

# UC San Diego

## International Symposium on Stratified Flows

### Title

VIIIth ISSF Scientific Program

### Permalink

<https://escholarship.org/uc/item/6hn6f21c>

### Journal

International Symposium on Stratified Flows, 1(1)

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### Publication Date

2016-08-29

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# VIII<sup>th</sup> International Symposium on Stratified Flows

August 29 - September 1, 2016 San Diego CA

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Novosibirsk 1972 Trondheim 1980 Pasadena 1987 Grenoble 1994 Vancouver 2000 Perth 2006 Rome 2011

## Scientific Program



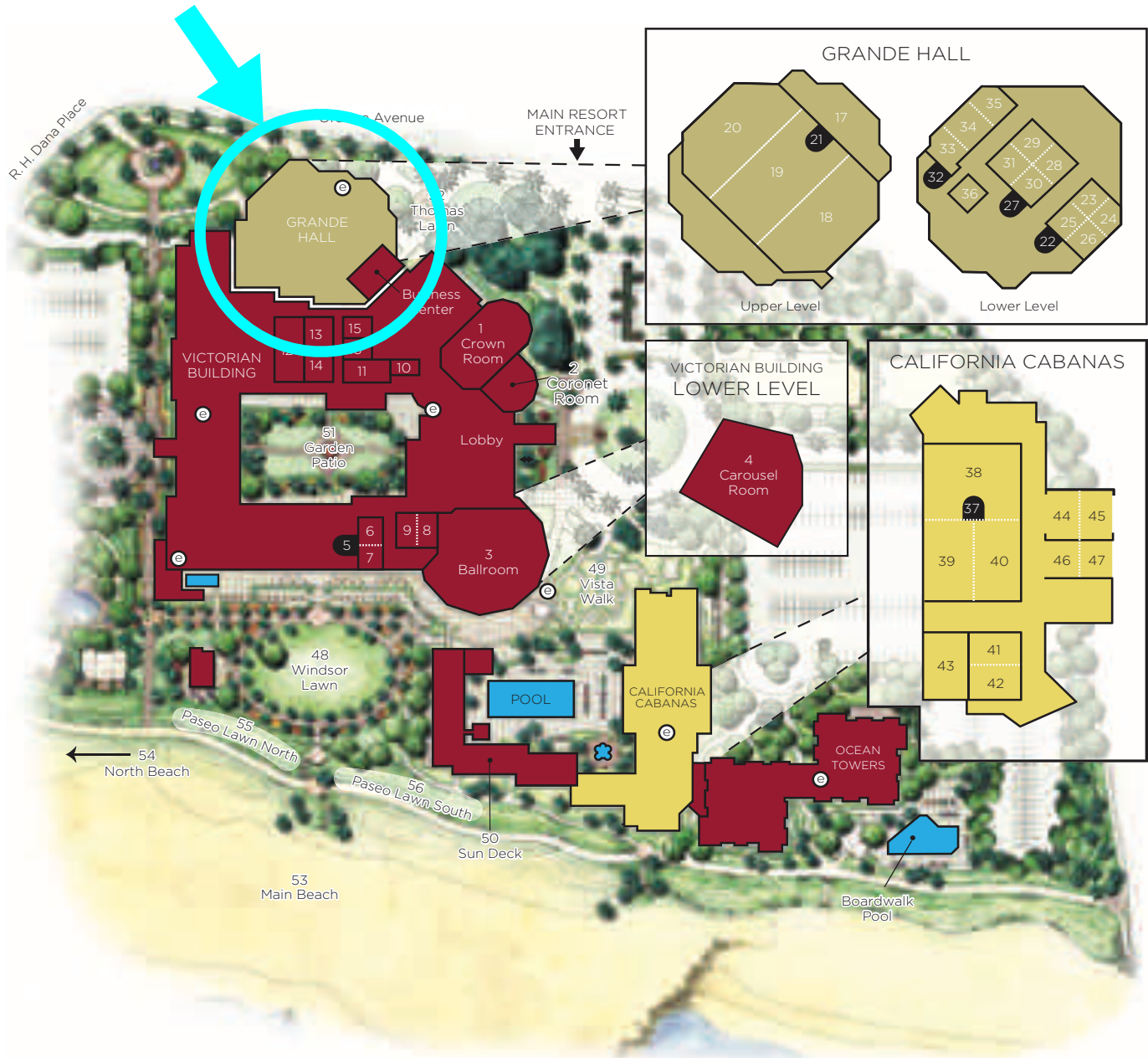
Point Loma Fogbank © Mike Nothum

International Association for Hydro-Environment Engineering and Research

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All Plenary and parallel sessions will be held in Upper Grande Hall. The Banquet will be held in the Crown Room. Box lunches can be eaten in the Garden Patio or, of course, on the beach.

## All scientific sessions held here



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# Scientific program overview

## Monday August 29, 2016

Morning Plenary **H.J.S. Fernando** 9:00 - 10:00 Upper Grande Center  
coffee

**Oceanic Internal Waves** **Emil J. Hopfinger Session** **Geophysical Fluid Dynamics**  
10:20-12:00 UG Left 10:15-12:00 UG Center 10:20-12:00 UG Right

Lunch

**Internal Wave Energy Cascade** **Instabilities in Laboratory Flows** **Stratified Turbulence: Observations**  
1:20-3:00 UG Left 1:20-3:00 UG Center 1:20-3:00 UG Right

coffee

**Generation of Internal Gravity Waves** **Stratified Turbulence in the Lab** **Layered Flows**  
3:20-5:00 UG Left 3:20-5:00 UG Center 3:20-5:00 UG Right

Evening Plenary **Arezoo Ardekani** 5:15-6:15 Upper Grande Center

## Tuesday August 30, 2016

Morning Plenary **Hans van Haren** 9:00 - 10:00 Upper Grande Center  
coffee

**Lab Experiments II** **Paul F. Linden Session** **Stratified Turbulence: Theory**  
10:20-12:00 UG Left 10:15-12:00 UG Center 10:20-12:00 UG Right

Lunch

**Buoyancy Driven Flows** **Double Diffusion** **Instability of Stratified Shear Flow**  
1:20-3:00 UG Left 1:20-3:00 UG Center 1:20-3:00 UG Right

coffee

**Internal Tides** **Convection** **Particle-laden Flows**  
3:20-5:00 UG Left 3:20-5:00 UG Center 3:20-5:00 UG Right

Evening Plenary **Pascale Garaud** 5:15-6:15 Upper Grande Center

## Wednesday August 31, 2016

Morning Plenary **Colm-cille Caulfield** 9:00 - 10:00 Upper Grande Center  
coffee

