

Sridhar Balasubramanian

Professor, Department of Mechanical Engineering

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RESEARCH INTERESTS

- Environmental Fluid Mechanics
- Rotating Convection
- Turbulence and mixing
- Experimental methods
- Particle-laden flows
- Buoyancy-driven flows

EDUCATION & CERTIFICATION

Ph.D., Mechanical Engineering, *December 2008*
Arizona State University, Tempe *GPA: 3.94/4.0*

Thesis title: Dynamics of sand ripples in heterogeneous sediment beds

Master of Science, Mechanical Engineering, *November 2005*
Arizona State University *GPA: 3.90/4.0*

*Thesis title: Ripple dynamics and mine burial in coastal zones:
Laboratory experiments and model evaluation*

Bachelor of Engineering, Mechanical Engineering, *May 2003*
Shanmugha College of Engineering, Bharathidasan University, India *Aggregate: 82%*

WORK EXPERIENCE

Professor *April 2022 - Present*
Department of Mechanical Engineering
Indian Institute of Technology, Bombay, India

Associate Professor *May 2016-March 2022*
Department of Mechanical Engineering
Indian Institute of Technology, Bombay, India

Assistant Professor *Sep 2012-April 2016*
Department of Mechanical Engineering
Indian Institute of Technology, Bombay, India

Adjunct Visiting Faculty *May - June 2015*
Department of Civil and Environmental Engineering and Earth Sciences
University of Notre Dame, Indiana, USA

Visiting Professor *May – July 2017*
Department of Mechanical Engineering
PSG College of Technology, Coimbatore, India

Post-Doctoral Research Associate, *Dec 2011-Aug 2012*
Center for Non-Linear Studies
Los Alamos National Laboratory, USA
Project Title: Rotating thermal convection in geostrophic regime.

- Study the thermal convection process in ocean under rotation to understand the heat and mass transfer due to upwelling and downwelling of buoyant fluid.
- Physically model the effects of rotation and temperature gradient on the convection process.

- Investigate the structure of the vertically coherent vortices using velocity and temperature diagnostics and also measure the heat flux and transport.

Post Doctoral Research Associate,

Jan 2009-Dec 2011

Physics Division, Extreme Fluids Team

Los Alamos National Laboratory, USA

Project Title: Turbulence and mixing in shock driven flows.

- Investigations of shock driven instabilities in a shock tube (at Mach numbers $Ma = 1.2$ to 3) with a varicose heavy gas-curtain used to separate two gases. Used high-resolution diagnostics such as Planar Laser Induced Fluorescence (PLIF) and Particle Image Velocimetry (PIV) to study turbulence characteristics.
- Experience with moderate and high-pressure safety systems, gas cylinders and various measurement techniques.
- Extensive use of LabView program for data acquisition and measurements.
- Developed codes for data analysis and collaborated with numerical modelers.

Graduate Intern,

Dec 2005 – May 2006

Pinnacle West, Arizona

- Analyzed the power and pressure drop data collected at different channels in the nuclear reactor at Palo Verde Nuclear Generating Station using Fast Fourier Transform and wavelets to determine power density spectrum levels at different frequencies for Variable Over-Power Trip (VOPT) investigation.
- Based on the power spectra, suggestions were given to optimize the functioning of the pressure channels to minimize VOPT.

Graduate Research Associate,

Aug 2003 – Dec 2008

Environmental Fluid Dynamics Laboratory, Arizona State University

- Implemented Particle Image Velocimetry to understand the presence of coherent structures around sediment ripples and solid objects (e.g. cylinder) in an oscillatory flow under shoaling waves.
- Designed and assembled an oscillatory tray to study sediment transport and ripple dynamics under variable wave forcing and homogeneous grid induced turbulence.
- Studied the characteristics of elevation and depression tsunami waves experimentally and theoretically. Used Acoustic Doppler Velocimetry to measure three components of velocity and wave gauges to measure wave height.

AWARDS/RECOGNITIONS

1. Selected as Member of *The National Academy of Sciences, India* (NASI) in the year 2021.
2. Selected as one of the top 8 reviewers for the journal *Environmental Fluid Mechanics* in 2020.
3. Mechanical Engineering Departmental Excellence in Teaching Award, 2020.
4. Featured in “The Economic Times” June 16, 2019 edition. Article title “War of the weathervanes”. This article had other contemporaries like DG of IMD, and CEOs of Skymet Weather and IBM.
5. Editorial board member of *Environmental Fluid Mechanics* journal.
6. Interview on 92.7 BIG FM during cyclone Nisarga, which was broadcasted on June 3, 2020.
7. Invited author & guest columnist for The Weather Channel (IBM company) & Gaon Connection.
8. Outstanding presentation award for the poster on “A Modeling Study of Interannual Variability of Bay of Bengal Mixing and Barrier Layer Formation” in the AGU Fall Meeting 2019 at San Francisco.
9. Awarded the Shastri Institute Collaborative Research Grant (SICRG), funded by Shastri Indo-Canadian Institute, for a joint collaborative research work with Prof. Bruce Sutherland, University of Alberta, Canada.
10. PhD student, Ms. Shikha Singh, awarded prestigious Fulbright-Kalam Climate Fellowship and is now a Visiting Researcher at the University of Massachusetts, Dartmouth working with our collaborator Prof. Amit Tandon.

