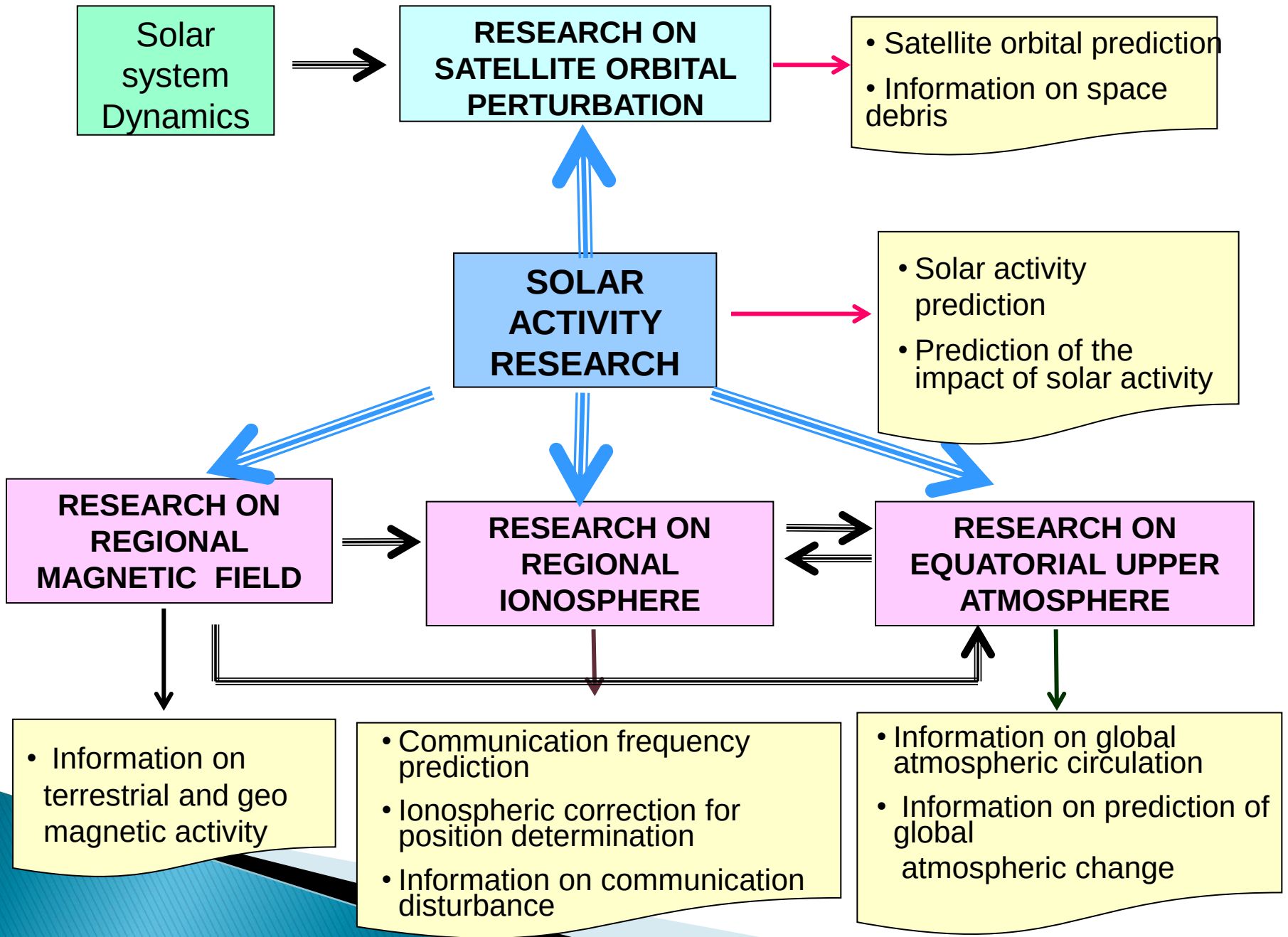
Current Status of Space Weather Program in Indonesia

Clara Y. YATINI
National Institute of Aeronautics and Space (LAPAN)
clara@lapan.go.id

