

A banner for the United Nations/Japan Workshop on Space Weather. It features a composite image of Earth from space, a satellite, the sun, and aurora borealis. The United Nations logo is centered at the top. The text reads: "UNITED NATIONS/JAPAN WORKSHOP ON SPACE WEATHER".

## UNITED NATIONS/JAPAN WORKSHOP ON SPACE WEATHER

"Science and Data Products from ISWI Instruments"  
2-6 March 2015, Fukuoka, Japan

# Space Weather Activities in National Space Agency of Malaysia: Past, Present and Future

Presented by : Nyanasegari Bhoo Pathy

*Zahira Md Radzi, Zulia Kurnia Dewi, Mhd Fairos Asillam, Noordin Ahmad*

Space Science Research Division  
National Space Agency (ANGKASA)  
Ministry of Science, Technology and Innovation  
MALAYSIA

# Overview of ANGKASA

**Vision :** Harnessing space as a platform for knowledge generation, wealth creation and society well-being.

**Mission :** To develop the country's potential in the space sector to support the development on the new economy, generate knowledge and strengthen the national security infrastructure.

## Core Business

- ✓ Space Education and Awareness
- ✓ Space System and Ground Infrastructure
- ✓ Space Industry and Application Development
  - ✓ Space Science and Research Division
    - ✓ Space Law and Policy

# INTRODUCTION : Malaysia ISWI Program

Malaysia has joined the international initiative “International Space Weather Initiative (ISWI)” which is an international program of research and education on space weather on July 2010.

Malaysia has also established a National Working Committee in which coordinated by the National Space Agency of Malaysia (ANGKASA)

Objectives of Malaysia ISWI Working Committee are:-

- i. To develop space weather research activities and services in Malaysia;
- ii. To encourage local, regional and international collaborations in space weather; and
- iii. To educate and promote space weather to the public through education and public awareness programmes.

# SPACE WEATHER ROADMAP

2005

- Langkawi National Observatory (LNO)

- MAGDAS in LNO

2007

- Set-up Solar telescope systems

2011:

- Installation of CALLISTO, AGREES, SID, GISTM, GPS Station
- Development of radio astronomy antenna for SW application
- Kick-off of NSWLC
- My\_GNSSnet for NRT Ionospheric Monitoring

2015

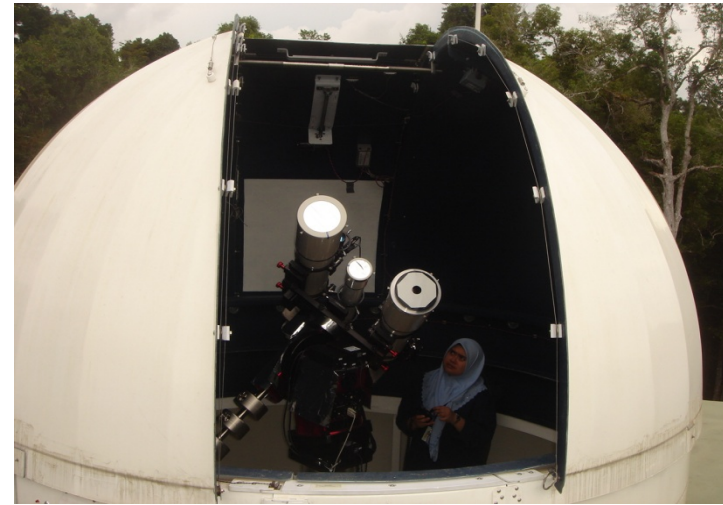
Automated Early warning system

- Development of various model to support NSWLC
- Set-up Antenna farm at PAN

2020

Operation of space weather services

# LANGKAWI NATIONAL OBSERVATORY (LNO) ESTABLISHED IN YEAR 2005



# INVOLVEMENT IN INTERNATIONAL INITIATIVES THROUGH MAGDAS LANGKAWI

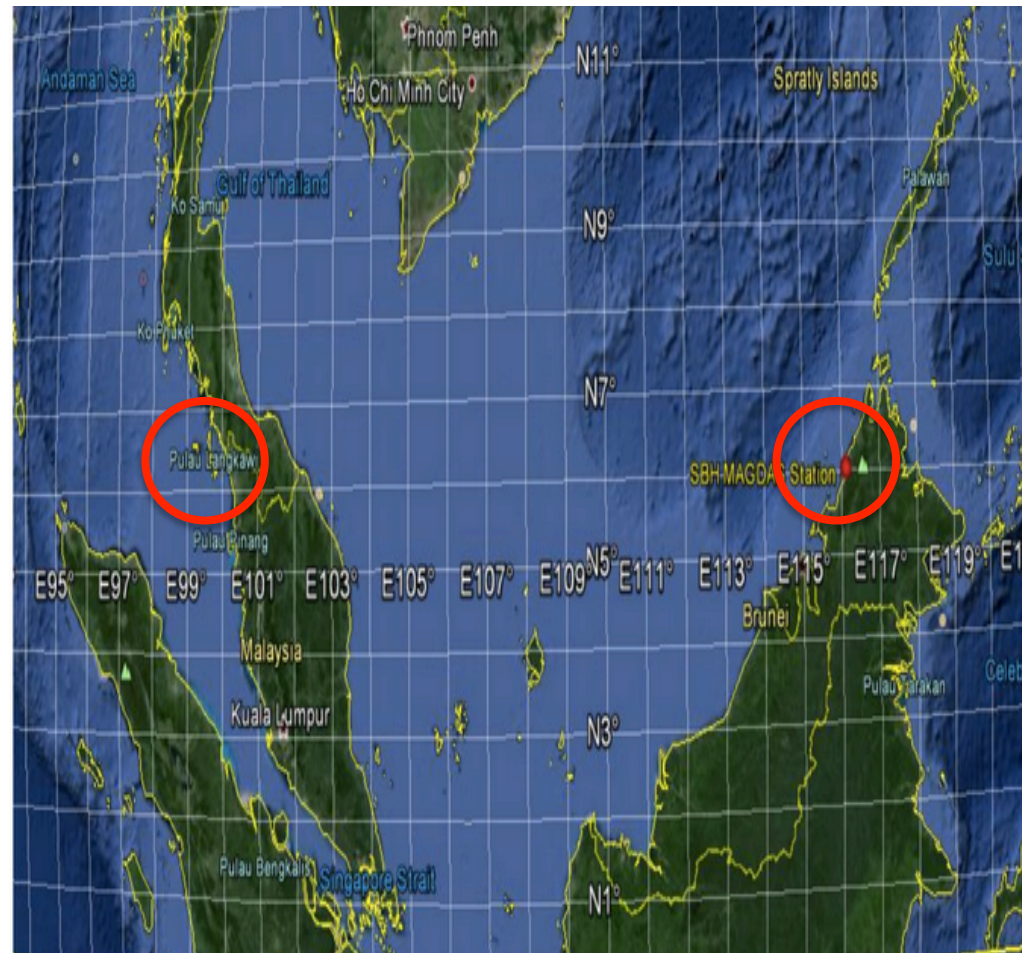
- ✓ **International Heliophysical Year (IHY)**  
-2007 → MAGDAS-1
- ✓ **International Space Weather Initiatives (ISWI)** - 2012 → Callisto, MAGDAS-9, SID device, AGRESS (*African GPS Receivers for Equatorial Electrodynamics Studies*)