11. Recipient of IEI Young Engineer Award 2015, recognizing research contributions by an individual below the age of 35 years. Conferred by Institutions of Engineers India (IEI).
12. Won DOE/NNSA Defense Programs Award of Excellence, 2012 for significant contributions in the area of high-speed flows. Conferred by US Department of Energy in 2014.
13. Telford Premium for best journal paper titled “Draw-down and run-up of tsunami waves on sloping beaches” Institution of Civil Engineers (ICE), London, UK, 2013.
14. Young Principal Investigator award from Department of Science and Technology, India, 2013.
15. Best presenter for the paper titled “Experimental study of Rayleigh-Bénard convection in the presence of rotation” Fluid dynamics and thermal technologies, Istanbul, Turkey, 2013.
16. “Top 3-7 notable contributions’ award at the High Energy Density Plasma and Fluids (HEDPF) review for the work “*Frontier Experiments for Shock-Driven Mixing*” by K.P. Prestridge, G.C. Orlicz, S. Balasubramanian, R. Mejia-Alvarez, A. Martinez, L. Mazzaro and S. Gerashchenko, Los Alamos National Laboratory, April 2012.
17. Conferred the prestigious Los Alamos Awardees Program (LAAP) for contribution to Los Alamos Postdoctoral Association – FY’ 10.

TEACHING

1. Mechanical Measurements (UG level) – Spring 2023
2. Engineering Drawing and Graphics (UG level) – Spring 2021
3. Advanced heat transfer (UG/PG level) – Fall 2019, 2020, 2021
4. Fundamentals of waves and instabilities (PG level) – Spring 2019
5. Mathematical methods in Engineering (UG/PG level) – Fall 2016, 2017, 2018, 2022
6. Fluid Mechanics (UG) – Spring 2014, Fall 2014 & 2015.
7. Geophysical Fluid Dynamics (PG level) – Spring 2015, 2016, 2017, 2018, 2020, 2022
8. Advanced Fluid Mechanics (PG level) – Fall 2013.
9. Heat Transfer Laboratory (UG level) – Spring 2013.
10. Fluid Mechanics Laboratory (UG level) – Spring 2015, 2016 (Coordinator), 2017, 2018
11. Thermal & Fluids Engg. Laboratory (PG level) – Fall 2014, Spring 2015 (Coordinator), 2018, 2019
12. Measurements Laboratory (UG level) – Fall 2018 & 2019, Spring 2021 (Coordinator)

ONGOING AND COMPLETED RESEARCH PROJECTS

Project Title: Characterization of flow structures in rotating convection with superimposition of vertical and horizontal heat fluxes (PI, 2018-2022). *Sponsor: Ministry of Earth Sciences (Funding amount: INR 33.96 Lakhs) – ONGOING.*

Project title: Time resolved PIV & PIV-PLIF facility for gas and liquid flows (1 of 4 PIs) *Sponsor: Central facility through Research Infrastructure IIT-Bombay grant (Funding amount: INR 5.5 Crores) – ONGOING.*

Project Title: Dispersed particle-laden plumes in linearly stratified environment (PI, 2018-2020). *Sponsor: SHASTRI Indo-Canadian Institute. SHASTRI Fellow under SICRG. Canadian Collaborator – Prof. Bruce Sutherland, University of Alberta (Funding amount: INR 10 Lakhs) – COMPLETED.*

Project Title: Experimental study of turbulence modulation in dispersed particle-laden flows using simultaneous PIV/PTV diagnostics (PI, 2017-2021). *Sponsor: Department of Science & Technology (Funding amount: INR 60 Lakhs) – COMPLETED*

Project Title: Dynamics of Meso-Scale and Submeso-Scale processes in the Indian Ocean using Modular Ocean Model (PI, 2018-2020). *Sponsor: INCOIS (Funding amount: INR 24 Lakhs) – COMPLETED.*

Project Title: Meso-scale subsurface mixing dynamics in the Indian Ocean region using Modular Ocean Model (Co-PI, 2017-2020). *Sponsor: Department of Science and Technology (Funding amount: INR 42 Lakhs) – COMPLETED.*

Project Title: Experimental study of flow dynamics & turbulent entrainment of jets/plumes in stratified environment (PI, 2013-2016). *Sponsor: Department of Science & Technology (Funding amount: INR 25.20 Lakhs) – COMPLETED*

Project title: High-resolution simultaneous PIV-PLIF measurements of flow dynamics & turbulent mixing in buoyant stratified jets/plumes (PI, 2014-2017). *Sponsor: Ministry of Earth Sciences (Funds: INR 48.18 Lakhs) – COMPLETED*

Project Title: High-resolution diagnostics development for study of fluid instabilities and mixing (PI, 2013-2016).
Sponsor: Seed grant from Indian Institute of Technology, Bombay (Funding amount: INR 30 Lakhs) – COMPLETED

Project Title: Turbulent thermal convection in the presence of rotation. *Sponsor: Departmental excellence funding (Funding amount: INR 9 Lakhs) – COMPLETED*

Project title: Consultancy project titled “Air curtains around the Taj Mahal” (PI, 6 months duration) *Sponsor: Ministry of Culture, India (Funding amount: INR 5 Lakhs) – COMPLETED*

PATENTS

- Patent titled “*Methods and systems for prediction of weather events and their extremes using deep learning*” filed on 21 September 2022 with **Indian Patent Application No. TEMP/E-1/62192/2022-MUM**.

Inventors: Mr. Kshitij Choudhary, Dr. Siddhesh Tirodkar, B & **Prof. Sridhar Balasubramanian**. (Part of MTech project work)

- Patent titled “*An integrated, compact, and non-intrusive device for in situ flow measurements in rotating systems*” filed on 30 April 2018 with **Indian Patent Application No. 201821016272**.

Inventors: Mr. Ayan Banerjee & **Prof. Sridhar Balasubramanian**. (Part of PhD research work)

- Patent titled “*An apparatus for measuring cosmic ray flux in a radiosonde telemetry system, and a method thereof*” filed on 03 August 2015 with **Indian Patent Application No. 2929/MUM/2015**.

Inventors: Mr. Pradip Gatikine & **Prof. Sridhar Balasubramanian**. (Part of BTech project work).

