Hemant Khatri

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Research Interests

Large-scale ocean circulation and climate change, meridional overturning circulation, mesoscale and sub-mesoscale ocean turbulence, topography – flow interactions in the oceans

Education

Ph.D., Applied Mathematics and Mathematical Physics 2016 – 2019
Imperial College London, London, UK *Advisor: Prof Pavel Berloff*
Thesis – Dynamics of ocean jets over topography

M.Sc., Atmospheric & Oceanic Sciences 2013 – 2015
Indian Institute of Science (IISc), Bengaluru, India *Advisor: Dr Jai Sukhatme*
Thesis – Mesoscale turbulence on the ocean surface from satellite altimetry

B.E. (Hons.), Chemical Engineering 2009 – 2013
Birla Institute of Technology & Science (BITS), Pilani, India

Professional Appointments

Research Associate 2021 – Present
Earth, Ocean and Ecological Sciences, University of Liverpool, Liverpool, UK *Advisor: Prof Ric Williams*
Research focus – Impacts of atmospheric variability on the North Atlantic overturning circulation

Postdoctoral Research Associate 2019 – 2021
Atmospheric and Oceanic Sciences, Princeton University, Princeton, USA *Advisor: Dr Stephen Griffies*
Research focus – Role of bathymetry in the large-scale ocean circulation

Modeling Associate (Intern) Feb – Aug 2019
Risk Management Solutions, London, UK
Research focus – Assessment of financial impacts of sea-level rise on coastal storm surge in the USA

Teaching & Mentorship

Guest Lecturer Atmospheric and Oceanic Wave Dynamics (Feb 2020)

Teaching Assistant Mathematical Methods, Multivariable Calculus, Numerical Analysis (2016 – 2018), Geophysical Fluid Dynamics (Spring 2015)

Teaching Transcript Certification McGraw Center for Teaching and Learning, Princeton University (2021)

Mentor Catherine Berridge (2022 – 2023, U. Liverpool), Jack Davies (2018 – 2019, Imperial College), Ruchir Dwivedi (2017 – 2018, Imperial College)

Research Fellowships & Grants

CIMES Postdoctoral Fellowship Atmospheric and Oceanic Sciences, Princeton University (2019 – 2021)

Research Grants Mathematics for Planet Earth CDT, Imperial College London (2016 – 2019)

President's PhD Scholarship Imperial College London (2016 – 2019)

Jeremy Grantham Fellowship Divecha Centre for Climate Change, IISc (2014 – 2015)

GATE Fellowship Ministry of Education, India (2013 – 2015)

Merit-cum-Need Scholarship BITS Pilani, India (2011 – 2013)

Publications

- **H. Khatri**, B. Storer, S. Griffies, H. Aluie, M. Sonnewald, and R. Dussin. A scale-dependent analysis of barotropic vorticity budget in an eddy-permitting global ocean simulation, *in preparation*.
- **H. Khatri**, R. Williams, T. Woollings, and D. Smith. Fast and slow subpolar ocean responses to the North Atlantic Oscillation in depth and density coordinates, *in review*.
- B. Storer, M. Buzzicotti, **H. Khatri**, S. Griffies, and H. Aluie (2022). Global energy spectrum of the general ocean circulation, *Nature Communications*.
- G. Marques, N. Loose, E. Yankovsky, J. Steinberg, C. Chang, N. Bhamidipati, A. Adcroft, B. Fox-Kemper, S. Griffies, R. Hallberg, M. Jansen, **H. Khatri**, and L. Zanna (2022). An idealized model hierarchy to investigate ocean mesoscale eddies across resolutions, *Geoscientific Model Development*.
- N. Loose, R. Abernathey, I. Grooms, J. Busecke, A. Barthe, E. Yankovsky, G. Marques, J. Steinberg, A. Ross, **H. Khatri**, S. Bachman and L. Zanna (2022). A python package for diffusion-based spatial filtering of gridded data, *Journal of Open Source Software*.
- **H. Khatri**, S. Griffies, T. Uchida, H. Wang and D. Menemenlis (2021). Role of mixed-layer instabilities in the seasonal evolution of eddy kinetic energy spectra in a global submesoscale permitting simulation, *Geophysical Research Letters*.
- J. Davies, **H. Khatri** and P. Berloff (2021). Linear stability analysis for flows over sinusoidal bottom topography, *Journal of Fluid Mechanics*.
- **H. Khatri** and P. Berloff (2019). Tilted drifting jets over a sloped topography: effects of vanishing eddy viscosity, *Journal of Fluid Mechanics*.
- **H. Khatri** and P. Berloff (2018). Role of eddies in the maintenance of multiple jets embedded in eastward and westward baroclinic shears, *Fluids*.
- **H. Khatri** and P. Berloff (2018). A mechanism for jet drift over topography, *Journal of Fluid Mechanics*.
- **H. Khatri**, J. Sukhatme, A. Kumar and M. K. Verma (2018). Surface ocean enstrophy, kinetic energy fluxes, and spectra from satellite altimetry, *Journal of Geophysical Research: Oceans*.

