



UNIVERSITI TEKNOLOGI MARA

**DETECTION OF AEROSOL OPTICAL DEPTH
AND LOW-LEVEL CLOUD IN MODIS
SATELLITE IMAGERY FOR POTENTIAL
CLOUD SEEDING AREA**

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requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Cloud seeding is conducted to preserve more water resources with the presence of aerosols in the atmosphere. Aerosol optical depth (AOD) is a key component in cloud formation and plays a vital role in the hydrological cycle and the atmosphere's radiation budget. Thus, the detection of AOD and suitable cloud is important to determine the most efficient for cloud seeding operation. This study aims to determine the potential area for cloud seeding based on the detection of aerosol optical depth concentration (AOD) and low-level clouds distribution using Moderate Resolution Imaging Spectroradiometer (MODIS) satellite images in the inter monsoon seasons year 2019 and 2020. The objectives of this study are to i) to identify the concentration of AOD over the study area ii) to retrieve the distribution of low-level clouds using the single reflective band method iii) to identify the potential cloud seeding area based on aerosol optical depth concentrations and distribution of low-level clouds. Based on the extractions from MODIS AOD with python scripts and the low-level cloud from MODIS single reflective band, the potential areas for clouds seeding were identified. The results show that the AOD focused on the urban areas while the distribution of low-level cloud uniformly at the area in Malaysia. Most of the cloud seeding potential areas were found within the same area of cloud seeding operations as carried out by the Malaysian Meteorological Department (MET) in the year 2019, which were near agriculture and dam areas. The potential areas in the year 2020 were also found within the same locations as 2019 such as Kwong Dam and Pasir Puteh in Kelantan. Thus, the AOD concentrations with the low-level cloud distributions can be utilized to identify the areas for cloud seeding operations. This study will be beneficial for MET to determine the most potential locations for successful cloud seeding operations.

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