**Internal Gravity Waves** **James J. Riley Session** **Gravity Currents**  
10:20-12:00 UG Left 10:15-12:00 UG Center 10:20-12:00 UG Right

Lunch

**Simulation of Stratified Turbulence I** **Low-frequency Flow & Topography** **Stability: Theory & Numerics**  
1:20-3:00 UG Left 1:20-3:00 UG Center 1:20-3:00 UG Right

coffee

**Simulation of Stratified Turbulence II** **Stratified Boundary Layers** **Theory**  
3:20-5:00 UG Left 3:20-5:00 UG Center 3:20-5:00 UG Right

**Symposium Banquet** 6:00 - 10:00 Crown Room

## Thursday September 1, 2016

Morning Plenary **Bruce Sutherland** 9:00 - 10:00 Upper Grande Center  
coffee

**Process Studies in the Ocean & Atmosphere** **Larry G. Redekopp Session** **Simulation of Stratified Turbulence III**  
10:20-12:00 UG Left 10:15-12:00 UG Center 10:20-12:00 UG Right

Lunch

**Internal Waves in a Variable Medium** **Lakes and Rivers** **Stratified Wakes & Plumes**  
1:20-3:20 UG Left 1:20-3:20 UG Center 1:20-3:20 UG Right

## Special thanks for support for participation of early-career scientists

Cecil H. and Ida M. Green Foundation for Earth Sciences  
USC Viterbi School of Engineering  
UC San Diego Jacobs School of Engineering  
Scripps Institution of Oceanography Climate, Atmospheric Sciences and Physical Oceanography  
UC Santa Barbara College of Engineering  
U.S. National Science Foundation  
U.S. Army Research Office, Earth Materials and Processes

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# Monday August 29<sup>th</sup>

8:50 - 9:00 Welcoming remarks, Upper Grande Center

9:00 - 10:00 **IAHR Fluid Mechanics Committee Lecture**, Upper Grande Center  
Intraseasonal Dynamics of Equatorial Atmosphere and Oceans  
**H.J.S. Fernando**, University of Notre Dame  
Chair: Kraig Winters

## Coffee Break

**Emil J. Hopfinger Session** Upper Grande Center  
10:15 - 10:20 Introductory remarks, Larry Armi

10:20 - 10:40 Internal hydraulic jumps: Interactions between entraining shear layers and altered conjugate states. **Greg Lawrence**, UBC; Larry Armi, SIO, UCSD

10:40 - 11:00 Dynamics of lock-release gravity currents over sparse and dense rough bottoms  
**Claudia Cenedese**, Woods Hole Oceanographic Institution; Roger Nokes, Univ. of Canterbury; Jason Hyatt, Massachusetts Maritime Academy

11:00 - 11:20 The front condition for gravity currents propagating over rough boundaries.  
**Roger Nokes**, Univ. of Canterbury; Claudia Cenedese, Woods Hole Oceanographic Institution; Megan Ball, Univ. of Canterbury; Tim Williams, Univ. of Canterbury

11:20 - 11:40 Tracking mixing by overturning internal waves. **Philippe Odier**, Yvan Dossmann, Baptiste Bourget, Christophe Brouzet, Sylvain Joubaud, Thierry Dauxois; Laboratoire de Physique, ENS de Lyon, France

11:40 - 12:00 Gyre generation after a typhoon-induced upwelling in a stratified lake.  
Guillaume Auger, Tokyo University of Marine Science and Technology, **John C. Wells**, Ritsumeikan University

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<b>Oceanic Internal Waves</b>	Chair: Thomas Peacock	Upper Grande Left
10:20 - 10:40	Global patterns of internal wave variability from observations of full-depth rotary shear spectra. <b>Amy Waterhouse</b> , SIO; Eric Kunze, NWRA; Jennifer MacKinnon, SIO; Harper Simmons, U. of Alaska Fairbanks; Rob Pinkel, SIO, Maxim Nikurashin, University of Tasmania	
10:40 - 11:00	Variability of the internal wave continuum: study of 2500 worldwide seasonal to inter-annual time series. <b>Arnaud Le Boyer</b> , Matthew Alford; SIO, UCSD	
11:00 - 11:20	Interactions between surface gravity wave groups and deep stratification in the ocean. <b>Sean Haney</b> , William Young, SIO, UCSD	
11:20 - 11:40	Propagation of near-inertial waves beneath atmospheric storm tracks on the non-traditional $\beta$ -plane. Marine Tort, <b>Kraig Winters</b> ; SIO, UCSD	
11:40 - 12:00	Near-inertial wave transmission in the Arctic Ocean. <b>Thomas Peacock</b> , MIT; Sasan Ghaemsaïdi, MIT; Hayley Dossier; Yale University Luc Rainville; University of Washington	
<b>Geophysical Fluid Dynamics</b>	Chair: Andy Hogg	Upper Grande Right
10:20 - 10:40	Influence of forced near-inertial motion on the kinetic energy of a nearly-geostrophic flow. <b>Stephane Taylor</b> , David Straub; McGill University	
10:40 - 11:00	Laboratory modelling of momentum transport by internal gravity waves and eddies in the Antarctic circumpolar current. <b>Joel Sommeria</b> , Adekunle-Opeoluwa Ajayi, Keshav J. Raja, Chantal Staquet, Samuel Viboud, Bruno Voisin; LEGI, CNRS, Université Grenoble Alpes, France	
11:00 - 11:20	Interacting SQG vortices and passive scalar transport. <b>Stefan Llewellyn Smith</b> , Cecily Taylor; MAE, UCSD	
11:20 - 11:40	Boussinesq dynamics of an idealized tropopause. <b>Olivier Asselin</b> , Peter Bartello, David Straub; McGill University	
11:40 - 12:00	Buoyancy-driven gyres in the midlatitude ocean. <b>Andy Hogg</b> , Bishakhdatta Gayen; The Australian National University	

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**Instabilities in Laboratory Flows**

