Lois Elizabeth Baker

Date of Birth: 17/03/1994 **Website:** loisbaker.github.io **Email:** l.baker18@imperial.ac.uk

Profile

PhD candidate in Mathematics of Planet Earth at Imperial College London, advised by Dr Ali Mashayek. Background in mathematics, specialising in applying theoretical models to problems in physical oceanography. Currently interested in the dynamics and mixing properties of flow-topography interaction, including lee waves and wake vortices, approached from both a theoretical perspective and in a realistic setting using regional simulations of the Drake Passage.

Education

2018 - Present **Centre for Doctoral Training in Mathematics of Planet Earth, Imperial College London**

PhD Project (Years 2-4): *Generation, propagation, and surface reflection of oceanic lee waves. Advised by Dr Ali Mashayek.*

MRes Research Project (Year 1): *Superharmonics of internal tides in non-uniform stratification. Advised by Prof. Bruce Sutherland and Dr Ali Mashayek.*

2012 - 2016 **Queens' College, University of Cambridge**
BA + MMath Mathematics Degree (4 years)

2016 Part III: Distinction (81%)
Masters Essay: *Submesoscale Instabilities of an Ocean Jet. Advised by Dr John Taylor.*

2013-15 Part IA (1st Class, 77%), Part IB (1st Class, 80%), Part II (1st Class, 73%)

2010 - 2012 **Parkstone Grammar School**
2012 A Levels Maths (A*) Further Maths (A*) Physics (A*) French (A*)
STEP Maths I (S) II (S) III (1) , AEA Maths (Distinction)

Publications

Baker, L.E., Bell, M.J., & Blaker, A.T. (2022). TAO data support the existence of large high frequency variations in cross-equatorial overturning circulation, *Geophysical Research Letters, 49,* e2021GL096879. doi:10.1029/2021GL096879

Mashayek, A., Baker, L.E., Cael, B.B. & Caulfield, C.P. (2021). A marginal stability paradigm for shear-induced diapycnal turbulent mixing in the ocean, *Geophysical Research Letters,* 49, e2021GL095715. doi:10.1029/2021GL095715

Mashayek, A., Gula, J., Baker, L.E., Naveira Garabato, A. Cimoli, L., & Riley, J.J. (2021) Mountains to climb: on the role of seamounts in upwelling of deep ocean waters through turbulent mixing, *(preprint, submitted to Nature Geoscience)* doi:10.21203/rs.3.rs-939198/v1

Baker, L.E., & Mashayek, A. (2021). Surface reflection of bottom generated oceanic lee waves, *Journal of Fluid Mechanics, 924*, A17. doi:10.1017/jfm.2021.627

Baker, L.E., & Sutherland, B. R. (2020). The evolution of superharmonics excited by internal tides in non-uniform stratification. *Journal of Fluid Mechanics, 891*, R1. doi:10.1017/jfm.2020.188

Ellison, E., Baker, L. and Wilson, A. (2020), IPCC Special Report Meeting: Climate Change Around the Globe. Weather, 75: 293-294. doi:10.1002/wea.3722

AWARDS

2020 **Mathematics of Planet Earth CDT MRes Student Award**
In recognition of academic achievement and success.

2019 **Woods Hole Geophysical Fluid Dynamics Program Fellowship**
10 week intensive summer program and research project *'The evolution of superharmonics excited by internal tides in non-uniform stratification'*. Advised by Prof. Bruce Sutherland.

2015 **Bridgwater Summer Research Studentship - University of Cambridge**
8 week computational research project simulating the effect of internal waves and convection on reactive biogeochemical tracers. Advised by Dr John Taylor.

CONFERENCES AND INVITED TALKS

L.E. Baker & A. Mashayek, 2022: The impact of realistic topographic representation on the parameterisation of lee wave energy flux, *Oral presentation, DAMTP Geophysical and Environmental Processes seminar, University of Cambridge, March 2022*

L.E. Baker & A. Mashayek, 2022: The impact of realistic topographic representation on the parameterisation of lee wave energy flux, *Oral presentation, Scripps Institution of Oceanography Climate, Atmospheric Sciences, and Physical Oceanography seminar, February 2022*

L.E. Baker & A. Mashayek, 2021: Interaction of bottom generated oceanic lee waves with vertically varying background flows and the ocean surface, *Oral presentation, Warnemünde Turbulence Days, December 2021*

L.E. Baker & A. Mashayek, 2021: Surface reflection of bottom generated oceanic lee waves, *Oral presentation, Woods Hole Physical Oceanography Seminar, August 2021*

L.E. Baker & A. Mashayek, 2021: Topographically generated waves in a realistic nested model of the Drake Passage, *Oral presentation, SOCCOM Modelling Telecon, May 2021*

L.E. Baker & A. Mashayek, 2021: Surface reflection of bottom generated oceanic lee waves, *Oral presentation, DAMTP Atmosphere Oceans Group Meeting, University of Cambridge, Feb 2021*

L.E. Baker & A. Mashayek, 2020: Lee waves and submesoscales in a high resolution nested model of the Drake Passage, *Oral presentation, Ocean Modelling Meeting, Sept 2020*

L.E. Baker and B.R. Sutherland, 2020: The evolution of superharmonics excited by internal tides in non-uniform stratification, *Oral presentation, AGU Ocean Sciences Meeting, San Diego, Feb 2020*

L.E. Baker and A. Mashayek, 2020: Overturning lee waves and hydraulic jumps in the Drake Passage, *Poster presentation, AGU Ocean Sciences Meeting, San Diego, Feb 2020*

L.E. Baker and B.R. Sutherland, 2020: The evolution of superharmonics excited by internal tides in non-uniform stratification, *UCL Postgraduate Fluid Dynamics Seminars, Nov 2019*

TEACHING EXPERIENCE AND EMPLOYMENT

2020 - 2021 **MSc co-advisor**
Department for Civil and Environmental Engineering, Imperial College London.
Co-advisor for two Master's projects, working closely with the students at all stages of the dissertation process.

2019 - Present **Graduate teaching assistant**
Department for Civil and Environmental Engineering, Imperial College London.
Giving tutorials and marking for *Fluid Mechanics Fundamentals (MSc), Computational En gineering Analysis (3rd year UG), Fluid mechanics (3rd year UG)*.

2016 - 2017 **Account Manager**, Brainlabs Digital
Client facing role in a digital marketing agency. Role involved designing and running data-driven paid search campaigns, and presenting results to senior stakeholders.

SKILLS

Familiar with Python and MATLAB, including numpy, matplotlib, xarray, pandas. Experience with linux and shell scripting. Experience with running and analysing idealised and realistic ocean models.

POSITIONS OF RESPONSIBILITY

2021 **Organiser and chair**, Imperial College GFD group meetings.
2020 **Student Rep.**, Fluids section, Department of Civil and Environmental Engineering, Imperial College London.
2017 **Watch Officer**, Transatlantic Tall Ships Race.
2014 - 2016 **Vice-President**, Emmy Noether Society for female mathematicians.
2014 **President**, Queens' College Cambridge Maths Society.
2012 - Present **Watch Leader / Officer**, Rona Sailing Project.
2014 **Student Representative**, Maths Faculty Curriculum Committee, University of Cambridge.