

CURRICULUM VITAE

• PERSONAL INFORMATION

Full Name: CHRISTIAN E. BUCKINGHAM ORCID ID: 0000-0001-9355-9038
Nationality: United States of America www.linkedin.com/in/christian-buckingham-bas-ubo

• EDUCATION

2013 PhD Physical oceanography, University of Rhode Island, Kingston, RI
2004 MS Electrical engineering, Johns Hopkins University, Baltimore, MD
2000 BS Physics, Grove City College, Grove City, PA

• EMPLOYMENT

2019 – present **Marie-Sklodowska Curie Actions Individual Fellow (comparable to a Fulbright Fellowship)**
IUEM / Université de Bretagne, Occidentale, Plouzané, FR
2017 – 2018 **Postdoctoral Research Fellow in Polar Oceanography**
Polar Oceans, British Antarctic Survey, Cambridge, UK
2013 – 2016 **Postdoctoral Research Fellow in Physical Oceanography**
Ocean and Earth Science, National Oceanography Centre / Southampton, UK
2010 – 2013 **NASA Graduate Research Fellow**
Graduate School of Oceanography / University of Rhode Island, USA

I have additional employment experience prior to this period that I have elected to exclude. This includes tropical cyclone prediction in collaboration with professors at the University of Rhode Island, conducting research and engineering at Johns Hopkins University's Applied Physics Laboratory in Laurel, Maryland, engineering of integrated circuits (ICs) at Cadence Design Systems in Columbia, Maryland, and instructing advanced placement (AP) and honors physics at the secondary level.

• HONORS, GRANTS, AWARDS

2019 – present Honorary Researcher Affiliation with the British Antarctic Survey
2018 European Commission / Marie Skłodowska-Curie Individual Fellowship (176,000 EUR)
2017 NEXUSS Research Grant – thermal IR camera (5,000 GBP, with A. Brearley)
2016 Royal Society Global Challenge Research Fund (100,000 GBP, with A. N. Garabato)
2016 State Key Laboratory of Marine Geology, Tongji University, Shanghai (10,000 GBP)
2013 EOS Spotlight: “Eddies contribute to striations in sea surface topography”
2010 – 2013 NASA Earth and Space Science Fellowship (90,000 USD)
2012 Physical Oceanography Dissertation Symposium (2,000 USD)
2010 University of Rhode Island – Fillmore Merit Award (2,000 USD)

• FIELD EXPERIENCE

2017 (52 d) RRS James Clark Ross, **Turbulent Processes in the Weddell Sea**
Shift leader: daytime / nighttime CTD ops, mooring deployment & recovery
2007 (14 d) R/V Endeavor, **Formation of mid-shelf fronts off New Jersey**
2003 (03 d) P3 Orion, **Manned Aircraft survey off Mid-Atlantic**
2003 (18 d) M/V Ranger, US Navy, **Air-sea interaction processes in open ocean**
Shift member: daytime / nighttime CTD ops, bathymetric survey, mooring deployment & recovery
2002 (30 d) R/V Knorr & R/V Oceanus, **Topographically-generated internal waves**
Responsible for mooring deployment and recovery

• TEACHING ACTIVITIES

2018 – present Volunteer faculty at COESSING Summer School in Ghana, Africa
2013 – 2016 Introduction to Physical Oceanography, Methods in Oceanographic Data Analysis
Ocean and Earth Science (satellite oceanography), University of Southampton, UK
2000 – 2001 AP Physics (1 course), Honors Physics (3 courses) (full-time)
Seneca Valley Senior High, USA

• SUPERVISORY/MENTORSHIP EXPERIENCE

2015 (Co-Supervisor) MSc, *Observing the oceanic submesoscale from space*
National Oceanography Centre / University of Southampton, UK
2012 (Co-Supervisor) Undergraduate, *Generation/decay of eddies from satellite altimetry*
Graduate School of Oceanography, University of Rhode Island, USA
2011 (Co-Supervisor) Undergraduate, *Remote sensing using geostationary SST*
Graduate School of Oceanography, University of Rhode Island, USA
2010 (Co-Supervisor) Undergraduate, *Detection of ocean fronts in microwave SST*
Graduate School of Oceanography, University of Rhode Island, USA