Chair: Patrice Le Gal

Upper Grande Center

- 1:20 - 1:40 Experimental study of flow instabilities in a rotating annulus with local convective forcing. H el ene Scolan, **Peter Read**; University of Oxford
- 1:40 - 2:00 Layer formation in stratified Taylor-Couette flow. **Jamie Partridge**, Univ. of Cambridge; Colin Leclercq, Univ. of Bristol ; Colm-cille Caulfield, Univ. of Cambridge & BP Institute; Stuart Dalziel, Univ. of Cambridge
- 2:00 - 2:20 Shear instabilities in a tilting tube. **Edmund Tedford**, University of British Columbia; Jeffrey Carpenter, Helmholtz Zentrum Geesthacht; Gregory Lawrence, The University of British Columbia
- 2:20 - 2:40 The Barostrat instability: the baroclinic instability in a rotating stratified fluid. **Patrice Le Gal**, IRPHE, CNRS - Aix Marseille University, Centrale Marseille; Miklos Vincze, MTA-ELTE Theoretical Physics Research Group; Ion Borcia, Uwe Harlander; Brandenburgische Technische Universit at Cottbus-Senftenberg

**Internal Wave Energy Cascade**

Chair: Kurt Polzin

Upper Grande Left

- 1:20 - 1:40 Three-dimensional instability of internal gravity wave beams. Takeshi Kataoka, Kobe University **Triantaphyllos Akylas**, MIT
- 1:40 - 2:00 Damping of 3D internal wave attractors by lateral walls. **Felix Beckebanze**, Utrecht University; Leo Maas, NIOZ, Utrecht University
- 2:00 - 2:20 Energy cascade in internal wave attractors. **Thierry Dauxois**, ENS de Lyon, CNRS; Christophe Brouzet, ENS de Lyon, Evgeny Ermanyuk, Lavrentyev Institute of Hydrodynamics; Sylvain Joubaud, H el ene Scolan, ENS de Lyon; Ilias Sibgatullin, Moscow State University
- 2:20 - 2:40 A space-time approach to wave turbulence. **Kurt Polzin**, Woods Hole Oceanographic Institution; Yuri Lvov, Rensselaer Polytechnic Institute

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**Stratified Turbulence: Observations**                      Chair: Rocky Geyer                      Upper Grande Right

- 1:20 - 1:40            Direct measurements of flux Richardson number in the nearshore coastal ocean. **Jeffrey Koseff**, Stanford University; Ryan Walter, Cal Poly San Luis Obispo; Jamie Dunckley, EPRI; Michael Squibb, Stanford University; Brock Woodson, University of Georgia; Geno Pawlak, UC San Diego, Stephen G. Monismith; Stanford University
- 1:40 - 2:00            Anatomy of a turbulent patch in a large shallow lake. **Leon Boegman**, Civil Engineering, Queen's University; Damien Bouffard, EPFL, Lausanne
- 2:00 - 2:20            Mixing in stratified-shear flows forced by internal waves. **Cynthia Bluteau**, Nicole Jones, Gregory Ivey, University of Western Australia
- 2:20 - 2:40            Tidal mixing, scattering, and reflection on the East Tasman slope. **Robert Pinkel**, SIO, UCSD
- 2:40 - 3:00            Shear instability at marginally subcritical Ri. **Rocky Geyer**, Woods Hole Oceanographic Institution

**Coffee Break**

**Stratified Turbulence in the Lab**                      Chair: Olivier Eiff                      Upper Grande Center

- 3:20 - 3:40            First report of the Milestone experiment: strongly stratified turbulence and mixing efficiency in the Coriolis platform. **Antoine Campagne**, LEGI; Henrik Alfredsson, KTH; Remi Chassagne, LEGI; Diane Micard, Ecole Centrale Lyon; Nicolas Mordant, LEGI, Antonio Segalini, KTH ; Joel Sommeria, Samuel Viboud, LEGI; Ashwin Vishnu Mohanan, Erik Lindborg, KTH; Pierre Augier, LEGI
- 3:40 - 4:00            Three-dimensional, time-resolved velocity and density measurements of the stratified shear flow in an inclined duct. **Adrien Lefauve**, Jamie L. Partridge, Stuart B. Dalziel, P. F. Linden; DAMTP, University of Cambridge
- 4:00 - 4:20            Mixing efficiency in a lock exchange experiment. **Diane Micard**, LMFA, CNRS, Université de Lyon; Yvan Dossmann, ENS Lyon; Louis Gostiaux, LMFA, CNRS, Université de Lyon; Antoine Venaille, ENS Lyon
- 4:20 - 4:40            High Reynolds number stratified wakes. **Alan Brandt**, Kenneth Kalumuck; Johns Hopkins University Applied Physics Laboratory
- 4:40 - 5:00            Decaying stratified grid turbulence measurements. **Olivier Eiff**, Karlsruhe Inst. of Technology Adrien Thacker, Université de Toulouse, CNRS-INPT-UPS



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**Generation of Internal Gravity Waves**                      Chair: Peter Baines                      Upper Grande Left

- 3:20 - 3:40                      SOMAR-LES for multiscale modeling of internal tide generation. **Vamsi Chalamalla**, UNC Chapel Hill; Edward Santilli, Philadelphia University; Alberto Scotti, UNC Chapel Hill; Sutanu Sarkar, UCSD
- 3:40 - 4:00                      Oceanic internal gravity waves radiated after a cyclonic surface stress disturbance. **Georg Sebastian Voelker**, University of Bremen; Paul G. Myers, Bruce R. Sutherland, University of Alberta; Maren Walter, University of Bremen
- 4:00 - 4:20                      Soliton-like internal waves on a shelf: processes of their generation. **Andrey Serebryany**, P.P. Shirshov Institute of Oceanology RAS, Space Research Institute RAS, Andreyev Acoustics Institute
- 4:20 - 4:40                      Basin mode internal tides. **Jennifer Thomas** & Jim Lerczak, Oregon State University, CEOAS; Clint Winant & Kraig Winters, Scripps Institution of Oceanography, UCSD
- 4:40 - 5:00                      The generation of internal waves by explosive volcanic eruptions. **Peter Baines**, Dept. of Infrastructure Engineering, University of Melbourne

**Layered Flows**    Chair: Larry Pratt    Upper Grande Right

- 3:20 - 3:40                      Internal hydraulic jumps with upstream shear and topography. **Kelly Ogden**, MIT & Woods Hole Oceanographic Institution; Karl Helfrich, Woods Hole Oceanographic Institution
- 3:40 - 4:00                      Experimental study on dynamical blocking conditions of net exchange flows. **Janek Laanearu**, Tallinn University of Technology; Alan Cuthbertson, Heriot Watt University; Magda Carr, University of St Andrews; Joel Sommeria, LEGI, Grenoble; Madis-Jaak Lilover, Tallinn University of Technology; Samuel Viboud, LEGI, Grenoble; Jarle Brentsen, University of Bergen
- 4:00 - 4:20                      Extended fully-nonlinear and strongly-dispersive internal wave equations in a three-layer system. **Keisuke Nakayama**, Kobe Univ.; Kenji Shimizu, CSIRO
- 4:20 - 4:40                      Ageostrophic instability and mixing in a dense overflow. **Larry Pratt**, Woods Hole Oceanographic Inst.; Stefan Llewellyn Smith, MAE, UCSD; Karl Helfrich, Woods Hole Oceanographic Institution