STUDENT GUIDANCE AND LAB DEVELOPMENT

- PhD students graduated: 7
- PhD students under guidance: 3
- Master’s students graduated: 8
- Master’s students under guidance: 1
- Undergraduate student project guidance: 6
- Interns guided: 7
- Developed a research laboratory named “*Geophysical and Multiphase Flows laboratory*” with state-of-the-art facilities and equipment for performing cutting-edge research. The lab is equipped with setups for studying atmospheric and ocean dynamics with a relevance to weather modeling. One of the highlights of this lab is the **Coriolis rotating table** facility, useful for studying patterns in atmosphere/ocean (e.g. waves, Hadley cell etc.)
- Developed two new setups for undergraduate *Fluid Mechanics laboratory* to show importance of Bernoulli’s principle and boundary layer theory.

JOURNAL PUBLICATIONS

1. Harish Mirajkar, Partho Mukherjee, **Sridhar Balasubramanian**, 2023. On the dynamics of buoyant jets in a linearly stratified ambient, *Physics of Fluids*, doi: 10.1063/5.0136231

2. Mohnish Kapil, BR Sutherland, **Sridhar Balasubramanian**, 2022. Sediment characterization of bottom propagating reversing buoyancy particle-bearing jets, *Physical Review Fluids*, 7, 104302.
3. Partho Mukherjee, Harish Mirajkar, **Sridhar Balasubramanian**, 2022. Entrainment dynamics of buoyant jets in a stably stratified environment, *Environmental Fluid Mechanics*, <https://doi.org/10.1007/s10652-022-09893-y>.
4. Siddhesh Tirodkar, R. Murtugudde, Manasa R. Behera, **Sridhar Balasubramanian**, 2022. A comparative study of vertical mixing schemes in modeling the Bay of Bengal dynamics, *Earth and Space Science*, 9, e2022EA002327.
5. N Kumar, P Mukherjee, V Chalamalla, A Dewan, **Sridhar Balasubramanian**, 2022. Assessment of RANS-based turbulence model for forced plume dynamics in a linearly stratified environment, *Computers & Fluids*, 10528.
6. M Sarkar, S Tirodkar, R Chauhan, MR Behera, **Sridhar Balasubramanian**, Sensitivity analysis of vertical mixing schemes in a regional domain using Modular Ocean Model, *ISH J of Hydraulic Engineering*, accepted.
7. M Kapil, **Sridhar Balasubramanian**, 2021. Experimental Study on Propagation of Particle-Bearing Jets in a Confined Geometry, *J. Fluids Engineering*, 143 (10), 1-7.
8. M Pradhan, Suryachandra A Rao, A Bhattacharya, **Sridhar Balasubramanian**, 2022. Improvements in Diurnal Cycle and its Impact on Seasonal Mean by Incorporating COARE flux Algorithm in CFS, *Frontiers in Climate*, accepted (in press).
9. Partho Mukherjee, **Sridhar Balasubramanian**, 2021. Diapycnal mixing in lock-exchange gravity currents, *Physical Review Fluids*, 6 (013801), 1-12.
10. Ayan Banerjee, Amitabh Bhattacharya, **Sridhar Balasubramanian**, Investigation of heat transfer characteristics in a rotating convection system with bi-directional thermal gradients, *Journal of Heat Transfer* 143 (1), 1-9.
11. Mohnish Kapil, BR Sutherland, **Sridhar Balasubramanian**, 2021. Spreading & sedimentation from bottom propagating particle-bearing jets, *Journal of Fluid Mechanics*, 907, 1-19.
12. A Ruban, V Menezes, **Sridhar Balasubramanian**, K Srinivasan 2020, Shock-Boundary Layer-Interaction Control Through Recirculation in a hypersonic inlet, *ASME Journal of Fluids Engineering*, 142 (11), 1-4.
13. Partho Mukherjee, **Sridhar Balasubramanian**, 2020. Energetics and mixing efficiency of lock-exchange gravity currents using simultaneous velocity and density fields, *Physical Review Fluids*, 5 (063802), 1-18.
14. Harish Mirajkar, Partho Mukherjee, **Sridhar Balasubramanian**, 2020. PIV Study on the Dynamics of a forced plume in a stratified ambient, *Journal of Flow Visualization and Image Processing (Special Issue)*, 27(1) 29-45.
15. V. Praveen, V. Valsala, R.S. Ajayamohan, **Sridhar Balasubramanian**, 2020. Oceanic mixing over northern Arabian Sea in a warming scenario: Tug of war between wind and buoyancy forces, *Journal of Physical Oceanography*, 50, 945–964.
16. Avick Sinha, S. Gopalakrishnan, **Sridhar Balasubramanian**, 2019. Experimental study of external characteristics of a flashing water jet in water, *International Journal of Heat and Fluid Flow*, 78, 108424 1-9.
17. Shikha Singh, Vinu Valsala, AG Prajeesh, **Sridhar Balasubramanian**, 2019. On the variability of Arabian Sea mixing and its energetics, *Journal of Geophysical Research – Oceans*, 124 (11), 7817-7836.
18. Ayan Banerjee, Amitabh Bhattacharya, **Sridhar Balasubramanian**, 2018, Experimental study of rotating convection in the presence of bi-directional thermal gradients with localized heating, *AIP Advances*, 8 (11), 115324.
19. **Sridhar Balasubramanian**, Q Zhong, 2018, Entrainment and mixing in lock-exchange gravity currents using simultaneous velocity-density measurements, *Physics of Fluids*, 30 (5), 056601-1-14.
20. **Sridhar Balasubramanian**, Harish N Mirajkar, Ayan K Banerjee, 2018. Role of dispersed particles on the dynamics of an umbrella cloud of a forced plume in a linearly stratified environment, *Environmental Fluid Mechanics*, 18 (4), 985–1006.
21. A Ruban, V Menezes, **Sridhar Balasubramanian**, 2018, Boundary-Layer Control for Effective Hypersonic Intake, *Journal of Propulsion and Power* 34 (6), 1612-1614.
22. V Valsala, S Singh, **Sridhar Balasubramanian**, 2018, A Modeling Study of Interannual Variability of Bay of Bengal Mixing and Barrier Layer Formation, *Journal of Geophysical Research: Oceans*, 123, 3962-3981.

