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RELATIONSHIP BETWEEN AEROSOL OPTICAL DEPTH AND PARTICULATE MATTER (PM2.5) USING MODIS SATELLITE IMAGE

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ABSTRACT

Cloud and aerosol uncertainty continue to provide a challenge to estimates and explanations of the Earth's dynamic energy budget. In this study, satellite images and PM 2.5 data from air quality monitoring stations in Peninsular Malaysia were conducted to evaluate the relationship between Aerosol Optical Depth and Particulate Matter (PM 2.5). To evaluate PM variability in 2019, data from 47 air quality ground-based stations on monthly mean particulate matter (PM2.5) concentrations were analyzed. This study aimed to investigate the relationship between concentrations of PM2.5 and aerosol optical depth (AOD) using the tabular data of PM2.5 acquired from the Environment Statistic and being overlaid with the MODIS satellite image. A correlation test was performed using ArcGIS software using Inverse Distance Weighting (IDW) technique. Then, by using the Air Pollution Index data and the value of Aerosol Optical Depth, this study identifies the values that influence the cloud seeding by studying the relationship between PM2.5 and AOD using MODIS satellite image. The results showed that among the areas, Selangor is the areas that had the highest PM 2.5 and AOD levels. The PM 2.5 concentration was high during the period of cloud seeding missions which in September. This study showed that the release of silver iodine crystals during the missions may have increased the concentration of PM in the air. This work can benefit the future of cloud seeding in Malaysia as well as the Aerosol field of study to progress it.

Keywords: Cloud Seeding, Aerosol Properties, MODIS-Terra

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CHAPTER 1
INTRODUCTION

1.1 Research Background

An increasing number of countries have participated in weather manipulation technology and applications in due to water shortages worsened by increasing population and a changing climate (Al Hosari et al., 2021). Due to water shortages increased by growing population and a changing climate, an increasing number of nations have participated in weather manipulation technologies and applications (Al Hosari et al., 2021). Cloud seeding is a weather modification technique that adds condensation nuclei to the air intentionally, creating the conditions for snowflakes or raindrops to form and boosting a cloud's potential to generate rain or snow. Clouds form when water vapour in the atmosphere cools and condenses around a particle of dust or salt, forming little water droplets or ice crystals. Condensation nuclei are particles that allow raindrops or snowflakes to form, and precipitation is impossible without them (DRI, n.d.). One form of cloud seeding that has been done is static cloud seeding, which involves diffusing a chemical such as silver iodide into the air. As the silver iodide crystallises, moisture condenses. Because moisture is already present in the clouds, silver iodide boosts vertical air currents, allowing more water to travel through the clouds and producing more rain, making rain clouds more effective at dispersing their water. Dynamic cloud seeding has used up to 100 times more ice crystals than static cloud seeding, and hygroscopic cloud seeding encourages coalescence with hygroscopic salt nuclei produced by pyrotechnic flares or a fine spray of extremely concentrated salt; the purpose is to grow rainfall by encouraging coalescence with hygroscopic salt nuclei produced by pyrotechnic flares or a fine spray of highly concentrated salt solution (Malik, 2018)

Air pollution has become a worldwide issue, particularly in regions with a high population density and industrial activity. Particulate matter (PM) in the atmosphere is a complex mixture of organic and inorganic particles such as dust, soot, smoke, and water droplets. These particles may be suspended and dispersed through the