Sanjeev Dwivedi

Dr. Sanjeev Dwivedi
Scientist - C,
Meteorological Centre, Bhubaneswar,
India Meteorological Department,
Ministry of Earth Sciences (MoES),
Bhubaneswar – 752 020, INDIA
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RESEARCH EXPERIENCE

February 2021 – Present

- Scientist – C

Meteorological Centre, India Meteorlogical Department, Bhubaneswar, India

June 2019 – November 2020

- Post Doctoral Fellow

School of Earth, Ocean and Climate Sciences, Indian Institute of Technology Bhubaneswar, India

February 2017 – January 2019

- National Post Doctoral Fellow

National Atmospheric Research Laboratory (NARL), Department of Space, Govt. of India, Gadanki, India

Working on Department of Space and Technology – Science and Engineering Research Board (SERB) sponsored project on "Investigation on the Formation and Maintenance of thermal inversion over the Arabian Sea and relationship with Indian Summer Monsoon"..

May 2012 – January 2017

- Research Fellow

SRM University, Kattankulathur, Chennai

Worked in ISRO's INSAT-3D satellite project entitled "Low level Monsoon Inversion over Western Arabian Sea".

TEACHING EXPERIENCE

July 2019 - Present

- Teaching to M.Sc.

School of Earth, Ocean and Climate Sciences, Indian Institute of Technology Bhubaneswar, India

Micrometeorology, and Modelling of Dynamical Processes of Ocean and Atmosphere Courses to M.Sc. students

April 2010 - September 2011

- Lecturer in Physics

Ramgarhia Institute of Engineering and Technology, Phagwara, Punjab

Taught Physics to B. Tech. Students

June 2008 - March 2010

- Lecturer in physics

Ramgarhia College, Phagwara, Punjab

Taught Physics to B.Sc. Students

AWARDS AND HONOURS

2008 – Present

- **Best paper award** at International Tropical Meteorology Symposium (INTROMET-2017),Ahmedabad, Gujarat.
- Secured **Gold Medal** in M.Sc. (Astronomy and Space Physics) from Punjabi University, Patiala.
- Senior Research Fellow in ISRO INSAT – 3D Project on low level Monsoon Inversion.
- Secured **Bronze Medal** in PG Diploma from SATMET - 9 of United Nation – Centre for Space Science and Technology Education in Asia and the Pacific (UN-CSSTEAP).
- Awarded Science and Engineering Research Board - **National Post Doctoral Fellowship** from Department of Science and Technology.

EDUCATION

Dec 2016	Awarded Ph. D. in Physics Thesis title, "Investigations on low level Indian summer monsoon inversion" Course work percentage 93.3 *(CGPA 9.33)* *SRM University, Chennai.*
Oct 2017	Awarded M. Tech. (Satellite Meteorology and Global Climate) affiliated to UN – CSSTEAP at Space Applications Centre (SAC), ISRO, Ahmedabad, India percentage 91.3 *(CGPA 9.13)* *Andhra University, Visakhapatnam, Andhra Pradesh*
Apr 2015	Post Graduate Diploma (Satellite Meteorology and Global Climate) by UN – CSSTEAP percentage 91.3 *(CGPA 9.13)* *Space Applications Centre (SAC), ISRO, Ahmedabad, India.*
Jun 2008	M.Sc. (Astronomy and Space Physics) percentage 78.5 *Punjabi University, Patiala, Punjab*
Jun 2006	B.Ed. (Science and Maths) percentage 72.0 *Guru Nanak Dev University, Amritsar, Punjab*
Jun 2005	B.Sc. (Computer Science) percentage 60.1 *Guru Nanak Dev University, Amritsar, Punjab*