23. R More, **Sridhar Balasubramanian**, 2018, Mixing dynamics in double-diffusive convective stratified fluid layers, *Current Science* 114 (9), 1953-1960.
24. A Sinha, R Chauhan, **Sridhar Balasubramanian**, 2018, Characterization of a superheated water jet released into water using Proper Orthogonal Decomposition method, *ASME Journal of Fluids Engineering* 140 (8), 081107-081107-8.
25. Harish N Mirajkar, **Sridhar Balasubramanian**, 2017. Effects of Varying Ambient Stratification Strengths on the Dynamics of a Turbulent Buoyant Plume, *Journal of Hydraulic Engineering*, 143.
26. G. Orlicz, **S. Balasubramanian**, P. Vorobieff, K.P. Prestridge, 2015. Mixing transition in a shocked variable-density flow, *Physics of Fluids*, 27, 114102.
27. Harish N, Siddhesh Tirodkar, **Sridhar Balasubramanian**, 2015. Experimental Study on Growth and Spread of Dispersed Particle-Laden Plume in a Linearly Stratified Environment, *Environmental Fluid Mechanics*, 15, 1241-1262.
28. Avick Sinha, **Sridhar Balasubramanian**, Shivasubramanian Gopalakrishnan, 2015. A numerical study on dynamics of spray jets, *Sadhana Journal Indian Academy of Sciences*, 40(2), 787-802.
29. **S. Balasubramanian**, G.C. Orlicz & K.P. Prestridge, 2013. Experimental study of initial condition dependence on turbulent mixing in shock-accelerated Richtmyer-Meshkov fluid layers, *Journal of Turbulence*, 14 (3).
30. **S. Balasubramanian** & R.E. Ecke, 2013. Experimental study of Rayleigh-Bénard convection in the presence of rotation, *International Journal of Materials, Mechanics & Manufacturing*, 1 (2).
31. G.C. Orlicz, **S. Balasubramanian** & K.P. Prestridge, 2013. Incident shock Mach number effects on Richtmyer-Meshkov mixing in a heavy gas layer, *Phys. Fluids*, 25, 114101.
32. K.P. Prestridge, G.C. Orlicz, **S. Balasubramanian** & B.J. Balakumar, 2013. Review: Experiments of the Richtmyer-Meshkov instability, *Philosophical Transactions of the Royal Society A*.
33. **S. Balasubramanian**, G.C. Orlicz, K.P. Prestridge & B.J. Balakumar, 2012. Experimental study of initial condition dependence on Richtmyer-Meshkov instability in the presence of reshock, *Physics Fluids*, 24 (3).
34. B.J. Balakumar, G.C. Orlicz, J.R. Ristorcelli, **S. Balasubramanian**, K.P. Prestridge & C.D. Tomkins, 2012. Turbulent mixing in a Richtmyer-Meshkov fluid layer after reshock: Velocity & density statistics, *Journal of Fluid Mechanics*, 696.
35. **S. Balasubramanian**, K.P. Prestridge, G.C. Orlicz & B.J. Balakumar, 2011. Influence of initial conditions on turbulent mixing in shock driven Richtmyer-Meshkov flows, *AIAA Journal*, 3710, 1-11.
36. GC Orlicz, **S Balasubramanian**, KP Prestridge, BJ Balakumar, 2011. Investigation of Mach number effects on Richtmyer-Meshkov instability using simultaneous PIV and PLIF imaging diagnostics, *AIAA Journal*. 3709, 1-9.
37. C.A. Klettner, **S. Balasubramanian**, J.C.R. Hunt, H.J.S. Fernando, S. I. Voropayev & I. Eames, 2011. Drawdown and run-up of tsunami waves on sloping beaches, *Engineering and Computational Mechanics*, 164 (EM1).
38. **S. Balasubramanian**, S.I. Voropayev & H.J.S. Fernando, 2011. Heterogeneous sediment beds under weak oscillatory flow and turbulence: Ripples transformation and decay, *Ocean Engineering*, 38 (17).
39. **S. Balasubramanian**, S.I. Voropayev & H.J.S. Fernando, 2008. Grain sorting and degradation of sand ripples under oscillatory flow and turbulence, *Journal of Turbulence*, 9 (17).
40. S.I. Voropayev, **S. Balasubramanian** & H.J.S. Fernando, 2008. Grain sorting on sand ripples in heterogeneous sediments. *Journal of Visualization*, 11 (1).
41. H.J.S. Fernando, S.P. Samarawickrama, **S. Balasubramanian**, S.S.L. Hettiarachchi, S.I. Voropayev, 2008. Effects of porous barriers such as coral reefs on coastal wave propagation. *Journal of Hydro- Environment Research*, 1 (3).
42. F.Y. Testik, S.I. Voropayev, H.J.S. Fernando & **S. Balasubramanian**, 2007. Mine burial in the shoaling zone: scaling of laboratory results to oceanic situations. *IEEE Journal of Oceanic Engineering*, 32 (1).
43. F.Y. Testik, S.I. Voropayev, **S. Balasubramanian** & H.J.S. Fernando, 2006. Self-similarity of asymmetric sand-ripple profiles formed under nonlinear shoaling waves. *Physics Fluids*, 18 (10).