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5:15 - 6:15

**Evening Plenary Session**

Upper Grande Center

Vertical transport of particles, drops, and microorganisms in density-stratified fluids

**Arezoo Ardekani**, Purdue University

Chair: Eckart Meiburg

**7:16 Sunset on Coronado Island**



Christmas 2012 Sunset © Mike Nothum

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# Tuesday August 30<sup>th</sup>

9:00 - 10:00 **Morning Plenary Session**, Upper Grande Center  
High-resolution observations of internal wave induced turbulence in the deep ocean  
**Hans van Haren**, Royal Netherlands Institute for Sea Research & Utrecht University  
Chair: Thierry Dauxois

## Coffee Break

**Paul F. Linden Session** Upper Grande Center  
10:15 - 10:20 Introductory remarks, Colm-cille Caulfield

10:20 - 10:40 Buoyant convection from a discrete source in closed and leaky porous media.  
**Morris Flynn**, Mark Roes, Chunendra Sahu; Univ. of Alberta; Diogo Bolster,  
University of Notre Dame

10:40 - 11:00 A study of a model for the generation of internal waves by a moving body and  
its turbulent wake. **James Rottman**, Laura Brandt, Devin Conroy, Leidos, Inc.

11:00 - 11:20 Dynamics of plumes driven by localized heating in a stably stratified ambient.  
**Juan Lopez**, Arizona State University; Francisco Marques, Universitat  
Politecnica de Catalunya

11:20 - 11:40 Three-dimensional visualization of the interaction between a vortex ring and a  
stratified interface: the evolution of the density field. **Jason Olsthoorn**, Stuart  
Dalziel, DAMTP, University of Cambridge

11:40 - 12:00 The significance of engulfment in the process of turbulent entrainment by  
plumes. Henry Burridge, David Parker, Emily Kruger, Jamie Partridge, **Paul  
Linden**, DAMTP, University of Cambridge

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**Lab Experiments**

Chair: Alberto de la Fuente

Upper Grande Left

- 10:20 - 10:40 A filtering approach for analyzing turbulent stratified shear flows. **Robert Ecke**, Los Alamos National Laboratory; Philippe Odier, ENS de Lyon
- 10:40 - 11:00 High Stokes number wave focusing by a circular ridge: Internal, inertial and inertia-gravity waves. Natalia Shmakova, Jan-Bert Flor, Bruno Voisin, **Joel Sommeria** and Samuel Viboud; LEGI, CNRS-Universite Grenoble Alpes
- 11:00 - 11:20 Measurements of fluid transport by controllable vertical migrations of plankton. **Isabel Houghton** & John Dabiri, Stanford University
- 11:20 - 11:40 An affordable, open-source, microscale conductivity and temperature probe for density measurements in stratified flows. **Paolo Luzzatto-Fegiz**, UC Santa Barbara; Marco Carminati, Valerio Stefanelli; Politecnico di Milano
- 11:40 - 12:00 Laboratory study on periodic heat exchanges between water and sediment in extremely shallow flows. Salvador López, **Alberto de la Fuente**, Universidad de Chile; Francisco Suárez, Pontificia Universidad Católica de Chile, Carolina Meruane, Modelación Ambiental SpA; Ingeniería Civil, Universidad de Chile

**Stratified Turbulence: Theory**

Chair: Antoine Venaille

Upper Grande Right

- 10:20 - 10:40 Reduced modeling of strongly stratified turbulence. **Greg Chini**, University of New Hampshire
- 10:40 - 11:00 On the mixing efficiency in stably stratified turbulence. **Karan Venayagamoorthy**, Colorado State University; Jeffrey Koseff, Stanford
- 11:00 - 11:20 Isolating turbulent spots in stratified plane-Couette flow. **John Taylor**, Enrico Deusebio & Colm Caulfield; University of Cambridge, Rich Kerswell, University of Bristol
- 11:20 - 11:40 Mixing efficiency in stratified turbulence. **Andrea Maffioli**, Geert Brethouwer & Erik Lindborg, KTH Royal Institute of Technology, Stockholm
- 11:40 - 12:00 A statistical theory of mixing in stratified fluids. **Antoine Venaille**, ENS Lyon, Louis Gostiaux, Ecole Centrale Lyon, Joel Sommeria, LEGI, CNRS

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<b>Double Diffusion</b>	Chair: Rich Pawlowicz	Upper Grande Center
1:20 - 1:40	Salt-fingering convection in the small diffusivity ratio limit. <b>Jin-Han Xie</b> , UC Berkeley; Benjamin Miquel, U. Colo. Boulder; Edgar Knobloch, UC Berkeley; Keith Julien, U. Colo. Boulder	
1:40 - 2:00	Double-diffusive sedimentation. Peter Burns, <b>Eckart Meiburg</b> ; University of California Santa Barbara	
2:00 - 2:20	Double-diffusive lock-exchange gravity currents. <b>Nathan Konopliv</b> , Eckart Meiburg, University of California Santa Barbara	
2:20 - 2:40	Fingering convection in double-diffusive, sediment-laden flows. <b>Ahmad Alsinan</b> , Nathan Konopliv, Eckart Meiburg, UC Santa Barbara; Pascale Garaud, UC Santa Cruz	
2:40 - 3:00	Spatial and temporal characteristics of double-diffusive layering in relic seawater. <b>Rich Pawlowicz</b> , Artem Zaloga, Roger Pieters; U. of British Columbia	
<b>Buoyancy-Driven Flows</b>	Chair: Hugo Ulloa	Upper Grande Left
1:20 - 1:40	Entrainment in stratified environments — an interface-based approach. <b>Dominik Krug</b> , Ivan Marusic, University of Melbourne, Holzner Markus, ETH Zurich, Maarten van Reeuwijk, Imperial College London	
1:40 - 2:00	Global stability and flow transition in horizontal convection. <b>Pierre-Yves Passaggia</b> , Alberto Scotti, Brian White, UNC Chapel Hill	
2:00 - 2:20	Surface salinity response to transient river discharges in a NZ ROFI system. <b>Joe O'Callaghan</b> , Craig Stevens, NIWA	
2:20 - 2:40	Tidal effects in a realistic model of a thermally buoyant plume north of Pt. Conception. <b>Sutara Suanda</b> , Nirnimesh Kumar, SIO; Emanuele Di Lorenzo, Georgia Institute of Technology, Arthur Miller, SIO; Kevin Haas, Georgia Institute of Technology, Falk Feddersen, SIO	
2:40 - 3:00	High variability in cross-shore thermally driven exchange. <b>Hugo Ulloa</b> , MAE, UCSD; Kristen Davis, UC Irvine; Geno Pawlak, MAE, UCSD; Stephen Monismith, Stanford University	

