CV: John Trowbridge October 17, 2018

Senior Scientist
Department of Applied Ocean Physics & Engineering
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Expertise:

Coastal hydrodynamics and sediment transport, ocean observing systems

Education:

- ScD, Oceanographic Engineering, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, 1983
- SM, Civil Engineering, Massachusetts Institute of Technology, 1979
- BS, Civil Engineering, University of Washington, 1977

Employment:

- Oct 2018-present: Principal Investigator (PI), Ocean Observatories Initiative (OOI). Reporting to the President & Director of the Woods Hole Oceanographic Institution (WHOI) and accountable to the National Science Foundation, responsible for operation and management of the OOI, including the Program Management Office and the Coastal & Global Scale Nodes at WHOI and subawards to the University of Washington, Oregon State University, and Rutgers University for the Cabled Array, Endurance Array, and Cyberinfrastructure, respectively.
- Jan 2012-Sep 2018: co-PI, Coastal & Global Scale Nodes, OOI, with co-PI Bob Weller (WHOI). Reporting to the WHOI President & Director and accountable to the Consortium for Ocean Leadership, responsible for the design, construction, deployment, operation and maintenance of the coastal Pioneer Array off of New England and Global Arrays in the Irminger Sea, Northeast Pacific, Southern Ocean, and Argentine Basin.
- Sep 2009-Jan 2012 and Mar 2013-Apr 2016: Chair, Department of Applied Ocean Physics & Engineering (AOPE), WHOI. Reporting to the WHOI Director of Research, responsible for oversight of research and development in AOPE, with staff of approximately 160 full-time WHOI employees, annual expenditures (excluding the OOI) of approximately $33 million, and externally funded research and development in coastal & ocean fluid dynamics, ocean acoustics, deep submergence technology and operations, and oceanographic vehicles and sensors.
- Sep 1987-present: Assistant, Associate, Associate with Tenure, and Senior Scientist, AOPE, WHOI. Reporting to the AOPE Department Chair, responsible for maintaining, executing, and disseminating the results of an externally funded research program, with optional participation in education through the WHOI Postdoctoral Scholar Program and the Massachusetts Institute of Technology (MIT) – WHOI Joint Program.
- Sep 1983-Aug 1987: Assistant Professor, Civil Engineering, University of Delaware. Reporting to the Department Chair, responsible for teaching undergraduate and graduate courses in fluid dynamics, wave mechanics, and coastal engineering; advising undergraduate and graduate students; and obtaining funding for, executing, and disseminating the results of research on coastal processes and coastal engineering.

Refereed Publications:

1. Scully, M. E, J. H. Trowbridge, C. R. Sherwood, K. Samuelson, and P. Traykovski. 2018. Direct measurement of mean Reynolds stress and ripple roughness in the presence of energetic forcing by surface waves. *J. Geophys. Res.* JGRC2275, DOI: 10.1002/2017JC013252
2. Trowbridge, J. H. and S. J. Lentz. 2018. The bottom boundary layer. *Annual Review of Marine Science*. W10, 397-420. https://doi.org/10.1146/annurev-marine-121916-063351
3. Trowbridge, J. H., M. E. Scully and C. R. Sherwood. 2018. The cospectrum of stress-carrying

turbulence in the presence of surface gravity waves. *Journal of Physical Oceanography*. 48, 29-44. DOI: 10.1175/JPO-D-17-0016.1