BOOK CHAPTERS (PEER REVIEWED)

1. Mousumi Sarkar, Shweta Sharma, Siddhesh Tirodkar, Rajesh Chauhan, **Sridhar Balasubramanian**, Manasa Ranjan Behera, 2022. Grid Sensitivity Study of Modular Ocean Model in Capturing Regional-Scale Dynamics of Bay of Bengal Under Seasonal Wind Patterns, *River and Coastal Engineering*, Springer, 203-212.
2. Shivam Swarnakar, Ayan Banerjee, Amitabh Bhattacharya, Sridhar Balasubramanian, Numerical Investigation of Rotating Convection in a New Configuration with Bi-directional Thermal Gradients, *Fluid Mechanics and Fluid Power. Lecture Notes in Mechanical Engineering*. Springer, Singapore, 517-523
3. **Sridhar Balasubramanian**, 2019, An Experimental Approach Toward Modeling Atmosphere and Ocean Mixing Processes, *Climate Change Signals and Response, Springer Nature*, 127-146.
4. Harish N, Alan John Maniamkot, **S. Balasubramanian**, 2017. Experimental study of boundary effects on buoyant jet dynamics in linearly stratified medium, *Book chapter in Fluid Mechanics and Fluid Power – Contemporary Research*, Springer publishers, in press. Eds: Saha, A., Das, D., Srivastava, R., Panigrahi, P.K., & Muralidhar, K. ISBN 978-81-322- 2743-4, 737-745
5. Avick Sinha, **Sridhar Balasubramanian**, Shivasubramanian Gopalakrishnan, 2015. Internal and external characteristics of a superheated jet, *Book chapter in Computational Methods in Multiphase Flow VIII*, WIT Transactions of Engineering Sciences, WIT Press, Vol. 89, pp. 225-236. Eds: P. Vorobieff, C.A. Brebbia, & J.L. Munoz-Cobo.
6. Harish N, **Sridhar Balasubramanian**, 2015, Effect of Dispersed Particles on Buoyant Plumes in Stratified Environments, *Book chapter in 10th Pacific Symposium on Flow Visualization and Image Processing*, FedOA-Università di Napoli Press. Ed: Gennaro Cardone, ISBN: 978-88-906484-3-4, pp.1-8.
7. G Orlicz, **S Balasubramanian**, K Prestridge, 2015. Investigation of Mach Number Dependence on the Richtmyer-Meshkov Mixing Transition for a Shocked Heavy-Gas Curtain, *Book chapter in 29th International Symposium on Shock Waves*, Springer publishers, Vol. 2, pp. 1101-1106. Eds: Riccardo Bonazza & Devesh Ranjan,
8. F.Y. Testik, S.I. Voropayev, H.J.S. Fernando & **S. Balasubramanian**, 2007. Sand ripples dynamics and degradation under oscillatory flow and turbulence. *Rivers, Coastal and Estuarine Morphodynamics*, Edited by C . Marjolein Dohmen-Janssen and Suzanne J . M . H . Hulscher, Taylor & Francis 2007, pp. 379–385, ISBN: 978-0-415-45363-9
9. S.I. Voropayev, F.Y. Testik, H.J.S. Fernando & **S. Balasubramanian**, 2006. Sediment transport, ripple dynamics and object burial under shoaling waves. *Particle Laden Flow: From Geophysical to Kolmogorov Scales*, Springer Science, Netherlands.

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. Siddhesh Tirodkar, Srinivas L. Vellala, Manasa Ranjan Behera, **Sridhar Balasubramanian**, Dynamics and energetics of regional domain in the Bay of Bengal using Modular Ocean Model, IIOSC 2022, GOA, 14-18 March, 2022. (Accepted)
2. Tirodkar, S., Behera M. R., **Sridhar Balasubramanian**, 2020. A regional study of Bay of Bengal processes using radiation boundary condition in Modular Ocean Model, EGU General Assembly 2020, held online. (P)
3. Tirodkar, S., Behera M. R., **Sridhar Balasubramanian**, 2020. A regional study of Bay of Bengal processes using radiation boundary condition in Modular Ocean Model, EGU General Assembly 2020, held online. (P)
4. Singh, S., Valsala, V., **Sridhar Balasubramanian**, 2019. A Modeling Study of Interannual Variability of Bay of Bengal Mixing and Barrier Layer Formation", AGU Fall Meeting, San Francisco, US. (P)
5. Sarkar, M., Chauhan, R., Tirodkar, S., Sharma, S., **Sridhar Balasubramanian**, Behera M. R., 2019. "Bay of Bengal mixing layer dynamics under different seasonal wind scenarios using Modular Ocean Model", AGU Fall Meeting, San Francisco, US. (P)
6. Sridhar Balasubramanian, 2019. Energetics & mixing efficiency of a forced plume using simultaneous velocity-density measurements, Environmental Fluid Dynamics: Confronting Grand Challenges Meeting, Ecole de Physique des Houches, Les Houches, France. (P)

