

SITI NABILA SHAMSUL ANUAR

BACHELOR OF SURVEYING SCIENCE AND GEOMATICS (HONOURS)

AUGUST 2023

CLOUD SEEDING POTENTIAL AREAS FROM REMOTE SENSING
OF LOW-LEVEL CLOUD AND ATMOSPHERIC WATER VAPOUR

SITI NABILA SHAMSUL ANUAR

2020840282



COLLEGE OF BUILT ENVIRONMENT
UNIVERSITI TEKNOLOGI MARA
PERLIS

AUGUST 2023

**CLOUD SEEDING POTENTIAL AREAS FROM
REMOTE SENSING OF LOW-LEVEL CLOUD AND
ATMOSPHERIC WATER VAPOUR**

SITI NABILA SHAMSUL ANUAR

2020840282



**Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfilment for the award of the degree of the
Bachelor of Surveying Science and Geomatics (Honours)**

AUGUST 2023

AUTHOR'S DECLARATION

I declare that the work in this thesis 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 Undergraduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Siti Nabila Binti Shamsul Anuar

Student I.D. No. : 2020840282

Programme : Bachelor of Surveying Science and Geomatics –
AP220

Faculty : College of Built Environment, CBE

Thesis Title : Cloud Seeding Potential Areas from Remote Sensing
of Low-Level Cloud and Atmospheric Water Vapour

Signature of Student :

Date : 18 July 2023

ABSTRACT

Cloud seeding operations are carried out to increase the amount of precipitation due to drought phenomena that affect the availability of water for agricultural and industrial areas. Silver iodide compound (AgI) was used by dispersing it into clouds that act as ice nuclei and thus, alter the microphysical processes within the potential cloud. However, the success rate of cloud seeding operations in Malaysia is only 57 to 65 percent due to location and temporal factors. The low-level cloud and atmospheric water vapour (AWV) are parts of the main parameters contributing to successful precipitation from cloud seeding. Therefore, this study aims to determine the potential areas for cloud seeding operations based on low-level cloud distribution and AWV concentration in Peninsular Malaysia using MODIS satellite images. To achieve the aim of the study, the objectives of this project are: i) to integrate cloud masking and MODIS single reflective band methods for low-level cloud detection. ii) to compute the atmospheric water vapour concentration using the MODIS water vapour product. iii) to determine the potential areas for cloud seeding operation based on the distribution of low-level clouds and the AWV concentration. The potential areas were detected from the low-level cloud distribution and the concentration of AWV from remote sensing satellite images of Terra MODIS and mapped with GIS overlay operation. From the results, six (6) locations were found to be potential for cloud seeding operations located in Kemubu Agricultural Development Authority (KADA) in Kelantan, Muda Dam, Pedu Dam, Ah Ning Dam in Kedah, Durian Tunggal Dam, and Jus Dam in Melaka. The locations found were also coincidentally used in previous cloud seeding operations conducted by the Malaysian Meteorological Department (MET) in 2019. The AWV concentration indicates a range between 4 cm to 7.2 cm from the previous locations of operations. Thus, the maps of potential areas based on low-level cloud and AWV for cloud seeding operations can be produced using Remote Sensing satellite images. The approach can potentially be utilised by related agencies such as MET to improve further and practically identify the appropriate time and areas for cloud seeding operations.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	i
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xiii
LIST OF NOMENCLATURE	xvi
CHAPTER ONE INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Research Question	7
1.4 Aim and Objectives	7
1.5 Scope and Limitation of Study	7
1.6 Significance of Research	8
1.7 Summary	9
CHAPTER TWO LITERATURE REVIEW	9
2.1 Introduction	10
2.2 Rain Formation	10
2.3 Cloud Seeding Operation	11
2.4 Monsoon in Malaysia	12
2.5 Cloud Category and Physical Properties	14
2.6 Cloud Detection from Satellite	15