

Kaustubha Raghukumar, Ph.D.

Consultant



Education and Credentials

Ph.D., Oceanography, Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California, 2009

M.S., Telecommunications, New Jersey Institute of Technology, Newark, New Jersey, 2003

B.E., Electronics and Telecommunications, Goa University, Goa, India, 2000

Continuing Education and Training

Research Associate, Naval Postgraduate School, Monterey, California, 2015

Postdoctoral Fellow, University of California, Santa Cruz, Santa Cruz, California, 2012

Professional Affiliations

Member of the Acoustical Society of America

Member of the American Geophysical Union

Professional Profile

Dr. Kaustubha Raghukumar is an oceanographer with a solid background in physical oceanography, ocean acoustics, and wave propagation physics, and has authored a number of peer-reviewed scientific papers in this area. He has 13 years of experience in modeling and at-sea measurements of hydrodynamic processes, such as surface waves, internal waves, and underwater sound. He has participated in several international at-sea experiments that focused on the impact of oceanographic fluctuations on ocean acoustic propagation. Dr. Raghukumar continues to develop state-of-the-art acoustic monitoring techniques and technologies for the U.S. Department of Energy and the Office of Naval Research. He is concurrently involved in modeling efforts to assimilate wave measurements into regional wave models, to study long-term shoreline change, and to examine the potential environmental effects of marine renewable energy devices.

Relevant Experience

Physical Oceanography

Measurement Buoy Development, Advanced Research Projects

Agency – Energy—Responsible for algorithm development and field validation of a low-cost wave measurement buoy, the Spotter, developed by Spooondrift, Integral, and Sandia National Laboratories.

Matilija Dam Removal, California—Developed nearshore phase-resolved wave models to accurately advect expected sediment loads following the removal of the Matilija Dam on the Ventura River and inform long-term shoreline change.

Vandenberg Unexploded Ordnance Study, Point Sal, Central California—Led a 3-month field effort to examine the long-term fate and transport of unexploded munitions under the influence of physical forcing such as waves and currents.



Ocean Acoustics

NoiseSpotter, U.S. Department of Energy—Leading the development of a vector sensor array with real-time telemetry to monitor the acoustic output of marine renewable energy devices, ultimately to help abate risk associated with sound from marine renewable energy installations.

Inner Shelf Direct Research Initiative, Office of Naval Research—Responsible for experimental design, field effort, and data analysis to characterize transmission loss in the surf zone and to examine the effect of bubble plumes in attenuating sound.

Ecosystem Modeling

Ecosystem Model, MEGAMER Facility, University of California, Santa Cruz—Implemented a coupled ecosystem model (ROMS) of the California Current System and studied the biological impact of assimilating physical oceanographic data. Proposed a simple method to mitigate the deleterious effects of physical data assimilation while simultaneously preserving improvements following data assimilation.

Publications

Raghukumar, K., G. Chang, F. Spada, and C. Jones. 2020. A vector sensor-based acoustic characterization system for marine renewable energy. *J. Mar. Sci. Eng.* 8(3):187. doi:10.3390/jmse8030187.

Raghukumar, K., G. Chang, F.W. Spada, and C.A. Jones. 2019. NoiseSpotter: A rapidly deployable acoustic monitoring and localization system. D. Vicinanza et al. (eds), Proc. of the 13th European Wave and Tidal Energy Conference, Naples, Italy.

Raghukumar, K., G. Chang, F. Spada, C. Jones, J. Spence, S. Griffin, and J. Roberts. 2019. Performance characteristics of a vector sensor array in an energetic tidal channel. pp. 653–658. J.S. Papadakis (ed), Proc. of the Fifth Underwater Acoustics Conference and Exhibition, Crete, Greece.

