Welcome live and direct from Edinburgh!

A few bits of house keeping for the session

- Audio Check
- Recording of the session
- Programme presentation
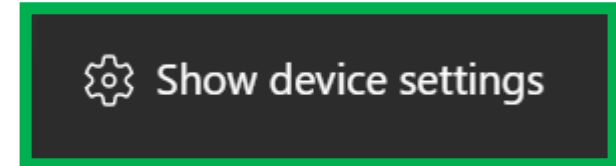- Alumni presentation
- Question and Answer
- Next steps

Audio check

- Can you hear the presenter speaking?
- Please type "**no**" in the Chat area **if you cannot hear the presenter**
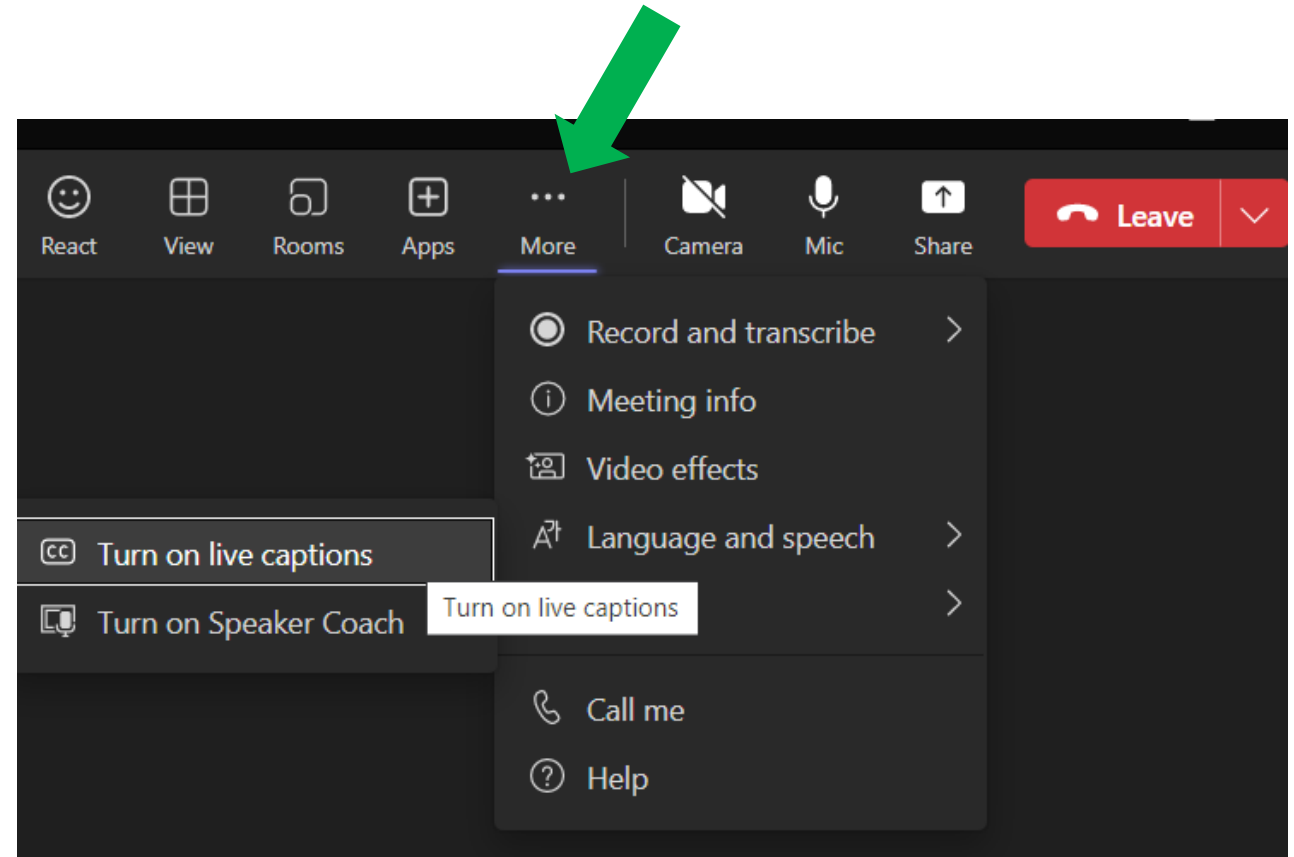
If you can't hear:

- Check your settings by clicking on the three little dots on the options bar and then 'show device settings'. Here you can check and change your speakers.