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• INSTITUTIONAL RESPONSIBILITIES

- 2018 – 2018 Strategic Science Team (SST), British Antarctic Survey, Cambridge, UK
2017 – 2018 Host, Polar Oceans Seminar Series, British Antarctic Survey, Cambridge, UK
2014 – 2016 Host, Physical Oceanogr. and Climate Seminar Series, National Oceanography Centre, UK

• MEMBERSHIPS OF SCIENTIFIC SOCIETIES (*not always consecutive years)

- 2014 – 2015 Challenger Society, UK
2018 – 2019* European Geophysical Union, EU
2006 – 2017 The Oceanography Society, USA
2006 – 2020* American Geophysical Union, USA
2006 – 2013 American Meteorological Society, USA
2006 – 2013* Institute of Electrical and Electronics Engineers, USA

• INVITED REVIEWER FOR SCIENTIFIC RESEARCH GRANTS

- 2017 – 2020 *ERC Advanced Grant, NERC*

• REVIEWER FOR SCIENTIFIC JOURNALS

Journal of Physical Oceanography, Geophysical Research Letters, Journal of Geophysical Research-Oceans, Journal of Advances in Modelling Earth Systems (JAMES), Remote Sensing of the Environment, Remote Sensing (MDPI), Ocean Dynamics, Frontiers in Marine Science

• SOFTWARE EXPERIENCE

MATLAB, FORTRAN, Python, Julia, C, IDL, Mathematica, EXCEL, Mac OS X / Unix, Microsoft Windows

• SCIENCE TEAMS

SEASTAR — a prototype satellite-based estimate of high-resolution ocean currents for polar/coastal regions

• LANGUAGE PROFICIENCY

English (native), French (intermediate)

• COLLABORATIONS

France: Julien LeSommer (IGE), Jonathan Gula (UBO), Xavier Carton (UBO), USA: Peter Cornillon (URI)*, Sonya Legg (Princeton)*, Stephen Griffies (NOAA/GFDL)*, Kurt Polzin (WHOI), UK: Christine Gommenginger (NOCS)*, Eleanor Frajka-Williams (Southampton), George Nurser (NOCS), Adrian Martin (NOCS)*, Adrien Martin (NOCS), David Marshall (Oxford), John Allen (Portsmouth), Tom Rippeth (Bangor)*, Natasha Lucas (Bangor)*, Karen Heywood (UEA), Gillian Damerell (UEA), Stephen Belcher (UK MetOffice), Povl Abrahamsen (BAS)*, Keith Nicholls (BAS)*, J. Alexander Brearley (BAS)*, Alberto Naveira Garabato (Southampton), Israel: Ayah Lazar (IOLR)

• PEER-REVIEWED PUBLICATIONS (*denotes w/o PhD supervisor, **denotes supervised student)

* Spingys, C. P., A. C. Naveira Garabato, S. Legg, K. L. Polzin, E. P. Abrahamsen, **C. E. Buckingham**, A. Forryan, & E. E. Frajka-Williams (2021). Mixing and transformation in a deep western boundary current: a case study, *JPO*, doi: 10.1175/JPO-D-20-0132.1 (IF: 3.150).

* **Buckingham, C. E.**, J. Gula, & X. Carton (2021): The role of curvature in modifying frontal instabilities, part 1: Review of theory and presentation of a nondimensional instability criterion, *JPO*, **51**(2), 299-315, doi: 10.1175/JPO-D-20-0258.1 (IF: 3.150).

* **Buckingham, C. E.**, J. Gula, & X. Carton (2021): The role of curvature in modifying frontal instabilities, part 2: Application of the criterion to curved density fronts at low Richardson numbers, *JPO*, **51**(2), 317-341, doi: 10.1175/JPO-D-19-0265.1 (IF: 3.150).

* **Buckingham, C. E.**, N. Lucas, S. E. Belcher, T. Rippeth, A. Grant, J. Le Sommer, A. Ajayi and A. Naveira Garabato (2019). The contribution of surface and submesoscale processes to turbulence in the open ocean surface boundary layer. *JAMES*, **11**, 1–29, doi:10.1029/2019MS001801 (IF: 4.333).

