

# Navid C. Constantinou


ARC Centre of Excellence for Climate Extremes  
Research School of Earth Sciences  
Australian National University, Australia

✉ [navid.constantinou@anu.edu.au](mailto:navid.constantinou@anu.edu.au)  
w [www.navidconstantinou.com](http://www.navidconstantinou.com)  
🔗 [navidcy](#) 📧 [navidcy](#)  
📞 0000-0002-8149-4094  
📄 [arXiv/a/constantinou\\_n\\_1](https://arxiv.org/a/constantinou_n_1)

## Interests

Geophysical fluid dynamics, physical oceanography, atmospheric dynamics, climate dynamics, fluid mechanics

## Education

- Oct. 2010 – Feb. 2015 **Ph.D. in Physics**  
*National & Kapodistrian University of Athens, Greece*  
SUPERVISOR : Petros J. Ioannou  
THESIS : Formation of large-scale structures by turbulence in rotating planets [\[arXiv\]](#) 
- Sep. 2008 – Jun. 2010 **M.Sc. in Physics w/ Honors** (summa cum laude)  
Astrophysics, Astronomy and Mechanics  
*National & Kapodistrian University of Athens, Greece*
- Sep. 2003 – Jun. 2008 **B.Sc. in Physics w/ Honors** (summa cum laude, class of 2008 valedictorian, 9.16/10)  
*National & Kapodistrian University of Athens, Greece*  
Exchange through Socrates-Erasmus program during spring semester 2006 at the  
*Rheinische Friedrich-Wilhelms Universität, Bonn, Germany*
- Jul. 2001 – Aug. 2003 **Cyprus National Guard**  
Military service (obligatory) as Second Lieutenant in Armored Forces, Cyprus

## Experience


- May. 2018 – **Research Fellow**, part of the ARC Centre of Excellence for Climate Extremes  
*Research School of Earth Sciences, Australian National University* (with Andy Hogg)
- Sep. 2015 – Apr. 2018 **Postdoctoral Researcher (NOAA Climate & Global Change Postdoctoral Fellow)**  
*Scripps Institution of Oceanography, University of California San Diego, USA* (with William R. Young)
- Jun. 2015 – Aug. 2015 **Visiting Researcher**  
*Cyprus Oceanography Center, University of Cyprus*


## Grants & Awards


- 2019 *Best paper among Early Career Researchers within ARC Centre of Excellence for Climate Extremes*
- 2015-2017 *NOAA Climate & Global Change Postdoctoral Fellowship* (150,000 USD)
- 2009-2014 *Alexander S. Onassis Foundation*  
Scholarship for the 2<sup>nd</sup> year of M.Sc. and for 4 years of Ph.D. studies (47,700 USD)
- 2009-2012 *A. G. Leventis Foundation*  
Scholarship for the 2<sup>nd</sup> year of M.Sc. and the first 2 years of Ph.D. studies (16,000 USD)
- 2003-2006 *Department of Physics, National & Kapodistrian University of Athens, Greece*  
1<sup>st</sup> student for academic years 2003-04 and 2004-05  
Honorary Scholarship for academic year 2005-06
- 2001 *International Physics Olympiad, June 2001*  
Participation with the national team of Cyprus

## Publications



### Submitted / In Review



Lozano-Durán, A., Nikolaidis, M.-A., **Constantinou**, N. C., and Karp, M. Alternative physics to understand wall turbulence: Navier–Stokes equations with modified linear dynamics. (submitted on Dec. 2019, arXiv:[1912.07532](#)) 

Rocha, C. B., **Constantinou**, N. C., Llewellyn Smith, S. G., and Young, W. R. The heat flux of horizontal convection: definition of the Nusselt number. *J. Fluid Mech.* (submitted on Dec. 2019, arXiv:[1912.05229](#)) 



Lozano-Durán, A., Nikolaidis, M.-A., **Constantinou**, N. C., and Karp, M. Wall turbulence without modal instability of the streaks. (submitted on Oct. 2019, arXiv:[1909.05490](#)) 



### In Press / Published



**Constantinou**, N. C. and Hogg, A. McC. (2019). Eddy saturation of the Southern Ocean: a baroclinic versus barotropic perspective. *Geophys. Res. Lett.*, **46**. (in press, doi:[10.1029/2019GL084117](#))   (Best Early Career Researcher paper within [CLEx](#) for year 2019.)