# **PART 1 : UPDATE ON ISWI INSTRUMENTS IN MALAYSIA**

# MAGDAS in Malaysia

1<sup>st</sup> unit of MAGDAS in Malaysia was installed at Langkawi National Observatory, Langkawi (LNO) in year 2006;

2<sup>nd</sup> unit of MAGDAS was installed in University Malaysia Sabah (UMS), in year 2013





# (MAGDAS-9 INSTALLATION) in 2012 at Langkawi

Dr Geri Gopir (National Univ. of Malaysia)

Mohd Helmy Hashim (ANGKASA)

Ms. Etho (ICSWSE)

Mr Ridhuan (ANGKASA)

Mr Sobri (ANGKASA)

Mr. Huzaimy (Universiti Teknologi MARA)

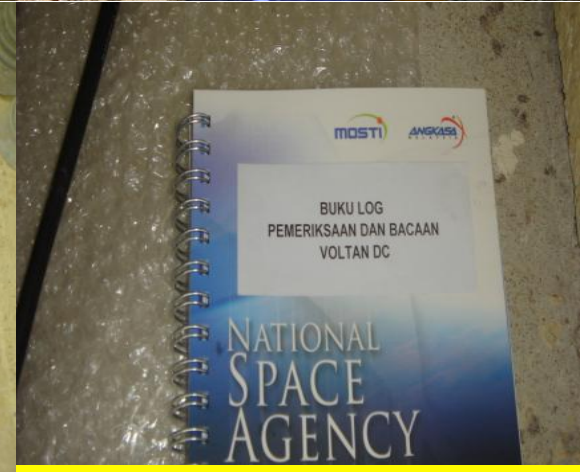


# MAGDAS in LANGKAWI



Pre-Amp Hut

Sensor Hut



Mag-9 Data Logger

Mag-9 Sensor

MAGDAS maintenance log book

# MALAYSIAN PROJECTS/STUDIES USING MAGDAS

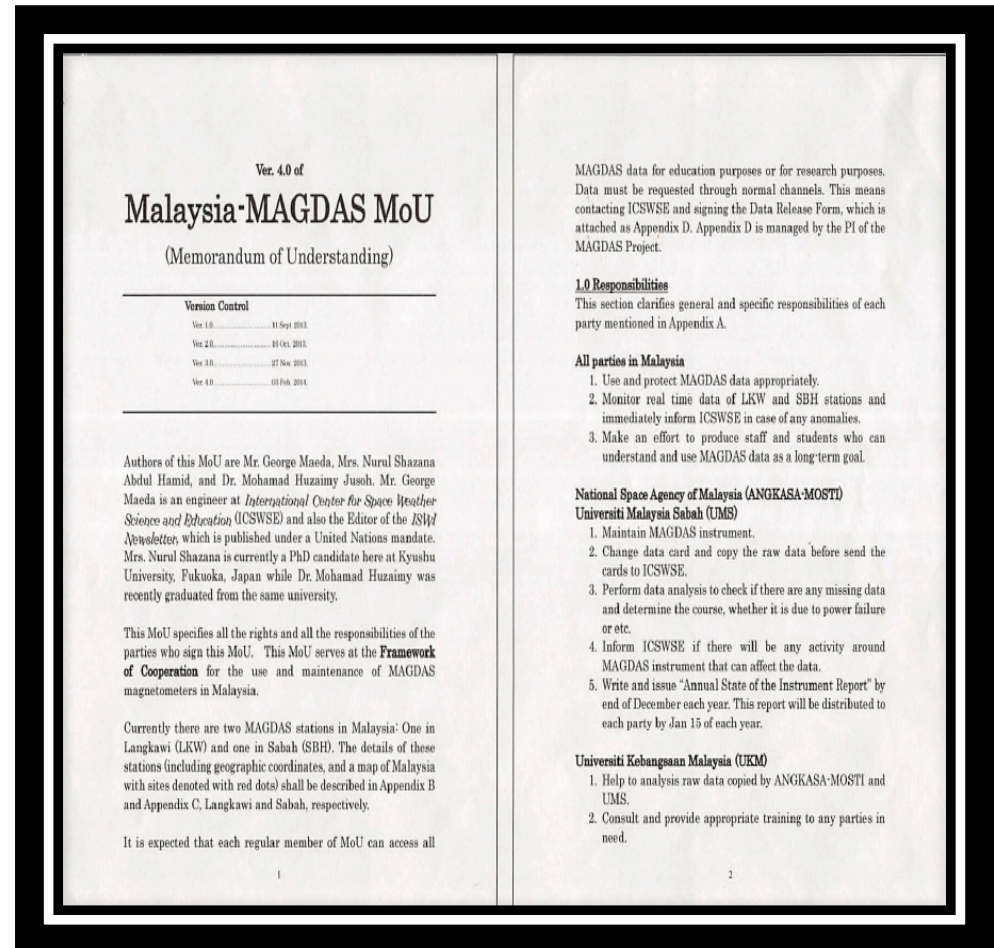
NO	RESEARCH TITLE	MAGDAS STATION	INSTITUTION	FIELD
1.	Ionospheric & magnetic field effects observed during the 2005 geomagnetic storms in the South-East Asia sector	Langkawi, Malaysia	UKM	Space Weather Instrumentation
2.	Determination of fractal properties of geomagnetic field derived from MAGDAS	Langkawi, Malaysia	UKM	Space Weather Instrumentation, Statistical
3.	Scaling and fractal properties of the horizontal geomagnetic field at the tropical stations of Langkawi and Davao in February 2007	Langkawi, Malaysia, Davao, Philippines	UKM	Space Weather Instrumentation, Statistical
4.	Power spectrum analysis of horizontal geomagnetic field component time series at Station Cebu, Philippines in December 2005	Cebu, Philippines	UKM	Space Weather Instrumentation, Statistical
5.	The hyst exponents of the geomagnetic horizontal component during quiet and active periods	Cebu & Davao Philippines	UKM	Space Weather Instrumentation
6.	Correlation analysis between MAGDAS data and Ionospheric parameter	Manado, Indonesia	UITM	Space Weather