* Gommenginger, C., B. Chapron, A. Hogg, **C. E. Buckingham**, B. Fox-Kemper and coauthors (2019). SEASTAR: a mission to study ocean submesoscale dynamics and small-scale atmosphere-ocean processes in coastal, shelf and polar seas. *Frontiers in Ocean Science*, **6**, 1–7, doi: 10.3389/fmars.2019.00457 (IF: 3.661).

* Meunier, T., A. R. Angulo, E. P. Sànz, M. Tenreiro, J. Ochoa and **C. E. Buckingham** (2019). Observations of Layering under an Anticyclonic Warm-Core Ring in the Gulf of Mexico. *JPO*, **49** (12): 3145–3162, doi:10.1175/JPO-D-18-0138.1 (IF: 3.150).

* Naveira Garabato, A. C. and coauthors (2019). Rapid mixing and exchange of deep-ocean waters in an abyssal boundary current. *PNAS*, **116**(27), 13233, doi: 10.1073/pnas.1904087116 (IF: 9.350).

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- * Yu, X., A. C. Naveira Garabato, A. P. Martin, **C. E. Buckingham**, L. Brannigan and Z. Su (2019). An Annual cycle of submesoscale vertical flow and re-stratification in the upper ocean. *JPO*, **49**, 1439–1461, doi:10.1175/JPO-D-18-0253.1 (IF: 3.150).
- * Skakala, J., T. Smyth, R. Torres, **C. E. Buckingham**, J. A. Brearley, A. Grant, P. Hyder and A. Coward (2019). SST dynamics at different scales: evaluating the oceanographic model resolution skill to represent SST processes in the Southern Ocean. *JGR: Oceans*, 2546–2570, doi:10.1029/2018JC014791 (IF: 3.560).
- * **Buckingham, C. E.**, Z. Khaleel**, A. Lazar, A. P. Martin, J. T. Allen, A. C. Naveira Garabato, A. Thompson, and C. Vic (2017). Testing Munk’s hypothesis for submesoscale eddy generation using observations in the North Atl. *JGR: Oceans*, 1–20, doi:10.1002/2017JC012910 (IF: 3.560).
- * **Buckingham, C. E.**, A. C. Naveira Garabato, A. F. Thompson, L. Brannigan, A. Lazar, D. P. Marshall, A. J. George Nurser, G. Damerell, K. J. Heywood, and S. E. Belcher (2016). Seasonality of submesoscale flows in the ocean surface boundary layer. *GRL*, 1–9, doi:10.1002/2016GL068009 (IF: 4.253).
- * Thompson, A. F., A. Lazar, **C. E. Buckingham**, A. C. Naveira Garabato, G. M. Damerell, and K. J. Heywood (2016). Open-ocean submesoscale motions: A full seasonal cycle of mixed layer instabilities from gliders. *JPO*, **46**, 1285–1307, doi:10.1175/JPO-D-15-0170.1 (IF: 2.345).
- Buckingham, C. E.**, P. C. Cornillon, F. Schloesser, and K. M. Obenour** (2014). Global observations of quasi-zonal bands in microwave sea surface temperature. *JGR: Oceans*, **119**(8), 4840–4866, doi:10.1002/2014JC010088 (IF: 3.560).
- Buckingham, C. E.**, and P. C. Cornillon (2013). The contribution of eddies to striations in absolute dynamic topography. *JGR: Oceans*, **118**(1), 448–461, doi:10.1029/2012JC008231 (IF: 3.560).
- Buckingham, C. E.**, T. Marchok, I. Ginis, L. Rothstein, and D. Rowe (2010). Short- and medium- range prediction of tropical and transitioning cyclone tracks within the NCEP Global Ensemble Forecasting System. *Weather and Forecasting*, **25**(6), 1736–1754, doi:10.1175/2010WAF2222398.1 (IF: 2.178).
