

# Takahiro (Tak) SAKAI

Aerospace and Mechanical Engineering  
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## Education

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**2008** Ph.D. in Aerospace Engineering, **University of Southern California**  
**2004** MS in Aerospace Engineering, **University of Southern California**  
**1995** MS in Mechanical Engineering, **Meiji University**, Japan  
**1993** BS in Mechanical Engineering, **Meiji University**, Japan

## Research Experiences

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**2014 summer** Visiting Research Scientist  
Civil and Environmental Engineering, **Cornell University**, Ithaca, NY

**2011–2013** Postdoctoral Research Associate  
Civil and Environmental Engineering, **Cornell University**, Ithaca, NY  
Research Project: *Numerical Simulation of Turbulent Bottom Boundary Layer under a Nonlinear Internal Wave.*  
Support: Office of Naval Research  
Supervisor: Prof. Peter Diamessis

## Teaching Experiences

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**2013–present** Senior Lecturer  
Aerospace and Mechanical Engineering, **University of Southern California**  
Courses taught:  
1. Computational Solutions to Engineering Problems (AME404)  
2. Calculus II (Math126)  
3. Calculus III (Math226)  
4. Mathematics of Physics and Engineering (Math245)  
5. Calculus III for Engineers and Scientists (Math229)  
7. Calculus II for Engineers and Scientists (Math129)  
8. Dynamics of Fluids (AME309)

**2009–2011** Lecturer, Part-time  
Aerospace and Mechanical Engineering, **University of Southern California**  
Courses taught:  
1. Introduction to Computational Fluid Mechanics (AME535a–Graduate)  
2. Introduction to Computational Methods (AME150L–Undergraduate)  
3. Calculus II (Math126–Undergraduate)  
4. Calculus III (Math226–Undergraduate)  
5. Mathematics for Physics and Engineering (Math245–Undergraduate)  
6. Linear Algebra and Differential Equations (Math225–Undergraduate)

Lecturer, Calculus, Summer Leadership Academy, USC Viterbi School of Engineering (2009)

**2005–2008** Graduate teaching assistantship, USC Department of Mathematics  
Courses taught: Calculus (Math125; Math126) and Differential Equations (Math245)

## Industry Experiences

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- 1995–2003**     **Fuji Heavy Industries LTD. (SUBARU), Aerospace Company**, Tochigi, Japan  
 Propulsion & Mechanical Systems Design
- (2002–2003)     Lead Engineer, Wing Mechanical & Fluid systems, Hawker 4000 program
- (1996–2002)     Engineer, Wing Mechanical & Fluid Systems, Hawker 4000 program
- (1995–1996)     Engineer, Propulsion & Transmission Systems of commercial and military helicopters

## Publications

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### Peer Review Papers:

1. Sakai, T., Diamessis, P. D., Jacobs, G. B. **Self-sustained instability, transition, and turbulence induced by a long separation bubble in the footprint of an internal solitary wave. I. Flow topology**, *Phys. Rev. Fluids*, **5**, 103801, 2020.
2. Sakai, T., Diamessis, P. D., Jacobs, G. B. **Self-sustained instability, transition, and turbulence induced by a long separation bubble in the footprint of an internal solitary wave. II. Flow statistics**, *Phys. Rev. Fluids*, **5**, 103802, 2020.
3. Escobar-Vargas, J., Diamessis, P. D., Sakai, T. **A spectral quadrilateral multidomain penalty method model for high-Reynolds number incompressible stratified flows.**, *Int. J. Numer. Meth. Fluids.*, doi: 10.1002/fld.38.99, 2014
4. Sakai, T., & Redekopp, L. G., **Lagrangian Transport in a Circular Lake: Effect of Nonlinearity and the Second Vertical mode.**, *Nonlin. Processes Geophys.*, **18**, pp.765–778, 2011.
5. Sakai, T., & Redekopp, L. G., **A Weakly Nonlinear Evolution Model for Long Internal Waves in a Large Lake.**, *J. Fluid Mech.* **656**, pp.260–297, 2010.
6. Sakai, T., & Redekopp, L. G., **A Parametric Study of the Generation and Degeneration of Wind Forced, Long Internal Waves in Narrow Lakes.**, *J. Fluid Mech.*, **645**, pp.315–344, 2010
7. Sakai, T., & Redekopp, L. G., **A Weakly Nonlinear Model for Multi-Modal Evolution of Wind-Generated Long Internal Waves in a Closed Basin.**, *Nonlin. Processes Geophys.*, **16**, pp.487–502, 2009
8. Sakai, T., & Redekopp, L. G., **An Application of One-Sided Jacobi Polynomial for Spectral Modeling of Vector Field in Polar Coordinates.**, *J. Comput. Phys.*, **228**, pp.7069–7085, 2009.
9. Sakai T., & Redekopp, L. G., **Models for Strongly-Nonlinear Evolution of Long Internal Waves in a Two-Layer Stratification.**, *Nonlin. Processes Geophys.*, **14**, pp.31–47, 2007.