- Try signing out and signing back into the session
- Don't worry, the session is being recorded

Live captions

You can turn on automated live captions as follows:

- More > Language and speech > Turn on live captions
- These are automated therefore won't be 100% accurate
- Please DO NOT CHANGE language (as this impacts recording captions)

Welcome to Edinburgh

- Historic and cultured city of breath-taking beauty and world-class attractions

- Population of 500,000, around one tenth are students

- Year-round destination and festival city

- UNESCO World Heritage Site

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School of Mathematics

- We are located in the James Clerk Maxwell Building at the King's Buildings campus in south Edinburgh.

- This is about 2.5km from main campus.

- About 35 min walk, 20 min bus, 10 min cycle.

- Around 140 academic research and teaching staff and over 150 PhD students.

- Around 1000 undergraduate students.

- Around 250 MSc students each year, of which around 35 study the CAM MSc.
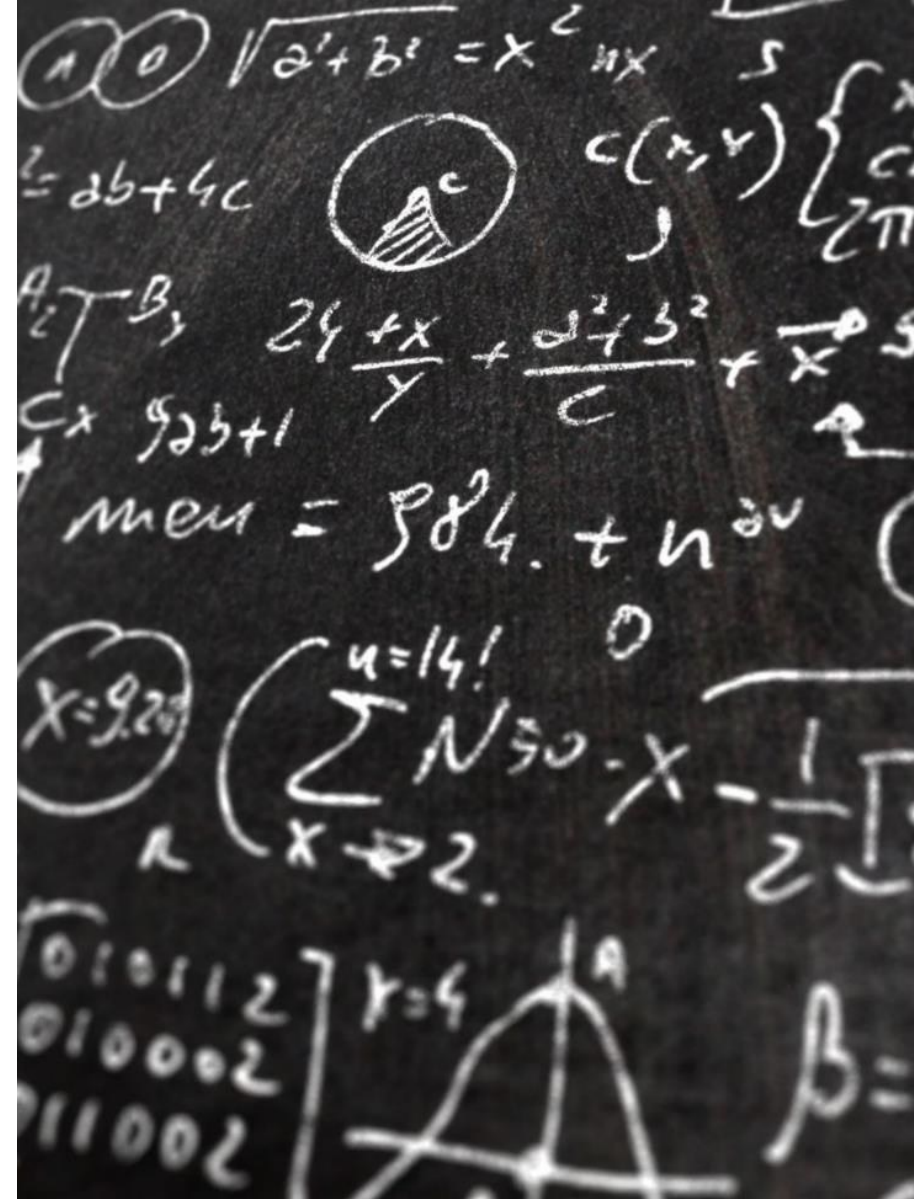
CAM MSc: Key areas