CURRENT RESEARCH INTEREST

- Boundary layer with emphasis on low level monsoon inversion
- Monsoon inversion and pollutant levels relation using satellite data along with FLEXPART and HYSPLIT back trajectory model.
- WRF ARW - v6 Model simulation of Monsoon inversion using dynamical downscaling approach.
- WRF ARW – Data Assimilation of conventional and satellite radiance assimilation.
- WRF Chem Model simulation for the dust events over India.
- Radiative Transfer Model (RTTOV, SBDART) for the study using radiance data and Radiative Forcing studies.
- Intra-annual and intra-Seasonal variation of monsoon
- Improvement of Satellite derived Rainfall
- Climate change and long term variability of monsoon inversion

COMMUNICATION SKILLS

- English
- Hindi
- Punjabi

COMPUTER SKILLS AND EXPERIENCE

Application Softwares	:	MATLAB, GrADS, FERRAT, Latex, Origin, ERDAS, Envi, BRAT, IGIS.
Operating System	:	Windows and Linux.
Programming Languages	:	FORTRAN, Python, C, Oracle 9i, D-Base.
Weather Prediction	:	WRF - ARW, WRF – Chem, WRF - DA
Back Trajectory Models	:	FLEXPART and HYSPLIT
Experience	:	Experience in installing, compiling, testing, and customizing atmospheric models on new computer systems and the ability to work with large observation data sets analysis and different format HDF, NETCDF, GRIB etc.

PAPERS PUBLISHED

1. **Dwivedi S.**, Thakur, M. K., Lakshmi Kumar, T. V., Rao, B. M., Kisthawal, C. M.& Narayanan, M. S., "An appraisal of rainfall estimation over India using remote sensing and in situ measurements", Accepted in **Indian Journal of Radio and Space Physics,** 2021.

2. **Dwivedi, S.**, Yesubabu V., Venkat Ratnam, M., Dasari H. P., Langodan S., Akhil Raj S. T., & Hoteit I.," Variability of the Monsoon Inversion over Arabian Sea and its associated impact on rainfall: Observations and Model simulations", Published in **International Journal of Climatology,** doi: 10.1002/joc.6896, 2019 **(IF 3.70).**

3. Yesubabu V., Dasari H. P., **Dwivedi S.**, Venkat Ratnam, M., Langodan S., & Hoteit I., "Variability of Monsoon Low Level Jet and associated rainfall over India", published in **International Journal of Climatology,** doi:10.1002/joc.6256, 1-23, 2019 **(IF 3.70).**

4. Thakur, M. K., Lakshmi Kumar, T. V., **Dwivedi, S.**, & Narayanan, M. S.,"On the rainfall asymmetry and distribution in tropical cyclones over Bay of Bengal using TMPA and GPM rainfall products", published in **Springer- Natural Hazards**, doi: 10.1007/s11069-018-3426-5, Vol. ---, online print, 2018 (**IF 2.32**).

5. **Dwivedi, S.**, Uma, R., Lakshmi Kumar, T. V., Narayanan, M. S., Pokhrel, S., & Kripalani, R. H.,"Spatio-Temporal indices of Indian Summer Monsoon Rainfall", published in **Springer- Theoretical and Applied Climatology**, doi: 10.1007/s00704-018-2428-2 Vol. 131, online print, 2018 **(IF 2.72)**.

6. **Dwivedi, S.**, Narayanan, M. S., Venkat Ratnam, M., & Narayana Rao, D., "Characteristics of Monsoon Inversion over Arabian Sea observed by satellite

sounder and reanalysis data set", published in **Atmospheric Chemistry Physics,** doi: 10.5194/acp-16-4497-4509, Vol. 15. No.23, 2016 **(IF 5.67)**.

7. **Dwivedi, S.**, Sathiyamoorthy, V., Narayanan, M. S., & Narayana Rao, D., "A Study on the Lower Tropospheric Thermal Inversion over the Arabian sea using Radiosonde and IASI Data", published in **IEEE – Journal of Selected Topics in Applied Earth Observations and Remote Sensing,** doi: 10.1109/JSTARS.2015. 2506759, Vol. 9 No. 1, 490-495, 2016 **(IF 3.39)**.

8. **Dwivedi, S.**, Narayanan, M. S., & Narayana Rao, D., "Monsoon low level inversion from MetOp satellite", published in **Vayumandal** from Tropmet 2012, Vol. 38 No. 1 - 4,117-120, 2012 **(IF NA)**.

