

# Laure Zanna

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**Research Interests:** Climate dynamics and large-scale ocean circulation. Climate variability, predictability and prediction. Role and response of the ocean in regional and global climate change. Interaction between climate and the carbon cycle.  
*Tools:* A hierarchy of numerical models, advanced analytical, numerical and statistical methods and available observations.

## Education

Ph.D., **Harvard University**, 2009. Subject: Climate Dynamics.

M.Sc., **Weizmann Institute of Science**, 2003.

B.Sc., **Tel Aviv University**, 2001.

## Appointments

Oct 2011-present: **University Lecturer**, Department of Physics, University of Oxford.

Apr 2009-Oct 2011: **James Martin Research Fellow**, Oxford Martin School, University of Oxford.

Apr 2009-Oct 2011: **Junior Research Fellow**, Balliol College, University of Oxford.

Apr 2009-Oct 2010: **Research Associate**, Atmospheric, Oceanic & Planetary Physics, University of Oxford.

Oct 2003-Mar 2009: **Graduate Research Assistant**, Earth & Planetary Sciences, Harvard University.

Oct 2001-Jul 2003: **Graduate Research Assistant**, Environmental Sciences, Weizmann Institute of Science.

## Teaching

2010-present: **College Tutor**, *University of Oxford*

*St Anne's College:* CP1 Mechanics, CP1 Special Relativity, CP2 Electromagnetism, B1.1 Flows, Fluctuations and Complexity.

*Mansfield College:* B1.1 Flows, Fluctuations and Complexity.

2009: **Invited Lecturer**

*Joint UW-MIT-Bjerknes* Advanced Climate Dynamics Course, Bergen, Norway.

*MIT* Course on Adjoint methods: from large scale optimization to climate modeling.

2004-2008: **Teaching Fellow**, *Harvard University*.

Introduction to Climate & Physical Oceanography (undergrad, Earth & Planetary Sci., spring 2008)

The Atmosphere (undergrad, Core Curriculum for non-scientists, spring 2007)

Introduction to Physical Oceanography (grad/undergrad, Earth & Planetary Sci., fall 2005)

Ordinary and Partial Differential Equations (grad/undergrad, Applied Math, spring 2005)

Nonlinear Dynamical Systems (grad/undergrad, Applied Math, fall 2004).

1999-2001: **High School Teacher**, Mathematics, Tel Aviv, Israel - *High School Maze*.

1998-2001: **Mathematics and Physics Tutor**, *Tel Aviv University*.

## Honors and Awards

John Fell OUP Fund, University of Oxford, 2011-2013.

Oxford Martin School Fellowship, University of Oxford, 2009-2012.

Balliol College Junior Research Fellowship, University of Oxford, 2009-2012.

Outstanding Student Paper Award, American Geophysical Union, Fall Meeting 2008.

Bertram J. Cohn Fellowship for Environmental Studies, Harvard University, 2005-2007.

Young Scientist Outstanding Paper Award, European Geosciences Union, General Assembly 2006.

Certificate of Distinction in Undergraduate Teaching, Harvard University, Spring 2005, Fall 2005 & Spring 2008.

Beni Landau Fellowship, Weizmann Institute of Science, 2003.

## Publications

### Manuscripts in preparation

Conceptual model of ocean heat uptake and anthropogenic climate change.

A dynamical constraint on the vertical structure of biogeochemical tracers.

Deterministic and stochastic non-normal effects on tropical SST hotspots and associated atmospheric feedbacks.

### Manuscripts published or in press

**Zanna L.**, 2011: Forecast Skill and Predictability of observed Atlantic sea surface temperatures. *In Press, J. of Climate*.

**Zanna L.**, 2011. Ocean Model Uncertainty in Climate Prediction. *ECMWF Proceedings, Workshop on Representing model uncertainty and error in numerical weather and climate prediction models*.

**Zanna L.**, Heimbach, Moore, Tziperman, 2011: Upper Ocean Singular Vectors of the North Atlantic Ocean with Implications for Linear Predictability and Variability. *Q.J.R.M.S.*, DOI: 10.1002/qj.937.

**Zanna L.**, Heimbach, Moore Tziperman, 2011: Optimal excitation of interannual Atlantic meridional overturning circulation variability. *J. of Climate*, **24**, 2, 413427.