- **PUBLICATIONS IN PREPARATION (*denotes w/o PhD supervisor, **denotes supervised student)**
- * **Buckingham, C. E.** The role of curvature ... A conservation theorem for the f plane, *submitted*, 29 Jan. 2021
- * Naveira Garabato, A. C. and co-authors (2020). Mesoscale and submesoscale energy exchanges, *in review*
- **BOOK CHAPTER**
- Cornillon, P. C., E. Firing, A. Thompson, L. Ivanov, I. Kamenkovich, **C. E. Buckingham** and I. Afanasayev (2019). ‘Zonal jets in nature: oceans’. In: *Zonal Jets: Phenomenology, Genesis, and Physics*. Ed. by B. Galperin and P. L. Read. In press. Cambridge, UK: Cambridge University Press. Chap. 3, pp. 46–71, doi:10.1017/9781107358225.003.
- **OTHER CONTRIBUTIONS**
- Cornillon, P. C., and community (2010). “Sea surface temperature error budget,” Kingston, Rhode Island, a NASA white paper on estimating errors on satellite-derived ocean temperatures.
- **SELECT PRESENTATIONS**
- Buckingham, C. E.** (2021). Submesoscale potential vorticity. **Oral**. Univ. Rhode Island / GSO.
- Martin, P., **C. E. Buckingham**, M. Foster-Martinez, and B. Arbic (2020). Python and open-source software for developing countries: A catalyst for change. In: AGU Fall 2020. **Oral**. (Given by P. Martin.)
- Buckingham, C. E.** (2020). The role of curvature in modifying frontal instabilities. In: AGU Fall 2020. **Oral**.
- Buckingham, C. E.** (2020). The contribution of surface and submesoscale processes to turbulence in the open ocean surface boundary layer. In: DRAKKAR Meeting. **Oral / Invited**. IGE/Université, Grenoble, France.
- Buckingham, C. E.** (2019). The contribution of surface and submesoscale processes to turbulence in the open ocean surface boundary layer. In: Journées Mixing: Dynamiques haut fréquence et processus turbulents. **Oral**. Sorbonne, Paris, France.
- Buckingham, C. E.** (2019). Pourquoi des zigouious? A study of an unstable front and the birth of submesoscale turbulence. In: Lunch Seminar. **Oral**. IUEM/Université de Bretagne Occidentale IFREMER, Plouzané, France.
- Buckingham, C. E.** (2018). How to Propose (and win!) a European Marie Skłodowska-Curie Actions (MSCA) Individual Fellowship. In: **Oral / Invited**. British Antarctic Survey, Cambridge, UK.
- Buckingham, C. E.** (2018). Examining mechanisms for submesoscale eddy generation in the open ocean. In: Space and Atmospheric Physics Seminar. **Oral / Invited**. Imperial College, London, UK.
- Buckingham, C. E.** (2018). Observational evidence for submesoscale baroclinic instability in the open ocean. In: Department of Applied and Mathematical Sciences Seminar Series. **Oral / Invited**. Loughborough University, UK.
- Buckingham, C. E.**, N. Lucas, A. Naveira Garabato, T. Rippeth, X. Yu and S. E. Belcher (2017). Submesoscale