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**Instability of Stratified Shear Flow**                      Chair: Jeff Carpenter                      Upper Grande Right

- 1:20 - 1:40      Stability of stratified downslope flows with an overlying isolating layer. **Arjun Jagannathan**, Kraig Winters, Laurence Armi; SIO, UCSD
- 1:40 - 2:00      Prandtl number effects on mixing in Kelvin-Helmholtz billows. **Mona Rahmani**, Brian Seymour, Gregory Lawrence; University of British Columbia
- 2:00 - 2:20      Stability and mixing of shear layers forced by standing internal waves. **Alexis Kaminski**, John Taylor; DAMTP, University of Cambridge
- 2:20 - 2:40      The effect of vortex pairing and Prandtl number on mixing in moderate Reynolds number stratified flows. **Wenjing Dong**, Mona Rahmani, Gregory Lawrence; The University of British Columbia
- 2:40 - 3:00      Understanding critical layers in stratified shear flow instabilities: A wave interaction perspective. **Jeff Carpenter**, Helmholtz Zentrum; Anirban Guha, Indian Institute of Technology Kanpur; Eyal Heifetz, Tel Aviv University

**Coffee Break**

**Convection**    Chair: Bishakhdatta Gayen    Upper Grande Center

- 3:20 - 3:40      Effects of solar radiation on convective plumes and internal waves in ice covered lakes. **Damien Bouffard**, EPFL; Roman Zdrovennov & Galina Zdrovennova,RAS; Arkady Terzhevik, RAS; Alfred Wüest, EPFL & EAWAG
- 3:40 - 4:00      The interaction of convection & internal waves: A natural co-dimension-three dynamics. **Larry Redekopp**, Hang Song, Univ. of Southern California
- 4:00 - 4:20      Internal wave excitation by turbulent convection. **Daniel Lecoanet**, UC Berkeley; Michael Le Bars, IRPHE; Keaton Burns, MIT; Eliot Quataert, UC Berkeley; Geoffrey Vasil, Univ. of Sydney; Benjamin Brown, Univ. of Colorado; J. S. Oishi, Farmingdale State College
- 4:20 - 4:40      Convection in rotating flows with simultaneous imposition of radial and vertical temperature gradients. Ayan Kumar Banerjee, **Sridhar Balasubramanian**, Amitabh Bhattacharya; IIT Bombay
- 4:40 - 5:00      Effects of stratification on the dissolution of a vertical ice-face: effect of Rayleigh number. **Bishakhdatta Gayen**, Mainak Mondal, Ross W. Griffiths; ANU

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**Internal Tides**                                      Chair: Scott Wunsch                                      Upper Grande Left

3:20 - 3:40      Modeling internal solitary wave development at the head of a submarine canyon. **Timothy Duda**, Weifeng Zhang, Karl Helfrich, Ying-Tsong Lin, Arthur Newhall; Woods Hole Oceanographic Institution

3:40 - 4:00      The demise of semidiurnal internal tides in the Equatorial Pacific: incoherence or dissipation? **Maarten Buijsman**, Univ. of Southern Mississippi; Brian Arbic, Univ. of Michigan; James Richman, Luis Zamudio, Florida State University

4:00 - 4:20      A process study of tidal mixing over rough topography. **Young (Paul) Yi**, Sonya Legg, Robert Nazarian; Princeton University

4:20 - 4:40      On the baroclinic response of supercritical topography to an oscillating tide: LES results. **Masoud Jalali**, Sutanu Sarkar; University of California, San Diego

4:40 - 5:00      Internal tide energy transfer by nonlinear refraction. **Scott Wunsch**, Theo Drivas; The Johns Hopkins University

**Particle-laden Flows**                                      Chair: Bernhard Vowinckel                                      Upper Grande Right

3:20 - 3:40      Particle transport due to trapped cores. Gonçalo T. C. Gil, **Oliver Fringer**; Stanford University

3:40 - 4:00      High-resolution simulations of down-slope turbidity currents into a stratified saline ambient. **Raphael Ouillon**, Senthil Radhakrishnan, Eckart Meiburg; UC Santa Barbara; Bruce Sutherland, University of Alberta

4:00 - 4:20      Experiments on gravity currents. **Andrew Woods**, Diana Sher, Pond Samasiri, Nicola Mingotti; BP Institute, University of Cambridge

4:20 - 4:40      Comparison of averaging methods for interface conductivities in one-dimensional unsaturated flow in layered soils. Ruowen Liu, **Bruno Welfert**, Sandra Houston; Arizona State University

4:40 - 5:00      Phase-resolved simulations of sediment erosion due to unsteady pressure drag. **Bernhard Vowinckel**, Edward Biegert, Eckart Meiburg; UC Santa Barbara

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5:15 - 6:15

**Evening Plenary Session**

Upper Grande Center

Stratified shear instabilities at low Peclet numbers

**Pascale Garaud**, Applied Mathematics and Statistics, UC Santa Cruz

Chair: Geno Pawlak

**7:15 Sunset on Coronado Island**



Sunset Over Point Loma © Mike Nothum



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# Wednesday August 31<sup>st</sup>

9:00 - 10:00 **Morning Plenary Session**, Upper Grande Center  
Making a LIST and checking it twice: Length scales of Instabilities and Stratified Turbulence  
**Colm-cille Caulfield**, T. S. Eaves; BP Institute, DAMTP, University of Cambridge  
Chair: Alberto Scotti

## Coffee Break

**James J. Riley Session** Upper Grande Center  
10:15 - 10:20 Introductory remarks, M-Pascale Lelong

10:20 - 10:40 The elephant in the room: how to define a rotation-aware Available Energy.  
**Alberto Scotti**, Pierre Yves Passaggia; Marine Sciences, UNC Chapel Hill

