**Dhruv Balwada**

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**Research Interests**

Physical oceanography, geophysical fluid dynamics, turbulence and transport, parameterizations, impacts of submesoscales on biogeochemical processes, observational data analysis techniques.

**Education**

PhD Geophysical Fluid Dynamics2010 – 2016

*Geophysical Fluid Dynamics Institute, Florida State University, USA*

MS Applied and Computational Mathematics 2010 – 2015

*Florida State University, USA*

BE Chemical Engineering 2006 – 2010

*Birla Institute of Technology and Science, India*

**Research Appointments**

Postdoctoral Scholar Oct 2019 – present

*School of Oceanography, University of Washington, Seattle, WA*

Postdoctoral Research Associate Jan 2017 – Sept 2019

*Courant Institute of Mathematical Sciences, New York University, New York, NY*

Graduate Research Assistant Aug 2010 – Dec 2016

*Florida State University, Tallahassee, FL*

Undergraduate Researcher May – Dec 2009

*Center for Mathematical Modeling and Computer Simulations, Bangalore, India*

**Academic Activities**

Visiting Scholar at Planetary Boundary Layers in Atmospheres, Oceans,

and Ice on Earth and Moons 2018

*Kavli Institute of Theoretical Physics, Santa Barbara, CA, USA*

Summer School on Fundamental Aspects of Turbulent Flow in Climate Dynamics 2017

*Les Houches, Chamonix, France*

Summer School on Dynamics, Stochastics and Predictability of the Climate System 2014

*Valsavarenche, Valle d'Aosta, Italy*

Visiting Student at WHOI Geophysical Fluid Dynamics Program 2013

*Woods Hole, MA, USA*

Summer School on Indian Ocean Dynamics 2010

*National Institute of Oceanography, Goa, India*

**Experience at Sea**

Field work for Marine Field Method Course, 1 week in Apalachicola Bay 2015

US-5 DIMES Cruise, 3 weeks in Drake Passage 2013

UK-3 DIMES Cruise, 6 weeks in Scotia Sea 2012

**Publications**

***Published***

1. Relative dispersion in the Antarctic Circumpolar Current  
   **Dhruv Balwada**, J.H. LaCasce, K. Speer, & R. Ferrari  
   *Journal of Physical Oceanography (2020)*
2. Vertical eddy iron fluxes support primary production in the open Southern Ocean  
   Takaya Uchida, **D. Balwada**, R. Abernathey, G. McKinley, S. Smith & M. Levy  
   *Nature Communications (2020)*
3. The contribution of submesoscale over mesoscale eddy iron transport in the open Southern Ocean  
   Takaya Uchida, **D. Balwada**, R. Abernathey, G. McKinley, S. Smith & M. Levy  
   *Journal of Advances in Modeling Earth Systems (2019)*
4. Southern Ocean phytoplankton blooms observed by biogeochemical floats  
   Takaya Uchida, **D. Balwada**, R. Abernathey, C.J. Prend, E. Boss & S.T. Gille  
   *Journal of Geophysical Research: Oceans (2019)*
5. Modulation of lateral transport by submesoscale eddies and inertia gravity waves  
   Anirban Sinha, **D. Balwada**, N. Tarshish & R. Abernathey  
   *Journal of Advances in Modeling Earth Systems (2019)*
6. **Submesoscale vertical velocities enhance tracer subduction in an idealized Antarctic Circumpolar Current  
   Dhruv Balwada**, S. Smith & R. Abernathey   
   Geophysical Research Letters *(2018)*
7. **Global observations of horizontal mixing from Argo float and surface drifter trajectories**Christopher Roach**, D. Balwada &** K.G. Speer   
   Journal of Geophysical Research: Oceans (2018)
8. Scale dependent distribution of kinetic energy from surface drifters in the Gulf of Mexico  
   **Dhruv Balwada**, J.H. LaCasce & K.G. Speer  
   *Geophysical Research Letters (2016)*
9. Horizontal mixing in the Southern Ocean from Argo float trajectories  
   Christopher Roach, **D. Balwada** & K.G. Speer  
   *Journal of Geophysical Research: Oceans (2016)*
10. Circulation and stirring in the South East Pacific Ocean and the Scotia Sea sectors of the Antarctic Circumpolar Current  
    **Dhruv Balwada**, K. G. Speer, J. H. LaCasce, B. Owens, R. Ferrari & J. Marshall   
    *Journal of Physical Oceanography (2016)*
11. Tracking with ranked signals  
    Tianyang Li, H. Pareek, P. Ravikumar, **D. Balwada** & K.G. Speer  
    *31 Conf. on Uncertainty in Artificial Intelligence (2015)*
12. Float-derived isopycnal diffusivities in the DIMES experiment  
    Joseph H. LaCasce, R. Ferrari, R. Tulloch*,* **D. Balwada** and K.G. Speer  
    *Journal of Physical Oceanography (2014)*
13. The Diapycnal and Isopycnal Mixing Experiment: A first assessment  
    Sarah T. Gille, J. Ledwell, A. Naveira-Garabato, K. Speer, **D. Balwada**, A. Brearley, J. B. Girton, A. Griesel, R. Ferrari, A. Klocker, J. LaCasce, P. Lazarevich, N. Mackay, M. P. Meredith, M.J. Messias, B. Owens, J.-B. Sallée, K. Sheen, E. Shuckburgh, D. A. Smeed, L. C. St. Laurent, J. M. Toole, A. J. Watson, N. Wienders, and U. Zajaczkovski  
    *CLIVAR Exchanges (2012)*