CONFERENCE PROCEEDINGS

1. **Dwivedi, S.**, Sathiyamoorthy,V., Bhomia S., Jangid, B. P., Narayanan, M. S., & Narayana Rao, D.,"A Study on the Arabian Sea Lower Tropospheric Thermal Inversion using Radiosonde and Satellite Data", published in **water resources of the Republic of Tajikistan and this value of economy development of the country** from International conference Water resources-2015.

PAPERS UNDER COMMUNICATION

1. **Dwivedi, S.**, Narayanan, M. S., Venkat Ratnam, M., Sathiyamoorthy, V., Yesubabu V., Vinoj V. & Sharma S. K. "Climatology of Monsoon Inversion over the Arabian Sea – the role of subsidence and advection", Under Review **Journal of Climatology**.

2. Akhil Raj S. T., Venkat Ratnam, M., & **Dwivedi, S.**, "Potential vorticity intrusion down to the lower troposphere over Indian region: Case studies", Under Review **Atmospheric Environment**.
3. Ekka, S., Sahu, S. K., **Dwivedi, S.**, Khuman, S. N., Das, S., Gaonkar, O and Chakraborthy P. "Seasonality, atmospheric transport and inhalation risk assessment of polycyclic aromatic hydrocarbons in PM2.5 and PM10 from industrial belt of Odisha, India", revised in **Environmental Geochemistry and Health**.

CONFERENCES/WORKSHOPS/SCHOOLS PARTICIPATED/ PRESENTED PAPERS

INTERNATIONAL

1. Attended Two Days Workshop on "Monsoon Inversion (MI): Formation and maintenance Mechanisms over Arabian sea and it's impact on pollutant's concentration over coastal stations and rainfall over country", International Workshop (online virtual model) named "Water and Air Research Societal Health (WaARISH), 24 -24 Aug 2021.
2. "Attended workshop", "Short Course on Weather Forecasting using Numerical Weather Prediction Models" , "Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP)", Indian Space Research Organisation (ISRO), Ahmedabad, 1 – 12 July 2019.
3. "Attended workshop", "Two days data analysis workshop on the Balloon measurement campaign Asian Tropopause Aerosol Layer (BATAL)", National Atmospheric Research Laboratory (NARL), Gadanki, India,01 – 02 February 2018.
4. "Remote Sensing of Rainfall over Coastal Oceans: Spatio – Temporal match between GPM, DWR and INSAT – 3D", "Understanding, Predicting and projecting Climate change over Asian Region (UPCAR)", Sri Venkateswara University and National Atmospheric Research Laboratory (NARL), Gadanki, Tirupati, India, 07-11 January 2018.
5. "1-day short-term course:- Space-borne radars: Concepts and meteorological applications", "India radar meteorology (iRAD2018)",National Atmospheric Research Laboratory (NARL), Gadanki, Tirupati, India, 07 January 2018.
6. Proposed Mechanism of formation and maintenance for the Monsoon Inversion over the Arabian Sea", "International symposium on Tropical Meteorology (INTROMET)", Space Applications Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad, India 07- 10 Nov 2017.
7. "Temporal changes in Rainfall / latent heat characteristics associated with intensity changes of Bay of Bengal Cyclones", "International symposium on Tropical Meteorology (INTROMET)", Space Applications Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad, India 07- 10 Nov 2017.
8. "Attended workshop","Understanding, Predicting and projecting Climate change over Asian Region (UPCAR)", Sri Venkateswara University and National Atmospheric Research Laboratory, Gadanki, Tirupati, India, 26-28 June 2017.
9. "Attended workshop", "International Workshop on Representation of Physical Processes in Weather and Climate Model (INTROSPECT 2017), Indian Institute of Tropical Meteorology (IITM), Pune,13-16 Feb, 2017.
10. "A Study on the Arabian Sea Lower Tropospheric Thermal Inversion using Radiosonde and Satellite Data", International conference Water resources - 2015, republic of Tajikistan, 21 – 30 May 2015.

