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EXAMINATION OF BIN ANALYSIS AND SEASONAL ANALYSIS IN DELHI AIR POLLUTION FOR VARIOUS RESPIRATORY PROBLEM

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ABSTRACT

ARIs are also responsible for the economic burden that they impose on society. This burden is caused by the direct costs of medical care and the indirect costs of missed work. In the work most of the AOD retrievals from Terra DT that are inside the EE range are between 0.5 and 1.0. On the other hand, only around 55% of DB's AOD observations are inside the EE range. The results above show that DT obtained AOD is more accurate than DB10K, and the values between 0.5 and 1.0 are significantly in accord with AODAERONET

KEY WORDS: *Acute respiratory infections (ARI), Aerosol Optical Depth (AOD), Dark target (DT), Pollution, Asthma.*

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1. INTRODUCTION

India is home to twenty-one of the thirty cities in the world that have the highest levels of pollution. In 2016, 140 million people in India were exposed to air that was about ten times more polluted than the World Health Organization's safety limits. According to the 2022 global air quality assessment, India has the second highest level of pollution in the world, with a PM2.5 concentration of 91µg/m3. Data on air pollution levels were collected from all monitoring locations in India between 2015 and 2020. This data was made up of measurements that were taken every hour and every day.

NO2 comes from motor vehicles, airlines, factories, and power plants. Due to the strict lockdown that was implemented in 2020, the planes have been cancelled, traffic has dropped, and the facilities are shuttered. Because of these causes, the level of NO2 pollution has dropped considerably. The building industry is the source of PM10. The industries have been closed, which has resulted in a major reduction in the pollutant PM10. The significant reduction in the pollutant NO2 can be attributed to the shutdown of industries, the reduction of automobile emissions, and the decrease in fossil fuel consumption. Before the lockdown in India, which happened largely in January 2020, there were high levels of the remaining pollutants. Delhi, the capital of India, was already one of the most polluted cities in the world before the COVID-19 outbreak. The local administration has put in place smog towers and water sprinklers all across the city in an attempt to lower the amount of pollution. When the virus initially began, numerous countries imposed a lockdown, and the city's the number of contaminants has decreased significantly.

In this study bin analysis and seasonal analysis in has been examined in Delhi air pollution using various parameters.

2. METHODOLOGY

AOD For this analysis, AERONET data (AODAERONET) used and coupled it with MODIS Terra-Aqua collection 6 (C6) (MCD19A2). The research was conducted between January 2010 and December 2019. In the current study, the AODMAIAC was evaluated at 550 nm with a spatial resolution of 1 km. This method frequently merges image processing with time series analysis. The MAIAC approach creates a look-up table that is based on background aerosol models and SHARM scalar code by considering the effects of bidirectional surface reflectance. At the moment, the MAIAC MCD19 version is being used with elements from Collection AERONET Data. AERONET collects current data, which is then used to validate aerosol products that are obtained from satellite observations.

3. RESULT AND DISCUSSION

3.1. BIN ANALYSIS

Three bins were defined based on the higher and lower limits of AOD in order to validate AODMODIS against AODAERONET: (i) AOD≤0.5, (ii) 0.51. Aqua AODMODIS and AODAERONET are shown to have a significant connection (R=0.79). The assumption of aerosol type in the DT obtained AOD was incorrect, which caused in an inaccuracy in the assessment of surface reflectance. As a result, the AOD values were estimated incorrectly. AODMODIS and AODAERONET have been found to have a linear connection. Validation of AODMODIS against AODAERONET over Amity University and Gual Pahari, Gurugram. MODIS AQUA (MYD04C6.1) (a, b, c) and MODIS TERRA (MOD04C6.1) (d, e, f) The green line is a regression line, the dashed red lines illustrate the predicted error, and the solid black line is a 1:1 line.

Most of the AOD retrievals from Terra DT that are inside the EE range are between 0.5 and 1.0. On the other hand, only around 55% of DB's AOD observations are inside the EE range. The results above show that DT obtained AOD is more accurate than DB10K, and the values between 0.5 and 1.0 are significantly in accord with AODAERONET. As a result, Gual Pahari's highest

The concentrations of AOD are between 0.5 and 1, and the lowest concentrations are larger than 1. However, the figures from Amity University show the opposite tendency. It has been found that about 70% of EE retrievals fell within the range of 0.5 to 1.0. As a result, AODMAIAC performed better than all other retrieval algorithms that were assessed in the previous study. Only two bins (AOD >0.5 and 0.51) were used to compare AODMAIAC to AODAERONET because there was not enough ground data for bin AOD >1.0. The observations show that the 0.5-1.0 AOD bin has the largest population, whereas the AODs >1 bin has the lowest population. AODMAIAC has a strong correlation (0.73–0.86) and an RMSE of 0.15–0.16. The regression line for both sites has a slope that is greater than one.

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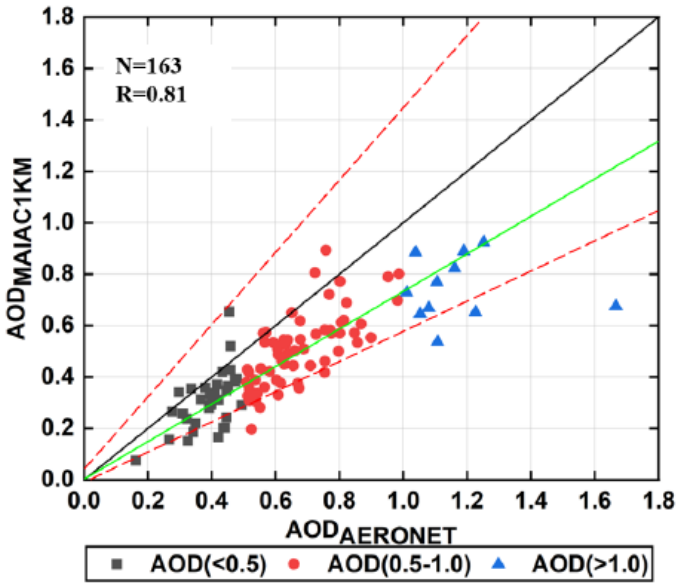


Figure 1: shows the validation of AODMAIAC against AODAERONET with bins of <0.5, 0.5-1.0, and >1.0.

