# CHARACTERIZATION OF REGIONAL EARTH MAGNETIC ACTIVITY BASED ON MAGDAS DATA

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KHAIRUL AFIFI BIN NASUDDIN
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM,
SELANGOR, MALAYSIA

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## ABSTRACT

Earth magnetic data can be measured by magnetometer, Magnetic Data Acquisition System and other devices. MAGDAS is a realtime system magnetometers that are being deployed by Kyushu Sangyo University of Fukuoka, Japan. On the April 2007 the deployment was concentrated along the 210 magnetic meridian. However, during the current stage of expansion, units are also being deployed along the geomagnetic equator, in places such as Malaysia, Ethiopia, Nigeria, Ivory Coast, and also Brazil. The ordinary data from the MAGDAS can be used for studies of long-term variations, like magnetic storm and auroral substorms, while the induction-type will be useful for studies of ULF waves, transient and impulsive phenomena. The earth magnetic data from the MAGDAS can also be used as part of earth magnetic data monitoring, mainly for earth events such as earthquake and space events such as geomagnetic storm. For this project, data from stations at the north, equatorial and south region are considered as monitored data to be analyzed. The data will be taken at stations located at Onagawa, Japan, Langkawi, Malaysia and Cooktown, Australia. The data is taken at different latitude and longitude to see the different of earth magnetic field and its characterization. The analyses are based on the different biases of MAGDAS data at different region. From the analysis, the earth magnetic polar at different region can be mapped and defined. The results are useful to give the regional of magnetic format data.

## TABLE OF CONTENTS

# CHAPTER 1

# INTRODUCTION

## 1.1 TEC Characterization

TEC is an important descriptive quantity for the ionosphere of the Earth. TEC is the total number of electrons present along a path between two points, with units of electrons per square meter, where 1016 electrons/$m^2$ = 1 TEC unit (TECU) .TEC is significant in determining scintillation and group delay of a radio wave through a medium [1]. For this project, MAGDAS data will be use to identify the characterization of the earth magnetic field instead of TEC since there are only a few researcher focused on using MAGDAS data in their project.

## 1.2 The Earth's Magnetosphere

The magnetosphere is the outer part of the Earth's magnetic field, a region in the near-Earth space environment where the shape and behavior of the geomagnetic field is governed by the Sun. The Sun is a highly dynamic presence within the solar system. It has its own dynamo, generating a somewhat tangled magnetic field that extends out into interplanetary space. The Sun also emits a wind of electrically-charged particles, plasma that flows outwards into space and which carries with it the heliomagnetic field and because of the pressure exerted by the solar wind on the geomagnetic field, the magnetosphere is compressed on the day side and elongated on the night side of the Earth [4].

In dimension along the equatorial plane, the day-side magnetosphere, the boundary of which is called the 'magnetopause', is about 10 Earth radii from the surface of the Earth, while the length of the 'magnetotail' varies greatly, being very approximately 100 Earth radii in length. Since the solar wind is supersonic, having a velocity relative to the Earth that is faster than the speed of sound within the plasma, there is a shockwave that precedes the Earth in its passage through the solar wind [4].