11. "Satellite Meteorology and Global Climate", "Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP)", Indian Space Research Organisation (ISRO), Ahmedabad, Aug 2014 to Apr 2015.

12. "Monsoon Inversion over Arabian Sea from Satellite Soundings", "International symposium on Tropical Meteorology (INTROMET)", SRM University, Kattankulathur, 21 - 24 Feb – 2014.

NATIONAL

1. "Attended Workshop", "Research Opportunities at National Atmospheric Research Laboratory", Indian Institute of Technology, Bhubaneshwar, India, 26 July 2019.
2. "Investigation of impact of Climate Change on Monsoon inversion over Arabian Sea using 37 year downscaled simulations of WRF-ARW model","TROPMET-2018 National Symposium on Understanding Weather and Climate Variability: Research for Society", Banaras Hindu University, Varanasi, India, 24 – 27 Oct 2018.
3. "Attended workshop","Recent Advances in Observations and Data Assimilation Techniques For Severe Weather Forecasting", Sri Venkateswara University, Tirupati, 23 – 24 Mar 2017.
4. "Attended workshop", "104th Indian Science Congress - Science & Technology For National Development", Sri Venkateswara University, Tirupati, 03 – 07 Jan 2017.
5. "Spatio – Temporal comparison of Rainfall estimated GPM, DWR and INSAT", "National Space Science Symposium (NSSS)", Trivandrum,09 – 12 Feb 2016.
6. "Remote Sensing of Rainfall over Coastal Oceans: Spatio – Temporal match between GPM, DWR and INSAT – 3D", "National Conference on Science and Technology for Indigenous Development in India (NCST – IDI)", Department of Physics and Nanotechnology, SRM University, Kattankulathur, 26 – 27 Nov 2015.
7. "Application of High Performance Computing Cluster", organised by SRM University, Chennai, 23 Dec 2013.
8. "Weather and Climate in Tropics", "Science and Engineering Research Board (SERB) School", Indian Institutes of Technology (IIT) – Delhi, 03 – 26 June 2013.
9. "Monsoon Inversion Studies over western Arabian Sea from Satellite Observations", "Workshop on Southwest Monsoon 2012", Indian Institute of Tropical Meteorology (IITM), Pune, 19 - 20 Feb 2013.
10. "Arabian Sea Low Level Inversion Studies from Atmospheric Refractivity Data of MetOp Satellite during Two Contrasting Monsoons", "National symposium on Tropical Meteorology TROPMET", Indian Institute of Remote Sensing (IIRS), Dehradun, 20 - 22 Nov 2012.

REFERENCES

1. **Dr. M. Venkat Ratnam (Group Head ARTG and NPDF Mentor)**
   Scientist, National Atmospheric Research Laboratory,
   Department of Space, Gadanki, P.B.123, Tirupati – 517 502, India.
   Phone: 0877-2500540, Email : vratnam@narl.gov.in

2. **Prof. D. Narayana Rao (Ph D Supervisor)**
   Pro Vice Chancellor, SRM-AP
   RK Galleria, Srinivasa Nagar Bank Colony, Vijaywada,A. P.- 520 008, India.
   Ph: 044-27455698 (office), Email : narayanarao.d@srmuniv.ac.in
   (Since, he is a Pro VC, Hence I request you to contact him for recommendation after final confirmation)
3. **Dr. M. S. Narayanan (Ph D Co-Supervisor)**
   Visiting Professor, SRM University
   Former Group Director, ISRO
   SRM University, Kattankulathur - 603 203, India.
   Ph: 044-2223 8565 (R) / 81486 00208(m), Email: u.m.s.narayanan@gmail.com

4. **Dr. V. Sathiyamoorthy (M Tech Supervisor)**
   Head, MRTD Division
   Space Applications Centre (ISRO), Ahmedabad – 380 015, India.
   Phone: 079-26916046 (office), Email: sathya@sac.isro.gov.in

