

# Mukesh Rai

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## Work Experiences







- January 2023 – Present
- 📌 **NASA Jet Propulsion Laboratory/Caltech - Postdoctoral Fellow** I use the transport diagnostic tools that leverage the atmospheric river concept, tropospheric chemistry reanalysis products, and new satellite observations of peroxyacetyl nitrate (PAN) to analyze large-scale transport of trace gases, improve the use of satellite PAN observations in transport analysis, evaluate current chemistry reanalysis and satellite products and characterize long-range transport phenomena and quantify impacts on local air quality extremes.
- September 2022 – December 2022
- 📌 **The International Centre for Integrated Mountain Development (ICIMOD), Air Quality Dashboard – Modelling (Consultant)** To support the development and customization of the national level and regional dashboards. Support in incorporating NASA/SERVIR air quality model and satellite products in the atmospheric watch initiative (AWI) air quality dashboard. Evaluations of the air quality observation models and satellite products. Support server maintenance, data storage and management aspects. Regular quality check of dashboard operation. Support with on-demand data analysis
- October 2017 – March 2018
- 📌 **ICIMOD, Research Assistant** Worked on the installation of black carbon (BC) monitoring station in a glacierized place [Langtang-Nepal]. Contributed to workshop and Science Policy Dialogue: Air Pollution, Climate, and Health in South Asia and the Hindu Kush Himalaya. Assisted research group leader in the project. Involved in research paper writing by using the real-time BC aerosol source, sink, their optical and physical properties, radiative forcing, heating rate, and its implication.
- January 2017 – June 2017
- 📌 **ICIMOD, Intern** Test functionality of successful testing of autonomous black carbon station: Complete instrument deployment and data transmission.
- January 2015 – March 2016
- 📌 **MinErgy-Nepal, Research Assistant** Provided technical inputs on gaseous pollutants measurement campaign. Assisted program coordinator in finalizing emission monitoring project.

## Education

- September 2018 – May 2022  **PhD, University of Chinese Academy of Sciences, China** Analysis of aerosols transport, radiative perturbation and contribution using **WRF-Chem**  
Thesis title: *Tracing atmospheric aerosol distribution, transport mechanism, and their radiative effects over Third Pole region using WRF-Chem simulation*
- September 2015 – August 2017  **M.S by Research in Glaciology [Kathmandu University, Nepal]** Estimation of aerosol optical properties using **SBDART** and **OPAC** models  
Thesis title: *Aerosol radiative forcing estimation over a remote high-altitude location ( 4900 masl) near yala glacier, nepal.*
- February 2011 – January 2013  **M.Sc in Environmental Science [Tribhuvan University, Nepal]** Climate Change and pollution control

## Research Publications

### Published

- 1 Chen, P., Kang, S., Li, C., Hu, Z., Tripathee, L., **Rai, M.**, ... Gustafsson, Ö. (2022). Carbonaceous aerosol transport from the indo-gangetic plain to the himalayas: Carbon isotope evidence and light absorption characteristics. *Geoscience Frontiers*, 14, 101516.  doi:<https://doi.org/10.1016/j.gsf.2022.101516>
- 2 Yang, J., Kang, S., Chen, D., Zhao, L., Ji, Z., Duan, ... Gillies, R. (2022). South asian black carbon is threatening the water sustainability of the asian water tower. *Nature Communication*, 13, 7360.  doi:<https://doi.org/10.1038/s41467-022-35128-1>
- 3 **Rai, M.**, Kang, S., Yang, J., Chen, X., Hu, Y., & Rupakheti, D. (2022). Tracing atmospheric anthropogenic black carbon and its potential radiative response over pan-third pole region: A synoptic-scale analysis using wrf-chem. *Journal of Geophysical Research-Atmosphere*, 127, e2021JD035772.  doi:<https://doi.org/10.1029/2021JD035772>
- 4 **Rai, M.**, Mahapatra, P. S., Gul, C., Kayastha, R. B., Panday, A. K., & Puppala, S. P. (2022). Aerosol radiative forcing estimation over a remote high-altitude location ( 4900 masl) near yala glacier, nepal. *Aerosol and Air Quality Research*, 19(8), 1872–1891.  doi:[10.4209/aaqr.2018.09.0342](https://doi.org/10.4209/aaqr.2018.09.0342)
- 5 Dhital, Y., Tang, J., Pokharel, A., Tang, Q., & **Rai, M.** (2022). Impact of aerosol concentration on elevation-dependent warming pattern in the mountains of nepal. *Atmospheric Science Letter*, 13, 321.  doi:<https://doi.org/10.1002/asl.1101>
- 6 Hu, Y., Kang, S., Yang, J., Chen, X., Ji, Z., & **Rai, M.** (2022). Transport of black carbon from central and west asia to the tibetan plateau: Seasonality and climate effect. *Atmospheric Research*, 267, 105987.  doi:<https://doi.org/10.1016/j.atmosres.2021.105987>
- 7 Li, C., Yan, F., Zhang, C., Kang, S., **Rai, M.**, Zhang, H., ... He, C. (2022). Coupling of decreased snow accumulation and increased light-absorbing particles accelerates glacier retreat in the tibetan plateau. *Science of The Total Environment*, 809, 151095.  doi:<https://doi.org/10.1016/j.scitotenv.2021.151095>
- 8 Maharjan, L., Kang, S., Tripathee, L., Gul, C., Zheng, H., **Rai, M.**, & Santos, E. (2022). Atmospheric particle-bound polycyclic aromatic compounds over two distinct sites in pakistan: Characteristics, sources and health risk assessment. *Journal of Environmental Science*, 112, 1–15.  doi:[10.1016/j.jes.2021.04.024](https://doi.org/10.1016/j.jes.2021.04.024)