Martínez-Moreno, J., Hogg, A. McC., Kiss, A. E., **Constantinou**, N. C., and Morrison, A. K. (2019). Kinetic energy of eddy-like features from sea surface altimetry. *J. Adv. Model. Earth Sy.*, **11** (10), 3090-3105.   (Featured in the [CLEx](#) press news.)



Parker, J. B. and **Constantinou**, N. C. (2019). Magnetic eddy viscosity of mean shear flows in two-dimensional magnetohydrodynamics. *Phys. Rev. Fluids*, **4**, 083701.   (Featured in the [ANU](#) and [LLNL](#) press news.)



Bakas, N. A., **Constantinou**, N. C., and Ioannou, P. J. (2019). Statistical state dynamics of weak jets in barotropic beta-plane turbulence. *J. Atmos. Sci.*, **76** (3), 919-945.   (Featured in the [CLEx](#) press news.)



**Constantinou**, N. C. and Parker, J. B. (2018). Magnetic suppression of zonal flows on a beta-plane. *Astrophys. J.*, **863**, 46.   (Featured in the [ANU](#) and [LLNL](#) press news; also read about it in [The Conversation](#).)



**Constantinou**, N. C. (2018). A barotropic model of eddy saturation. *J. Phys. Oceanogr.*, **48**(2), 397-411.  



**Constantinou**, N. C. and Young, W. R. (2017). Beta-plane turbulence above monoscale topography. *J. Fluid Mech.*, **827**, 415-447.  



Farrell, B. F., Ioannou, P. J., Jiménez, J., **Constantinou**, N. C., Lozano-Durán, A., and Nikolaidis, M.-A. (2016). A statistical state dynamics-based study of the structure and mechanism of large-scale motions in plane Poiseuille flow. *J. Fluid Mech.*, **809**, 290-315.  

**Constantinou**, N. C., Farrell, B. F., and Ioannou, P. J. (2016). Statistical state dynamics of jet–wave coexistence in barotropic beta-plane turbulence. *J. Atmos. Sci.*, **73** (5), 2229-2253.  



Bakas, N. A., **Constantinou**, N. C., and Ioannou, P. J. (2015). S3T stability of the homogeneous state of barotropic beta-plane turbulence. *J. Atmos. Sci.*, **72** (5), 1689-1712.  

**Constantinou**, N. C., Lozano-Durán, A., Nikolaidis, M.-A., Farrell, B. F., Ioannou, P. J., and Jiménez, J. (2014). Turbulence in the highly restricted dynamics of a closure at second order: comparison with DNS. *J. Phys.: Conf. Ser.*, **506**, 012004.  

**Constantinou**, N. C., Farrell, B. F., and Ioannou, P. J. (2014). Emergence and equilibration of jets in beta-plane turbulence: applications of Stochastic Structural Stability Theory. *J. Atmos. Sci.*, **71** (5), 1818-1842.  

**Constantinou**, N. C. and Ioannou, P. J. (2011). Optimal excitation of two dimensional Holmboe instabilities. *Phys. Fluids*, **23**, 074102.  

### Chapters in Books (refereed)

**Constantinou**, N. C., Ioannou, P. J., and Bakas, N. A. (2016). Structure and stability of low amplitude jet equilibria in barotropic turbulence. In Karacostas, T., Bais, A., and Nastos, T. P. (eds.) *Perspectives on Atmospheric Sciences*, 369-375, Springer International Publishing.  