NO	RESEARCH TITLE	MAGDAS STATION	INSTITUTION	FIELD
7.	Characterization of regional Earth Magnetic activity based on MAGDAS data	North, equatorial and South region	UITM	Geophysics
8.	Monitoring and analysis MAGDAS data during Ionospheric Events (Geomagnetic storm, SID, TID)	Ashbetsu, Japan	UITM	Space Weather
9.	Correlation between Electromagnetic Phenomena and Earthquake	Manado & Seram, Indonesia	UITM	Geophysics
10.	Gravity data processing for the Andaman Sea (on 2008)	Langkawi, Malaysia	Petroleum Geoservices Exploration (M) Sdn. Bhd.	Geophysics
11.	Studies of geomagnetic field fluctuations using Magnetic Data Acquisition System (MAGDAS) – the Malaysian Beginning.	Langkawi, Malaysia	ANGKASA	Space Weather, general
12.	Langkawi geomagnetic study approaching to solar maximum	Langkawi, Malaysia	ANGKASA	Space Weather, general
13.	The Profile of Daily Geomagnetic Field Variation and its Correlation with Neutral-to-ground Current of A Power Transformer in A Transmission Line	Langkawi, Malaysia	UTM	Space Weather

**75% Space weather**  
**25% Geophysics**

# Malaysia-MAGDAS MoU

Malaysia-MAGDAS MoU  
between ANGKASA, National  
University of Malaysia (UKM),  
University Malaysia Sabah  
(UMS), University Teknologi  
Mara (UITM) and ICSWSE are  
effective on  
**3<sup>rd</sup> October 2014**



# Capacity Building Program : National School on Space and Earth Electromagnetism (SEE), 02 – 05 Dec 2014, Langkawi

## The school aim to

a) establish effective mechanisms for nurturing and sharing the development and experiences in space weather research and education focusing on electromagnetism among Malaysia-MAGDAS MoU Members, researchers and students.

b) promote cooperation in the field of education, research and popularisation of electromagnetism studies using Magnetic Data Acquisition System (MAGDAS) magnetometer platform with the cooperation from International Center for Space Weather and Education (ICSWSE), Kyushu University, Japan.

**The sessions were divided into scientific research talks, hands on training, student presentations and close meeting for Malaysia-MAGDAS MoU Members.**



**NATIONAL SCHOOL ON SPACE AND EARTH  
ELECTROMAGNETISM (SEE) 2014**  
02-05 DECEMBER 2014  
LANGKAWI NATIONAL OBSERVATORY  
NATIONAL SPACE AGENCY, MALAYSIA (ANGKASA)

**BACKGROUND**  
The National School on SEE 2014 organized by National Space Agency, Malaysia (ANGKASA) at Langkawi National Observatory aims to promote cooperation in the field of education, research and popularisation of electromagnetism studies using Magnetic Data Acquisition System (MAGDAS) magnetometer platform with the cooperation from International Center for Space Weather and Education (ICSWSE), Kyushu University, Japan. The sessions will be divided into scientific research talks, hands on training, student presentations and close meeting for Malaysia-MAGDAS MoU Members.

**OBJECTIVE**  
The school aim to establish effective mechanisms for nurturing and sharing the development and experiences in space weather research and education focusing on electromagnetism among Malaysia-MAGDAS MoU Members, researchers and students.

# National School on Space and Earth Electromagnetism (SEE), 02 – 05 Dec 2014, Langkawi



# Hands on Training Session





## INTRODUCTION : Space Weather Program using SuperSID

- Through ISWI Instrument Program, Malaysia has received 3 Sudden Ionospheric Disturbance monitors (SuperSID) that were developed by Stanford University Solar Center.
- ANGKASA has distributed the monitor to 2 local university which is Universiti Kebangsaan Malaysia (UKM) and Universiti Malaysia Pahang (UMP) and installed one SuperSID in Langkawi National Observatory (ONL).



# Installation in LNO

- The SuperSID was installed in Langkawi National Observatory (LNO) on 9 October 2012.



# EDUCATION PROGRAM- Space Weather Innovation Competition 2013

Ministry of Education of Malaysia (MOE).

- The purpose of this competition is to provide exposure and to enhance science education through the study on space weather using the SID monitors.
- This competition is open to all secondary school students in Malaysia.
- Schools are only allowed to send in one team comprises of 4 students supervised by 2 teachers.
- The students are required to assemble the electronic component parts, build their own antenna and monitor and analyse the data.
- The students also required to send in their report of activities via official website provided for this competition.



BH 12 JUN 2013 © RABU

NASIONAL 27

# Pertandingan inovasi cunghkil saintis muda

**Kuala Lumpur:** Pelajar sekolah menengah seluruh negara berpeluang bergelut saintis muda cuaca angkasa dengan menyertai Pertandingan Inovasi Cuaca Angkasa anjuran Agensi Angkasa Negara (ANGKASA) dengan kerjasama Institut Sains Angkasa Universiti Kebangsaan Malaysia.

Pertandingan di bawah Program Gerakan Inovasi Nasional

2013 - Pembudayaan Sains, Teknologi dan Inovasi itu memberi pendedahan kepada peserta melakukan penyelidikan mengenai cuaca angkasa menggunakan instrumentasi yang dinamakan 'Sudden Ionospheric Disturbance' (SID).

### Mampu ukur tahap

Instrumentasi khas ini mampu mengukur tahap gangguan

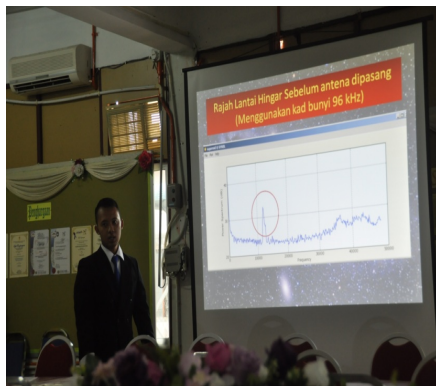
cuaca angkasa di lapisan atmosfera bumi.

Pertandingan terbuka kepada pelajar Tingkatan Empat dan Lima yang berada di sekolah-sekolah yang berdaftar dengan Kementerian Pelajaran Malaysia dan Maktab Rendah Sains Mara (MRSM) sahaja.

Untuk pendaftaran penyer-taan, guru pembimbing perlu mendaftar nama sekolah bagi

mendapatkan kata nama dan kata laluan serta maklumat lanjut pertandingan dalam laman web [inovasisid2013.angkasa.gov.my](http://inovasisid2013.angkasa.gov.my).

