

**Dr. Jennifer MacKinnon**  
**Associate Professor, UCSD**

Scripps Institution of Oceanography  
9500 Gilman Drive, M/C 0213  
La Jolla, CA 92093  
**Citizenship: USA**

[jmackinn@ucsd.edu](mailto:jmackinn@ucsd.edu)  
<http://www-pord.ucsd.edu/~jen/>  
phone: 858-822-3716  
fax: 858-534-8045

## **RESEARCH INTERESTS**

As a physical oceanographer, I study small-scale dynamical processes in the ocean, primarily internal waves and turbulence. My main interests lie in integrating ocean observations and numerical simulations to better understand the intricate physics of small-scale turbulent mixing and the effect it has on the larger scale circulation. Part of my work involves going to sea to observe these processes, using the ocean as a natural laboratory. Simultaneously, I am working with collaborators to turn this dynamical understanding into better parameterizations of small-scale processes to improve global climate models.

## **EDUCATION**

- Ph. D.**     **University of Washington, Department of Oceanography. June, 2002.** Thesis title: Coastal Recipes: Internal waves, turbulence and mixing on the New England continental shelf. Thesis committee: Drs. Michael Gregg (chair), Eric Kunze, Eric D'Asaro, Parker MacCready.
- Sc. M.**     **University of Washington, Department of Oceanography, June, 1999.**
- B.A.**     **Swarthmore College, June 1995.** Major in Physics. Graduated with Distinction.

## **POSITIONS:**

**Associate Professor**, Oceans and Atmosphere Section, Scripps Institution of Oceanography. [November 2009-present].

**Assistant Research Faculty**, Physical Oceanography Research Division, Scripps Institution of Oceanography. [Jan 2004-October 2009].

**Post-Doctoral Research Associate**, Scripps Institution of Oceanography, advised by Kraig Winters. [Oct 2002-Dec 2003].

## EXTERNAL FUNDING

**Pinkel, R., MacKinnon, J.A., Johnston, T.M.S., Rudnick, D., and 4 co-PIs**, Tasmanian Tidal Dissipation Experiment (T-TIDE), *National Science Foundation*, 2012-2015.

**MacKinnon et al.** Climate Process Team: Representing internal-wave driven mixing in global ocean models, *National Science Foundation*, \$2,618,524, 2010-2013.

**Gille, S.T., Sprintall, J., and MacKinnon, J.A.**, RAPID: Evaluating Fine-Structure Estimates of Diapycnal Mixing from the DIMES 2010 Research Cruise, *National Science Foundation*, \$361,357, 2009-2011.

**Smith, J.A., and MacKinnon, J.A.**, Near-N Internal Waves and Transition Layer Mixing, *National Science Foundation*, \$361,357, 2009-2012.

**Johnston, T.M.S., MacKinnon, J.A. and Rudnick, D.**, Internal tide generation and propagation in a strong, sheared current, *Office of Naval Research*, \$579,737, 2009-2011.

**MacKinnon, J.A., Johnston, T.M.S., and Pinkel, R.**, Internal Waves and Mixing Above the South-West Indian Ridge, *National Science Foundation*, \$873,233, 2007-2010.

**MacKinnon, J.A.**, Numerical Investigations of Current, Eddy Kinetic Energy, and Internal-waves in the Southern Ocean (NICKELS), *National Science Foundation*, \$150,470, 2005-2008

**MacKinnon, J.A.**, Numerical Studies of Coastal Internal-Wave Mixing, *Office of Naval Research*, \$126,645, 2005-2008 (recent extension and supplemental funding of \$82,000 through 2010).

**Smith, J. A., and MacKinnon, J.A.** Langmuir circulation, internal waves, and shear: Data and Modeling, *National Science Foundation*, \$359,965, 2005-2008.

**Alford, M.H.A, MacKinnon, J.A., Munk, W., Pinkel, R., and Winters, K.**, Internal Waves Across the Pacific, *National Science Foundation*, \$2,521,486, 2004-2008.