4. Scully, M. E., J. H. Trowbridge and A. W. Fisher. 2016. Observations of the transfer of energy and momentum to the oceanic surface boundary layer beneath breaking waves. *Journal of Physical Oceanography*. 46, 1823-1837, DOI: 10.1175/JPO-D-15-0165.1
5. Trowbridge, J. H. and P. Traykovski. 2015. Coupled dynamics of interfacial waves and bed forms in fluid muds over erodible seabeds in oscillatory flows. *Journal of Geophysical Research.* 120, 5698–5709, DOI: 10.1002/2015JC010872.
6. Traykovski, P., Trowbridge, J. H., and G. C. Kineke. 2015. Mechanisms of surface wave energy dissipation over a high concentration sediment suspension. *Journal of Geophysical Research.* 120, DOI: 10.1002/2014JC010245.
7. Kukulka, T., A. J. Plueddemann, J. H. Trowbridge and P. P. Sullivan. 2011. The influence of cross-wind tidal currents on Langmuir circulation in a shallow ocean. *Journal of Geophysical Research.* 116, C08005, doi:10.1029/2011JC006971.
8. Scully, M. E., W. R. Geyer, and J. H. Trowbridge. 2011. The influence of stratification and non-local turbulent production on estuarine turbulence: An assessment of turbulence closure with field observations. *Journal of Physical Oceanography*, 41: 166-185.
9. Geyer, W. R., A. C. Lavery, M. E. Scully & J. H. Trowbridge. 2010. Mixing by shear instability at high Reynolds number. *Geophysical Research Letters*, 37, L22607.
10. Kukulka T., A. J. Plueddemann, J. H. Trowbridge, and P. P. Sullivan. 2010. Rapid mixed layer deepening by the combination of Langmuir and shear instabilities—a case study. *Journal of Physical Oceanography*, 40: 2381–2400.
11. Kukulka, T., A. J. Plueddemann, J. H. Trowbridge, and P. P. Sullivan, 2009. Significance of Langmuir circulation in upper ocean mixing: comparison of observations and simulations. *Geophysical Research Letters*, 36, L10603, doi:10.1029/2009GL037620.
12. Jumars, P. A., J. H. Trowbridge, E. Boss, and L. Karp-Boss, 2009. Turbulence-plankton interactions: a new cartoon. *Marine Ecology*, 30: 133-150.
13. Gerbi, G. P., J. H. Trowbridge, E. A. Terray, A. J. Plueddemann, and T. Kukulka, 2009. Observations of turbulence in the ocean surface boundary layer: energetics and diffusivity. *Journal of Physical Oceanography*, 39, 1077-1096.
14. Gerbi, G.P., J.H. Trowbridge, J.B. Edson, A.J. Plueddemann, E.A. Terray, and J.J. Fredericks, 2008. Measurements of momentum and heat transfer across the air-sea interface. *Journal of Physical Oceanography*, 38: 1054-1072.
15. Li, M., J. H. Trowbridge and W. R. Geyer, 2008. Asymmetric tidal mixing due to a horizontal density gradient. *Journal of Physical Oceanography*, 38: 418-434.
16. Edson, J. B., T. Crawford, J. Crescenti, T. Farrar, N. Frew, G. Gerbi, C. Helmis, T. Hristov, D. Khelif, A. Jessup, H. Jonsson, M. Li, L. Mahrt, W. McGillis, A. Plueddemann, L. Shen, E. Skyllingstad, T. Stanton, P. Sullivan, J. Sun, J. Trowbridge, D. Vickers, S. Wang, Q. Wang, R. Weller, J. Wilkin, A. Williams, D. K. P. Yue, and C. Zappa, 2007. The Coupled Boundary Layers and Air-Sea Transfer Experiment in Low Winds (CBLAST-Low). *Bulletin of the American Meteorological Society*, 88: 341-356.
17. Feddersen, F., J. H. Trowbridge, and A. J. Williams, 2007. Vertical structure of dissipation in the nearshore. *Journal of Physical Oceanography*, 37: 1764-1776.
18. Feddersen F. and J.H. Trowbridge, 2005. The effect of wave breaking on surfzone turbulence and alongshore currents: a modeling study. *Journal of Physical Oceanography*, 35, 2187-2203.
19. Trowbridge, J. and Y. Agrawal, 2004. A two-spot sensor for measurement of dissipation by means of laser-Doppler velocimetry. *Journal of Atmospheric and Oceanic Technology*, 21: 1104-1111.
20. Fries, S.J. and J.H. Trowbridge, 2003. Flume observations of enhanced fine particle deposition to permeable sediment beds. *Limnology and Oceanography*, 48:802-812.
21. Trowbridge, J.H. and S. Elgar, 2003. Spatial scales of stress-carrying nearshore turbulence.

