtropical North Pacific Ocean**, *WCRP OSC*, Denver, CO (October 2011)
- **Giglio, Donata**, Dean Roemmich, Sarah T. Gille, 2012: **Wind-driven Variability of the Subtropical North Pacific Ocean**, *Joint Argo and Altimetry Workshop*, San Diego, CA (October 2011)

Mentions

- “The Galápagos’s Secret Weapon Against Climate Change” - An oceanic cold spot breathes life into the archipelago. How long can it last? - By Richard Kemeny, *The Atlantic* (2022) <https://www.theatlantic.com/science/archive/2022/11/galapagos-islands-climate-change-cold-water/672183/>
- “The Geological Fluke That’s Protecting Sea Life in the Galapagos” - The islands are in the line of an icy current that provides marine ecosystems refuge amid warming oceans. But the good news might not last for long. - by Richard Kemeny, *WIRED* (2022) <https://www.wired.com/story/the-geological-fluke-thats-protecting-sea-life-in-the-galapagos/>