## PROFESSIONAL ACTIVITIES

**Lead PI:** Climate Process Team to develop and incorporate improved representations of diapycnal mixing into global climate models [ Summer 2010-present].

**Session Chair:** Invited chair for mixing session at Coastal Oceanography Gordon Research Conference [2009].

**Chair:** SCOR-affiliated Ocean Mixing Working Group. [ 2008 - present].

**Participant:** Geophysical Fluid Dynamics summer program [2004 - present, episodically].

**Session Chair:** IUGG Meeting, chair of one session of Ocean Mixing Symposium, Perugia Italy. [July 2007].

**Convener:** AGU Ocean Sciences Meeting. Co-convenor of the Ocean Mixing Session and session chair. [Feb 2006].

**Senator:** Oceanography department representative to the University of Washington Graduate and Professional Student Senate. [September 1997 – June 1999].

**Facilitator,** Student Physical Oceanography Retreat. In charge of organizing and running 4-day academic student workshop in Friday Harbor, WA. [Sept 1997-June 1999].

**Graduate Student Representative.** Student liaison between Oceanography Department graduate students and faculty. [September 1999 – June 2000]

**Reviewer** for JPO, JGR, GRL, JTECH, JMR, JFM, NSF

**Member** of American Physical Society, American Geophysical Union, Sigma Xi Honor Society.

## HONORS AND AWARDS

Scripps Graduate Teaching Award [2011].

National Defense Science and Engineering Graduate (NDSEG) Fellowship [1997-2000].

Geophysical Fluid Dynamics Fellowship: Woods Hole Oceanographic Institution. [Summer 1999].

Bachelors with Distinction in Physics, Swarthmore College. [1995].

National Merit Finalist [1991].

## TEACHING EXPERIENCE

**Geophysical Fluid Dynamics** (SIO 212A) [Winter 2010, 2011, 2012].

**Seminar on Ocean Mixing** (SIO219) [Winter 2011].

**Introduction to Physical Oceanography** (SIO 210) [Fall 2009]

## MENTORING

### Graduate Students:

- Caitlin Whalen (co-advised with Lynne Talley) [2010-present]
- Ruth Musgrave (co-advised with Rob Pinkel) [2012 - present]
- Tamara Beitzel [2008-2011]. Obtained a Masters degree at Scripps, now completing a PhD at Université Pierre et Marie Curie, Paris France.

### Post-docs:

- Amy Waterhouse [2010 - present]
- Tycho Huussen (co-advised with Jerry Smith) [2010 - present]
- Jeff Polton [2007], now at National Oceanography Centre, Liverpool, U.K.
- Andres Tejada Martinez [2006], now at University of South Florida

**Graduate committee member** for Oliver Sun [PhD 2011], Andrew Thompson [PhD 2006]

## REFEREED PUBLICATIONS

**Whalen, C.B., L. D. Talley and J.A. MacKinnon, 2012:** Spatial and temporal variability of global ocean mixing inferred from Argo profiles, *Geophysical Research Letters*, 39, doi:10.1029/2012GL053196

**Alford, M.H, J.A. MacKinnon, J.D. Nash, H. Simmons, A. Pickering, J.M. Klymak, R. Pinkel, O. Sun, L. Rainville, R. Musgrave, T. Beitzel, K-H Fu, and C-W Lu, 2011:** Energy flux and dissipation in Luzon Strait: two tales of two ridges, *Journal of Physical Oceanography*, 41(11), 2211-2222.

**MacKinnon, J.A, M. H. Alford, P. Bouruet-Aubertot, N. Bindoff , S. Gille, J.B. Girton, M. C. Gregg, R. Hallberg, E. Kunze, A.C. Naveira Garabato, H. Phillips, R. Pinkel, K. Polzin, T. B. Sanford, H. L. Simmons and K. G. Speer,** Using global arrays to investigate internal-waves and mixing, Proceedings of the "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference, Venice, Italy, 21-25 September 2009, Hall, J. and D.E. Harrison and D. Stammer, Editors.