***Submitted***

1. Observational evidence for ventilation hot spots in the Southern Ocean  
   Lilian Dove, Andrew F. Thompson, **D. Balwada**, & Alison R. Gray  
   *Journal of Geophysical Research: Oceans*
2. Diagnosing the thickness-weighted averaged eddy-mean flow interaction in an eddying North Atlantic ensemble  
   Takaya Uchida, Q. Jamet, W. Dewar, **D. Balwada**, J. Le Sommer, & T. Penduff  
   *Journal of Advances in Modeling Earth Systems*
3. Parameterizing non-propagating form drag over rough bathymetry  
   Jody M. Klymak, **D. Balwada**, A.C.N. Garabato & R. Abernathey  
   *Journal of Physical Oceanography*
4. Influence of surface water flows on phytoplankton distribution in a shallow estuary  
   Natalie L. Geyer, **D. Balwada**, E. Simons, K. Speer & M. Huettel  
   *Estuarine, Coastal and Shelf Science*
5. Vertical fluxes conditioned on vorticity and strain reveal submesoscale ventilation  
   **Dhruv Balwada**, Qiyu Xiao, Shafer Smith, Ryan Abernathey, & Alison R. Gray  
   *Journal of Physical Oceanography*

***In Preparation (drafts available on request)***

1. Eddy transport tensor in an inhomogenous ocean channel  
   **Dhruv Balwada**, S. Smith & R. Abernathey
2. Eddy driven meridional transport across the Antarctic Circumpolar Current  
   **Dhruv Balwada**, L. Juillon, K. G. Speer, R. Ferrari & J. Marshall
3. Spectral energy flux and energy injection scales from surface drifter observations  
   Jin-Han Xie, **D. Balwada**, R. Marino
4. Relative dispersion in the deep waters of the Gulf of Mexico  
   Javier Rodriguez, P. Perez-Brunius, L.Z. Sanson, **D. Balwada** & F.J. Beron-Vera