**Zanna L.**, Heimbach, Moore, Tziperman, 2010: The role of ocean dynamics in the optimal growth of tropical SST anomalies. *J. Phys. Ocean.*, **40**, 5, 983-1003.

Tziperman, **L. Zanna**, Penland, 2008: Non normal thermohaline circulation dynamics in a coupled ocean-atmosphere GCM. *J. Phys. Ocean.*, **38**, 3, 588-604.

**Zanna L.**, Tziperman, 2008: Optimal surface excitation of the thermohaline circulation. *J. Phys. Ocean.*, **38**, 8, 1820-1830.

**Zanna L.**, Tziperman, 2005: Non normal amplification of the thermohaline circulation. *J. Phys. Ocean.*, **35**, 9, 1593-1605.

### Other publications

**Zanna L.**: Optimal excitation of Atlantic ocean variability and implications for predictability. 2009. PhD thesis, *Harvard University*, 177 pages.

**Zanna L.**: Calculation of Singular and Forcing Vectors Based on the Tangent Linear and Adjoint of a General Circulation Model. *MITgcm Online Manual, In Prep.*

## Meetings & Seminars

### Invited Seminars:

**2012:** NYU.

**2011:** Imperial College; University of Hamburg/Max Planck Institute of Meteorology.

**2010:** University of Reading; University of Oxford; ECMWF.

**2009:** Proudman Oceanographic Laboratory, Liverpool; University of Cambridge; University of East Anglia; National Oceanography Centre, Southampton; University of Oxford; MIT; Columbia University/LDEO; Princeton/GFDL; Tel Aviv University; Hebrew University of Jerusalem; Beer Sheva University, Sde Boker Campus.

**earlier:** Princeton/GFDL (2008); Harvard University (×3: Feb + May 2008, Sep 2007); Boston University (2008).

### Conferences & Workshops, presenter:

**2012:** AGU Ocean Sciences.

**2011:** ECMWF Workshop on Representing Model Uncertainty in Weather and Climate Prediction (**invited**); RAPID/ US AMOC annual meeting; Ocean Modelling (talk); WCRP Denver.

**2010:** AGU Ocean Sciences (talk); RAPID annual meeting (talk); Challenger Conference (talk); CLIVAR Workshop on Decadal Variability, Predictability & Prediction (talk).

**2009:** Ocean Modelling (talk); RAPID annual meeting (talk); EGU *Vienna* (1 **solicited** talk, 1 contributed talk, 1 poster).

**2008:** AGU (talk); ECCO2 Meeting (talk); AGU Ocean Sciences Meeting (poster).

**2004-2007:** EGU 2005; ECCO/CLIVAR Meeting 2006 (talk); AGU, 2004, 2006 & 2007 (posters).

### Summer Schools & Workshops, participant:

Workshops: "Ocean Mesoscale Eddies", Exeter, 2009; "Reducing uncertainty in the prediction of global warming", Jerusalem, 2009; "CLIVAR: Climate Variability", Boston, 2006.

Summer School on "Modern Mathematical Methods in Physical Oceanography (NSF/CMG)", Colorado, 2006.

AMS 15th Conference on "Atmospheric and Oceanic Fluid Dynamics", Cambridge, MA, 2005.

## **Supervision**

**M.Phys/ M.Sc. Students:** Nicholas Gyan Mathias (2011), Brodie Pearson (2011), Shaomin Cai (2012).

**D.Phil/ Ph.D Students:** Ben Bronselaer (2011 - present).

**Postdocs:** Luca Mana (2011 - present), Dan Rowlands (2011 - present).

## **Selected Academic Service**

Reviewer for National Science Foundation, NERC, Journal of Climate, Geophysical Research Letters, Climate Dynamics, Ocean Modelling, Journal of Physical Oceanography and Philosophical Transactions of the Royal Society.

NERC Peer Review College Member, 2011-.

Co-Chair session AGU Ocean Sciences 2012.

Speaker at the Oxford Physics Undergraduate Conference, April 2011.

Organizer of Climate Dynamics & Geochemistry lecture series/journal club, Harvard University, 2003-2006.

Organizer of the Physical Oceanography & Climate Group meetings, University of Oxford, since April 2010.

Governing body, Balliol College, Oxford, 2009-2011.

Executive Committee, Balliol College, Oxford, 2010-2011.

Governing body, St Cross College, Oxford, 2011-.

Member of: American Meteorological Society (since 2004), American Geophysical Union (since 2004), Challenger Society (since 2010).