Maklumat lanjut dan pertanyaan mengenai pertandingan boleh diperoleh dengan menghubungi urus setia pertandingan, Zulia Kurnia Dewi Nurlisman di talian 03-3180 4377 atau e-mel [zulia@angkasa.gov.my](mailto:zulia@angkasa.gov.my)



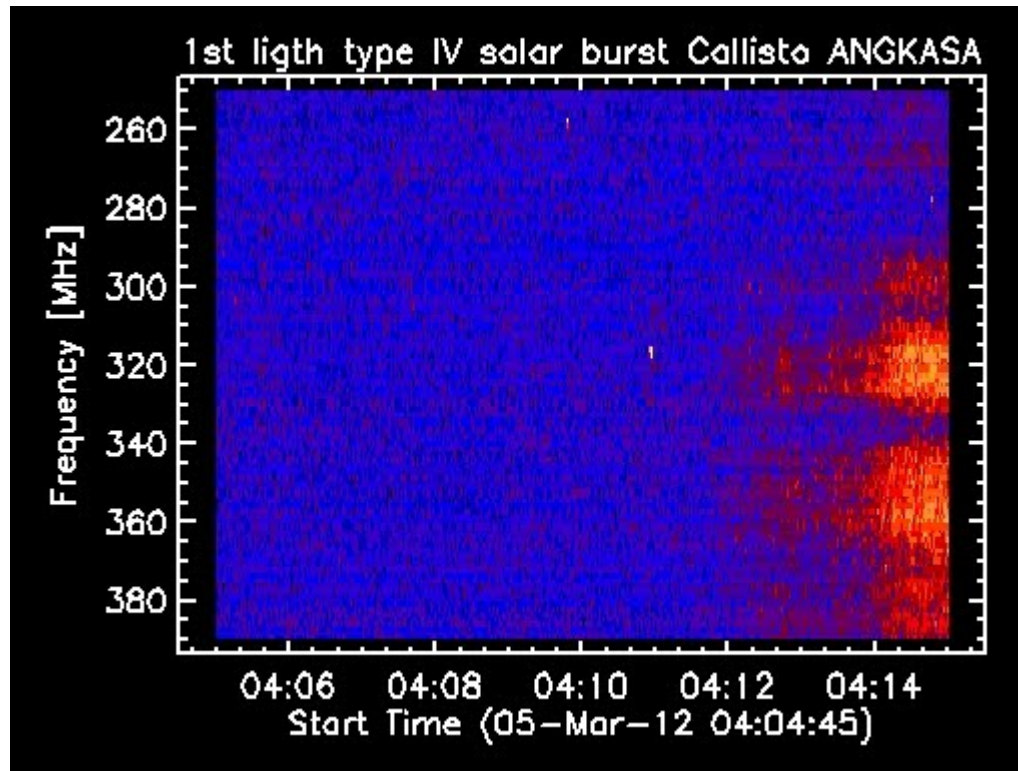
# CALLISTO (Compound Astronomical Low Cost Low Frequency Instrument for Spectroscopy Observatory)

- Installation at Malaysia Space Centre, Banting on 20 – 22 Feb 2012 with the collaboration of University Malaya (UM) participation from University of Malaysia (UKM) and University Teknologi Mara (UITM) with the expert, Christian Monstein, ETH Zurich, Switzerland



# CALLISTO

- First light : 05 March 2012



# CALLISTO: Research Outputs

*IJFPS, Vol. 2, No.2, pp. 32-34, Jun, 2012*

Z.S.Hamidi



*IJFPS, Vol. 2, No.4, pp. 72-75, Dec, 2012*

Z.S.Hamidi



## The Beginning Impulsive of Solar Burst Type IV Radio Emission Detection Associated with M Type Solar Flare

Z.S.Hamidi<sup>1\*</sup>, Abidin, Z.ZI, Ibrahim, Z.A.I, C. Monstein<sup>2</sup>, N.N.M.Shariff<sup>1</sup> and M.Sabaghi<sup>1</sup>

<sup>1</sup>Faculty of Science, University Malaya, 50603 Kuala Lumpur, Malaysia  
<sup>2</sup>Institute for Astronomy, ETH Zurich, Switzerland

Email: [zsharizat@yahoo.co.uk](mailto:zsharizat@yahoo.co.uk)

(Received May 2012; Published Jun 2012)

### ABSTRACT

First light detection of solar burst type IV in Malaysia in the region of 260 MHz till 380 MHz has been successfully detected on 5<sup>th</sup> March 2012. This significant solar burst variations is associated with solar flare type M level 2.0 occurred from 0412UT. Due to the effect, strong bursts that caused by extraordinary solar flares due to magnetic reconnection effect potentially induced in the near-Earth magneto tail. One possible reason behind the formation of this very complex long duration of this loop is the magnetic reconnection and disruption of the loops which is observed during flare maximum. Sunspot 1429 active region was a site of several intense in several days. In Malaysia, monitoring solar burst in radio region is just in beginning by involved the project under International Space Weather Initiative (ISWI) since 2011. We also analyzed multi wavelength observation from different sites as continuity of the phenomenon. Observations presented in this paper confirmed that Malaysia can be one of the potential countries to focus on solar monitoring solar radio emission at low-broadband frequency (45-870) MHz using ground-based telescope due to 12 hours per day throughout a year.

## Application of Log Periodic Dipole Antenna (LPDA) in Monitoring Solar Burst at Low Region Frequencies Region

Z.S.Hamidi<sup>\*1,2</sup>, N.M.Anim<sup>1</sup>, N. N.S.Hakimi<sup>2</sup>, N.Hamzan<sup>2</sup>, A.Mokhtar<sup>1</sup>, N.Syukri<sup>1</sup>, S.Rohizat<sup>1</sup>, I.Sukma<sup>1</sup>, Ibrahim, Z.A.<sup>1</sup>, Z.Z.Abidin<sup>1</sup>, N.N.M.Shariff<sup>1</sup>, C.Monstein<sup>3</sup>

<sup>1</sup>Department of Physics, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia  
<sup>2</sup>Faculty of Applied Sciences, MARA University of Technology, UiTM 40450 Shah Alam Selangor, Malaysia  
<sup>3</sup>Institute of Astronomy, ETH, Zurich, Switzerland  
Email: [zetysharizat@siswa.um.edu.my](mailto:zetysharizat@siswa.um.edu.my)

(Received Oct 2012; Published Dec 2012)

### ABSTRACT

The Sun is considered as one of the strongest radio sources and observation in radio region can provide information on structures throughout the solar atmosphere. In radio wavelengths, we could possible to investigate high quality images within an arc second resolution at different layers of the solar atmosphere. Solar monitoring in this wavelength makes various demands on the used antennas. Therefore, Logarithmic Periodic Dipole Antenna (LPDA) was constructed for monitoring Sun

