

RESEARCH INTERESTS

Turbulence, Machine Learning, Computational Fluid Dynamics (CFD), Atmospheric and Oceanic flows and Climate dynamics.

EDUCATION

University of California San Diego, La Jolla, CA, USA

Jacobs School of Engineering

Doctor of Philosophy,

Mechanical Engineering,

July 2011 - September 2016

- Thesis: Dynamics of stratified flow past a sphere: simulations using temporal, spatial and body inclusive numerical models.
- Advisor: Prof. Sutanu Sarkar, Mechanical and Aerospace Engineering, UCSD
- CGPA: 3.7/4.0

Indian Institute of Technology Kanpur, Uttar Pradesh, INDIA

Master of Technology,

Fluid Mechanics and Thermal Sciences, Department of Mechanical Engineering.

August 2008 - May 2010

- Thesis: Enhancement of heat transfer by delta winglet-type vortex generators with common-flow-up configuration for fin tube heat exchangers.
- Advisors: Prof. Gautam Biswas and Prof. Vinayak Eswaran, Mechanical Engineering, IIT Kanpur
- Cumulative Performance Index (CPI): 8.75/10

Kalyani Government Engineering College, WestBengal, INDIA

Bachelor of Technology, Mechanical Engineering (CPI 8.12/10)

2003 - 2007

PROFESSIONAL EXPERIENCE

Distinguished Postdoctoral Research Associate,

Computational Climate Scientist

Center for Computational Sciences **Oak Ridge National Laboratory**.

June 2017 - present.

Postdoctoral Scholar,

Department of Atmospheric and Oceanic Sciences **University of California Los Angeles**.

October 2016 - June 2017

PUBLICATIONS

JOURNALS

1. **Pal A.**, "Deep learning parameterization of subgrid-scale processes in wall bounded turbulent flows." *submitted*.
2. **Pal A.**, Mahajan S, and Norman M. R., "Using Deep Neural Networks as Cost-Effective Surrogate Models for GCM Radiative Transfer." *Geophys. Res. Lett. in press*.
3. **Pal A.** and Chalamalla V. K., "DNS of turbulent convection in a rotating and stratified fluid." *under review J. Fluid Mech.*
4. **Pal A.** and Sarkar S., "Internal gravity waves in stratified turbulent flow past a towed sphere at $Re = 3700$." *submitted in J. Fluid Mech.*
5. **Pal A.**, Sarkar S., Posa A., and Balaras E. "Direct numerical simulation of stratified flow past a sphere at a subcritical Reynolds number of 3700 and moderate Froude number." *J. Fluid Mech.*, 826, 5-31 (2017).
6. Chongsiripinyo K., **Pal A.** and Sarkar S., "On the vortex dynamics of flow past a sphere at $Re = 3700$ in a uniformly stratified fluid." *Phys. of Fluids.*, 29, 020704 (2017).

7. **Pal A.**, Sarkar S., Posa A., and Balaras E., "Regeneration of turbulent fluctuations in low-Froude number flow over a sphere at a Reynolds number of 3700." *J. Fluid Mech.*, 804 R2 (2016).
8. **Pal A.** and Sarkar S., "Effect of external turbulence on the evolution of a wake in stratified and unstratified environments" *J. Fluid Mech.*, 772, 361-385 (2015).
9. Bazilevs Y., Korobenko A., Yan J., **Pal A.**, and Sarkar S., "ALE-VMS formulation for stratified turbulent incompressible flows with applications," *Mathematical Models and Methods in Applied Sciences*, 25(12), 2349-2375 (2015).
10. **Pal A.**, deStadler M.B. and Sarkar S., "The spatial evolution of fluctuations in a self-propelled wake compared to a patch of turbulence," *Phys. of Fluids.*, 25 (9), 095106 (2013).
11. **Pal A.**, Bandyopadhyay D., Biswas G. and Eswaran V., "Enhancement of heat transfer using delta-winglet type vortex generators with a common-flow-up arrangement," *Numerical Heat Transfer, Part A: Applications.*, 61(12), 912-928 (2012).

CHAPTERS IN BOOKS

1. Chongsiripinyo K., **Pal A.**, and Sarkar S., "Scaling laws in the axisymmetric wake of a sphere," *Direct and Large-Eddy Simulation X Series: ERCOFTAC Series*, Springer, Vol. 24 (2018).