7. Chauhan, R., Tirodkar, S., Sarkar, M., Behera M. R., **Sridhar Balasubramanian**, 2019. Modelling tidal energy dissipation and diffusivity in Bay of Bengal using Modular Ocean Model, OSICON 19, Cochin, India. (O)
8. Tirodkar, S., Chauhan, R., Sarkar, M., Behera M. R., **Sridhar Balasubramanian**, 2019. "Wind driven circulation study in the Bay of Bengal with radiation boundary conditions in Modular Ocean Model", OSICON 19 Conference, Cochin, India. (O)
9. Sarkar, M., Chauhan, R., Tirodkar, S., Sharma, S., **Sridhar Balasubramanian**, Behera M. R., 2019. "Study of mesoscale and sub-mesoscale processes in a shear-stratified regional ocean using Modular Ocean Model", EGU General Assembly, Austria Center Vienna, Vienna, Austria. (O)
10. Partho Mukherjee, **Sridhar Balasubramanian**, 2018. Mixing Dynamics of Lock-Exchange Gravity Currents Using Simultaneous Velocity and Density Measurements, 8th International Symposium on Environmental Hydraulics (ISEH), University of Notre Dame, Indiana, USA.
11. V Praveen, V Valsala, AM Ravindran, **S Balasubramanian**, 2018. The role of wind induced shear in northern Arabian Sea mixing under global warming, *AGU Fall Meeting Abstracts, San Francisco, California*.
12. AK Banerjee, A Bhattacharya, **Sridhar Balasubramanian**, 2018. Study of convection in rotating flow in a new configuration with bi-directional temperature gradients, *Bulletin of the American Physical Society, 71st APS DFD Meeting, Georgia, Atlanta*.
13. Sarkar, M., Sharma, S., Tirodkar, S., Chauhan, R., **Balasubramanian, S.**, Behera M. R., 2018. Grid sensitivity study of Modular Ocean Model in capturing regional-scale dynamics of Bay of Bengal under seasonal wind patterns, *HYDRO-2018 INTERNATIONAL conference, NIT Patna, India*.
14. Chauhan, R., Tirodkar, S., Sarkar, M., Sharma, S., Behera M. R., **Balasubramanian, S.**, 2018. Regional modelling of a stratified ocean under wind forcing using Modular Ocean Model: link to Bay of Bengal process dynamics, *HYDRO-2018 INTERNATIONAL conference, NIT Patna, India*.
15. H Mirajkar, **Sridhar Balasubramanian**, 2018. Energetics of a forced plume in a linearly stratified environment using simultaneous velocity & density fields, *Bulletin of the American Physical Society, 71st APS DFD Meeting, Georgia, Atlanta*.
16. Sarkar, M., Tirodkar, S., **Balasubramanian, S.**, Behera, M. R., 2017. Study of sub-surface mixing in the Bay of Bengal using Modular Ocean Model, *OSICON 17, NCESS Thiruvananthapuram, India*.
17. H Mirajkar, **Sridhar Balasubramanian**, 2017. Study of mixing efficiency of a buoyant plume using velocity and density measurements, *Bulletin of the American Physical Society, 70th APS DFD Meeting, Denver, Colorado*.
18. AK Banerjee, A Bhattacharya, **Sridhar Balasubramanian**, 2017. Study of rotating convection in a new configuration with simultaneous imposition of radial and vertical temperature gradients, *Bulletin of the American Physical Society, 70th APS DFD Meeting, Denver, Colorado*.
19. **Sridhar Balasubramanian**, H Mirajkar, AK Banerjee, 2017. Role of dispersed particles on the dynamics of the umbrella cloud of a buoyant plume, *Bulletin of the American Physical Society, 70th APS DFD Meeting, Denver*.
20. A Sinha, S Gopalakrishnan, **S Balasubramanian**, 2016. Investigation of coherent structures in a superheated jet using decomposition methods, *Bulletin of the American Physical Society, 69th APS DFD Meeting, Portland*.
21. Harish N Mirajkar, **Sridhar Balasubramanian**, 2016, Dynamics of a buoyant plume in linearly stratified environment using simultaneous PIV-PLIF, *8th International Symposium on Stratified Flows, San Diego, USA*.
22. Ayan K Banerjee, Siddhesh Tirodkar, Amitabh Bhattacharya, **Sridhar Balasubramanian**, 2016, Convection in rotating flows with simultaneous imposition of radial and vertical temperature gradients, *8th International Symposium on Stratified Flows, San Diego, USA*.
23. **Sridhar Balasubramanian**, Q Zhong, H Fernando, 2015, Entrainment dynamics in self-adjusting gravity currents using simultaneous velocity-density measurements, *Bulletin of the American Physical Society 60, 68th APS DFD Meeting, Boston*.
24. A Sinha, S Gopalakrishnan, **Sridhar Balasubramanian**, 2015, Numerical and experimental study of the dynamics of a superheated jet, *Bulletin of the American Physical Society 60, 68th APS DFD Meeting, Boston*.
25. Harish N Mirajkar, **Sridhar Balasubramanian**, 2015, Dynamics of particle-laden plume in linearly stratified

environment, *Bulletin of the American Physical Society* 60, 68th APS DFD Meeting, Boston.