**Zhao, Zhongxiang, Matthew H. Alford, Jennifer A. MacKinnon, and Rob Pinkel, 2010:** Long-Range Propagation of the Semidiurnal Internal Tide from the Hawaiian Ridge, *J. Phys Oceanogr*, 40(4), p713-736.

**Tejada-Martinez, Andres E., Chester E. Grosch, Ann E. Gargett, Jeff A. Polton, Jerome A. Smith, and J. A. MacKinnon, 2009:** A hybrid spectral/finite-difference large-eddy simulator of turbulent processes in the upper ocean, *Ocean Modelling*, 30, 115-142.

**MacKinnon, J.A., T.M. Shaun Johnston, and R. Pinkel, 2008:** Strong transport and mixing of deep water through the Southwest Indian Ridge, *Nature Geosciences*, 1, 755-758, doi:10.1037/ngeo340.

**Polton, J. A., J.A. Smith, J.A. MacKinnon and A. E. Tejada-Martinez, 2008:** Rapid generation of high-frequency internal waves beneath a wind and wave forced oceanic surface mixed layer, *Geophys. Res. Lett.*, 5, L13602, doi:10.1029/2008GL033856..

**MacKinnon, J.A. and Winters, K.B., 2008:** Tidal mixing hotspots governed by rapid parametric subharmonic instability, *in revision*

**Alford, M.H., J.A. MacKinnon, Z. Zhao, R. Pinkel, J. Klymak, and T. Peacock, 2007:** Internal waves across the Pacific, *Geophys. Res. Lett.* 34, L24601, doi:10.1029/2007GL031566

**Thompson, Andrew F., Sarah T. Gille, J.A. MacKinnon, and Janet Sprintall, 2007:** Spatial and Temporal Patterns of Small-Scale Mixing in Drake Passage, *J. Phys Oceanogr.*, 37 (3), 572-592.,

**MacKinnon, J.A. and Winters, K.B., 2005:** Subtropical Catastrophe: significant loss of low-mode tidal energy at 28.9 degrees, *Geophys. Res. Lett.*, Vol. 32, No. 15, VOL. 32, L15605, doi: 10.1029/2005GL023376.

**MacKinnon, J. A. and M.C. Gregg, 2005.:** Near-Inertial Waves on the New England Shelf: the role of evolving stratification, turbulent dissipation, and bottom drag, *J. Phys. Oceanogr.*, 35 (12), 2408-2424.

**MacKinnon, J. A. and M.C. Gregg, 2005.:** Spring Mixing on the New England Shelf. *J. Phys. Oceanogr.*, 35(12), 2425-2443

**Winters, K.B., J.A. MacKinnon and B. Mills, 2004:** A Spectral Model for Process Studies of Rotating, Density-Stratified Flows, *J. Atmos. Ocean. Tech.*, 21(1): 69-94.

**MacKinnon, J. A. and M.C. Gregg, 2003:** Mixing on the Late-Summer New England Shelf – Solibores, Shear and Stratification, *Journal of Physical Oceanography*, 33(7), 1462-1475.

**MacKinnon, J. A. and M.C. Gregg, 2003.:** Shear and Baroclinic Energy Flux on the Summer New England Shelf, *Journal of Physical Oceanography*, 33(7), 1476-1492.

**Gardner, W.D., J.C. Blakey, I.D. Walsh, M.J. Richardson, S. Pegau, J.R.V. Zaneveld, C.Roesler, M.C. Gregg, J.A. MacKinnon, H.M. Sosik and A.J. Williams III, 2001.** Optics, particles, stratification and storms on the New England continental shelf, *Journal of Geophysical Research*, 106(C5), 9473-9497.

**MacKinnon, J.A., J. Eckert, D.F. Coker, and A.L.R. Bug, 2001.** Computational study of molecular hydrogen in zeolite Na-A. II. Density of rotational states and inelastic neutron scattering spectra. *Journal of Chemical Physics*, 114(22); 10137-10150.