Jones, C., G. Chang, A. Dallman, J. Roberts, K. Raghukumar, and S. McWilliams. 2019. Assessment of wave energy resources and factors affecting conversion. B. Carrier and D. Ball (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29570-MS

Raghukumar, K., S. McWilliams, G. Chang, J. Roberts, and C. Jones. 2019. Wave energy converter arrays: Optimizing power production while minimizing environmental effects. C. Jones and J. Chitwood (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29658-MS

Raghukumar, K., G. Chang, F.W. Spada, and C.A. Jones. 2019. Performance characteristics of the NoiseSpotter: An acoustic monitoring and localization system. A. Cooper and P. Gibbs (eds), Offshore Technology Conference, Houston, TX. doi:10.4043/29425-MS



- Raghukumar, K., G. Chang, F. Spada, C. Jones, W. Gans, and T. Janssen. 2019. Performance characteristic of Spotter, a newly developed real-time wave measurement buoy. *J. Atmos. Ocean. Tech.* doi: 10.1175/JTECH-D-18-0151.1
- Jones, C., G. Chang, K. Raghukumar, S. McWilliams, A. Dallman, and J. Roberts. 2018. Spatial Environmental Assessment Tool (SEAT): A modeling tool to evaluate potential environmental risks associated with wave energy converter deployments. *Energies* 11(8):2036. doi:10.3390/en11082036.
- Raghukumar, K., C.A. Edwards, N.L. Goebel, G. Broquet, M. Veneziani, A.M. Moore, and J.P. Zehr. 2015. Impact of assimilating physical oceanographic data on modeled ecosystem dynamics in the California Current System. *Prog. Oceanogr.* 138:546–558.
- Raghukumar, K., and J.A. Colosi. 2015. High frequency normal mode statistics in a shallow water waveguide: The effect of random linear surface and internal waves. *J. Acoust. Soc. Am.* 137:2950–2961.
- Raghukumar, K., and J.A. Colosi. 2014. High frequency normal mode statistics in a shallow water waveguide: The effect of random linear internal waves. *J. Acoust. Soc. Am.* 136:66–79.
- Raghukumar, K., B.D. Cornuelle, W.S. Hodgkiss, and W.A. Kuperman. 2010. Experimental demonstration of the utility of pressure sensitivity kernels in time-reversal. *J. Acoust. Soc. Am.* 128:989–1003.
- Raghukumar, K., B.D. Cornuelle, W.S. Hodgkiss, and W.A. Kuperman. 2008. Sensitivity analysis applied to time-reversal acoustics. *J. Acoust. Soc. Am.* 124:98–112.
- Song, H.C., W.S. Hodgkiss, W.A. Kuperman, W.J. Higley, K. Raghukumar, T. Akal, and M. Stevenson. 2006. Spatial diversity in passive time reversal communications. *J. Acoust. Soc. Am.* 120:2067–2076.
- Wang, S., K. Raghukumar, A. Abdi, J. Wallace, and M. Jensen. 2004. Indoor MIMO channels: A parametric correlation model and experimental results. pp. 1–5. In: Proc. of IEEE/Sarnoff Symposium on Advances in Wired and Wireless Communication, Princeton, NJ.
- Chakraborty, B., K. Raghukumar, A. Hegde, and A. Pereira. 2001. Acoustic seafloor sediment classification using self-organizing feature maps. *IEEE Transactions on Geoscience and Remote Sensing* 39:2722–2725.

Invited Presentations/Panels/Peer Reviews

The acoustical and biological relevance of internal waves and spice. Moss Landing Marine Labs, Moss Landing, California. November 2014.

Introduction to ocean acoustics. Moss Landing Marine Labs, Moss Landing, California. September 2014.



Presentations/Posters

Raghukumar, K., and F. Spada. 2020. Observations of acoustic intensity fluctuations recorded during the Inner Shelf DRI experiment. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Spada, F., K. Raghukumar, G. Chang, and C. Jones. 2020. NoiseSpotter: Real-time underwater acoustic characterization in support of marine renewable energy projects. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Jones, C., S. McWilliams, K. Raghukumar, G. Chang, and J. Roberts. 2020. Optimization of wave energy converter array deployments while minimizing potential environmental risks. Platform presentation at the 2020 Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Jones, C., K. Raghukumar, and L. Marx. 2019. Assessment of natural hazard vulnerability and resilience in coastal environments. Poster presentation at SERDP ESTCP Symposium, Washington, DC. December 3–5.

Raghukumar, K., C. Jones, J. Weidenbach, S. Kleinhelder, K. Catlett, and P. Black. 2019. An offshore munitions mobility study at Vandenberg Air Force Base, California. Poster presentation at SERDP ESTCP Symposium, Washington, DC. December 3–5.