- Computational methods and techniques

- Numerical methods

- High-level applied mathematics

- Options in topics including:
  - Machine learning and data science
  - Statistics
  - Optimization

CAM MSc: Student cohort

- Super cosmopolitan cohort

- ~35 students in recent years
  - Azerbaijan
  - China
  - France
  - Hong Kong
  - India
  - Indonesia
  - Ireland
  - Italy
  - Poland
  - Saudi Arabia
  - Spain
  - Thailand
  - United Kingdom
  - United States of America

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CAM MSc: How is it different to undergraduate maths?

- One year degree

- Full 12 months of study

- More intense study

- More focused on the subject area

- Two semesters of courses (120 credits)

- Followed by a substantial summer dissertation (60 credits)

Current core courses

Semester 1:

- Industrial Mathematics

- Numerical Linear Algebra

Semester 2:

- Applied Dynamical Systems

- Numerical Partial Differential Equations

Both semesters:

- Research Skills in Computational Applied Mathematics

Semester 1: Optional Courses

- Applied Stochastic Differential Equations
- Bayesian Theory
- Fluid Dynamics
- Fundamentals of Optimization
- Mathematical Biology
- Python Programming
- Statistical Methodology (introductory course)
- Statistical Programming
- Stochastic Modelling

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Semester 2: Optional Courses

- Bayesian Data Analysis
- High Performance Data Analytics
- Large Scale Optimization for Data Science
- Machine Learning in Python
- Numerical Ordinary Differential Equations and Applications
- Optimization Methods in Finance
- Time Series
- Numerical Methods for Data
- Numerical Methods for Uncertainty Quantification
- Nonlinear Optimization

Taught component: credits

- 120 credits of taught courses
- 60 credits in semester 1 (Sep-Dec, Dec exams)
- 60 credits in semester 2 (Jan-Apr, May exams)
- Full year Research Skills for Computational Applied Mathematics (20 credits)
- 2 further core courses in each semester (10 credits each)
- 3 optional courses in Semester 1 (10 credits each)
- 3 optional courses in Semester 2 (10 credits each)

Typical week during the semester

- A semester consists of six 10 credit courses (five 10 credit courses + half of full year Research Skills). Typically:
  - Each course has 2 hourly lectures per week
  - Followed by an hour of tutorials every second week
  - The more computationally intensive courses also contain computer labs

- All lectures/workshops/labs take place at King's Buildings (typically the James Clerk Maxwell Building)

Sample timetable (Semester 1)

	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00
Monday	Industrial Mathematics lecture				Python Programming lecture	Applied Stochastic Differential Equations lecture			
Tuesday			Numerical Linear Algebra lecture			Applied Stochastic Differential Equations lecture	Industrial Mathematics workshop		
Wednesday	Research Skills for Computational Applied Mathematics lecture		Numerical Linear Algebra workshop		Fundamentals of Optimization workshop (every 2nd week)				
Thursday	Applied Stochastic Differential Equations workshop (every 2nd week)		Fundamentals of Optimization lecture						
Friday	Numerical Linear Algebra lecture	Applied Stochastic Differential Equations computer workshop (every 3rd week)			Python Programming workshop			Research Skills for Computational Applied Mathematics workshop (every 2nd week)	

Dissertation component

After completing the taught component, in June you start working on your summer dissertation project (60 credits).