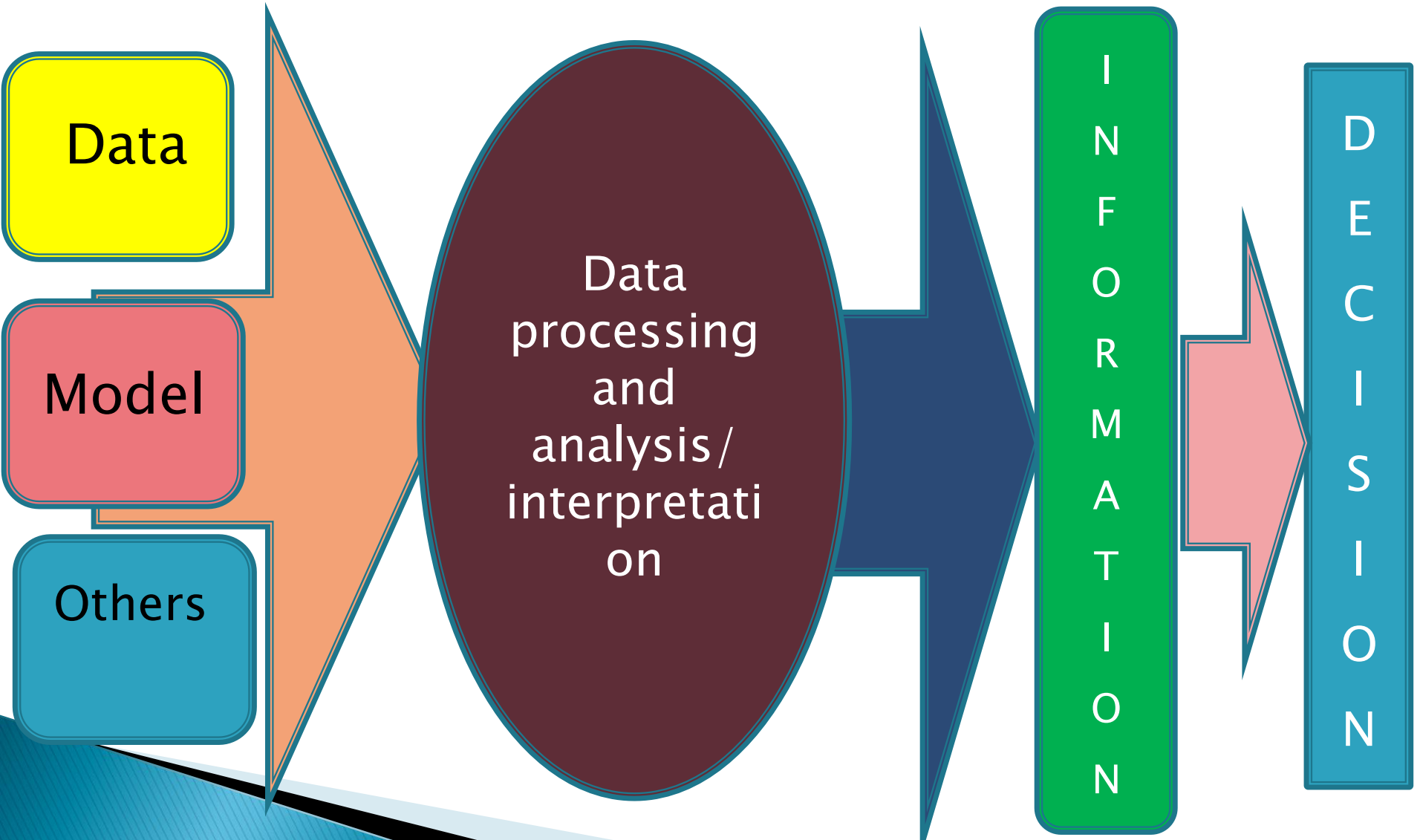
Background

- The use of space-based technology.
- LAPAN conducts the research and observation related with space weather parameters, including the Sun, ionosphere, geo and space magnetism, and space environment.
- An observation network has been established, operates several optical and radio-based observation equipments located over Indonesia.

