

# Navid C. Constantinou


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## 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, 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 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

- 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



**Constantinou, N. C.** and Hogg, A. McC. (2019). Eddy saturation of the Southern Ocean: a baroclinic versus barotropic perspective. *Geophys. Res. Lett.* (in review, arXiv:[1906.08442](#)) 


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.* (in review, arXiv:[1906.01929](#)) 


### In press / Published



Parker, J. B. and **Constantinou, N.C.** (2019). Magnetic eddy viscosity of mean shear flows in two-dimensional magnetohydrodynamics. *Phys. Rev. Fluids* (in press, arXiv:[1902.01105](#)) 



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](#), [LLNL](#), and [CLEx](#) 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.  

### 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

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. *Eurochem 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

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 transition 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 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, Tasmania, TAS, Australia [\[URL\]](#)

2018     **ARC Centre of Excellence for Climate Extremes Annual Workshop**

- November 19 - November 21, Wollongong, NSW, 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. [\[URL\]](#)

## 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](#)

## Teaching experience

- 2018 Course Coordinator for **Instabilities in fluids** (Honours/Masters)  
[lecture notes and student’s 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

## 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)

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**Andy McC. Hogg** (postdoc supervisor)

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**William R. Young** (postdoc supervisor)

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