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- instabilities and enhanced dissipation at ocean fronts. In: APL Brown-Bag Seminar Series. **Oral**. Johns Hopkins University, Baltimore, Maryland.
- Buckingham, C. E.**, N. Lucas, A. C. Naveira Garabato, T. Rippeth, X. Yu, and S. E. Belcher (July 2017). Support for symmetric instability in the ocean surface boundary layer. In: Waves, Internal Waves and Oceanic Mixing Workshop. **Oral**. Bangor, Wales.
- Buckingham, C. E.** (June 2017). Examining mechanisms of submesoscale eddy generation using observations in the North Atlantic. Polar Oceans Seminar. **Oral**. BAS, Cambridge, UK.
- Buckingham, C. E.**, N. Lucas, A. C. Naveira Garabato, T. Rippeth, X. Yu, and S. E. Belcher (May 2017). Submesoscale instabilities and enhanced dissipation at ocean fronts. In: Liège Colloquium. **Oral**. Liège, Belgium.
- Buckingham, C. E.** (Dec. 2016). Submesoscale instabilities at ocean fronts. Polar Oceans Seminar. **Oral**. BAS, Cambridge, UK.
- Buckingham, C. E.**, Z. Khaleel, A. Lazar, A. P. Martin, J. T. Allen, A. C. Naveira Garabato, and A. Thompson (Sept. 2016). Observations of an unstable submesoscale front. In: CLIVAR Open Science Conference. **Poster**. Qingdao, China.
- Buckingham, C. E.**, N. Lucas, A. C. Naveira Garabato, T. Rippeth, and X. Yu (Sept. 2016). Submesoscale instabilities and turbulent dissipation at ocean fronts observed during winter in the North Atlantic. In: CLIVAR Open Science Conference. **Poster**. Qingdao, China.
- Buckingham, C. E.**, Z. Khaleel, A. Lazar, A. P. Martin, J. T. Allen, and A. C. Naveira Garabato (May 2016). An unstable front in the open ocean. In: Liège Colloquium. **Oral**. Liège, Belgium.
- Yu, X., A. C. Naveira Garabato, A. P. Martin, **C. E. Buckingham**, and L. Brannigan (May 2016). Vertical flow and restratification in the upper ocean by mesoscale and submesoscale processes. In: Liège Colloquium. Liège.
- Khaleel, Z., **C. E. Buckingham**, A. Lazar, A. P. Martin, J. T. Allen, and A. C. Naveira Garabato (Feb. 2016). Observations of an unstable front. In: Ocean Sciences Meeting. **Poster**. New Orleans, LA.
- Buckingham, C. E. (Nov. 2015). Submesoscale instabilities at ocean fronts in the North Atlantic. LPO Seminar. **Oral / Invited**. Université Bretagne Occidentale/IUEM, Brest, France.
- Buckingham, C. E.** (Oct. 2015). Vorticity skewness in the upper ocean revisited. POETS Seminar. **Oral**. National Oceanography Centre, Southampton, UK.
- Buckingham, C. E.** (June 2015). Submesoscale instabilities at ocean fronts observed during winter in the North Atlantic. In: IUGG General Assembly. **Oral**. Prague, Czech Republic.
- Buckingham, C. E.**, A. C. Naveira Garabato, L. Brannigan, D. P. Marshall, A. F. Thompson, A. Lazar, and G. Nurser (June 2015). The seasonal signature of submesoscale turbulence from moorings in the North Atlantic. In: IUGG General Assembly. **Oral**. Prague, Czech Republic.
- Buckingham, C. E.** (Apr. 2015). A search for multiple zonal jets in the mid-latitude ocean. Physical Oceanography Seminar. **Invited**. University of South Florida, St. Petersburg, FL.
- Buckingham, C. E.** (May 2014). A search for oceanic jets. Space and Atmospheric Physics Seminar. **Invited oral presentation**. Imperial College, London, UK.
- Buckingham, C. E.** (May 2014). Global observations of multiple quasi-zonal bands in microwave sea surface temperature. Physical Oceanography & Climate Seminar. **Oral**. National Oceanography Centre, Southampton, UK.
- Buckingham, C. E.**, L. Brannigan, A. C. Naveira Garabato, A. F. Thompson, A. Lazar, G. Nurser, and D. P. Marshall (Dec. 2014). The seasonal evolution of submesoscale turbulence statistics from an $O(1\text{ km})$ -resolving mooring array. In: AGU Fall Meeting. **Oral**. San Francisco, CA.
- Buckingham, C. E.**, P. C. Cornillon, F. Schloesser, and K. M. Obenour (Feb. 2014). An observed relationship between mesoscale SST and SSH in the subtropics. In: Ocean Sciences Mtg. Honolulu, HI.
- Buckingham, C. E.** (Oct. 2012). Ubiquitous zonal bands in subtropical oceans observed from space: a search for jets. **Oral / Invited**. Lihue, HI, Physical Oceanography Dissertation Symposium (PODS), Sponsored by NSF/NASA/NOAA.
- Buckingham, C. E.** and P. C. Cornillon (Feb. 2012). Eddies as a source of striations in time-averaged sea level anomaly. In: Ocean Sciences Meeting. **Poster**. Salt Lake City, UT.
- Buckingham, C. E.** and P. C. Cornillon (Oct. 2010). Zonal patterns in the California Current System from microwave SST. In: Fourth Coastal Altimetry Workshop/OSTST Meeting. **Poster**. Ocean Surface Topography Science Team. Oporto and Lisbon, Portugal.
- Buckingham, C. E.** and P. C. Cornillon (Feb. 2010). Observed quasi-zonal banded structures in SST front probability: why do we see them? In: Ocean Sciences Meeting. **Oral**. Portland, OR.