Many different research areas to choose from. Examples might include:

- Mathematical biology
- Computational harmonic analysis
- Mathematical aspects of data science
- Numerical analysis
- Complex fluids and soft matter

- Molecular dynamics
- Exponential asymptotics
- Uncertainty quantification
- Bayesian inverse problems

Examples of previous dissertations

Machine Learning

- Confined friction adaptive descent for neural network training
- Compressing Tractable Generative Models
- Exploiting structured matrices in large language models
- Machine learning new numerical methods for viscoelastic fluid dynamics
- Advantages of having a brain: evolutionary algorithm for neural networks
- Symmetry-invariant Tractable Generative Models
- Adversarial attacks and the limitations of neural networks
- Efficient Bayesian adaptation of neural network topology
- Applications of neural networks to studies of ocean turbulence

Examples of previous dissertations

Numerical models and data

- Markov Chain Monte Carlo methods in Computational Imaging
- Cause and effect in imaging data
- Randomized numerical linear algebra for linear systems, eigenvalue problems, and PDEs
- Differentiating solvers for time dependent partial differential equations using JAX
- Ocean modelling using Julia

Examples of previous dissertations

Mathematical Biology

- Modelling the flow around the brain accounting for brain sulci
- Nonlinear waves in the brain: Industry project with Sigma Solutions
- Quantifying the contribution of DNA damage to cancer mutations
- Using machine learning techniques for remotely detecting tree death and forest disturbance
- Multiple scales in models for three-trophic-level food chains
- Disease Spread on a Hypergraph Model of Edinburgh
- Affects of ageing on accumulation of mutations in bacteria

Examples of previous dissertations

Many other topics…

- Discrete Exterior Calculus on graphs
- Evolving Network Models: Beyond Triadic Closure
- Exponential asymptotics for integrals
- Friends of Friends
- Inferring the size of tiny droplets from impact force
- Learning to optimize
- Random graph topology and phase transition
- Stable 3-body orbits and unstable N-body choreographies

Support during your studies

- Student support
  - Student Advisers
  - Academic Cohort Leads
  - Advice on study technique
  - Employability/careers guidance
  - General pastoral support

- MSc community
  - MScHub dedicated study space
  - MScBase study support from tutors
  - MathSoc

Careers after CAM

- Machine Learning Engineer - ABN AMRO Bank

- Software Engineer - Microsoft

- Investment Analyst - Abrdn

- Data Scientist - Space Intelligence

- Software Engineer - Esri

- Data Scientist - Greene King

- PhD studies at Bristol, Edinburgh, St Andrews, Oxford, Warwick, ETH, EPFL…

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How to Apply

- Apply using the University's Degree Finder

- No application fee

- You will need to provide: personal statement, details of relevant knowledge/training skills, degree certificates and academic transcripts, evidence you meet English language requirements, one reference

- If documents are not in English, certified translations must be provided

Round	Application deadline	Decisions made or applications rolled to the next deadline
1	15 December	1 March
2	31 March	31 May
3	31 May	31 July

Scholarship opportunities

- School of Mathematics Masters Scholarships – 25% or 50% tuition fee discount
  - Various countries eligible

- British Council GREAT Scholarships - £10,000
  - Ghana, Mexico, Thailand

- European Merit Scholarship - £10,000
  - France, Germany, Spain

- India Merit Scholarship - £5,000

Tristan Pang

- From: New Zealand

- Programme: MSc Computational Applied Mathematics

- Year of graduation: 2023

- Current Role: PhD student at the University of Oxford (NERC DTP) in Physical Oceanography and Numerical Analysis

Computational Applied Maths: A student's perspective

Tristan Pang

About me:

- Did CAM 2022-2023

- From New Zealand

- Maths/Physics BSc from the University of Auckland (specialised in number theory and laser physics)
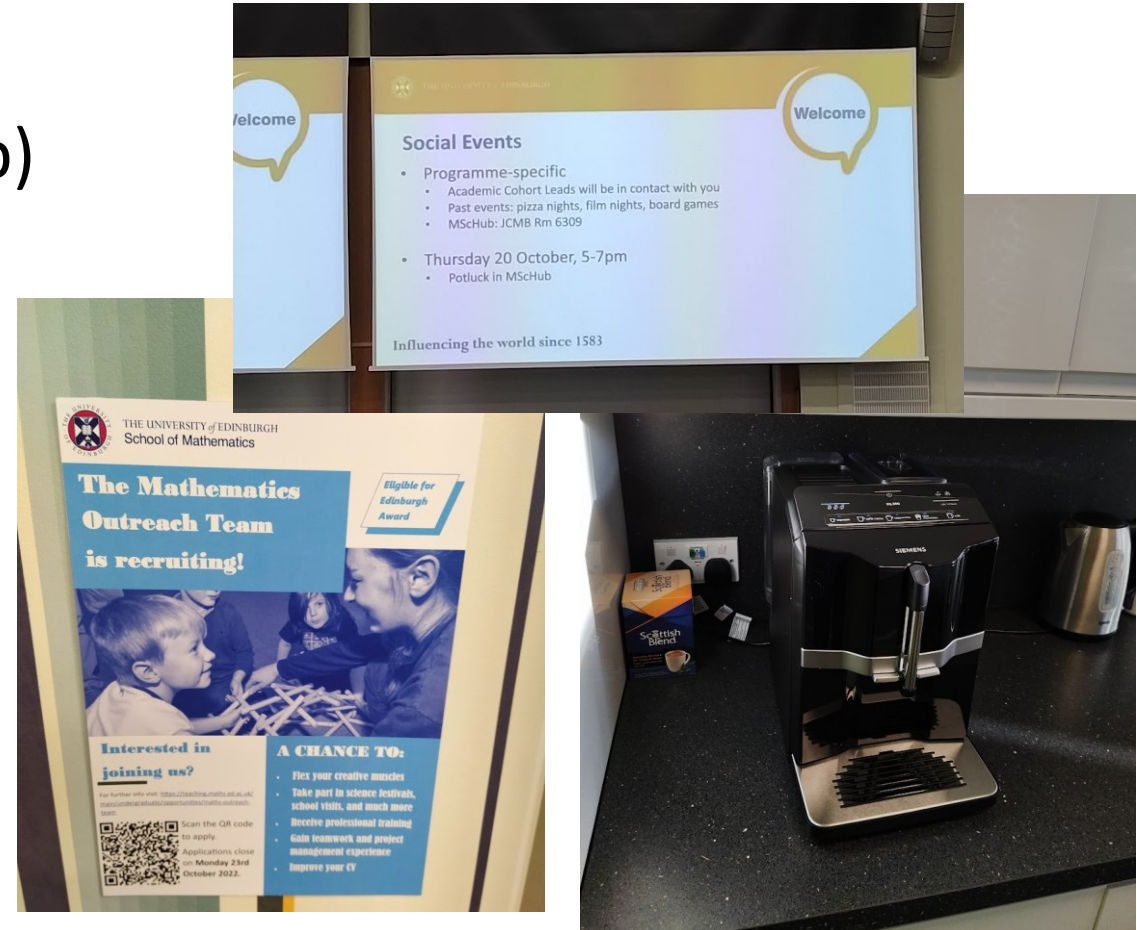
- Now at Oxford doing a Dphil (in oceanography)

- https://tristanpang.github.io/

Life in Edinburgh

- Lots to explore in the city
- Good history
- Vibrant city with lots of shops an
  pubs
- Close to the beach
- Easy(ish) to cycle around
- Free bus travel and cheap tickets
  through YoungScots
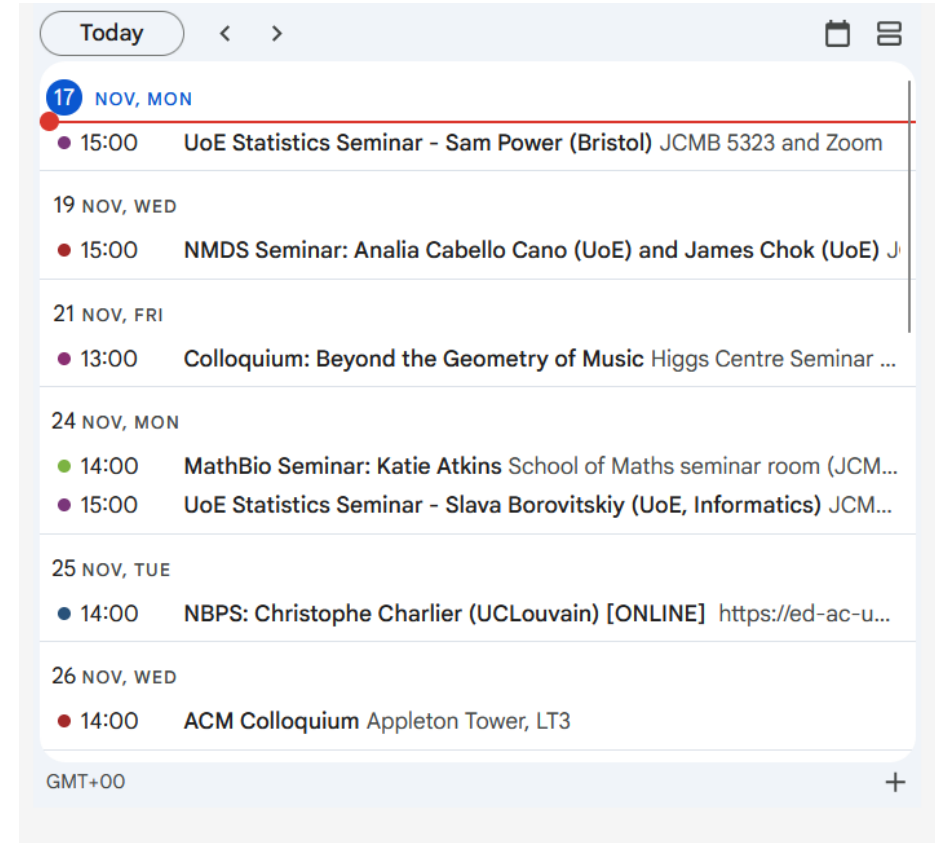- Easy to go up to the highlands
- Good train connections