10:40 - 11:00 Atmospheric boundary layer dynamics in an Alpine valley during persistent temperature inversions. **Chantal Staquet**, LEGI, Université Grenoble Alpes, Gabriele Arduini, University of Hertfordshire, UK & LEGI, Charles Chemel, University of Hertfordshire

11:00 - 11:20 Tidal bores, turbulence and mixing above deep-ocean slopes. **Kraig Winters**, Scripps Institution of Oceanography, UCSD

11:20 - 11:40 Toward Direct Numerical Simulations of the stratified turbulence inertial range. Steve de Bruyn Kops, Univ. of Massachusetts Amherst; James J. Riley, Univ. of Washington; **G. D. Portwood**, Univ. of Massachusetts Amherst

11:40 - 12:00 Lateral stirring in the ocean on scales of .1-10km: the role of internal waves. **M.-Pascale Lelong**, Jeffrey Early, Eric Kunze, NorthWest Research Associates

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<b>Internal Gravity Waves</b>	Chair: Jenny Thomas	Upper Grande Left
10:20 - 10:40	Non-linear internal waves pulse cold water into the shallow inner-shelf and surfzone. <b>Gregory Sinnett</b> , Falk Feddersen, Andrew Lucas, Eugene Pawlak, Eric Terrill, Scripps Institution of Oceanography, UCSD	
10:40 - 11:00	The influence of a shoaling internal gravity wave on a dense gravity current. <b>Charlie Hogg</b> , Valerie Pietrasz, Caltech; Galen Egan, Stanford University; Nicholas Ouellette, Jeffrey Koseff, Stanford University	
11:00 - 11:20	Nonlinear interactions of two incident internal waves. <b>Tom Dobra &amp;</b> Andrew Lawrie, University of Bristol, Stuart Dalziel, University of Cambridge	
11:20 - 11:40	Transmission of internal waves generated by a localized surface forcing. <b>Rohit Supekar</b> , Thomas Peacock; Massachusetts Institute of Technology	
11:40 - 12:00	Scattering and trapping of obliquely incident, low-mode internal tides off a continental shelf and slope. <b>James Lerczak</b> , Oregon State University	
<b>Gravity Currents</b>	Chair: Mohamad Nasr-Azadani	Upper Grande Right
10:20 - 10:40	Intrusive gravity currents propagating into two-layer stratified ambients: Vorticity modeling. <b>Mohammad Amin Khodkar</b> , Mohamad Nasr-Azadani, Eckart Meiburg; University of California, Santa Barbara	
10:40 - 11:00	On a slippery slope. <b>Maarten van Reeuwijk</b> , Imperial College London; Markus Holzner, ETH Zurich; Colm-cille Caulfield, University of Cambridge; Harm Jonker, Delft University of Technology	
11:00 - 11:20	On gravity currents over changing topography. Eletta Negretti, Jan-Bert Flor, <b>Emil Hopfinger</b> ; LEGI, CNRS UMR	
11:20 - 11:40	Mixing efficiency in a run-down gravity current. <b>Graham Hughes</b> , Imperial College London, Paul Linden; University of Cambridge	
11:40 - 12:00	Vorticity-based modeling of gravity currents penetrating into ambients with arbitrary shear and density stratification. <b>Mohamad Nasr-Azadani</b> , Eckart Meiburg; University of California at Santa Barbara	

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<b>Low-frequency Flow &amp; Topography</b>	Chair: Trevor McDougall	Upper Grande Center
1:20 - 1:40	A new theory for downslope windstorms and trapped mountain waves. <b>Francois Lott</b> , Laboratoire de Meteorologie Dynamique, ENS, Paris	
1:40 - 2:00	The momentum balance of steady flow past an island. <b>Ruth Musgrave</b> , Tom Peacock; Massachusetts Institute of Technology	
2:00 - 2:20	Observations of high-frequency internal waves and strong turbulent dissipation rates generated by a constriction between two coral atolls. <b>Matt Rayson</b> , Cynthia Bluteau, Greg Ivey, Nicole Jones; University of Western Australia	
2:20 - 2:40	Fortnightly modulation of deep mixing inside a Mid-Ocean Ridge fracture zone in the Brazil Basin. <b>Louis Clement</b> , Andreas Thurnherr; Lamont-Doherty Earth Observatory, Columbia University	
2:40 - 3:00	The bottom-intensification of mixing causes large abyssal upwelling and downwelling. <b>Trevor McDougall</b> , University of New South Wales; Raf Ferrari, Department of Earth Atmosphere and Planetary Science, MIT	
<b>Simulation of Stratified Turbulence I</b>	Chair: Joe Werne	Upper Grande Left
1:20 - 1:40	Orientation of vortical structures in turbulent stratified shear flow. <b>Frank Jacobitz</b> , Adam Moreau; University of San Diego	
1:40 - 2:00	Turbulent mixing in a marginally-unstable stratified shear layer. <b>Hieu Pham</b> , Sutanu Sarkar; Mechanical and Aerospace Engineering, UCSD; William D. Smyth, James N. Moum; Oregon State University	
2:00 - 2:20	Energetics aspects in Direct Numerical Simulations of a turbulent stratified flow: irreversible mixing. <b>Ernesto Horne</b> , Ecole Centrale de Lyon, Universite de Lyon; Alexandre Delache, Univ Lyon, UJM-Saint-Etienne, LMFA; Louis Gostiaux, LMFA, CNRS, Ecole Centrale de Lyon, Universite de Lyon	
2:20 - 2:40	Instability, evolution, and mixing in stratified shear flow as a function of Richardson number. <b>Joseph Werne</b> , NorthWest Research Associates, Bjørn Pettersson-Reif, Forsvarets forskningsinstitutt (FFI), Norway	

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<b>Stability: Theory &amp; Numerics</b>	Chair: Kevin Chen	Upper Grande Right
1:20 - 1:40	Coherent structures in stably stratified plane Couette flow. <b>Daniel Olvera</b> , Rich Kerswell; University of Bristol	
1:40 - 2:00	Taylor-Caulfield instabilities in a layered stratified shear flow. <b>Giordano Ponetti</b> , Università di Catania; Neil Balmforth, University of British Columbia	
2:00 - 2:20	Stability and nonlinear dynamics of a settling fresh water particle laden fluid below a salt water layer. <b>Cristian Reyes</b> , Christian Ihle, Cristóbal Arratia; Univ. de Chile	
2:20 - 2:40	Surprising behaviour in the large-wavelength approximation of turbulent flow past a wavy bottom. <b>Paolo Luchini</b> , Università di Salerno	
2:40 - 3:00	The sensitivity of stratified flow stability to base flow modifications. <b>Kevin Chen</b> , Geoffrey Spedding; University of Southern California	