Bakas, N. A., **Constantinou**, N. C., and Ioannou, P. J. (2016). On the dynamics underlying the emergence of

coherent structures in barotropic turbulence. In Karacostas, T., Bais, A., and Nastos, T. P. (eds.) *Perspectives on Atmospheric Sciences*, 361-367, Springer International Publishing. [doi](#) [↓](#)

## Conference Proceedings (refereed)

Bakas, N. A., Ioannou P. J., and **Constantinou**, N. C. (2014). Emergence of non-zonal coherent structures in barotropic turbulence. In Kanakidou, M., Mihalopoulos, N. and Nastos, P. (eds.) *Proceedings of the 12th International Conference on Meteorology, Climatology & Atmospheric Physics (COMECAP)*, Heraklion, Crete, 28-31 May, Vol. 1, 107-111, ISBN: 978-960-524-430-9. [↓](#)

**Constantinou**, N. C. and Ioannou, P. J. (2014). Emergence and equilibration of zonal winds in turbulent planetary atmospheres. In Kanakidou, M., Mihalopoulos, N. and Nastos, P. (eds.) *Proceedings of the 12th International Conference on Meteorology, Climatology & Atmospheric Physics (COMECAP)*, Heraklion, Crete, 28-31 May, Vol. 1, 210-214, ISBN: 978-960-524-430-9. [↓](#)

## Other publications

Lozano-Durán, A., Karp, M., and **Constantinou**, N. C. (2018). Wall turbulence with constrained energy extraction from the mean flow. *Center for Turbulence Research – Annual Research Briefs 2018*, 209-220. [↓](#)

**Constantinou**, N. C. (2018). Jupiter’s magnetic fields may stop its wind bands from going deep into the gas giant. *The Conversation*, 10th August 2018. [\[URL\]](#)

## Conferences

Eddy saturation of the Southern Ocean: a baroclinic versus barotropic perspective. *Ocean Sciences Meeting 2020*, San Diego, CA, USA, 16-21 Feb. 2020. (poster) [↓](#)

Demystifying the Southern Ocean’s response to wind variability. *ARC Centre of Excellence for Climate Extremes Annual Workshop 2019* [\[URL\]](#), Hobart, Tasmania, Australia, 19-21 Nov. 2019. (invited talk) [↓](#)

Barotropic versus baroclinic eddy saturation: implications to Southern Ocean dynamics. *22nd Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland ME, USA, 24-28 Jun. 2019. (talk) [↓](#)

Magnetic eddy viscosity of mean shear flows in 2D magnetohydrodynamics: possible application to gas giants’ interiors. *22nd Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland ME, USA, 24-28 Jun. 2019. (poster) [↓](#)

Barotropic versus baroclinic eddy saturation. *AGU Fall Meeting 2018*, Washington DC, USA, 10-14 Dec. 2018. (poster) [↓](#)

Magnetic suppression of zonal flows on a beta plane. *AGU Fall Meeting 2018*, Washington DC, USA, 10-14 Dec. 2018. (poster) [↓](#)

Statistical state dynamics reveals mechanism for organization of coherent structures in turbulent flows. *Euro-mech Colloquium 598: Coherent structures in wall-bounded turbulence*, Imperial College London, London, UK, 29-31 Aug. 2018. (invited keynote talk) [↓](#)

Eddy saturation in a barotropic model. *21st Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland OR, USA, 25-30 Jun. 2017. (talk) [↓](#)

A statistical state dynamics based theory for jet-wave coexistence in beta-plane turbulence. *21st Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland OR, USA, 25-30 Jun. 2017. (poster) [↓](#)

Understanding self-organization in turbulent flows by studying the statistical state dynamics, *Conference on “Recurrence, self-organization, and the dynamics of turbulence”*, KITP, UC Santa Barbara, USA, 9-13 Jan. 2017. (invited talk) [↓](#)

Topographic beta-plane turbulence and form stress. *AGU Fall Meeting 2016*, San Francisco, USA, 12-16 Dec. 2016. (poster) [↓](#)