5. **Dr. C. M. Kishtawal (M Tech Co-Supervisor)**
   Group Director
   Atmospheric and Oceanic Sciences Group
   Space Applications Centre (ISRO), Ahmedabad – 380 015, India.
   Phone: 079-26916003 (office), Email: chandra@sac.isro.gov.in

PERSONAL INFORMATION

Name	**SANJEEV DWIVEDI**
Father's Name	Sh. SHAM BADAN DWIVEDI
Mother's Name	Smt. SHAIL DWIVEDI
Date of Birth	26th July 1984
Sex	Male
Status	Married
Present Address	Plot No: -124/1973, Udayagiri Vihar, Patrapada-751 019, Bhubaneswar, Odisha, India.
Permanent Address	Flat No. C1203, Iris Court, Mahindra World City, Near Paranur Railway station, Chengalpattu, Dist Kancheepuram, Tamilnadu – 603 002
Village Address	S/O Sh. Sham Badan Dwivedi, village Bairghatta, post Kanapar, Peppeganj, Dist. Gorakhpur, Uttar Pradesh - 273 165
Passport No.	R7296672
Contact No.	+91-8754442296 (M), +91-8754442297 (R)
E-Mail	dwivedi.narl@gmail.com
Nationality	Indian
Hobbies	Martial arts and swimming Listening music Computer Applications Reading Novels

PLACE: Bhubaneswar, India
DATE: 21 Sep 2021

Sanjeev Dwivedi
(Sanjeev Dwivedi)

Summary of Ph. D. , M. Tech. and Post-Doctoral Fellow

The study of Monsoon Inversion (MI) over Arabian Sea (AS) has got a new fillip to understand all its facets, with the advent of high resolution observations from both polar and geostationary satellite platforms, coupled with model reanalysis data since about a decade and a half. This work deals with the investigation of the characteristics and formation - maintenance mechanism of Monsoon Inversion over AS. A detailed study of MI has been carried out over the AS using in - situ radiosonde, space based sounder and reanalysis data sets from 2009 to 2015. Various characteristics of monsoon inversion, their detection from satellites, etc. have been studied in detail. The formation and maintenance mechanism are examined to understand the relative roles of advection and subsidence. Over the western Arabian Sea, thermal inversion is seen at the lower troposphere during the Indian summer monsoon season of June to September. Different kinds of MI are seen over two stations viz., Muscat (23.5° N; 58.5° E) and Salalah (17.0° N; 54.1° E). The reasons for the multiple and zig - zag inversion are studied using the HYbrid Single - Particle Lagrangian Integrated Trajectory (HYSPLIT) back trajectory model. MI behaviour associated with intra-seasonal oscillation and inter-annual variations is also studied. The initiation and cessation times of MIs, their percentage of occurrence, strength etc., have been examined using a large satellite database. Based on our results we suggest that MI can be included as a seventh semi-permanent feature of the summer monsoon. The basic study deals formation and maintenance mechanism of Monsoon Inversion. From the thermodynamic energy equation, advection and subsidence components are computed. We seem to be observing another type of inversion (subsidence dominated) during pre and post monsoon season, whose characteristics are different from those of MI. Qualitative comparison of results from WRF model simulation and ERA - Interim data for areal spread of MI are made for an active – break spell of the year 2009.

In M. Tech., dissertation, an effort has been made to link the lower tropospheric thermal inversion over the AS with monsoon onset over West Coast of India and pollution levels in the lower troposphere. Influence of inversion on pollution (CO_2, CO, O_3, SO_2 and N_2O) concentrations is studied using satellite data. Thesis summaries that subsidence is the main cause of the formation of monsoon inversion during May – June and subsequently advection is mainly responsible for its maintenance.

During my Post-Doc, I worked on climatology of Monsoon Inversion over the Arabian Sea using satellite observations and model simulations. Using WRF model, the variability of Monsoon Inversion, Monsoon Low Level Jet and associated rainfall over India were studied. Monsoon rainfall indices were computed from 100 years of India Meteorological Department (IMD) gridded rainfall data. Some of these works (3) got published and some are under review (2).