Activities

- Volunteering opportunities

- Outreach (department and club)

- Department organised social events (pizza!)

- Good common room (with coffee!)

- Interactions with other maths MScs
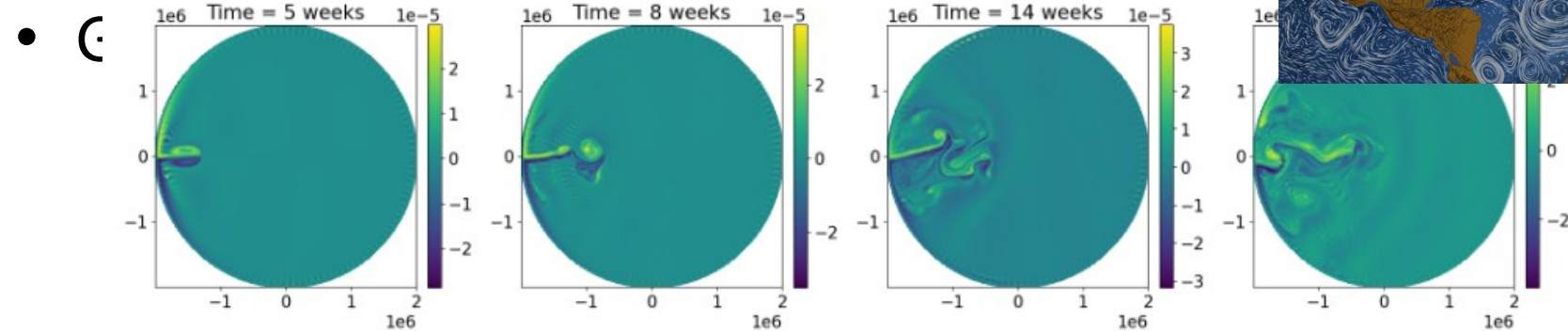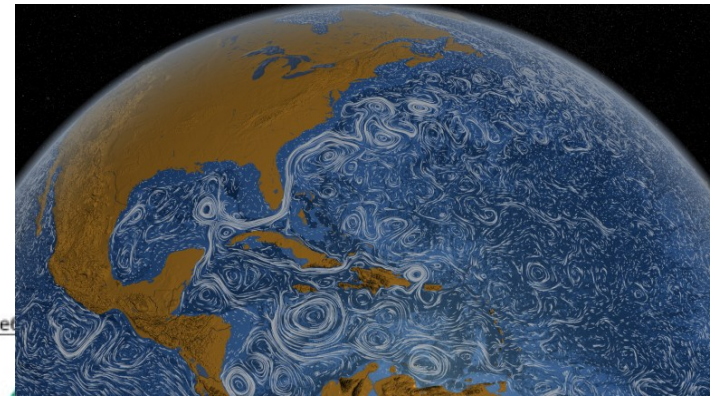
- Good feedback system

