## PROPAGATION OF TWEEK ATMOSPHERICS IN EARTH IONOSPHERE OBSERVE IN MALAYSIA

Thesis is presented in partial fulfillment for the award of the

**Bachelor of Engineering (Hons.) Electronics (Communication)** 

UNIVERSITI TEKNOLOGI MARA (UiTM)



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**JULAI 2012** 

### ACKNOWLEDGEMENT

#### With the name of ALLAH Most Gracious and Most Merciful

Alhamdulillah, thank you ALLAH S.W.T for His wills and blessings, I successfully completed my Final Year Project for my first degree of Bachelor of Engineering (Hons) Electronics (Communication).

First and foremost, I would like to express my highest gratitude to my FYP Supervisor, Khairul Khaizi Bin Mohd Shariff for the guidance and encouragement given from the early phase of my FYP project to the end of the last stage of my research thesis.

A sincere gratitude to University of Stanford for providing the AWESOME broadband data and to Global Hydrology and Climate Centre (GHCC), NASA for providing Lightning Imaging Sensor (LIS) data information on their webpage.

My great appreciation goes to my family who has supported me throughout the years. Their love and motivation provides me the spirit to complete this thesis successfully.

I also would like to express my gratitude to all friends who always besides me and never stop giving the motivations and encouragement during the whole process of research.

Last but not least, special thanks to people around me who willing to give a hand during project thesis, May Allah bless all of you.

### ABSTRACT

Lightning discharges produce ELF/VLF pulse signals propagate in Earth-Ionosphere waveguide over long distance with frequency dispersion characteristic known as tweeks atmospherics. This paper presents the observation of propagation of tweek atmospheric in Earth-ionosphere received at Selangor station (2.92°N, 101.77°E). A total of 714 tweeks were recorded during 25 May 2010 and 19 June 2010. Observation on 25<sup>th</sup> May 2010 found that the electron density at reflection height of 84-93 km varies from 21 to 24 el/cm<sup>3</sup> whereas on 19<sup>th</sup> June 2010 electron density at reflection height of 87-93 km varies from 21 to 23 el/cm<sup>3</sup>. Using LIS data from GHCC, Two tweeks were found to originate from Nepal and Philippines Island. The reflection height and the estimated electron density for tweek from Nepal and Philippines were found between 87.21 km and 23.46 el/cm<sup>3</sup> and 81.65 km and 25.06 el/cm<sup>3</sup> respectively. It shows that tweek originated from Nepal has higher reflection height compared to the tweek from Philippines.

# **TABLE OF CONTENTS**

### PAGES

DEC	CLA	RATION III
ACI	KNO	WLEDGEMENT
ABS	STR	ACTV
LIS	T OI	F FIGURE VIII
LIS	T OI	F TABLE
LIS	T OI	FABBREVIATIONSXI
LIS	T OI	F SYMBOLS XIII
CH	APT	ER 11
INT	ROI	DUCTION
1.	.1	BACKGROUND STUDY1
1.	2	OBJECTIVE
1.	.3	SCOPE OF STUDY
1.	.4	PROBLEM STATEMENT
1.	.5	OUTLINE OF THESIS
СН	АРТ	'ER 2
CH. LIT	<b>APT</b> ERA	* <b>ER 2</b>
CH LIT 2.	<b>APT</b> ERA .1	YER 2 4   ATURE REVIEW 4   INTRODUCTION 4
CH LIT 2. 2.	APT ERA .1 2	TER 2
CH. LIT. 2. 2.	<b>APT</b> ERA .1 .2 .2.1	TER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4
CH. LIT. 2. 2. 2. 2.	<b>APT</b> ERA .1 .2 .2.1 .2.2	TER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm 5
CH. LIT. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3	YER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm 5   Type of Lightning Discharge 6
CH. LIT. 2. 2. 2. 2. 2. 2. 2. 2.	<b>APT</b> ERA .1 .2 .2.1 .2.2 .2.3 .2.4	YER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm 5   Type of Lightning Discharge 6   Lightning Detection System 8
CH. LIT 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3 .2.4 .3	YER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm 5   Type of Lightning Discharge 6   Lightning Detection System 8   ELF/VLF RADIO SIGNAL 10
CH. LIT 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3 .2.4 .3 .3.1	<b>YER 2</b> 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm. 5   Type of Lightning Discharge 6   Lightning Detection System 8   ELF/VLF RADIO SIGNAL 10   Sferic 12
CH. LIT 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3 .2.4 .3 .3.1 .3.2	TER 2 4   ATURE REVIEW 4   INTRODUCTION 4   LIGHTNING 4   Electrical Structure of Thunderstorm 4   Characteristics of a Storm 5   Type of Lightning Discharge 6   Lightning Detection System 8   ELF/VLF RADIO SIGNAL 10   Sferic 12   Tweek 13
CH. LIT 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3 .2.4 .3 .3.1 .3.2 .3.3	YER 24ATURE REVIEW4INTRODUCTION4LIGHTNING4Electrical Structure of Thunderstorm4Characteristics of a Storm5Type of Lightning Discharge6Lightning Detection System8ELF/VLF RADIO SIGNAL10Sferic12Tweek13Whistler14
CH. LIT 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	APT ERA .1 .2 .2.1 .2.2 .2.3 .2.4 .3 .3.1 .3.2 .3.3 .4	YER 24ATURE REVIEW4INTRODUCTION4LIGHTNING4Electrical Structure of Thunderstorm4Characteristics of a Storm5Type of Lightning Discharge6Lightning Detection System8ELF/VLF RADIO SIGNAL10Sferic12Tweek13Whistler14THE IONOSPHERE15

### **CHAPTER 1**

### **INTRODUCTION**

### 1.1 BACKGROUND STUDY

Lightning strike is a power electromagnetic signals from few Hertz to tens of MHz but the maximum radiated energy is in the extremely low frequency (ELF: 3- 3000Hz) and very low frequency (VLF: 3-30 kHz) band[1]. Electromagnetic impulse signals launched by individual lightning discharges with certain frequency dispersion characteristics at lower end are known as tweek. The tweek waveform in the ELF/VLF range propagates by reflecting in multiple reflections from boundaries of natural waveguide formed by the Earth's surface and the lower ionosphere layer[2].

Tweeks have been used by researcher to estimate the ionospheric reflection height (h), equivalent electron densities  $(n_e)$  at reflection heights, propagation distance (d) and the geographical locations of the source discharge.