Navid C. Constantinou

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

✉ navid.constantinou@anu.edu.au
w www.navidconstantinou.com
navidcy navidcy
0000-0002-8149-4094
arXiv/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

2021-2024 *ARC Discovery Early Research Career Award 2021* (290,000 USD)

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 2nd year of M.Sc. and for 4 years of Ph.D. studies (47,700 USD)

2009-2012 *A. G. Leventis Foundation*
Scholarship for the 2nd year of M.Sc. and the first 2 years of Ph.D. studies (16,000 USD)

2003-2008 *Department of Physics, National & Kapodistrian University of Athens, Greece*
Valedictorian for graduating class 2008
1st 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

Martínez-Moreno, J., Hogg, A. McC., England, M. H., **Constantinou**, **N. C.**, Kiss, A. E., and Morrison, A. K. Global changes in oceanic mesoscale currents over the satellite altimetry record. (submitted on Oct. 2020; preprint at doi:10.21203/rs.3.rs-88932/v1)

In Press / Published

Lozano-Durán, A., **Constantinou**, **N. C.**, Nikolaidis, M.-A., and Karp, M. (2020). Cause-and-effect of linear mechanisms in wall turbulence. *J. Fluid Mech.* (to appear; arXiv:2005.05303)

Lozano-Durán, A., Nikolaidis, M.-A., **Constantinou**, **N. C.**, and Karp, M. (2020). Alternative physics to understand wall turbulence: Navier–Stokes equations with modified linear dynamics. *J. Phys.: Conf. Ser.*, **1522**, 012003.

Rocha, C. B., **Constantinou**, **N. C.**, Llewellyn Smith, S. G., and Young, W. R. (2020) The Nusselt numbers of horizontal convection. *J. Fluid Mech.*, **894**, A24.

Constantinou, **N. C.** and Hogg, A. McC. (2019). Eddy saturation of the Southern Ocean: a baroclinic versus barotropic perspective. *Geophys. Res. Lett.*, **46**, 12202–12212. (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.

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., Nikolaidis, M.-A., **Constantinou**, **N. C.**, and Karp, M. Wall turbulence without modal instability of the streaks. (arXiv:1909.05490)

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. *Euromech 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

Cause-and-effect of linear mechanisms in wall turbulence. Shear Flow Instability, Transition and Turbulence Seminar Series, Monash University [URL], (via Zoom), 7 Oct. 2020.

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 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 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**
[School Postponed due to COVID-19; 3 introductory lectures were given via Zoom]
(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 infomation 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

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

Supervision

Jul. 2020 – Oct. 2020 Supervised Elise Palethorpe (2rd year undergraduate student).
Project: "**Numerical methods for Partial Differential Equations**."
Aim: Learn basics of finite difference numerical schemes for solving hyperbolic and also study and implement high-order accurate weighted essentially non-oscillatory (WENO) schemes.

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 FourierFlows.jl Julia package.

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

Mobility

Studied and worked in academic institutions in **Greece**, **Cyprus**, **U.S.A.**, and **Australia**.

Other Scientific Activities

Reviewer : Journal of Fluid Mechanics, Journal of Physical Oceanography, Physics of Plasmas, Physics Letters A, Scientific Reports, Geophysical Research Letters, Fluids, Journal of Advances in Modeling Earth Systems.

References

Petros J. Ioannou (Ph.D. advisor)
Department of Physics
National & Kapodistrian University of Athens
Zografos, 157 84, Greece
☎ +30 210 7276910
✉ pjioannou@phys.uoa.gr
w http://users.uoa.gr/∼pjioannou

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

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

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