Raju Pathak

Visiting Research Fellow
Physical Science and Engineering Division
King Abdullah University of Science and Technology
Thuwal – 23955, Saudi Arabia
✉ rajuphyamu@gmail.com
☎ (+91) 99535054 18

Current Affiliation:

Dec. 2019- present **Visiting Research Fellow** – Physical Science and Engineering Division, King Abdullah University of Science and Technology (KAUST)

Responsibility: *To perform the parametric uncertainty quantification using Polynomial Chaos Expansion (PCE) and the parametric calibrations using Bayesian Optimization Technique for NCAR SCAM6 and CAM6 model*
Advisors: Prof. Ibrahim Hoteit and Prof. Aneesh Subramanian

Higher Education:

2015 – 2020 **Ph.D. (Atmospheric Science)** – Center for Atmospheric Sciences, Indian Institute of Technology Delhi, New Delhi – 110018, India
Thesis: "Improved Convection and Cloud Parameterization: *Towards an India Centric Climate Model (ICCM)*" (**Synopsis presented on 28th Nov. 2019**)
Advisors: Prof. Sandeep Sahany and Prof. Saroj K. Mishra

2013 – 2015 **M.Tech. (Atmospheric Science)** – Indian Institute of Tropical Meteorology Pune, and Department of Atmospheric and Space Sciences at University of Pune, India
Thesis: "*Retrieval of Atmospheric Temperature and Humidity Profiles using Ground Based Microwave Radiometer*"
Advisors: Dr. G. Pandithurai and Mr. S. Pillai

2011 – 2013 **M.Sc. (Physics) –** Department of Physics, Aligarh Muslim University, Aligarh – 201002, India
Thesis: "*Photoelectric Emission from Interstellar Dust Matter: Grain Charging and Gas Heating*"
Advisor: Prof. Abdul Qaiyum

Research Interest: *Cumulus cloud parameterization, Uncertainty quantification and Parameter calibration, Climate and Monsoon modeling*

Teaching Experience: ***Teaching Assistant***, Indian Institute of Technology Delhi, New Delhi, India

07/2015 – 11/2019 **Courses**: Numerical Simulation of Atmospheric and Oceanic Phenomena (ASL410), Earth System Modeling (ASL761), Numerical Modeling of the Atmosphere and Ocean (ASL738)

Responsibilities: *To assist in teaching, conducting tutorials, setting the question paper and evaluating the answer sheets, and setting-up the global climate model for project students*

Employment Experience:

05/2015 – 07/2015 **Junior Research Fellow (JRF)** – India Meteorological Department (IMD), Government of India, Pune – 411008, India

Responsibilities: *To perform the feasibility study of observing network density over the hilly regions in India for temperature and precipitation*

Professional and Community Services:

- Member, American Geophysical Union (AGU)
- Member, Asia Oceania Geo-science Society (AOGS)
- Member – Science Working Group , Young Earth System Scientists (YESS) Community
- Volunteering, Reviewed the TROP ICSU course on Climate Change Education across the Curricula across the Globe
- Volunteering, Open House Day (2015 – 2018) – A Science Expo at Indian Institute of Technology Delhi

Computational Skills:

- Model Handled: *NCAR's Coupled Earth System Model (CESM) version-1 & 2, NCAR's Standalone Community Atmosphere Model (CAM) version-4 & 5, NCAR's Single Column Atmospheric Model (SCAM) version-6*
- High Performance Machine Handled: *Linux Cluster with PGI and Intel Compilers*
- Programming Languages: *Fortran 90 & 95, C++, Shell scripting*
- Statistical & Graphic Analysis: *CDO, NCO, NCAR Command Language, MatLAB, and R-Studio*
- Data Emulation Techniques: *Polynomial Chaos Expansion (PCE), Neural Network (NN), Bayesian Approach, Basis Pursuit Compressed Sensing (BPCS)*

Awards and Honors:

- IIT Delhi Research Scholar Travel Award to attend the Asia Oceania Geoscience (AOGS) Meeting – 2019
- American Geophysical Union (AGU) student travel grant to attend AGU Fall Meeting – 2018
- Indian Institute of Technology Delhi PhD Scholarship
- Awarded by Silver Medal to secure 2nd position in the under graduation (B.Sc.)
- Awarded by Certificate of Appreciation and Consolation prize for my presentation on *"Free Space Optic Technologies"* at Christian College, Lucknow
- Received "*Best Tutor Award*" in National Service Scheme at Christian College

Training and Workshop Attended:

- *2nd ICTP Summer School on Theory, Mechanisms and Hierarchical Modelling of Climate Dynamics: Convective Organization and Climate Sensitivity*, 1st July- 12th July 2019, ICTP, **Italy**