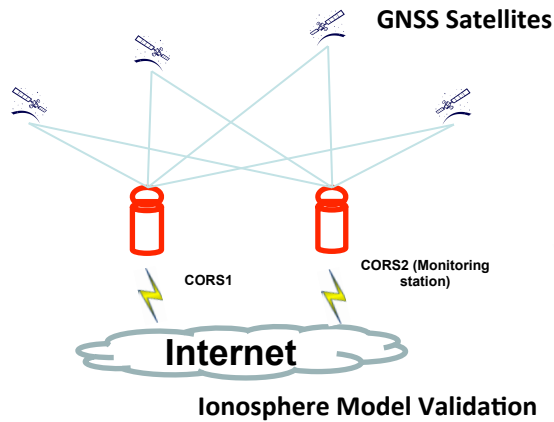
# **PART 2 : Other instruments to monitor Space Weather Activity**



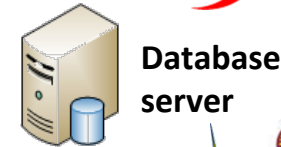
# SW Research Projects 2012 - current

1. *Reliability Study on Ionosphere Model for SBAS System – Sciencefund from Ministry of Science, Technology and Innovation (MOSTI) – (2012-2013)*
2. *Prediction of Solar Activity through Sunspot Digital Optical observation - Internal grant (2013-2015)*
3. *An Equatorial Ionosphere Index and Alert System for Space Weather Application - Sciencefund from Ministry of Science, Technology and Innovation (MOSTI) (2013-2015)*
4. *Development of Dipole-Based Antenna Array System for Low Frequency Radio Astronomy – Internal grant (2013-2015)*
5. *Studies of Solar Bursts for Space Weather and Inner Structures of Active Galactic Nuclei using radio interferometer network between Malaysia and Australia - HIR UM (2013-2016)*
6. *Design and Development of Pilot National Space Weather Data Network Management System(2014 - 2015)*

# Ionospheric TEC Value & Map Generator Service by ANGKASA



ANGKASA  
CONTROL  
CENTRE



Database  
server



PROCESSING CENTRE

Processing Core

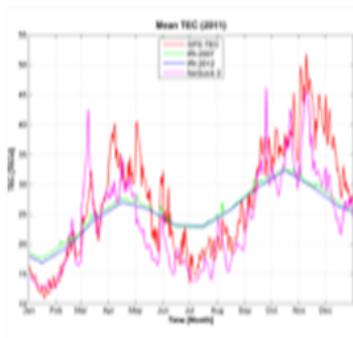


Data  
storage

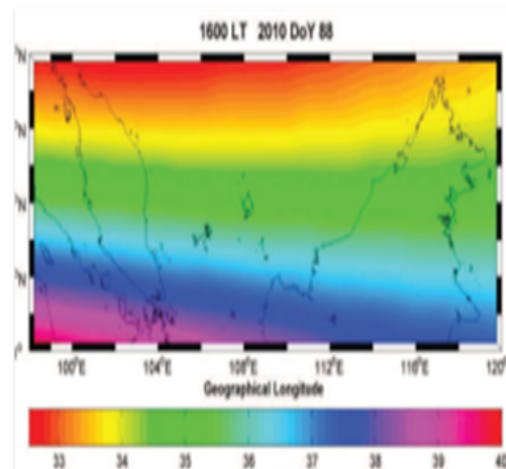


Ionospheric  
monitoring processor

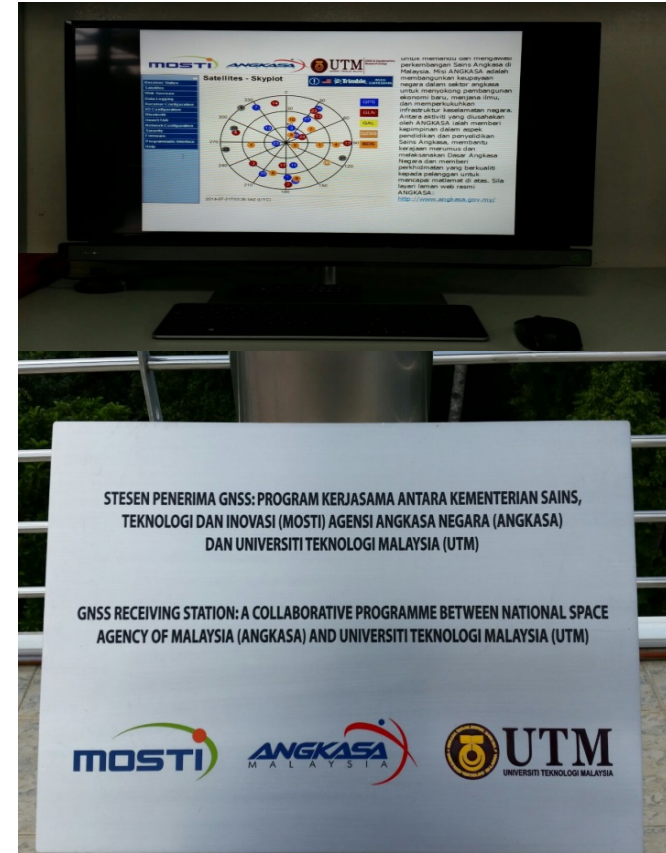
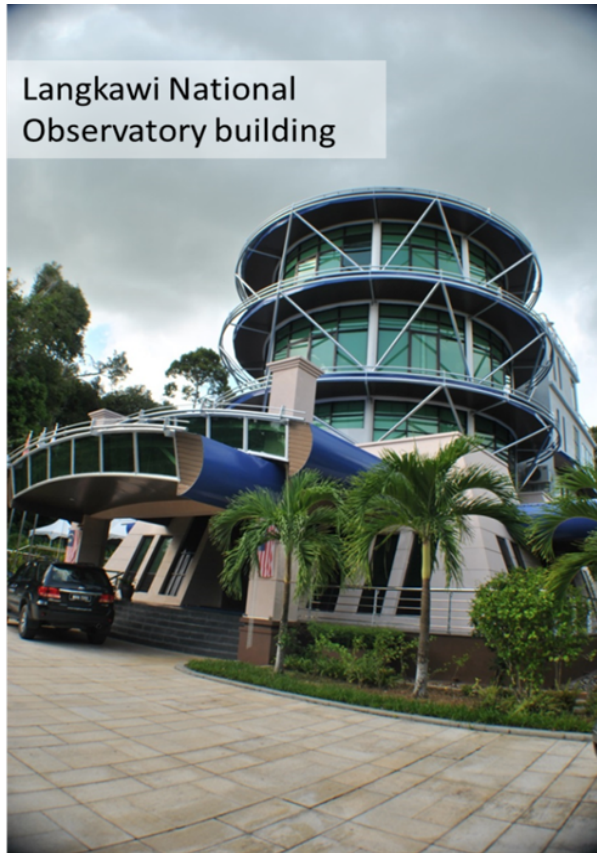
TEC time series