### Conference Proceedings (Peer reviewed):

1. Sakai, T., Diamessis, P. D., Jacobs, G. B., **Large Eddy Simulations of Turbulence under Internal Solitary Waves of Depression**, VIII-th International Symposium on Stratified Flows, San Diego, U.S.A., Aug 29–Sep 1, 2016.
2. Sakai, T., & Ito, A., **Visualization of Flow around the Auto-Rotating Flat Plate.** (Japanese), In Proceedings of The 22nd Information Visualization Symposium, Visualization Society of Japan, pp.63–66, 1994.
3. Sakai, T., & Ito, A., **Measurement of Aerodynamic Pressure Distribution on an Auto-Rotating Flat Plate.** (Japanese), In Proceedings of The 25th Fluid Dynamics Symposium, Japan Society for Aeronautical and Space Sciences, pp.101–104, 1993.

## Conference Presentations

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- 2013**     **Numerical Simulation of Bottom Boundary Layer Turbulence under an Internal Solitary Wave of Depression**, American Physical Society Division of Fluid Dynamics 66th Annual Meeting, Pittsburgh, PA, Nov. 25.
- 2013**     **Near-bottom Turbulence and Resuspension under Nonlinear Internal Waves**, Office of Naval Research Peer Review Meeting, Chicago, IL, Sep. 19.

- 2012 **Bottom Boundary Layer Turbulence under an Internal Solitary Wave of Depression: Effects of Barotropic Current**, American Physical Society Division of Fluid Dynamics 65th Annual Meeting, San Diego, CA, Nov. 18–20.
- 2012 **Lagrangian Particle Transport Driven by Basin-scale Internal Waves in a Circular Lake**, 55th Annual Conference International Association for Great Lakes Research, Cornwall, ON, Canada, May 15.
- 2012 **Towards Large-Eddy Simulations of Turbulent Bottom Boundary Layer under a Nonlinear Internal Wave of Depression**, 2012 Ocean Science Meeting, Salt Lake City, UT, Feb. 21.
- 2010 **Horizontal Transport of Lagrangian Particles by Basin-scale Waves in a Continuously-stratified Circular Lake**, American Physical Society Division of Fluid Dynamics 63rd Annual Meeting, Long Beach, CA, Nov. 21–23.
- 2008 **Wind-forced Evolution of Long Internal Waves in a Large Lake**, American Physical Society Division of Fluid Dynamics 61st Annual Meeting, San Antonio, TX, Nov. 23–25.
- 1994 **Visualization of Flow around the Auto-rotating Flat Plate.**, The 22nd Information Visualization Symposium, Tokyo, Japan.
- 1993 **Measurement of Aerodynamic Pressure Distribution on an Auto-Rotating Flat Plate.** The 25th Fluid Dynamics Symposium, Kobe, Japan.

## Lectures

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- 2013 **Bottom Turbulence Generated by an Internal Solitary Wave.** Environmental Fluid Mechanics Seminar, School of Civil and Environmental Engineering, Cornell University, Jan 31.
- 2012 **Modeling of Long Internal Waves in Lakes.** Environmental Fluid Mechanics Seminar, School of Civil and Environmental Engineering, Cornell University, April 5th.
- 2011 **Long Nonlinear Internal Waves.** Waves Seminar, School of Civil and Environmental Engineering, Cornell University, Nov. 18th.

## Thesises

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- 2008 **Generation and Degeneration of Long Internal Waves in Lakes.** Doctoral Dissertation, University of Southern California, Dissertation Committee: Larry Redekopp (Chair, Aerospace & Mechanical Engineering); Julian Domaradzki (AME); Tony Maxworthy (AME); Mohammed Ziane (Mathematics); Douglas Hammond (Earth Sciences)
- 1994 **Aerodynamic Force Acting on a Auto-rotating Flat Plate.** Master's Thesis, Meiji University, Advisor: Prof. Akira Ito
- 1992 **Aerodynamic Design of High Efficiency Propeller for Human Powered Airplane.** Graduation Thesis, Meiji University, Advisor: Prof. Akira Ito

## Journal Referee

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1. Journal of Fluid Mechanics
2. Journal of Geophysical Research
3. Limnology and Oceanography
4. World Journal of Modelling and Simulation
5. Wave Motion
6. IEEE Access

## Professional Society

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American Physical Society