- *Tropical Meteorology: Asian-Australian Monsoon, Tropical Cyclone and Climate Change (Short Term GIAN Course)*, 18th Feb. – 1st March 2019, IIT Delhi, **India** (Course Instructor: Prof. John McBride, Bureau of Meteorology, Australia)
- *Workshop on High-resolution Climate Projections and Analysis for India*, U.S.-India partnership for Climate Resilience, 2018, India Habitat Centre, **India**
- *Special Lecture series on Cloud Convection and Parameterization, 11 – 14th Dec. – 2017*, Indian Institute of Tropical Meteorology (IITM) Pune, **India** (Course Instructor: Prof. Christian Jakob, Monash University, Australia)
- *National Symposium on Vagaries of Monsoon and Annual Monsoon Workshop – 2014*, India Meteorological Society Pune Chapter, **India**
- *National Monsoon Workshop* – 2013, India Meteorological Society Pune Chapter, **India**

Peer-reviewed Publications:

- **Raju Pathak**, Sahany. S., Mishra, S. K. (2020). Uncertainty Quantification Based Cloud Parameterization Sensitivity Analysis in the NCAR Community Atmosphere Model. *Scientific Reports* (***Accepted with minor revision***)
- **Raju Pathak**, Sahany, S., Mishra, S. K. (2020). Usefulness of the Stochastic Entrainment in the Deep Convection Parameterization in Reducing the Present Day Model Biases over the South Asian Region. Geophysical Research – Atmosphere (***in process***)
- **Raju Pathak**, Sahany. S., Mishra, S. K., Neale, R. (2020). Formulation of physically based convective adjustment time-scale in the deep convection scheme of NCAR Community Atmosphere Model. *Climate Dynamics* (***in process***)
- **Raju Pathak**, Sahany. S., Mishra, S. K. (2020). An Automatic Parameter Optimization in the Cloud Parameterization used in NCAR CESM-CAM5. *Climate Dynamics* (**in process**)
- **Raju Pathak**, Sahany, S., Mishra, S. K., Dash, S. K. (2019). Precipitation Biases in CMIP5 Models over the South Asian Region. *Scientific Reports*, doi:10.1038/s41598-019-45907-4
- Sandeep Sahany, Mishra, S.K., **Pathak, R.**, & Rajagopalan, B. (2018). Spatiotemporal Variability of Seasonality of Rainfall over India. *Geophysical Research Letter*, doi:10.1029/2018GL077932
- Prashant K. Bal, **Pathak, R.**, Mishra, S. K., & Sahany, S. (2018). Effects of Global Warming and Solar Geoengineering on Precipitation Seasonality. *Environmental Research letter*, doi:10.1088/1748-9326/aafc7d

Papers under Preparation:

- *The global and the regional climate simulation from the improved convection and cloud parameterization, using NCAR CESM-CAM5 model.*
- *Role of model internal variability and inter-annual sea surface temperature variability on the precipitation biases during south Asian summer monsoon.*
- *Impact of sea surface temperature gradient and earth rotation on precipitation and atmospheric circulation using an idealized aqua planet simulation*
- *Understanding of Consecutive Indian Summer Monsoon Droughts*
- *Role of southern Indian land on the characteristic of Indian Summer Monsoon from an Idealized experiment*

Conference Presentations:

- **Raju Pathak**, Sahany, S., Mishra, S. K.: On Precipitation Biases in CMIP5 Models over the Maritime Continent Region. *AS28-A016, AOGS, 28th July - 2nd August 2019*, Singapore
- **Raju Pathak**, Sahany, S., Mishra, S. K.: Formulation of a Physically-based Convective Adjustment Time-Scale: Impact on Climate Simulations over the Maritime Continent. *AS29-A012, AOGS, 28th July - 2nd August 2019*, Singapore
- **Raju Pathak**, Sahany, S., Mishra, S. K.: Common and Unique Precipitation Biases over South Asia in the NCAR CESM vis-a-vis other CMIP5 models. *A13O-2677, AGU Fall Meeting, 10-14 Dec. 2018,* Washington D.C. USA
- Balaji Rajagopalan, Sahany, S., Mishra, S. K., **Pathak, R.**: Rainfall Seasonality and its Spatiotemporal Variability over India. *A51K-2315, AGU Fall Meeting, 10-14 Dec. 2018,* Washington D.C. USA
- S. K. Mishra, Sahany, S., Dash, S. K., Anand, A., **Pathak**, R., & Salunke, P.: Need for Reliable Simulations of Indian Climate Projections to Climate Engineering, ICTP Italy
- **Raju Pathak**, Sahany, S., Mishra, S. K., et al.: CMIP5 Vs CORDEX in the Context of Indian Monsoon. *AS08-A011, AOGS, 31st July – 5th August 2016*, China

References:

- Prof. Sandeep Sahany
  Centre for Atmospheric Sciences
  Indian Institute of Technology Delhi
  New Delhi-110016, INDIA
  ssahany@cas.iitd.ac.in

- Prof. Saroj K. Mishra
  Centre for Atmospheric Sciences
  Indian Institute of Technology Delhi
  New Delhi-110016, INDIA
  skm@iitd.ac.in