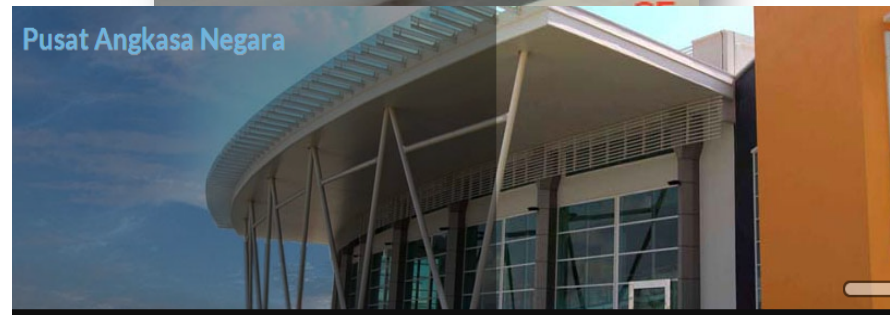
TEC Map



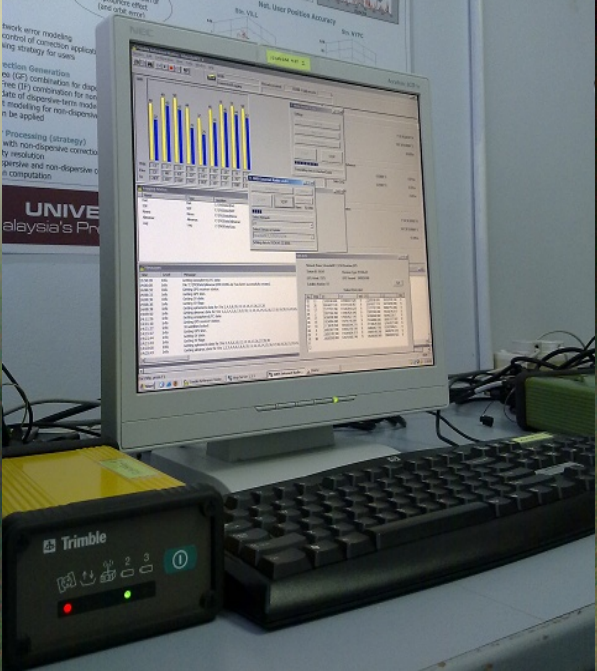
# GNSS CORS at LNO established in 2012



# CORS National Space Centre, Banting Selangor - MGM-Net



# The Control Centre



# New setup of MyGNSS-net for scientific and research purpose



RESEARCH UNIVERSITY

AGLG  
Langkawi National Observatory

AGKB  
Malaysian Metrological Department (MMD) Pengkalan Chepa

UTP,  
Sri Iskandar,  
Perak

ELS1  
Kepong, Selangor

AGKS  
Banting, Selangor

JLML  
Malaysia Marine Dept. Melaka

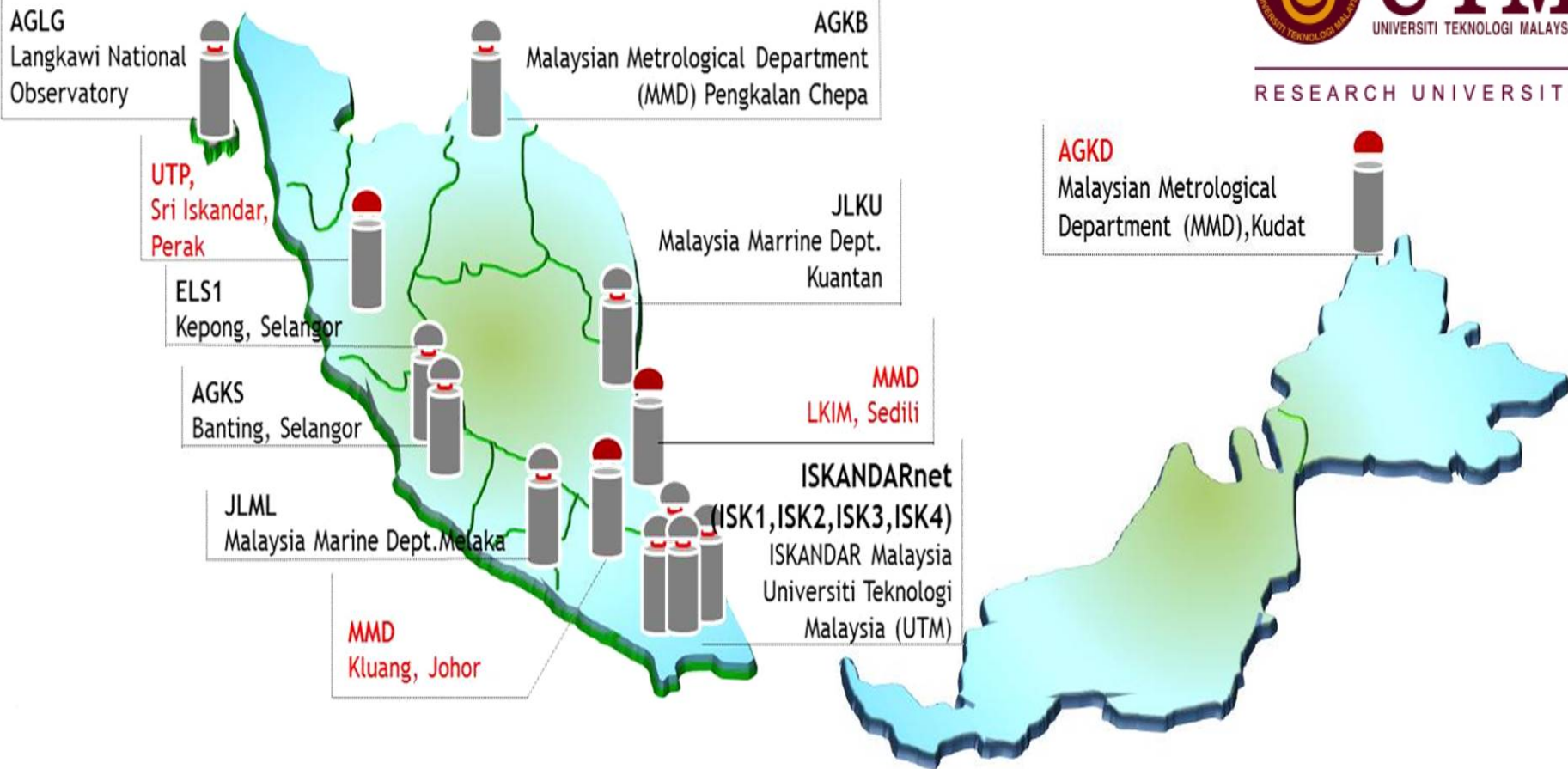
MMD  
Kluang, Johor

JLJU  
Malaysia Marine Dept. Kuantan

MMD  
LKIM, Sedili

ISKANDARnet  
(ISK1, ISK2, ISK3, ISK4)  
ISKANDAR Malaysia  
Universiti Teknologi  
Malaysia (UTM)