Structure and mechanism of turbulence under dynamical restriction in plane Poiseuille flow. *69th APS Division of Fluid Dynamics Meeting*, Portland, USA, 20-22 Nov. 2016. (talk) [↓](#)

Statistical state dynamics of jet-wave coexistence in beta-plane turbulence. *APS March Meeting 2016*, Baltimore, USA, 14-18 Mar., 2016. (talk) [↓](#)

Emergence and equilibration of zonal winds in turbulent planetary atmospheres. *12th International Conference on Meteorology, Climatology and Atmospheric Physics, COMECAP 2014* [\[URL\]](#), Heraklion, Crete, Greece, 28-31 May 2014. (poster) [↓](#)

Emergence and equilibration of jets in planetary turbulence. *EGU 2013 General Assembly* [\[URL\]](#), Vienna, Austria, 8-12 Apr. 2013. (talk) [↓](#)

Emergence and equilibration of jets in planetary turbulence. *8th Panhellenic Meeting "Fluid Flow Phenomena" (ROI 2012)* [\[URL\]](#), Volos, Greece, 16-17 November 2012. (talk) [↓](#)

## Seminars

What's underneath Jupiter's and Saturn's stripes? FEARS Meeting, Research School of Astronomy and Astrophysics [\[URL\]](#), Australian National University, Canberra, Australia, 29 Oct. 2019. [↓](#)

What is hiding underneath the stripes of Jupiter and Saturn? Department of Physics Colloquium, Department of Physics [\[URL\]](#), National and Kapodistrian University of Athens [\[URL\]](#), Athens, Greece, 16 Oct. 2019. [↓](#)

Barotropic versus baroclinic eddy saturation: implications to Southern Ocean dynamics. Geophysical Fluid Dynamics Summer Program, Woods Hole Oceanographic Institution [\[URL\]](#), Woods Hole, USA, 9 Jul. 2019. [↓](#)

Barotropic versus baroclinic eddy saturation: implications to Southern Ocean dynamics. Geophysical Fluid Dynamics Summer Program, Woods Hole Oceanographic Institution [\[URL\]](#), Woods Hole, USA, 9 Jul. 2019. [↓](#)

A barotropic process-model for eddy saturation. WHOI Physical Oceanography Seminar Series, Woods Hole Oceanographic Institution [\[URL\]](#), Woods Hole, USA, 16 Apr. 2019. [↓](#)

How does the Antarctic Circumpolar Current respond to the increasing winds over the Southern Ocean? Barotropic versus baroclinic eddy saturation. Physics & Physical Oceanography Department Seminar Series, University of North Carolina Wilmington [\[URL\]](#), Wilmington NC, USA, 11 Apr. 2019.

How does the Antarctic Circumpolar Current respond to the increasing winds over the Southern Ocean?: Barotropic versus Baroclinic Eddy Saturation. Fluids Seminar Math Department [\[URL\]](#), Monash University [\[URL\]](#), Melbourne, Australia, 12 Feb. 2019.

Statistical state dynamics: a new framework for understanding turbulent flows. Fluid Mechanics Research Group Seminar [\[URL\]](#), University of Melbourne [\[URL\]](#), Melbourne, Australia, 8 Feb. 2019.

Magnetic suppression of zonal flows on a beta plane. SpinLab Group Seminar [\[URL\]](#), University of California Los Angeles [\[URL\]](#), Los Angeles, CA, USA, 11 Jan. 2019. [↓](#)

Barotropic versus baroclinic eddy saturation. Oceans and Climate Group Seminar [\[URL\]](#), Geophysical Fluid Dynamics Laboratory [\[URL\]](#), Princeton, NJ, USA, 12 Dec. 2018. [↓](#)

Eddy saturation in a barotropic model. LDEO OCP Seminar [\[URL\]](#), Lamont-Doherty Earth Observatory [\[URL\]](#), Columbia University, Palisades, NY, USA, 27 Oct. 2017. [↓](#)