Conference Presentations & Seminars

- Inter-annual variability in the overturning circulation in the subpolar North Atlantic: A sensitivity analysis, *EGU General Assembly* (May′22)
- A scale-dependent analysis of barotropic vorticity budget in an eddy-permitting global ocean simulation, *National Oceanography Centre, Liverpool, UK* (Dec′21)

- A synthesis of upper ocean geostrophic kinetic energy spectra from a global submesoscale permitting simulation, *EGU General Assembly* (Apr′21)
- Effects of zonally varying topography on the dynamics of oceanic jets, *New York University, USA* (Mar′20)
- Evaluating the impacts of sea-level rise on storm surge risk and financial losses in the United States, *Risk Management Solutions, London, UK* (Aug′19)
- Dynamics of ocean jets formed over a sloped topography, *Workshop "Conservation Principles, Data, and Uncertainty in Atmosphere-Ocean Modelling", Potsdam, Germany* (Apr′19)
- Effects of zonally varying topography on the dynamics of oceanic jets, *Geophysical Fluid Dynamics Laboratory, Princeton, USA* (Mar′19)
- Ocean surface turbulence: Is it QG or surface-QG like?, *CliMathNet Conference, Reading, UK*. (Sep′18)
- Ocean surface spectral fluxes of kinetic energy, enstrophy and buoyancy, *Gordon Ocean Mixing Conference, Andover, USA* (Jun′18)
- Effects of zonally varying topography on the dynamics of oceanic jets, *21st Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, USA* (Jun′17)
- Drifting quasi-zonal jets, *Rotating Fluids Meeting, University of Oxford, UK* (Sep′17)
- Kinetic energy and enstrophy fluxes on the ocean surface, *Meeting: Energy Transfers in the Atmosphere and Oceans, Hamburg, Germany* (Apr′17)

Programming and Computational Skills

Programming Language & Software Python, Fortran, MATLAB, R, C/C++, QGIS, git version control, LaTeX

Analysis tools xarray, xgcm and dask libraries in python for analyzing large datasets, e.g. climate model outputs, atmospheric and oceanic reanalysis datasets, and experience of using JASMIN (jasmin.ac.uk) and Pangeo (pangeo.io) data-analysis services

Ocean Modelling Experience of running MOM6 general circulation model (github.com/NOAA-GFDL/MOM6) and analysing MITgcm and NEMO ocean model outputs

Other Academic Activities

Reviewer Journal of Physical Oceanography, Ocean Modelling, Fluids, Journal of Fluid Mechanics, Journal of Advances in Modeling Earth Systems, Geophysical Research Letters

Organiser Weekly ocean seminar series – University of Liverpool (2022), Annual student conference – Society of Industrial and Applied Mathematics at Imperial College London (2018)

Workshop Participation Rossbypalooza – University of Chicago (Jun′18), Turbulent flows and climate dynamics – School of Physics, Les Houches (Aug′17), Global climate change – University of Exeter (Jun′14)