CONFERENCE PRESENTATIONS

1. **Pal A.**, Mahajan S, and Norman M.R. "Using Deep Learning as Cost-Effective Surrogate Models for GCM Radiative Transfer." *American Meteorological Society 99th Annual Meeting*, Pheonix, AZ (2019).
2. **Pal A.**, and Chalamalla V. K., "Direct numerical simulation of deep-ocean convection in a rotating stratified fluid.," *70th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Atlanta, Ga (2018).
3. **Pal A.**, and Norman M. R., "Emulating RRTMG Radiation with Deep Neural Networks for the Energy Exascale Earth System Model," *American Geophysical Union Fall Meeting*, New Orleans, La (2017).
4. Sreepathi S., Norman M. R., **Pal A.**, Hannah W. and Ponder C., "Development of a cloud resolving model for heterogeneous supercomputers," *American Geophysical Union Fall Meeting*, New Orleans, La (2017).
5. **Pal A.** "DNS of unsteady, turbulent convection in a rotating stratified fluid," *70th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Denver, Co (2017).
6. **Pal A.**, and Sarkar S., "Dynamics of flow over a sphere at moderate Re in a highly stratified fluid," *69th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Portland, OR (2016).
7. Chongsiripinyo K., **Pal A.**, and Sarkar S., "Coherent structures and enstrophy dynamics in highly stratified flow past a sphere at Re= 3700," *69th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Portland, OR (2016).
8. **Pal A.**, Chongsiripinyo K. and Sarkar S., "Dynamics of flow over a sphere at Re=3700 in moderate to highly stratified environments." *VIIIth International Symposium on Stratified Flows (ISSF)*, San Diego, CA (2016)
9. **Pal A.**, and Sarkar S., "Internal gravity waves in stratified turbulent flow past a towed sphere at Re = 3700," *68th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Boston, MA (2015).
10. **Pal A.** and Sarkar S., "Effect of external turbulence on a turbulent wake," *Ninth International Symposium on Turbulence and Shear Flow Phenomena (TSFP-9)*, Melbourne, Australia (2015).
11. **Pal A.**, Posa A., Balaras E. and Sarkar S., "The turbulent, stratified near wake of a sphere at Re = 3700 and Fr = 1, 3," *International Conference on Jets, Wakes and Separated Flows (ICJWSF)*, Stockholm, Sweden (2015).
12. **Pal A.**, Posa A., Balaras E. and Sarkar S., "The turbulent, stratified near wake of a sphere at Re = 3700 and Fr = 3," *67th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, San Francisco, CA (2014).

13. **Pal A.** and Sarkar S., “Effect of External Turbulence on the Evolution of a Towed Wake in a Stratified Environment,” *66th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, Pittsburgh, PA (2013).
14. **Pal A.**, deStadler M. B., and Sarkar S., “A Comparative Study of Spatially Evolving Self-Propelled Wakes and a Patch of Turbulence in a Stratified Fluid,” *65th Annual Meeting of the American Physical Society - Division of Fluid Dynamics*, San Diego, CA (2012).

INVITED TALKS

1. “Dynamics of stratified flow past a sphere: simulations using body inclusive numerical models.” National Center for Computational Sciences, **Oak Ridge National Laboratory** (April 2017).
2. “Dynamics of stratified flow past a sphere: simulations using body inclusive numerical models.” Division of Geological and Planetary Sciences, **Caltech** (September 2016).
3. “Dynamics of stratified flow past a sphere: simulations using body inclusive numerical models.” Center for turbulence research, **Stanford University** (June 2016).

TEACHING AND MENTORING EXPERIENCE

1. Teaching assistant for undergraduate Fluid Mechanics (approximately 300 students), UCSD, Winter 2012.
2. Tutor for undergraduate and high-school students for Vector Calculus, Physics and Mathematics.
3. Guest lecturer for graduate level Turbulence class, UCSD, Spring 2016.
4. Mentored **three Ph.D** students in my research group, UCSD.

PROFESSIONAL SERVICES AND OUTREACH

- Reviewer
 1. Journal of Fluid Mechanics
 2. Journal of Marine Science and Engineering
- Professional member
 1. American Physical Society
 2. American Geophysical Union
- **Panelist** to advise prospective graduate students, UCSD, May 2013.
- **Abstract Sorter and Meeting Volunteer** of American Physical Society: Division of Fluid Dynamics conference, UCSD, November 2012.
- **Volunteer** for San Diego Festival of Science & Engineering, 2014 – 2016.
- Led lab tours for middle school students for Enspire, 2011 – 2013.
- Led lab tours for high school girls interested in engineering and computer science for Envision, 2011 – 2013.