## OTHER PUBLICATIONS

**MacKinnon, J.A., 2007:** Does extreme internal-wave breaking matter for ocean mixing?, in *Extreme Events, Proceedings of the 15th 'Aha Huliko'a Hawaiian Winter Workshop*, edited by P. Muller and D. Henderson.

**MacKinnon, J.A. and K.B. Winters, 2003:** Spectral Evolution of Bottom-Forced Internal Waves, in *Near-Boundary Processes and Their Parameterization, Proceedings of the 13th 'Aha Huliko'a Hawaiian Winter Workshop*, edited by P. Muller and D. Henderson, 73-83..

**MacKinnon, J.A., 2002:** Coastal Recipes: Internal waves, turbulence and mixing on the New England continental shelf. University of Washington thesis.

**Gregg, M.C., D.P. Winkel, J.A. MacKinnon, and R.-C. Lien, 1999.** Mixing over shelves and slopes, in *Dynamics of oceanic internal gravity waves II, Proceedings, Hawaiian Winter Workshop*, edited by P. Muller and D. Henderson, 35-42.

## SELECT INVITED PRESENTATIONS

MacKinnon, 2009, Mixing in a global perspective, IAPSO Assembly, Montreal, Canada.

MacKinnon 2008, Patchy Mixing Matters, Yale Ocean and Climate Forum, New Haven CT.

MacKinnon 2007, Breaking oceanic internal waves: statistical and dynamical views, *15th Aha Hulikoa Winter Workshop*, Honolulu Hawaii.

MacKinnon 2005, Internal Waves and Mixing in the Coastal Ocean, Gordon Research Conference in Coastal Ocean Circulation, New London, NH.

MacKinnon and Winters 2004, Pseudo-spectral models of internal-wave interaction, SCOR Ocean Mixing Meeting, Victoria, Canada.

MacKinnon, J.A. and K.B. Winters, 2004: Reconsidering a disqualified candidate for the energy balance of oceanic internal waves, AGU Ocean Science Meeting, Honolulu, HI.

MacKinnon, J.A. and K.B. Winters 2003: Spectral evolution of bottom-forced internal waves, *13th Aha Hulikoa Winter Workshop*

## CRUISE EXPERIENCE

- Internal Waves in Straits Experiment. R/V Revelle [ August 2010].
- Mixing above the South-west Indian Ridge. Chief Scientist. R/V Revelle [November 2007 - January 2008].
- Internal Waves Across the Pacific. R/V Revelle [April-June 2006].
- Coastal Mixing and Optics, New England shelf. R/V Seward Johnson. [August – September 1996].
- Monterey Canyon Internal Waves and Mixing Experiment, Monterey, CA. R/V Point Sur. [August 1997].
- Mixing in the Indonesian Throughflow, Banda Sea, Indonesia. R/V Baruna Jaya IV. [October – November 1998].

## REFERENCES

Robert Pinkel  
PORD/UCSD  
9500 Gilman Drive  
Mail Code 0213  
La Jolla, CA 92093-0231

858-534-2056  
rpinkel@ucsd.edu

Kraig Winters

IOD/UCSD  
9500 Gilman Drive  
Mail Code 0209  
La Jolla, CA 92093-0209  
858-822-3420  
[kraig@coast.ucsd.edu](mailto:kraig@coast.ucsd.edu)

Michael Gregg  
Applied Physics Laboratory and Department of  
Oceanography  
University of Washington  
1013 NE 40<sup>th</sup> Street  
Seattle, WA 98105  
206 – 543 – 1353  
[gregg@apl.washington.edu](mailto:gregg@apl.washington.edu)

Eric Kunze  
University of Victoria  
SEOS, U of Victoria  
P.O. Box 3055, STN CSC  
Victoria, B.C., V8W-3P6  
250-472-4482  
[kunze@uvic.ca](mailto:kunze@uvic.ca)