### Coffee Break

<b>Stratified Boundary Layers</b>	Chair: Craig Stevens	Upper Grande Center
3:20 - 3:40	Temperature fronts and vortical structures in turbulent stably stratified atmospheric boundary layers. <b>Peter Sullivan</b> , NCAR; Peter C. Weil, Edward G. Patton, Harmen J. J. Jonker, Dmitrii V. Mironov	
3:40 - 4:00	Observations and processes of persistent near-bottom offshore flow at the shelfbreak off South Carolina, USA. <b>Harvey Seim</b> , UNC Chapel Hill; Catherine Edwards, Skidaway Institute of Oceanography, Univ. of Georgia; Steve Lockhart; University of North Carolina at Chapel Hill	
4:00 - 4:20	On the synergy between numerics and subgrid scale modeling in LES of stratified flows: Grid convergence of a stratocumulus-topped boundary layer. <b>Georgios Matheou</b> , JPL, Caltech; Daniel Chung, Univ. of Melbourne; Joao Teixeira, JPL, Caltech	
4:20 - 4:40	Quantification of highly unsteady and inhomogeneous stratified turbulence in breaking internal waves on slopes. <b>Robert Arthur</b> , UC Berkeley; Karan Venayagamoorthy, Colorado State University; Jeffrey Koseff, Oliver Fringer, Stanford University	
4:40 - 5:00	Thorpe scales in the "Largest" Oceanic Reynolds number flow (but still stratified) on the planet. <b>Craig Stevens</b> , National Institute for Water and Atmospheric Research and University of Auckland	

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**Simulation of Stratified Turbulence II**

Chair: Peter Diamessis

Upper Grande Left

- 3:20 - 3:40 A numerical study of axisymmetric flow regimes in a rotating annulus with local convective forcing. **Peter Read**, Susan Wright, Oxford; Sylvie Su, ENS, Lyon; H el ene Scolan, Roland Young; Oxford
- 3:40 - 4:00 Turbulence, mixing and Prandtl number effects in stratified plane Couette flows. **Qi Zhou**, John Taylor, Colm-cille Caulfield; University of Cambridge
- 4:00 - 4:20 Temperature front formation in stably stratified turbulence. **Yoshifumi Kimura**, Nagoya University; Peter Sullivan, Jackson Herring; NCAR
- 4:20 - 4:40 Dynamics of flow over a sphere at  $Re=3700$  in moderate to highly stratified environments. **Anikesh Pal**, Karu Chongsiripinyo, Sutanu Sarkar; MAE, University of California San Diego
- 4:40 - 5:00 Reynolds number effects in stratified turbulent wakes. **Peter Diamessis**, Cornell University; Qi Zhou, University of Cambridge

**Theory**

Chair: Vladimir Zeitlin

Upper Grande Right

- 3:20 - 3:40 Radiation of internal waves by symmetrically unstable fronts. **Nicolas Grisouard**, Univ. of Toronto; Morgan B. Fox, Queen's University, Univ. of Toronto; Japinder Nijjer, DAMTP, University of Cambridge
- 3:40 - 4:00 Internal wave focusing by annular forcing. **Bruno Voisin**, LEGI, CNRS, Universit e Grenoble Alpes
- 4:00 - 4:20 Thermohaline layering in dynamically and diffusively stable shear flows. **Timour Radko**, Naval Postgraduate School
- 4:20 - 4:40 Spectral link for the mean velocity profile in the atmospheric boundary layer. **Dongrong Zhang**, Gustavo Gioia, Pinaki Chakraborty, Okinawa Institute of Science and Technology Graduate University
- 4:40 - 5:00 Understanding inertial instability on the  $f$ -plane with complete Coriolis force. **Vladimir Zeitlin**, Laboratory of Dynamical Meteorology, Ecole Normale Sup erieure and University P. and M. Curie

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## 7:14 Sunset on Coronado Island



Sunset Squall © Mike Nothum

## 6:00 - 10:00 Reception and Banquet Del Coronado Crown Room



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# Thursday September 1<sup>st</sup>

9:00 - 10:00

**Morning Plenary Session**, Upper Grande Center  
Flows induced by 1D, 2D and 3D internal gravity wavepackets  
**Bruce Sutherland**, University of Alberta and Ton S. van den Bremer, U. of Edinburgh  
Chair: Triantaphyllos Akylas

## Coffee Break

**Larry G. Redekopp Session**

Upper Grande Center

10:15 - 10:20

Introductory remarks, Geoffrey Spedding

10:20 - 10:40

Transient and global instabilities of internal solitary waves. Pierre-Yves Passigga, UNC Chapel Hill ; **Karl Helfrich**, Woods Hole Oceanographic Institution; Brian White; UNC Chapel Hill

10:40 - 11:00

Large eddy simulations of turbulence under internal solitary waves of depression. Takahiro Sakai, University of Southern California; **Peter Diamessis**, Cornell; Gustaaf Jacobs, San Diego State University

11:00 - 11:20

Internal solitary wave-induced bed failure in a stratified water column. **Gustavo Rivera-Rosario**, Peter Diamessis, James Jenkins; Cornell

11:20 - 11:40

Mode-2 internal solitary wave velocity fields and the effects of shear. **Kenneth Kalumuck**, Alan Brandt; The Johns Hopkins University APL

11:40 - 12:00

Oblique nonlinear interaction of internal solitary-like waves in the Andaman Sea. **Kenji Shimizu**, CSIRO; Keisuke Nakamaya, Kobe University