***Non-refereed***

1. Circulation and stirring by ocean turbulence

**Dhruv Balwada**   
*Thesis, Florida State University (2016)*

**Selected Oral Presentations**

1. Studies of mesoscale eddy diffusivity  
   *Physical oceanography lunch seminar, UW, November 2019*
2. Measuring eddy driven transport in a zonally inhomogeneous flow  
   *22nd Conference on Atmospheric and Oceanic Fluid Dynamics, June 2019*
3. Exploring the dynamical connections between GM and Redi mixing coefficients  
   *Sources and sinks of ocean mesoscale eddy energy, March 2019*
4. Global Redi and Gent-McWilliams diffusivities from surface drifters, Argo floats and RAFOS floats  
   *AGU Fall Meeting, December 2018*
5. Submesoscale subduction and ventilation in an idealized Southern Ocean model  
   *Ocean Science Meeting, February 2017*
6. Scale dependent distribution of kinetic energy from surface drifters in the Gulf of Mexico  
   *Atmospheric and Oceanic Fluid Dynamics, June 2017*
7. A Lagrangian view of oceanic turbulence  
   *AOS Colloquium, CIMS, NYU, February 2017*
8. Lagrangian observations of ocean turbulence  
   *WHOI, August 2016*
9. Lagrangian observations of ocean turbulence   
   *CNLS, Los Alamos, August 2016*
10. Potential vorticity and across ACC eddy transport in the Upper Circumpolar Deep Waters  
    *Ocean Science Meeting, AGU, February 2016*
11. A multi-basin three-dimensional perspective on the meridional overturning circulation in the Southern Ocean  
    *Graduate Climate Conference, November 2015*
12. Relative dispersion in the Antarctic Circumpolar Current  
    *Lagrangian Analysis and Prediction of Coastal Ocean Dynamics Winter Harbor Meeting, July 2015*
13. Relative dispersion in the Antarctic Circumpolar Current  
    *Atmospheric and Oceanic Fluid Dynamics, June 2015*
14. Floating around Antarctica  
    *Natural Sciences Graduate Symposium, October 2014*
15. DIMES float results  
    *International Meeting for the Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean, November 2013*
16. DIMES floats: A Lagrangian perspective of flow and isopycnal mixing in the Southern Ocean   
    *University of South Florida, October 2013*
17. Preliminary results from Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean (DIMES): Dispersion in the Southern Ocean   
    *CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS), May 2012*

**Teaching Experience**

Guest Instructor (Autumn 2019, UW)

*Physics of Ocean Circulation (graduate level course)*

*3 lectures on ocean stirring and mixing, and tides*

Instructor (Fall 2014, FSU)

*Introduction to Simple Models of Oceans and Climate (graduate level course)*

*8 weeks of classroom teaching. Prepared course structure, course materials, homework, etc.*

Teaching Assistant (5 semesters during 2010-2016, FSU)

*Introduction to Oceanography (online, undergraduate)*

Mentoring

*Graduate: Takaya Uchida (2017 - 2019, Columbia University), Qiyu Xiao (2019 - present, NYU)*

*Undergraduate: Chelsea Dodge (Fall 2013, FSU)*

*High School Student: William Chen (Fall 2017, NYU)*

**Service and Outreach**

- Session chair at conference

*Ocean Sciences 2020 (Session: Vertical Transport - Pathways from the Surface to the Interior)*

- Proposal Review Panel Member

*National Oceanographic and Atmospheric Administration-Climate Program Office, 2017*- Proposal Reviewer

*Mail in review for National Science Foundation, 2020*

- Journal Reviewer

*Journal of Physical Oceanography, Geophysical Research Letters, Ocean Modeling, Journal of Geophysical Research: Oceans, Quarterly Journal of Royal Meteorological Society, Journal of Advances in Modeling Earth Systems*

- Reviewed sections of the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) as part of the early career researcher group review organized by Association of polar early career scientists (APECS)

- Educational Outreach

* *Classroom demonstrations for 7th graders, February 2015 – Talk, presentation and demos about general oceanography and rotating fluids.*
* *Science fair judge at Celebration Baptist Church for homeschooled 8th graders, January 2015.*
* *9 educational videos (each ~5 minutes in length) created in collaboration with CPALMS for K-12 educators to use in mathematics/physics/oceanography/environment curriculum, September 2013.*

**Computational Skills**

Frequently – Python, MATLAB, Fortran, Linux, LATEX, Paraview

Not within last 2 years – Java, C, C++, Javascript, HTML, Ferret