Eddy saturation in a barotropic model. ClimaTea Seminar [\[URL\]](#), Harvard University, Cambridge, MA, USA, 26 Oct. 2017. [↓](#)

Eddy saturation in a barotropic model. CEAfM Seminar [\[URL\]](#), Department of Earth & Planetary Sciences, The Johns Hopkins University, Baltimore, USA, 13 Oct. 2017. [↓](#)

Topographic beta-plane turbulence and form stress. Geophysical Fluid Dynamics Summer Program, Woods Hole Oceanographic Institution [\[URL\]](#), Woods Hole, USA, 19 Jul. 2016. [↓](#)

Topographic beta-plane turbulence and form stress. Mathematics of Turbulence Reunion Conference, IPAM, UCLA [\[URL\]](#), Lake Arrowhead, 7 Jun. 2016. [↓](#)

Statistical state dynamics of planetary turbulence. CEAfM Seminar [\[URL\]](#), Whiting School of Engineering, The Johns Hopkins University, Baltimore, 18 Mar. 2016. [↓](#)

A theory for large-scale structure formation in atmospheric/oceanic turbulence: Is jet formation a phase transi-

tion phenomenon? CASPO Seminar, Scripps Institution of Oceanography, UC San Diego [\[URL\]](#), La Jolla, 10 Feb. 2016. [↓](#)

Formation of large-scale structures by turbulence in planetary atmospheres. Physics Department, University of Cyprus [\[URL\]](#), Nicosia, 5 May 2015. [↓](#)

Emergence of large-scale structure in planetary turbulence as an instability of the of the homogeneous turbulent state. IPAM, UCLA [\[URL\]](#), Los Angeles, 21 Oct. 2014. [↓](#)

Emergence and equilibration of zonal winds in turbulent planetary atmospheres. Cyprus Oceanography Center, University of Cyprus [\[URL\]](#), Nicosia, 7 Jan. 2014. [↓](#)

Verification of the predictions of SSST in nonlinear simulations. 2nd Meeting of “Zonal Jets and Eddies” team, International Space Science Institute (ISSI) [\[URL\]](#), Bern 2-5 Apr. 2013. [↓](#)

## Workshops

- 2019     **Advanced Ocean Modelling School**  
April 28 - May 3, Lake Pedder, Tasmania, Australia [\[URL\]](#)
- 2017     **Vorticity in the Universe: From Superfluids to Weather and Climate, to the Universe**  
Aspen Center for Physics  
August 27 - September 17 2017, Aspen, CO, USA [\[URL\]](#)
- 2017     **Les Houches Summer School on Fundamental Aspects of Turbulent Flows in Climate Dynamics**  
Les Houches Physics School  
July 31 - August 25 2017, Les Houches, France [\[URL\]](#)
- 2014     **Mathematics of Turbulence**  
Institute of Pure & Applied Mathematics, UCLA  
September 8 - December 12 2014, Los Angeles, USA [\[URL\]](#)
- 2013     **Geoturb: Numerical Modeling and Theoretical Challenges in Atmosphere and Ocean Turbulence**  
Ecole normale supérieure de Lyon  
2-4 October 2013, Lyon, France. [\[URL\]](#)
- 2013     **First Multiflow Summer Workshop**  
Universidad Politécnica de Madrid  
10 June - 12 July 2013, Madrid, Spain. [\[URL\]](#)
- 2011     **International Graduate School on Stability, Transition to Turbulence and Flow Control**  
Organized by Advanced Instability Methods (AIM) Network  
22-27 August 2011, Cambridge, UK. [\[URL\]](#)
- 2009     **Climate Variability & Climate Change: Estimating and Reducing Uncertainties**  
8-17 June 2009, Visegrád, Hungary. [\[URL\]](#)

