

ABIGAIL S BODNER

Department of Earth, Environmental and Planetary Sciences, Brown University

HOMEPAGE: abodner.github.io EMAIL: abigail_bodner@brown.edu

EDUCATION

PhD

Expected 2021

Earth, Environmental and Planetary Sciences

Brown University

Advisor: Dr. Baylor Fox-Kemper

ScM

2020

Applied Mathematics

Brown University

MSc (magna cum laude)

2019

Geophysics, Atmospheric and Planetary Sciences

Tel Aviv University

Advisor: Dr. Nili Harnik

BSc (Double Major)

2014

- Geophysics, Atmospheric and Planetary Sciences

- Mathematics

Tel Aviv University

INTERESTS

My interests span a broad range of problems involving climate dynamics, geophysical fluid dynamics and turbulence. I primarily use theory and models to study the non-linear interaction between small scale processes and larger scale dynamics.

THESES

PhD Thesis

2015 - Present

Building toward a more complete understanding of ocean submesoscales in the presence of turbulence, I developed a modified theory to account for the effects of turbulence on frontal evolution, and am now extending these findings to a more realistic environment using Large Eddy Simulations (LES). The final aspect of this work will be to implement new scaling laws of arrested frontal width, under different forcing parameter ranges, in submesoscale-permitting models and parameterizations in coarse resolution models.

MSc Thesis

2014-2019

Using an idealized model, I studied the effects of stationary waves generated by topography on large scale atmospheric circulation. Under certain conditions, it was found that the presence of topography in the midlatitudes leads to jet vacillation cycles, which have implications to quasi-stationary wave growth in the atmosphere.

RESEARCH EXPERIENCE AND TRAINING

Community Earth System Model (CESM) Tutorial

Summer 2019

Run by the National Center for Atmospheric Research (NCAR) in Boulder, CO.

Kavli Institute for Theoretical Physics Graduate Fellow

Spring 2018

Program for Planetary Boundary Layers in Atmospheres, Oceans, and Ice on Earth and Moons (University of California Santa Barbara).

Fundamental Aspects of Turbulent Flows in Climate Dynamics

Summer 2017

Summer school program run by Ecole de Physique des Houches (Les Houches, France).

Research Assistant under Dr. Nili Harnik

AY 2013-2014

Detecting wave disturbances in the stratosphere influenced by the Circumglobal Teleconnection Pattern (Tel Aviv University).

Senior Year Project in Geophysical Fluid Dynamics

Spring 2014

Under the guidance of Dr. Eyal Heifetz, worked on a revised solution for a Non-Boussinesq stratified shear flow (Tel Aviv University).

Research Assistant under Dr. Alon Ziv

Spring 2013

Relating the creep and slip rate of tectonic plate movements for the National Earthquake Early Warning System (Tel Aviv University).

PUBLICATIONS

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams, P.P. Sullivan: "A perturbation method to understanding the effects of turbulence on frontogenesis". *Journal of Fluid Mechanics*, 883:A25, January 2020.

A. Bodner and B. Fox-Kemper: "A breakdown in potential vorticity estimation delineates the submesoscale-to-turbulence boundary in large eddy simulations". *Journal of Advances in Modeling Earth Systems (JAMES)*. *Under review*.

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams, P.P. Sullivan: "Frontal evolution in the presence of submesoscale instabilities and turbulence". *In Preparation*.

A. Bodner, N. Harnik and O. Lachmy : "Flow regimes and vacillation cycles in the presence of topography". *In Preparation*.

SELECTED PRESENTATIONS

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams and P.P. Sullivan: "Frontal Formation in the Presence of Submesoscale Instabilities and Turbulence", Atmospheric and Oceanic Fluid Dynamics Meeting, AMS, Portland, ME, June 2019. *Oral*.

A. Bodner, B. Fox-Kemper: "Hidden Dangers in Potential Vorticity", Sources and Sinks of Ocean Mesoscale Eddy Energy Workshop (US CLIVAR), Tallahassee, FL, March 2019. *Oral*.

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams and P.P. Sullivan: "A Novel Approach to Understanding the Effects of Turbulence and Instabilities on Frontogenesis", Symposium on Geophysical Fluid Dynamics, Sde Boker, Israel, January 2019. *Oral*.

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams and P.P. Sullivan: "A Novel Approach

to Understanding the Effects of Turbulence and Instabilities on Frontogenesis”, CARTHE All Hands Meeting ,Miami, FL, November 2018. *Oral*.