Journal of Physical Oceanography, 33:1122-1128.
22. Shaw, W.J. and J.H. Trowbridge, 2001. The direct estimation of near-bottom turbulent fluxes in the presence of energetic wave motions. *Journal of Atmospheric and Oceanic Technology*, 18: 1540-1557.
23. Lentz, S.J. and J.H. Trowbridge, 2001. A dynamical description of fall and winter mean current profiles over the northern California shelf. *Journal of Physical Oceanography* 31: 914-931.
24. Hill, P.S., G. Voulgaris and J.H. Trowbridge, 2001. Controls on floc size in a continental shelf bottom boundary layer. *Journal of Geophysical Research* 106: 9543-9550.
25. Trowbridge, J.H. and S. Elgar, 2001. Turbulence measurements in the surf zone. *Journal of Physical Oceanography* 31: 2403-2417.
26. Shaw, W.J., J. H. Trowbridge and A. J. Williams, 2001. Budgets of turbulent kinetic energy and scalar variance in the continental shelf bottom boundary layer. *Journal of Geophysical Research* 106: 9551-9564.
27. Lentz, S.J. and J.H. Trowbridge, 2001. Mean current profiles on the northern California shelf. *Journal of Physical Oceanography* 31: 914-931.
28. Geyer, W.R., J.H. Trowbridge, and M. Bowen, 2000. The dynamics of a partially mixed estuary. *Journal of Physical Oceanography* 30:2035-2048.
29. Trowbridge, J.H., W.R. Geyer, M.M. Bowen, and A.J. Williams, 1999. Near-bottom turbulence measurements in a partially mixed estuary: turbulent energy balance, velocity structure, and along-channel momentum balance. *Journal of Physical Oceanography*, 29: 3056-3072.
30. Trowbridge, J.H., 1998. On a technique for measurement of turbulent Reynolds stress in the presence of surface waves. *Journal of Atmospheric and Oceanic Technology*, 15: 290-298.
31. Trowbridge, J.H. and S.J. Lentz, 1998. Dynamics of the bottom boundary layer on the northern California shelf. *Journal of Physical Oceanography*, 28: 2075-2093.
32. Voulgaris, G. and J.H. Trowbridge, 1998. Evaluation of the acoustic Doppler velocimeter for turbulence measurements. *Journal of Atmospheric and Oceanic Technology*, 15: 272-289.
33. Trowbridge, J.H., D.C. Chapman, and J. Candela, 1997. Topographic effects, straits and the bottom boundary layer. *The Sea* (K. Brink and A. Robinson, eds.), vol. 10, pp.63-88.
34. Kineke, G.C., R.W. Sternberg, J.H. Trowbridge, and W.R. Geyer, 1996. Fluid mud processes on the Amazon continental shelf. *Continental Shelf Research*, 16: 667-696.
35. Trowbridge, J.H., 1995. A mechanism for the formation and maintenance of shore-oblique sand ridges on storm-dominated shelves. *Journal of Geophysical Research*, 100: 16071-16086.
36. Trowbridge, J.H. and Y.C. Agrawal, 1995. Glimpses of a wave boundary layer. *Journal of Geophysical Research*, 100: 20729-20743.
37. Trowbridge, J.H. and G.C. Kineke, 1994. Structure and dynamics of fluid muds on the Amazon continental shelf. *Journal of Geophysical Research*, 99: 865-875.
38. Trowbridge, J.H., B. Butman, and R. Limeburner, 1994. Characteristics of the suspended sediment field over the northern California continental shelf based on measurements of optical attenuation during STRESS and SMILE. *Continental Shelf Research*, 14: 1257-1270.
39. Trowbridge, J.H. and A.R.M. Nowell, 1994. An introduction to the Sediment Transport Events on Shelves and Slopes (STRESS) program. *Continental Shelf Research*, 14, 1057-1061.
40. Trowbridge, J.H., 1992. A simple description of the deepening and structure of a stably stratified flow driven by a surface stress. *Journal of Geophysical Research*, 97, 15529-15543.
41. Geyer, W.R., R.C. Beardsley, J. Candela, B.M. Castro, R.V. Legeckis, S.J. Lentz, R. Limeburner, L.B. Miranda and J.H. Trowbridge, 1991. The physical oceanography of the Amazon outflow. *Oceanography*, 4, 1-14.
42. Villaret, C. and J.H. Trowbridge, 1991. Effects of stratification by suspended sediments on turbulent shear flows. *Journal of Geophysical Research*, 96: 10659-10680.
43. Lentz, S.J. and J.H. Trowbridge, 1991. The bottom boundary layer over the northern California shelf. *Journal of Physical Oceanography*, 21: 1186-1201.
44. Trowbridge, J.H. and S.J. Lentz, 1991. Asymmetric behavior of an oceanic boundary layer over a

sloping bottom. *Journal of Physical Oceanography*, 21: 1171-1185.