26. Ayan Kumar Banerjee, Amitabh Bhattacharya, **Sridhar Balasubramanian**, 2015, Effect of planetary rotation and baroclinicity on atmospheric circulation, heat transport, and turbulent convection, *National Climate Science Conference, Divecha Centre for Climate Change*, Indian Institute of Sciences, Bangalore, India.
27. Harish N Mirajkar, **Sridhar Balasubramanian**, 2015, Flow dynamics of dispersed particle-laden buoyant plumes, *National Climate Science Conference, Divecha Centre for Climate Change*, IISc, Bangalore, India.
28. Avick Sinha, Shivasubramanian Gopalakrishnan, **Sridhar Balasubramanian**, 2014, Numerical and experimental investigations of superheated jet dynamics, *10th European Fluid Mechanics Conference (EFMC10)*, TU Denmark, Copenhagen, Denmark.
29. Harish N, **Sridhar Balasubramanian**, 2014, Experimental study of dispersed buoyant jets in stratified environment, *10th European Fluid Mechanics Conference (EFMC10)*, TU Denmark, Copenhagen, Denmark.
30. Harish N, Shubham Yadav, **Sridhar Balasubramanian**, 2014, Mixing dynamics of buoyant jet and plume in a stratified environment, *Proc. 11th International Conference on Hydrodynamics*, Singapore.
31. Harish N, Shubham Yadav, Avik Das, **Sridhar Balasubramanian**, 2013, Experimental study of jets and plumes in stratified environment, *Proceedings of the Fortieth National Conference on Fluid Mechanics and Fluid Power*, NIT Hamirpur, Himachal Pradesh, India.
32. Avick Sinha, S. Gopalakrishnan, **Sridhar Balasubramanian**, 2013, Numerical study of dynamics of spray formed by a multiphase jet, *Proceedings of the Fortieth National Conference on Fluid Mechanics and Fluid Power*, NIT Hamirpur, India.
33. **S. Balasubramanian**, R. E. Ecke, 2013, Experimental study of Rayleigh-Bénard convection in the presence of rotation” Fluid dynamics and thermal technologies, Istanbul, Turkey, 2013.
34. **S. Balasubramanian**, G.C. Orlicz & K.P. Prestridge, 2011. Single and multi-mode initial condition influence on turbulent mixing in Richtmyer-Meshkov flows, *64th Annual Meeting of APS-DFD*, Nov 20-22, Baltimore, Maryland.
35. G.C. Orlicz, **S. Balasubramanian**, K.P. Prestridge & B.J. Balakumar, 2011. Investigation of Mach number effects on the Richtmyer-Meshkov instability using simultaneous PIV and PLIF imaging diagnostics, AIAA-2011-3709, In *Proceedings of 41st AIAA Fluid Dynamics Conference and Exhibit*, June 27-30, Honolulu, Hawaii.
36. K.P. Prestridge, **S. Balasubramanian**, G.C. Orlicz & 2011. Effects of Initial Conditions on Mixing in Richtmyer-Meshkov Turbulence Experiments, In *Proceedings of 28th International Symposium on Shock Waves*, 17-22 July, Manchester, UK.
37. A.A. Gowardhan, **S. Balasubramanian**, F.F. Grinstein & K.P. Prestridge, 2011. Analysis of computational and laboratory shocked gas-curtain experiments, AIAA-2011-3040, In *6th AIAA Theoretical Fluid Mechanics Conference*, June 27-30, Honolulu, Hawaii.
38. **S. Balasubramanian**, K.P. Prestridge, G.C. Orlicz & B.J. Balakumar, 2011. Experimental study of initial condition dependence on mixing in Richtmyer-Meshkov instabilities, In *Proceedings of the 12th International Workshops on the Physics of Compressible Turbulent Mixing*, July 12-17, Moscow, Russia.
39. **S. Balasubramanian**, K.P. Prestridge, B.J. Balakumar, G.C. Orlicz & G.R. Friedman, 2010. Effect of multi-mode initial conditions in shock-driven flows, *63rd Annual Meeting of APS-DFD*, volume 55, 16, Nov 21-23, Long Beach, California.
40. **S. Balasubramanian**, B.J. Balakumar, G.C. Orlicz, C.D. Tomkins & K.P. Prestridge, 2009. Initial conditions effects in shock driven instabilities, *62nd Annual Meeting of APS-DFD*, volume 54, 19, Nov 22-24, Minneapolis.
41. B.J. Balakumar, G.C. Orlicz, **S. Balasubramanian**, C.D. Tomkins & K.P. Prestridge, 2009. Measurement of turbulence statistics in Richtmyer-Meshkov mixing, *8th International symposium PIV'09*, Aug 25-28, Melbourne, Australia.
42. H.J.S. Fernando, **S. Balasubramanian**, C.A. Klettner, J.C.R. Hunt, S.I. Voropayev & I. Eames, 2009, Evolution of depressed and elevated tsunami waves, *62nd Annual Meeting of APS-DFD*, volume 54, 19, Nov 22-24, Minneapolis.

43. **S. Balasubramanian**, S. Voropayev & H. Fernando, 2008, Morphological evolution of sediment ripples in coastal zones, American Geophysical Union (AGU), *Fall Meeting 2008*, abstract #OS21E-1221, San Francisco, CA, USA.

INVITED TALKS

1. Panelist at the I-connect (ICEN56) event titled "*Climate Change through the lens of modelling, artificial intelligence and machine learning*" held on 21 July 2022.
2. Invited talk titled "Experimental study of dynamics of forced plumes in a linearly stratified ambient" as a part of IGR colloquium at University of Alberta Canada on Sep 17, 2019.
3. Invited talk titled "Energetics of a shear-stratified flow: Link to Indian Ocean process dynamics" on Nov 15, 2018 at INCOIS, Hyderabad.
4. Invited talk titled "Fluid Mechanics of Environmental Motions" at KJ Somaiya College of Engineering, Mumbai, on January 5th, 2018.
5. Invited talk titled "Dynamics of Equatorial Atmosphere and Oceans" at TISS, Mumbai, August 5, 2017.
6. Invited talk titled "Characterization of mixing in shear stratified flows" at the Buoyancy Driven Flows' meeting held in ICTS, Bangalore on June 19, 2017.
7. Lecture series on "Experimental methods in fluid and thermal sciences" at PSG College of Technology, Coimbatore (June 2017 - July 2017).
8. Invited talk titled "*Using experiments to study bulk and local mixing dynamics in stratified flows*" at Indian Institute of Tropical Meteorology, Pune, India, July 2016.
9. Invited talk titled "*Experimenting with fluid flows: What's the current state-of-the-art?*" at Fr. C. Rodrigues Institute of Technology, Vashi, Mumbai, India, February 2016.
10. Invited talk titled "*Mixing dynamics in complex fluid systems: An experimentalist's view*" at University of Rome, Tor Vergata, Rome, Italy, June 2015.
11. Invited talk titled "*The role of computational fluid dynamics in transport phenomena*" at CAPE 2013 organized by IChE, SASTRA University, Thanjavur, India, in October 2013.
12. Presented a talk titled "*Fluid instabilities and turbulent mixing in variable density flows*" at Department of Mechanical Engineering, Indian Institute of Sciences, Bangalore, India, on March 28th, 2013.
13. Presented a talk titled "*Fluid instabilities and mixing in incompressible and compressible flows*" at Department of Mechanical Engineering, Indian Institute of Technology, Bombay, India, on January 17th 2012.
14. Presented a talk titled "*Hydrodynamic instabilities and mixing in oceanic and shock-driven flows*" at Department of Mechanical Engineering, Indian Institute of Technology, Gandhinagar, India, on November 9th 2011.
15. Presented a talk titled "*Experimental study of hydrodynamic instabilities in oceanic and shock-driven flows*" at Department of Mechanical Engineering, Wright State University, Dayton, Ohio, USA, on June 9th 2011.
16. Presented a talk titled "*Morphological evolution of ocean bottom under shoaling waves*" at Department of Ocean Engineering, Indian Institute of Technology, Madras, India, on September 8th 2009.
17. Presented a talk titled "*Morphological evolution of ocean bottom under shoaling waves*" at Physics Division, Los Alamos National Laboratory, Los Alamos, New Mexico, USA on August 27th 2008.
18. Presented a talk titled "*Topographically affected flows: Study of wave-formed ripples in coastal zones*" at Navy Research Lab, Stennis Space Center, Mississippi, USA on August 18th 2008.