CAM highlights

- RSCAM
- A variety of projects
- Group work
- Machine Learning, industrial maths, hpc
- Lots of seminars to attend
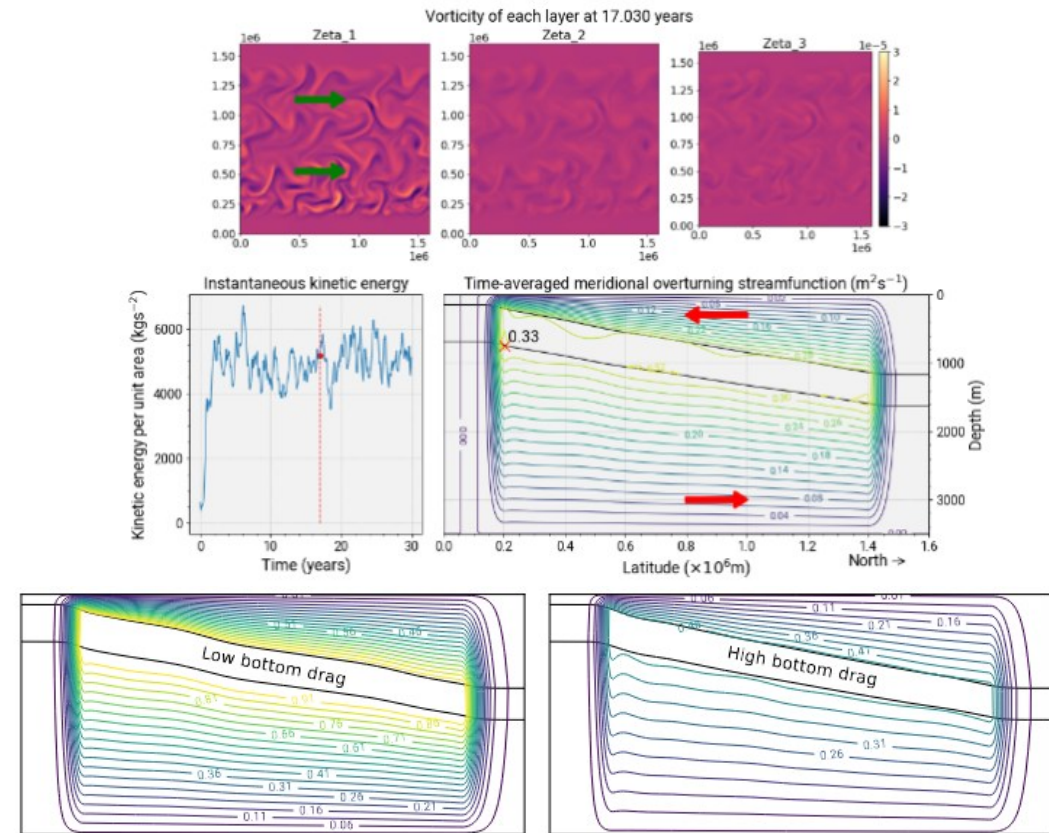- Career advice

My CAM research project

- "Modelling Geophysical Fluids Using Dedalus"

- Supervised by James Maddison

- Spectral methods

- Fluid simulations

- G

$$\partial_t \zeta + \nabla^\perp \psi \cdot \nabla(\zeta + \beta y) = \underbrace{Q(y)}_{\text{wind forcing}} + \underbrace{(-r_0 \nabla^2 \psi)}_{\text{drag}} + \underbrace{\nu \nabla^2 \zeta}_{\text{viscoscity}}$$

What I do now

- 4 year PhD (with 6 months taught) at Oxford funded by NERC
- Sit in Atmospheric, Oceanic and Planetary Physics
- Supervised by David Marshall and James Maddison
- How does friction influence overturning in the Southern Ocean?
- Numerical modelling, GFD, parameterisations
- Interact with diverse group of people in climate science, experimentalists, machine learning etc

Final words

- Good career options (academic and industry)
- Transferable skills
- Lots of opportunities to boost CV
- Good community
- Student perks
- Fun city to be in

- https://tristanpang.github.io/
- tristan.pang@new.ox.ac.uk

Next steps…

- Programme-specific info: https://postgraduate.degrees.ed.ac.uk/

- Chat to our Students: https://edin.ac/student-chat-pg

- Any other questions (including, Fees & Admissions) email: futurestudents@ed.ac.uk

Read our students' blogs at
blogs.ed.ac.uk/studentstories

Contact details for follow-up questions

- We apologise if we did not get through all of your questions in the time allotted for this session. If you have further questions that have not been answered, please email: futurestudents@ed.ac.uk

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