The International Conference on Regional Climate-CORDEX 2023
(IITM HUB* ICRC-CORDEX 2023*)

Investigation of Atmospheric Clouds over the western-Indian Region

Dharmendra Kumar Kamat[1,2], Som Kumar Sharma[1], Prashant Kumar[3], Kondapalli Niranjan Kumar[4], Sourita Saha[5]

[1]Physical Research Laboratory, India
dharmendrakamat@prl.res.in
[2]Indian Institute of Technology Gandhinagar, India
[3]Space Applications Centre, India
[4]National Centre for Medium Range Weather Forecasting, India
[5]University of California, Scripps Institutions of Oceanography, USA

Abstract

Clouds play a crucial role in the Earth's hydrological cycle and radiative budget and are integral to regional and global weather conditions. The cloud height, different layers, and vertical structure in the atmosphere significantly affect the weather/climate system, and changes in these properties manifest as climate change. The inadequate representation of these cloud parameters due to lack of observations causes uncertainty in models to determine the effect of clouds on future climate. To face future challenges and find solutions for climate change problems, monitoring and investigating the changes in cloud properties on both regional and global scales became essential. This study uses ground-based instruments, satellites, and reanalysis datasets to investigate clouds over a western-Indian region, Ahmedabad (23.02°N, 72.57°E) during 2019-2022. Ahmedabad is a highly polluted urban city in Gujarat, India, having a hot, semi-arid climate. Continuous observation of clouds is taken using a Ceilometer lidar stationed at the Physical Research Laboratory main campus. Ceilometer is a low-power, eye-safe, portable lidar which can measure cloud base heights and vertical visibility up to about 7.6 km with a vertical resolution of ~10 meters every 2 seconds. Investigations using lidar shows that the cloud occurrence over Ahmedabad doesn't show a distinct monthly pattern but is found maximum during the monsoon (June, July, August, and September). The total cloud occurrence over Ahmedabad in 2019, 2020, 2021, and 2022 is about 16%, 22%, 20%, and 15%, respectively. Single-layer clouds are found throughout the year, with average cloud base height lower during monsoon and higher during pre- and post-monsoon. The average CBH during April is ~ 6.6km, 7.4km, 6.6km, and 7.1km in 2019, 2020, 2021, and 2022, respectively. On the other hand, the average CBH in August is ~ 1.3km, 1.1km, 2.2km, and 1.3km from 2019-22. Muti-layer clouds are mostly found during the monsoon in all years of observation. These ground-based lidar observations substantiated by satellite and reanalysis datasets will be used to evaluate the radiation budget over the western-Indian region.

I prefer: ORAL presentation