- 9 Rupakheti, D., Rupakheti, M., **Rai, M.**, Yu, X., Yin, X., Kang, S., ... Hu, J. (2022). Characterization of columnar aerosol over a background site in central asia. *Environmental Pollution*, 316, 120501. [doi:https://doi.org/10.1016/j.envpol.2022.120501](https://doi.org/10.1016/j.envpol.2022.120501)
- 10 Yang, M., Li, Z., Anjum, M., Kayastha, R., Kayastha, R., **Rai, M.**, ... Xu, C. (2022). Projection of streamflow changes under cmip6 scenarios in the urumqi river head watershed, tianshan mountain, china. *Frontiers in Earth Science*, 721, 137752. [doi:https://doi.org/10.3389/feart.2022.857854](https://doi.org/10.3389/feart.2022.857854)
- 11 Gul, C., Mahapatra, P. S., Kang, S., Singh, C., Kumar, R., **Rai, M.**, ... Puppala, S. P. (2021). Black carbon concentration in the central himalayayas: Impact on glacier melt and potential source contribution. *Environmental Pollution*, 275, 116544. [doi:https://doi.org/10.1016/j.envpol.2021.116544](https://doi.org/10.1016/j.envpol.2021.116544)
- 12 Rupakheti, D., Rupakheti, M., Yin, X., Hofer, J., **Rai, M.**, Hu, Y., ... Kang, S. (2021). Modifications in aerosol physical, optical and radiative properties during heavy aerosol events over dushanbe, central asia. *Geoscience Frontiers*, 12(6), 101251. [doi:https://doi.org/10.1016/j.gsf.2021.101251](https://doi.org/10.1016/j.gsf.2021.101251)
- 13 Rupakheti, D., Yin, X., Rupakheti, M., Zhang, Q., Li, P., **Rai, M.**, & Kang, S. (2021). Spatio-temporal characteristics of air pollutants over xinjiang, northwestern china. *Environmental Pollution*, 268, 115907. [doi:https://doi.org/10.1016/j.envpol.2020.115907](https://doi.org/10.1016/j.envpol.2020.115907)
- 14 Tripathee, L., Gul, C., Kang, S., Chen, P., Huang, J., & **Rai, M.** (2021). Transport mechanisms, potential sources, and radiative impacts of black carbon aerosols on the himalayayas and tibetan plateau glaciers, 7–23. [doi:10.1007/978-3-030-70509-1\\_2](https://doi.org/10.1007/978-3-030-70509-1_2)
- 15 Neupane, B., Wang, J., Kang, S., Zhang, Y., Chen, P., **Rai, M.**, ... Thapa, P. (2020). Black carbon and mercury in the surface sediments of selin co, central tibetan plateau: Covariation with total carbon. *Science of The Total Environment*, 721, 137752. [doi:https://doi.org/10.1016/j.scitotenv.2020.137752](https://doi.org/10.1016/j.scitotenv.2020.137752)

## Submitted

- Junhua Yang, Schichang Kang, Yuling Hu, Xintong Chen, **Mukesh Rai** (2022). Springtime air pollution over the Tibetan Plateau caused by South Asian biomass burning emissions. *Science of Total Environment*.