45. Wong, K.C. and J.H. Trowbridge, 1990. Some observational evidence on the effect of atmospheric forcing on tidal variability in the Upper Delaware Bay. *Journal of Geophysical Research*, 95: 16229-16240.
46. Trowbridge, J.H. and D.T. Young, 1989. Sand transport by unbroken water waves under sheet flow conditions. *Journal of Geophysical Research*, 94: 10971-10991.
47. Trowbridge, J.H., 1987. Instability of concentrated free surface flows. *Journal of Geophysical Research*, 92: 9523-9530.
48. Trowbridge, J.H., R.A. Dalrymple and K.D. Suh, 1986. A simplified second order solution for a spiral wavemaker. *Journal of Geophysical Research*, 91: 11783-11798.
49. Aubrey, D.G. and J.H. Trowbridge, 1985. Kinematic and dynamic estimates from electromagnetic current meter data. *Journal of Geophysical Research*, 90: 9137-9146.
50. Adams, E.E. and J.H. Trowbridge, 1985. Circulation induced by coastal diffuser discharge. *Journal of Waterway, Port, Coastal and Ocean Engineering*, 111: 978-984.
51. Trowbridge, J.H. and O.S. Madsen, 1984. Turbulent wave boundary layers. Part 2. Second order solution and mass transport. *Journal of Geophysical Research*, 89: 7999-8007.
52. Trowbridge, J.H. and O.S. Madsen, 1984. Turbulent wave boundary layers. Part 1. Model formulation and first order solution. *Journal of Geophysical Research*, 89: 7989-7997.

Research Funding:

Maintained an externally funded research program from Sep 1987 to the present in the soft-money research environment at the Woods Hole Oceanographic Institution. Served as principal or co-principal investigator on grants and contracts funded by the National Science Foundation, the Office of Naval Research, the National Aeronautics & Space Administration, the National Oceanographic & Atmospheric Administration, and industry. Grants and contracts supported salary for principal investigators, technical staff, postdoctoral investigators, and graduate students, in addition to equipment, vessels, travel and logistics for US and international field measurement programs.

Educational Activities:

- Educational Coordinator, Joint Program in Applied Ocean Science & Engineering, Woods Hole Oceanographic Institution (WHOI) and Massachusetts Institute of Technology (MIT), Sep 2001-Sep 2004. High-level oversight of students and coordination of graduate educational activities between the Applied Ocean Physics & Engineering (AOPE) Department at WHOI and the MIT Departments of Civil and Environmental Engineering, Electrical Engineering and Computer Science, and Mechanical Engineering.
- WHOI/MIT courses taught: Coastal Engineering (2014); Air-Sea Interaction (2003, 2005, 2008, 2010); 12.862 Dynamics of Shelf Circulation (1995, 1997, 1999, 2000); Physics of Shallow Coastal Flows (1992, 1994).
- WHOI/MIT students supervised: S. Link (SM, 2009-2011, currently Academic Research and Development Engineer, San Francisco); S. Roe (SM, 2004-2005, currently US Naval Officer); G. Gerbi (PhD, 2003-2008, currently Skidmore College Faculty); J. Fries (PhD, 1998-2001, currently Senior Professional at CSC); W. Shaw (PhD, 1995-1999, currently Research Faculty at Naval Postgraduate School).
- WHOI Postdoctoral Scholars supervised: T. Kukulka (2007-2010, co-advised with A. Plueddemann, currently U Delaware Faculty); N. Scott (2003-2004, currently Riverside Research Staff); F. Feddersen (2000-2002, currently Scripps Institution of Oceanography Research Faculty); S. Beaulieu (co-advised with L. Mullineaux, 1998-99, currently WHOI Research Staff); G. Voulgaris (1996-1998, currently U South Carolina Faculty); C. Villaret (1988-90, currently Electricite de France Research Staff).
- University of Delaware courses taught: Fluid Mechanics, Mechanics of Free Surface Flow, Water Wave Mechanics, Turbulence and Random Processes.

- University of Delaware students supervised: G. Gong, C. N. Kanetkar, N. T. Wu, D. T. Young, U. Putrevu (all MS with thesis).

Professional Registration:

Civil Engineer, Massachusetts, License Number 49013

Synergistic Activities:

- Board of Directors, Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS), Sep 2009 – Dec 2011.
- Principal Investigator, National Oceanographic & Atmospheric Administration Implementation and Management Grants for NERACOOS, Sep 2007-Aug 2010.
- Director, Center for Ocean, Seafloor and Marine Observing Systems (COSMOS), Woods Hole Oceanographic Institution, Jul 2006-Sep 2009.
- Co-chair, Coastal Subcommittee, Ocean Observatories Initiative (OOI) Science and Technology Advisory Committee (STAC), Oct 2005-Jan 2007.
- Chief Scientist, Martha's Vineyard Coastal Observatory, Jan 2004-Dec 2005.

Honors and Awards:

Adams Chair, Woods Hole Oceanographic Institution.