INVITED VISITS

1. Visited *University of Alberta, Canada* for a period of 1 week in September 2019 to discuss research collaborations with Prof. Bruce Sutherland, Department of Physics.
2. Visited *Les Houches, France* to attend a workshop on **Environmental Fluid Dynamics: Confronting Grand Challenges**. The visit was for a period of 1 week in January 2019.

3. Visited *PSG College of Technology, Coimbatore, India* during the period May - July, 2017, as a visiting faculty in the department of mechanical engineering.
4. Visited *University of Notre Dame, Notre Dame, Indiana, USA*, as an adjunct visiting professor in the Department of Civil & Environmental Engineering and Earth Sciences during the period May - June, 2015. Conducted collaborative research with **Prof. Harindra J Fernando** (Wayne and Diana Murdy Endowed Professor at University of Notre Dame) on topic related to “Entrainment and mixing dynamics of dense gravity currents”.
5. Visited *ILA GmbH, Julich, Germany* to learn about the various optical diagnostics tools offered by them. Liaised with Mr. Frank Michaux, who is the head of PIV division at ILA GmbH. During this visit, also went to RWTH Aachen to see their aerodynamics laboratory. The visit was for a period of 1 week in May 2014.

SERVICES

- Editorial board member for *Environmental Fluid Mechanics*.
- Guest Editor & reviewer for *Journal of Flow Visualization and Image Processing*.
- Reviewer: *Physical Review Letters, Physical Review Fluids, Physics of Fluids, Environmental Fluid Mechanics, Journal of Fluids Engineering, Journal of Hydro-Environment Research, Journal of Hydraulic Research, Journal of Hydraulic Engineering, International J. Heat & Mass Transfer, Experimental Thermal & Fluid Sciences, Sadhana: Academy of Indian Sciences, Climate Dynamics*.
- External reviewer for multiple PhD theses.
- Session chair at Fluid Mechanics and Fluid Power conferences 2013-2018.
- Session chair at APS-DFD conference.
- Review committee for Fluid Mechanics and Fluid Power conference (2013-2018).
- National conference on Fluid Mechanics and Fluid power (FMFP) Organizing committee (2013-2018).
- Session chair for *41st AIAA Fluid Dynamics Conference and Exhibit*, Hawaii, USA, 2011.

LIST OF INTERNATIONAL & NATIONAL COLLABORATORS:

Prof. Harindra Joseph Fernando (University of Notre Dame, USA)

Prof. Bruce Sutherland (University of Alberta, Canada)

Dr. Vinu Valsala (Indian Institute of Tropical Meteorology Pune)

Prof. Vamsi K Chalamalla (IIT Delhi)

Prof. Saji Hameed (University of Aizu, Japan)

Prof. Amit Tandon (University of Massachusetts, Dartmouth, USA)

MEDIA COVERAGE:

1. One of the three panelists for a panel discussion on “Monsoon 2020” organized by The Weather Channel, IBM, India. Part of their initiative called “Let’s talk Weather”.
Two such sessions were conducted. The viewership was very good for both the sessions – streamed live via Twitter & Facebook.
2. I write **invited guest columns** for The Weather Channel (India) and Gaon Connection.
3. I am contacted by independent journalists on a regular basis to get scientific opinion on various weather related phenomenon (Indian monsoon, Thunderstorms, ENSO, et al.). I have now given my expert opinion to *Scroll Press, Livemint, Mongabay, and Times of India, Hindustan Times, Hindu, and other leading newspapers*.
4. Interviewed by journalists on a regular basis.

MEMBERSHIPS

- American Physical Society (APS)
- International Association for Hydro-Environment Engineering and Research (IAHR)
- National society of fluid mechanics and fluid power

SOFTWARE SKILLS

- Design Tools: AutoCAD, Solid Works, Design Expert, Minitab.
- Programming: MATLAB, C, C++, LabView.
- Operating systems: Windows, Macintosh, and Linux.
- Documentation tools: MS Office, Latex.

DIAGNOSTIC/INSTRUMENTATION

- Particle Image Velocimetry (PIV)
- Planar Laser Induced Fluorescence (PLIF)
- Particle Tracking Velocimetry
- Simultaneous PIV and PLIF
- Time- resolved (TR) PIV and PLIF
- Dye visualization