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- Process Studies in the Ocean & Atmosphere**      Chair: Ruth Musgrave      Upper Grande Left
- 10:20 - 10:40      The dissolution of polar ice into a stratified ocean. **Craig McConnochie**, Ross Kerr; RSES, The Australian National University
- 10:40 - 11:00      Turbulent dissipation rates, mixing, and heat fluxes in the Canadian Arctic from glider-based microstructure measurements. **Benjamin Scheifele**, Stephanie Waterman, University of British Columbia; Jeff Carpenter, Helmholtz-Zentrum Geesthacht
- 11:00 - 11:20      The dynamics of submesoscale eddies in the coastal ocean. **Burkard Baschek**, Ingrid Angel Benavides, Ryan Peter North; Helmholtz-Zentrum Geesthacht, Dave Miller, Geoffrey Smith; NRL, Jeffrey Carpenter, Helmholtz-Zentrum
- 11:20 - 11:40      On the control of buoyancy-driven devices in stratified, uncertain flowfields. **Gianluca Meneghello**, Flow Control Lab, UCSD; Paolo Luchini, DIMEC, Universit`a di Salerno; Thomas Bewley, Flow Control Lab, UCSD
- 11:40 - 12:00      Mode-2 internal waves: observations in the non-tidal sea. **Elizaveta Khimchenko**, Andrey Serebryany; P. P. Shirshov Institute of Oceanology RAS
- Simulation of Stratified Turbulence III**      Chair: Bill Smyth      Upper Grande Right
- 10:20 - 10:40      A multiscale point of view on the dynamics of stably stratified turbulence associated with geostrophic modes: simulations and model. **Fabien Godeferd**, LMFA, CNRS, Université de Lyon; Alexandre Delache, LMFA, Université Jean Monnet Saint-Étienne; Louis Gostiaux, Claude Cambon, LMFA, CNRS, Université de Lyon
- 10:40 - 11:00      Acceleration-driven variable-density turbulent flow. **Iana Gat**, Caltech; Georgios Matheou, JPL, Caltech; Daniel Chung, U. Melbourne; Paul Dimotakis, Applied Physics, Caltech
- 11:00 - 11:20      Turbulent mixing in strongly stratified shear flows. **Hesam Salehipour**, W. Richard Peltier, Univ. of Toronto; Colm-cille Caulfield, Univ. of Cambridge
- 11:20 - 11:40      Pulsating stratified turbulence in the upper equatorial oceans. **Bill Smyth**, Oregon State; Hieu Pham, UCSD; Jim Moum, Oregon State; Sutanu Sarkar, UCSD



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**Lakes and Rivers**

Chair: Leon Boegman

Upper Grande Center

- 1:20 - 1:40 Thermobaric stratification and circulation in very deep freshwater lakes. **Bertram Boehrer**, Helmholtz Centre for Environmental Research; Ryuji Fukuyama, Hokkaido Institute of Environmental Science; Lars Golmen & Jarl Eivind Løvik, Karsten Rahn, Helmholtz Centre for Environmental Research; Norwegian Institute for Water Research; Dag Klaveness, University of Oslo; Kazuhisa Chikita, Hokkaido University
- 1:40 - 2:00 Modeling the oxygen depletion within stratified bottom boundary layers of lakes. **Aidin Jabbari**, Leon Boegman, Queen's University; Murray MacKay, Environment Canada; Nader Nakhaei, Queen's University
- 2:00 - 2:20 Measurement of vertical oxygen flux in lakes from microstructure casts. **Nader Nakhaei**, Leon Boegman, Queen's University; Damien Bouffard, EPFL
- 2:20 - 2:40 Characteristics of salt water movement in mouth of River Iwaki. **Mikio Sasaki**, Hachinohe Inst. of Tech.; Hitoshi Tanaka & Makoto Umeda, Tohoku University
- 2:40 - 3:00 Investigating the effect of the Coriolis force on internal wave dynamics and flushing of a coastal embayment. **Bryan Flood**, Mathew Wells; U. of Toronto, Joelle Young, Ontario Ministry of the Environment and Climate Change; Erin Dunlop, Ontario Ministry of Natural Resources and Forestry
- 3:00 - 3:20 1DV model of wind-generated internal seiches. **Rob Uittenbogaard**, Deltares, Delft, The Netherlands; Maryam Rezvani, Texas A&M

**Internal Waves in a Variable Medium**

Chair: Kevin Lamb

Upper Grande Left

- 1:20 - 1:40 Internal-gravity wave propagation in a range-dependent waveguide with forcing at the bottom. **Noe Lahaye**, Stefan Llewellyn Smith, MAE, UCSD
- 1:40 - 2:00 The relative importance of transient wave-mean-flow interactions and turbulent wave breaking in atmospheric gravity-wave parameterizations. **Gergely Bölöni**, Ulrich Achatz, Bruno Ribstein, Jewgenija Muraschko, Christine Sgoff, Junhong Wei; Goethe, University Frankfurt am Main
- 2:00 - 2:20 An experimental investigation of evanescent wave propagation through a turning depth. **Allison Lee**, Julie Crockett, Brigham Young University

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2:20 - 2:40 Instability associated baroclinic critical layers in rotating stratified shear flow. **Chen Wang**, Neil Balmforth, University of British Columbia

2:40 - 3:00 The three-dimensional propagation of tsunami-generated acoustic-gravity waves in the atmosphere. **Yue Wu**, Stefan Llewellyn Smith, James Rottman; MAE, UCSD; Dave Broutman, Computational Physics, Inc.; Jean-Bernard Minster, Scripps Institution of Oceanography, UCSD

3:00 - 3:20 Tide-topography interactions: Asymmetries in internal wave generation due to surface trapped currents. **Kevin Lamb**, University of Waterloo; Michael Dunphy, IFREMER

### **Stratified Wakes & Plumes**

Chair: Joe O'Callaghan

Upper Grande Right

1:20 - 1:40 Porous media plumes: transient filling box solutions. **Ali Moradi**, Morris Flynn, University of Alberta

1:40 - 2:00 Turbulent scales observed in a buoyant river plume driven by a highly variable flow. **Rebecca Adam McPherson**, University of Auckland; Craig Stevens, NIWA, University of Auckland; Joe O'Callaghan, NIWA; Drew Lucas, SIO, UCSD, Jonathan Nash, Oregon State University

2:00 - 2:20 Dynamics of a buoyant plume in linearly stratified environment using simultaneous PIV-PLIF. **Harish N Mirajkar**, Sridhar Balasubramanian, Mechanical Engineering, IIT Bombay

2:20 - 2:40 Experiments and simulations of low Re sphere wakes with and without stratification. **Xinjiang Xiang**, Kevin Chen, Trystan Madison, Prabu Sellappan, Geoffrey Spedding; University of Southern California

2:40 - 3:00 Large eddy simulation of buoyant jet in shallow water. **Akihiko Nakayama**, J. D. Bricker, Z. Nizamani; Universiti Tunku Abdul Rahman

3:00 - 3:20 Quasi-continuous 2-D observations of inner-shelf internal bore breaking and run-up from a novel fiber optic temperature sensing system. **Andrew J. Lucas**, Robert Pinkel; SIO, UCSD

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