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams and P.P. Sullivan: ”A Perturbation Method to Understanding the Effects of Turbulence and Instabilities on Frontogenesis”, Ocean Sciences Meeting, TOS/ASLO/AGU, Portland, OR, February 2018. *Oral*.

A. Bodner, B. Fox-Kemper, L.P. Van Roekel, J.C. McWilliams and P.P. Sullivan: ”Arrest of Frontogenesis by Submesoscales and Turbulence”, Ocean Sciences Meeting, TOS/ASLO/AGU, New Orleans, LA, February 2016. *Poster*.

A. Bodner, N. Harnik and O. Lachmy: ”Global Circulation Regimes in the Presence of Stationary Planetary Wave Forcing”, Geophysical Fluid Dynamics Seminar, Weizmann Institute, Israel, July 2015. *Oral*.

A. Bodner, N. Harnik and O. Lachmy: ”Global Circulation Regimes in the Presence of Stationary Planetary Wave Forcing”, 20th conference on Atmospheric and Oceanic Fluid Dynamics, Minneapolis, MN, June 2015. *Poster*.

A. Bodner, N. Harnik and O. Lachmy: ”Effects of Stationary Forcing on Global Circulation Regimes”, Symposium on Geophysical Fluid Dynamics, Sde Boker, Israel, January 2015. *Poster*.

INVITED TALKS

A. Bodner: ”On the interaction between submesoscales and turbulence: from theory to implementation in global climate models”, Physical Oceanography Seminar, Woods Hole Oceanographic Institution, June 2020.

A. Bodner: ”On the interaction between submesoscales and turbulence: from theory to implementation in global climate models”, The Center for Atmosphere Ocean Science, Courant Institute of Mathematical Sciences, New York University, October 2019.

A. Bodner: ”Frontal evolution in the presence of submesoscale instabilities and turbulence”, Atmosphere, Ocean, and Climate Dynamics Seminar, Yale University, April 2019.

TEACHING EXPERIENCE

Studying the Ocean from the Classroom to the Bay *Summer 2018 & 2019*
Course designer and co-instructor in Summer@Brown pre-college program (Brown University).

Principles in Planetary Climate *Fall 2018*
Teaching assistant under Professor Jung-Eun Lee (Brown University).
Guest lecture: ”Large Scale Dynamics in the Ocean and Atmosphere”.

Teaching Consultant Program, Brown University Sheridan Center. *Fall 2017*

Climate Change: Fact or Fiction? *Summer 2017*
Course designer and instructor in Summer@Brown middle school program (Brown University).

Reflective Teaching Program, Brown University Sheridan Center. *Fall 2016*

Continuum Mechanics - Fluids *Spring 2015*
Teaching assistant under Professor Eyal Heifetz (Tel Aviv University).

Climate Theory*Spring 2015*

Teaching assistant under Professor Nili Harnik (Tel Aviv University).

Laboratory Experiments in Atmospheric Sciences*Fall 2014*

Teaching assistant under Professor Nili Harnik (Tel Aviv University).

Earth Sciences Teacher*2012-2013*

High school senior year research project (Shay Agnon High School, Israel).

Mathematics Teacher*2009-2014*

Middle school gifted children program (Bar-Ilan University).

High school and pre-college students (Raz Etgarim Educational Center, Israel).

At-risk youth (Haklai Boarding school, Israel).

HONORS AND AWARDS

Student Oral Presentation Award at the Atmospheric and Oceanic Fluid Dynamics Meeting
of the American Meteorological Society*June 2019*

Associate of Sigma Xi Scientific Research Honor Society

2019

Gulf of Mexico Research Initiative Scholar

2018

Departmental First Year Fellowship, Brown University

AY 2015-2016

Rana Samuels Ofran MSc Student Excellence Award

*AY 2014-2015***SERVICE**

Reviewer for the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report

Reviewer for Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

Reviewer for Journal of Physical Oceanography

2017-Present

Graduate School Community Fellow

2018-2019

First Year Graduate Student Mentor

2018-2019

International Student Representative and Event Organizer

2016-2018

Leadership Alliance - Graduate Student Panel

2018

Volunteer at the Division of Fluid Dynamics Meeting (APS DFD)

*November 2015***PROFESSIONAL AFFILIATIONS**

Affiliate Graduate Student in the Institute at Brown for Environment & Society (IBES)

Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE)

Graduate Fellow of the Rhode Island Consortium for Coastal Ecology Assessment Innovation & Modeling (C-AIM).

American Geophysical Union

American Meteorological Society

SOFTWARE LANGUAGES

Matlab, Python, Fortran, C, Latex.