Raghukumar, K., F.W. Spada, G. Chang, and C. Jones. 2019. Characterization of near-bed particle motion by the NoiseSpotter: A three-dimensional vector sensor array. Poster presentation at Fifth International Conference on the Effects of Noise on Aquatic Life. Den Haag, The Netherlands. July 7–12.

Raghukumar, K., G. Chang, F. Spada, and C. Jones. 2019. NoiseSpotter: New technology for underwater acoustic characterization. Poster presentation at 6th Annual Marine Energy Technology Symposium. Washington, DC. April 1–3.

Raghukumar, K., S. McWilliams, C. Jones, and J. Roberts. 2019. Marine hydrokinetic energy assessment: Balancing efficiency and environmental concerns. Poster presentation at 6th Annual Marine Energy Technology Symposium. Washington, DC. April 1–3.

Scheu, K., C. Flanary, K. Raghukumar, C. Jones, L. Ziliani, B. Groppelli, S. Ceccon, and D. Bocchiola. 2019. Evaluating climate change effects on natural recovery of a contaminated sediment site. Platform presentation at Tenth International Conference on the Remediation and Management of Contaminated Sediments, New Orleans, LA. February 11–14.



- Raghukumar, K., K. Scheu, F. Spada, and C. Jones. 2018. Observations of acoustic intensity fluctuations and ambient noise in the surf zone. Oral presentation. 176th Meeting of the Acoustical Society of America. November 4–9, Victoria, BC, Canada.
- Scheu, K., C. Flanary, K. Raghukumar, and C. Jones. 2018. Evaluation of climate change effects on natural recovery in an alpine lake. Platform presentation. SETAC North America 39th Annual Meeting, November 4–8, Sacramento, CA.
- Raghukumar, K., F. Spada, G. Chang, and C. Jones. 2018. Initial field trials of the NoiseSpotter: An acoustic monitoring and localization system. Oral presentation at the 6th Annual Marine Energy Technology Symposium, April 30–May 2, Washington, DC.
- Raghukumar, K., G. Chang, and C. Jones. 2018. Improved sea state characterization in support of marine renewable energy projects. Poster presented at 6th Annual Marine Energy Technology Symposium, April 30–May 2, Washington, DC.
- Raghukumar, K., F. Spada, G. Chang, and C. Jones. 2018. Spatial characterization of surface waves using an array of newly developed wave buoys. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, February 11–16, Portland, OR.
- Spada, F., G. Chang, C. Jones, K. Raghukumar, P. Barney, W. Gans, T. Janssen, and Z. Kirshner. 2018. A motion-controlled wave buoy test stand for high fidelity data validation. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, February 11–16, Portland, OR.
- Raghukumar, K., J.A. Colosi, Y.-T. Lin, A. Newhall, T. Duda, K. Becker, and P. Hines. 2014. Comparison of shallow water mode transport theory with acoustic transmissions during shallow water experiment 2006. 167th Meeting of the Acoustical Society of America, Providence, RI.
- Raghukumar, K., and J.A. Colosi. 2013. The effect of surface and linear internal waves on higher order acoustic moments in shallow water. 21st International Congress on Acoustics, Montreal, Canada.
- Raghukumar, K., and J.A. Colosi. 2012. Transport theory applied to shallow water acoustics: The relative importance of surface scattering and linear internal waves. 164th Meeting of the Acoustical Society of America, Kansas City, MO.
- Raghukumar, K., N. Goebel, M. Veneziani, C. Edwards, G. Broquet, and A. Moore. 2011. Impact of assimilating physical oceanographic information on a complex ecosystem model in the California Current System. ASLO Aquatic Sciences Meeting, Puerto Rico.



Raghukumar, K., B.D. Cornuelle, W.S. Hodgkiss, and W.A. Kuperman. 2008. Optimized source functions based on pressure sensitivity kernels. Acoustical Society of America–European Society of Acoustics '08, Paris, France.

Raghukumar, K., B.D. Cornuelle, W.S. Hodgkiss, and W.A. Kuperman. 2007. Sensitivity analysis applied to time-reversal acoustics. 154th Meeting of the Acoustical Society of America, New Orleans.

Raghukumar, K., P. Roux, W.S. Hodgkiss, and W.A. Kuperman. 2003. Towards multichannel underwater communications using time reversal. 146th Meeting of the Acoustical Society of America, Austin.