## Teaching/Supervision Experience

- Jun. 2020     **Atmosphere and Ocean Dynamics Winter School 2020**  
(main lecturer along w/ Martin Singh and Annie Foppert)  
Institute for Marine and Antarctic Studies & University of Tasmania  
[organized by ARC Centre of Excellence for Climate Extremes; more information [online](#)]
- 2020     Course Coordinator for **Basics of Dynamical Systems and Bifurcation Theory** (Honors/Masters/Graduate)  
[3 lectures by Henk Dijkstra; 3 workshops by myself; lecture & workshop slides/notes available at [github](#)]  
Research School of Earth Sciences, Australian National University, Australia
- Nov. 2019 – Feb. 2020     Supervised Fabian Antonio Circelli (3rd year undergraduate student).  
Project: “**Fourier-based Pseudospectral Methods for Solving Partial Differential Equations.**”  
Aim: Learn basics of pseudospectral techniques for solving PDEs and implement GPU functionality in Fourier-Flows.jl Julia package.  
Research School of Earth Sciences, Australian National University, Australia

- 2018 Course Coordinator for **Instabilities in Fluids** (Honors/Masters)  
[lecture notes and students' project reports available at [github](#)]  
Research School of Earth Sciences, Australian National University, Australia
- 2018 Visiting lecturer for **Fluid Mechanics** (Undergraduate) [lecture notes available at [github](#)]  
Department of Physics and Physical Oceanography, University of North Carolina Wilmington, USA
- 2017 Teaching assistant for **Applied Mathematics III** (Graduate)  
Scripps Institution of Oceanography, University of California San Diego, USA
- 2010-2014 Teaching assistant for **Nonlinear Dynamical Systems** (3rd year Undergraduate)  
Physics Department, National & Kapodistrian University of Athens, Greece

## Programming skills

[julia](#), Python, Matlab, git, markdown

## Software

Core developer for “FourierFlows.jl”: Julia ecosystem for solving partial differential equations on periodic domains with Fourier-based pseudospectral methods; doi:[10.5281/zenodo.1161724](#)

Core developer for “GeophysicalFlows.jl”: Julia modules for solving problems in Geophysical Fluid Dynamics on periodic domains using Fourier-based pseudospectral methods; doi:[10.5281/zenodo.1463809](#)

## Other Scientific Activities

- Reviewer : Journal of Fluid Mechanics, Journal of Physical Oceanography, Physics of Plasmas, Physics Letters A, Scientific Reports, Geophysical Research Letters.
- Member : American Geophysical Union, American Meteorological Society, American Physical Society (also member of Topical Group on the Physics of Climate).

## References

**Petros J. Ioannou** (Ph.D. advisor)  
Department of Physics  
National & Kapodistrian University of Athens  
Zografos, 157 84, Greece  
☎ [+30 210 7276910](tel:+302107276910)  
✉ [pjioannou@phys.uoa.gr](mailto:pjioannou@phys.uoa.gr)  
w <http://users.uoa.gr/~pjioannou>

**Andy McC. Hogg** (postdoc supervisor)  
Research School of Earth Sciences  
Australian National University  
Canberra, ACT 2601, Australia  
☎ [+61 2 61259962](tel:+61261259962)  
✉ [andy.hogg@anu.edu.au](mailto:andy.hogg@anu.edu.au)  
w <http://rses.anu.edu.au/people/academics/prof-andy-hogg>

**William R. Young** (postdoc supervisor)  
Scripps Institution of Oceanography  
University of California San Diego  
La Jolla, CA 92037-0213, USA  
☎ [+1 \(858\) 534-1380](tel:+18585341380)  
✉ [wryoung@ucsd.edu](mailto:wryoung@ucsd.edu)  
w <http://pordlabs.ucsd.edu/wryoung/>

**Brian F. Farrell**  
Department of Earth and Planetary Sciences  
Harvard University  
Cambridge, MA 02138, USA  
☎ [+1 \(617\) 495-2998](tel:+16174952998)  
✉ [farrell@seas.harvard.edu](mailto:farrell@seas.harvard.edu)  
w <http://brian-f-farrell.fas.harvard.edu>