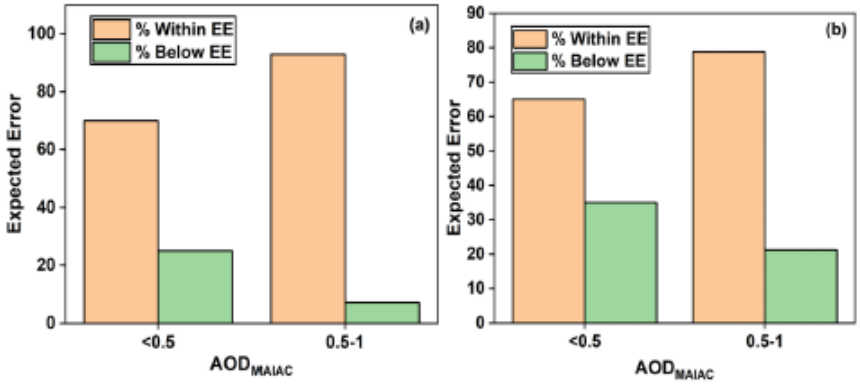


Figure 2: shows the anticipated error representation of AODMAIAC in AOD bins of less than 0.5, 0.5 to 1.0, and greater than 1.0.

The MAIAC AOD retrievals on bright surfaces are not as accurate as those on dark surfaces, but they are still far more accurate than the DT and DB algorithms. To create a local or regional validation database of data, AERONET sites, such as Amity University, should be explored for further research.

3.2 SEASONAL ANALYSIS

For the current study area, there are several elements that contribute to seasonal oscillations of AOD, including changing climatic conditions, vegetation cover, sources of aerosol emission, and crop development phases. As a result, surface reflectance is considered for obtaining aerosol optical characteristics. The AOD levels are highest during the premonsoon and monsoon seasons, according to the seasonal distributions of AOD levels. Because the region has a semi-arid climate, it experiences frequent dust storms during the pre-monsoon season, which leads to high levels of air pollution. Even while clouds and precipitation can remove particles through washout and rainout, it is not possible to establish a definite connection between aerosols and precipitation in Indian situations due to the unpredictable nature of rainfall. When there is light rain, the humidity in the air goes up, which causes the concentration of aerosol particles to increase. Due to the high population density and increased human activity, the current study area may also experience high aerosol loads following precipitation events. This is caused by emissions from large and small industries, brick kilns, vehicles, dust from construction, thermal power plants, road dust, diesel generators, and emissions from households.

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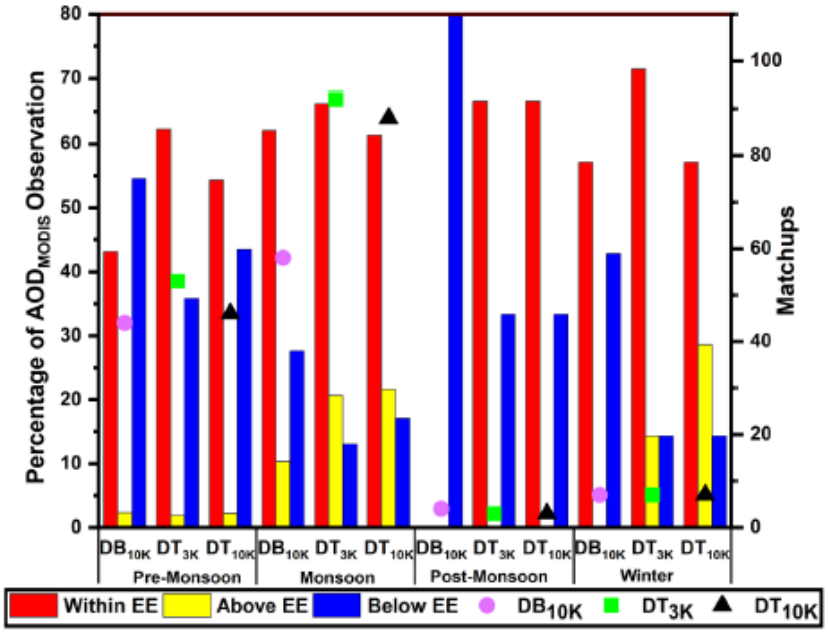


Figure 3: Inter-seasonal variation and comparison

3.1. CONCLUSION

Respiratory disease is the leading cause of illness in people of all ages and is the most common cause of mortality for children under five years old worldwide. This study examined the AOD levels are highest during the premonsoon and monsoon seasons, according to the seasonal distributions of AOD levels. Because the region has a semi-arid climate, it experiences frequent dust storms during the pre-monsoon season, which leads to high levels of air pollution. Even while clouds and precipitation can remove particles through washout and rainout, it is not possible to establish a definite connection between aerosols and precipitation in Indian situations due to the unpredictable nature of rainfall. When there is light rain, the humidity in the air goes up, which causes the concentration of aerosol particles to increase.

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