## In preparation

- Rawat, B., Yin, X., Sun, X., Li, M., Sharma, C., Tripathee, L., Paudyal, R., **Rai, M.**, Tiwari, P., Pandey, A., Kandel, K., Kang, S., Zhang, Q. (2022). Variations and Influencing factors of Total Gaseous Mercury (TGM) in Kathmandu, A South Asian Metropolis
- Regmi, J., Poudyal, K., Adhikari, N.P., Pokherl, A., Malakar, N., Tripathee, L., **Rai, M.**, Wilson, K., Aryal, R. (2022). Comparison of Surface Level Particulate Matter (PM2.5) and Atmospheric Column Aerosol Optical Depth over Kathmandu Valley
- Guo, J., Paudyal, R., Kang, S., Tripathee, L., **Rai, M.**, Dingming, N., (2022). Mercury in Snow cover over the Southern Altai Mountains in Northwest China: A Case Study from Continuous Observation.
- Rai, M.**, S., Kang, Yang, J., Rupakheti. M., Rupakheti, D., Tripathee, L., , Hu. Y.,Chen (2023) Insight into seasonal aerosol concentrations, meteorological influence, and transport over the Pan-Third Pole region using multi-sensors satellite and model simulation

## Skills

Languages English, Nepalese, Kiranti, Mandarin Chinese.

## Skills (continued)

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Programming/Others	📌 Python, R, Matlab, Linux, NCL, CDO, Github, Obsidian, GMT
Models/Tools	📌 WRF-Chem, HYSPLIT/PySPLIT, SBDART, OPAC, ArcGis, TrajStat, IPART
Misc.	📌 Academic research, High performance computing, Satellite data handling, $\LaTeX$ , publishing.

## Training

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12-15 January 2016	📌 <b>Data Analysis with R</b> Organised by ICIMOD, Nepal
21-25 November 2016	📌 <b>Air Quality Instrument Operation and Maintenance</b> Organised by ICIMOD, Nepal
23-24 October 2016	📌 <b>Field Techniques and Data Tools for Monitoring High Mountain Environments</b> Organised by University of Zurich, Switzerland
12-23 August, 2019	📌 <b>Climate Change and Social Impact on the Third Pole</b> Organised by TPE, TranTip, China
22 October 2020	📌 <b>NASA'S Applied Remote Sensing Training Program on MODIS to VIIRS Transition for Air Quality Applications</b> Organised by NASA
13-17 September 2021	📌 <b>Capacity Development Program on Air Quality Management and Emission Reduction on PM<sub>2.5</sub> for Asian Countries</b> Organised by Regional Resource Centre for Asia and the Pacific, Thailand
06 June 2021	📌 <b>Air Quality using Copernicus Sentinel data</b> Organised by WEKEO, Mercator Ocean International
22 June - 1 July 2021	📌 <b>Atmospheric Chemistry and Aerosols in the Asian Monsoon region using Satellite and Model data</b> Organised by ACAM
01 March 2022	📌 <b>Tools for Analyzing NASA Air Quality Model Output</b> Organised by ARSET NASA





## Conference Presentation

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28-30 August, 2019	📌 <b>International forum on the cryosphere and society The voice of the Hindu Kush Himalaya</b> Organised by ICIMOD, Nepal
24 July 2021	📌 <b>4th Congress of China Geodesy and Geophysics</b> Organised by Maritime Silk Road and Earth System Sciences, Qingdao, China
22 October 2021	📌 <b>Atmospheric Chemistry and Aerosols in the Asian Monsoon region using Satellite and Model data</b> Organised by Organised by ACAM, ICIMOD, ECMWF

## Awards and Achievements

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- 2023  **Postdoctoral Fellowship**, Jet Propulsion Laboratory, Caltech, USA
- 2018  **President's Fellowship**, CAS-TWAS President's Fellowship awardee, Trieste, Italy
- 2015  **M.S Thesis grant**, Cryosphere Monitoring Project (CMP) fellowship, Norwegian Embassy and ICIMOD-Nepal
- 2013  **M.Sc Thesis grant**, Grant from SEAM-Nepal/Government of Finland.