AGKD  
Malaysian Metrological  
Department (MMD), Kudat



# Space Weather Online

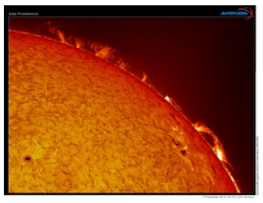
- 1<sup>st</sup> Real Time Ionospheric Monitoring Facility in Malaysia.
- Welcome to browse the website at <http://161.139.104.104/iono/index.php>

**Space Weather System**

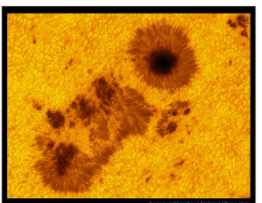
Home Info Infrastructure Ionosphere Model Services Publications Links Gallery

**Ionosphere & Space Weather Information**

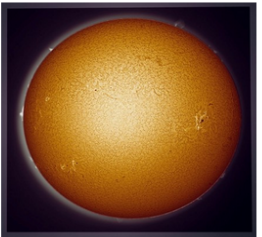
Space weather refers to the physical and morphological conditions of the Sun, space environment and the upper atmosphere of the Earth. The Earth's ionosphere, which is highly dynamic plasma medium, is one of the major components of space weather. Knowledge of the state of the ionosphere plays a crucial role in this chaotic weather system, as space weather induces severe ionospheric disturbances that can cause damages to space-borne and ground-based technological systems. The main industries whose operations can be severely affected by extreme space weather are the electric power, spacecraft, aviation, and satellite-based positioning and navigation industries.



Solar flare (image taken from Langkawi National Observatory).



SUNSPOT AR1982  
2014-02-24, 01:48:30 UT



The Sun (image taken from Langkawi National Observatory).

Best viewed using Google Chrome or Mozilla Firefox v12.0 and above on 1024x768 resolution.  
Copyright © 2014. All Rights Reserved.

**Space Weather System**

Home Info Infrastructure Ionosphere Model Services Publications Links Gallery

## Services

Single Epoch TEC | [Multiple Epoch Chart](#)

### Single Epoch TEC Value Calculator

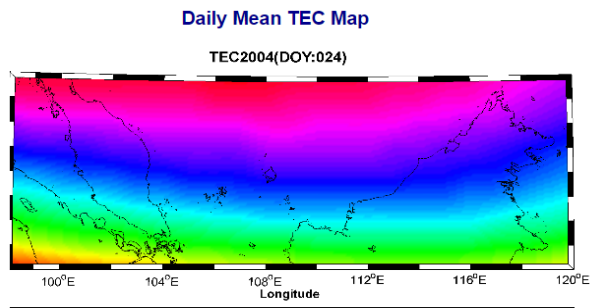
Latitude:

Longitude:

Date:

Time (UTC):

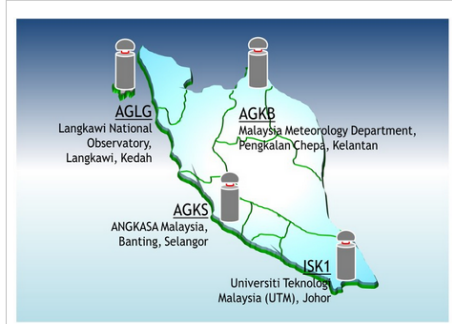
TEC value = 104.2495



**Space Weather System**

Home Info Infrastructure Ionosphere Model Services Publications Links Gallery

## MyGNSSnet for Ionosphere & Space Weather



The GPS-derived Total Electron Content (TEC) is produced from ground-based Global Navigation Satellite System (GNSS) network in Malaysia known as MyGNSSnet. The MyGNSSnet Continuously Operating Reference Stations (CORS) consist of at least dual-frequencies Global Positioning System (GPS) receiver and operated by both ANGKASA and UTM.

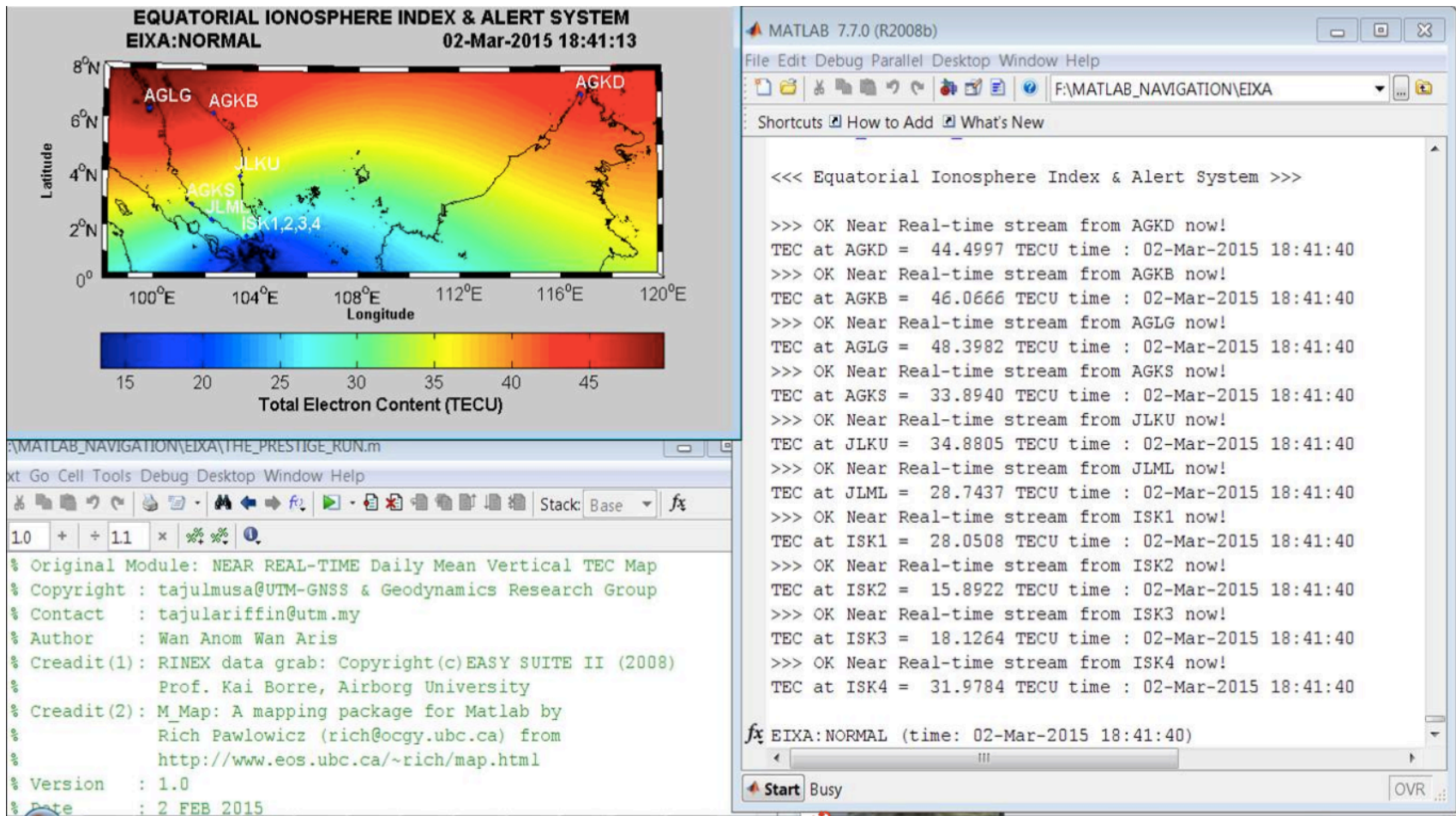
Currently, there are four MyGNSSnet stations are deployed, i.e. AGLG at Langkawi Island, Kedah (AGLG); Pengkalan Chepa, Kelantan (AGKB); UTM, Johor (ISK1) and Banting, Selangor (AGKS). GPS observation data from these CORS are stream at UTM processing centre to generate GPS-derived TEC values.

This MyGNSSnet CORS infrastructure offers a unique opportunity to probe the equatorial GPS-derived TEC and product include map of Vertical TEC (VTEC) and ASCII data of the TEC value.

- View each MyGNSSnet stations:**
1. [Langkawi National Observatory, Kedah \(AGLG\)](#)
  2. [Pengkalan Chepa, Kelantan \(AGKB\)](#)
  3. [Universiti Teknologi Malaysia, Johor Bahru \(ISK4\)](#)
  4. [Banting, Selangor \(AGKS\)](#)

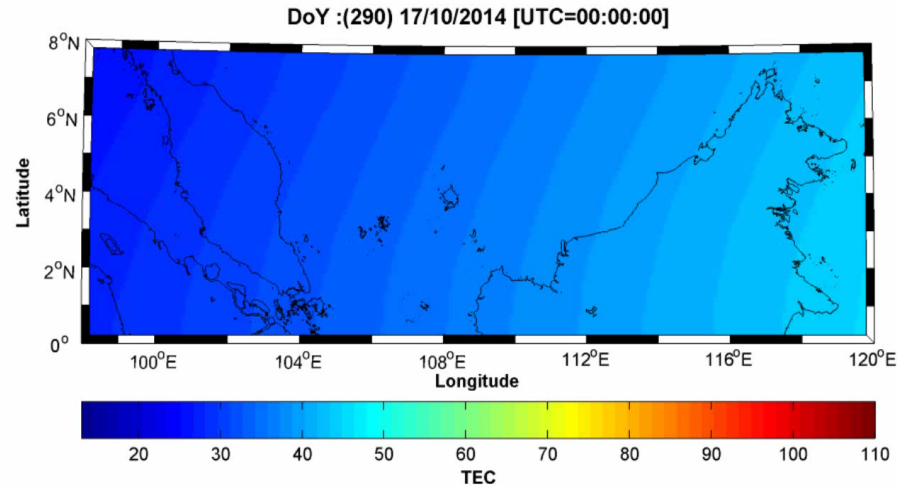
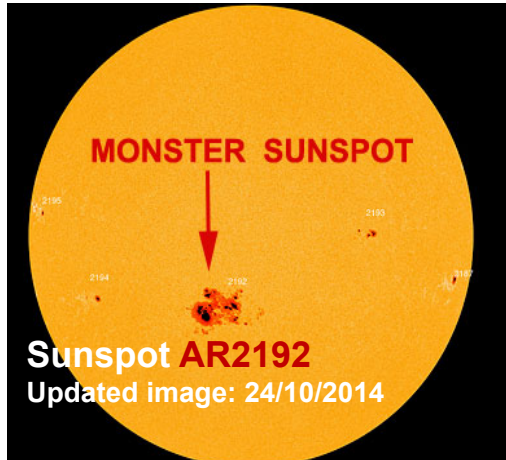
MyGNSSnet GPS network for Ionosphere & Space Weather.

# Real Time TEC Monitoring using My-GNSSNet

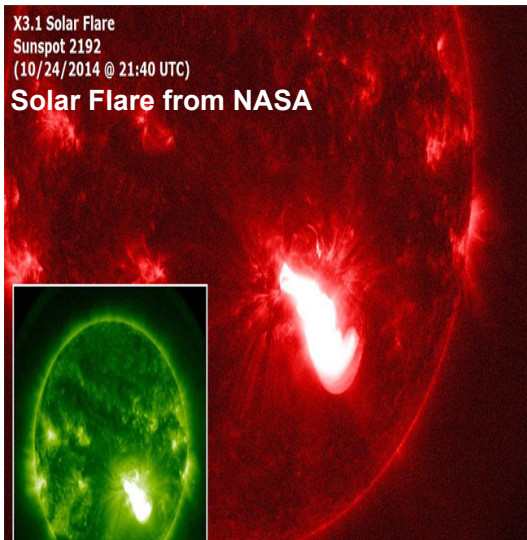




# Recent result



generated by anomarisUTMG&G



- Giant spot group AR2192 faces Earth squarely has been identified by NASA.
- Estimated GPS-derived TEC MyGNSSnet stations has shown remarkable spatial and temporal ionospheric gradient over Malaysia region during this period.

# What's Next

## Space Weather Monitoring and Prediction Service –

Real-time updates and alert system on local ionospheric and space weather conditions for radio communication and other operations to support and enhance national security, defense, emergency services, public safety and industry.

**The service will benefit industries whose operations can be severely affected by extreme space weather such as aviation, electric power, spacecraft and satellite-based positioning and navigation industries.**

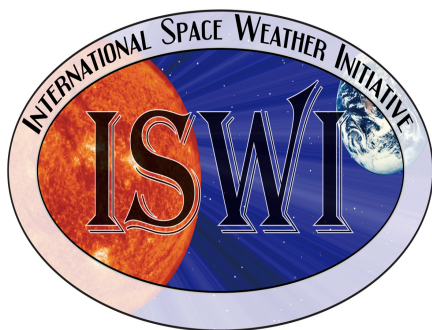
# Operation of Malaysian Space Weather Lab Centre



**We are looking forward to contribute our data to International Space Weather Research Community**

# COLLABORATION IS THE WAY FORWARD

Arigatou Gozaimasu  
Thank you  
Terima kasih



**COLLABORATE, COMMUNICATE & CONNECT**