PROGRAMME INTEGRATION



DECISION SUPPORT SYSTEM

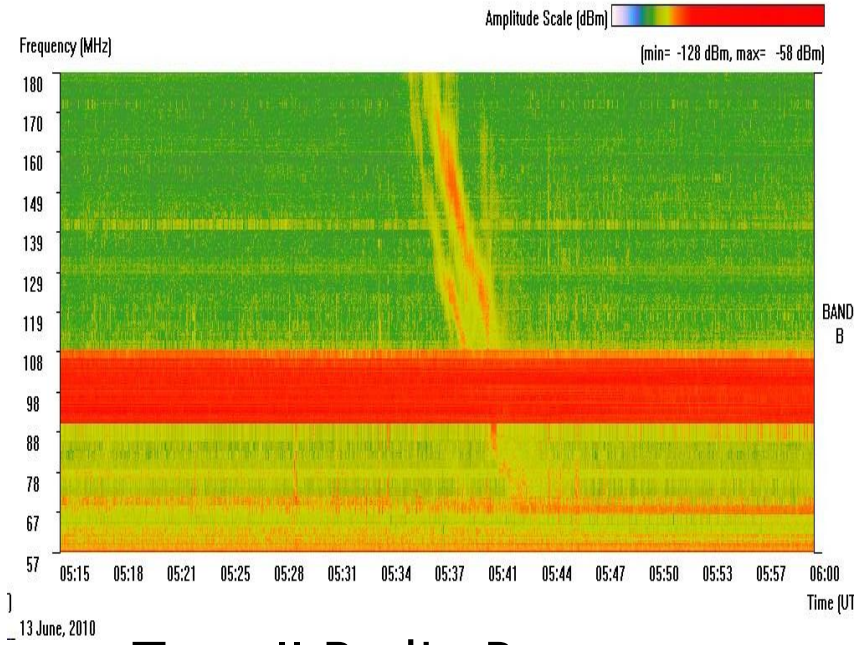


Solar Observation

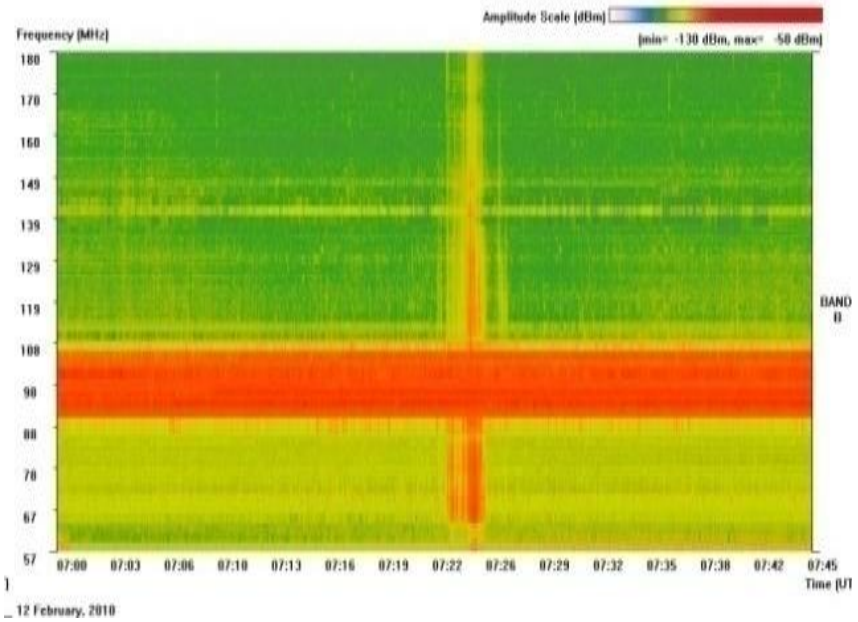
- Optical telescope: 2
  Sumedang, Watukosek
- Radio Telescope:
  - Solar Radio Spectrograph (Sumedang)
  - Callisto (Sumedang)

The Sun

- Prediction of Solar Flare
- The impact of Space Weather (Sun–Earth connection)
- Solar Radio Burst;
- velocity from solar spectra
- precursor of geomagnetic storm, travel time

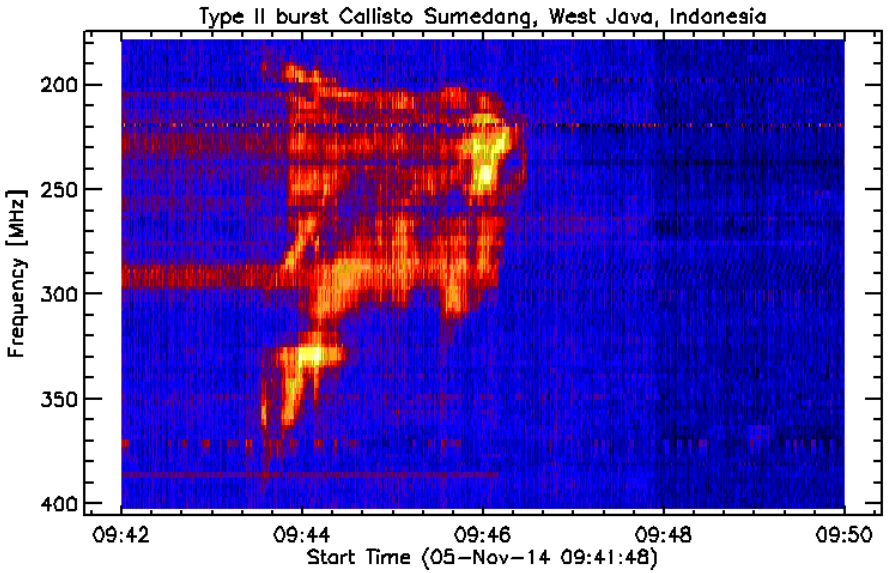


Type II Radio Burst on June 13, 2010
V = 700 km/s



Type III radio burst

Callisto

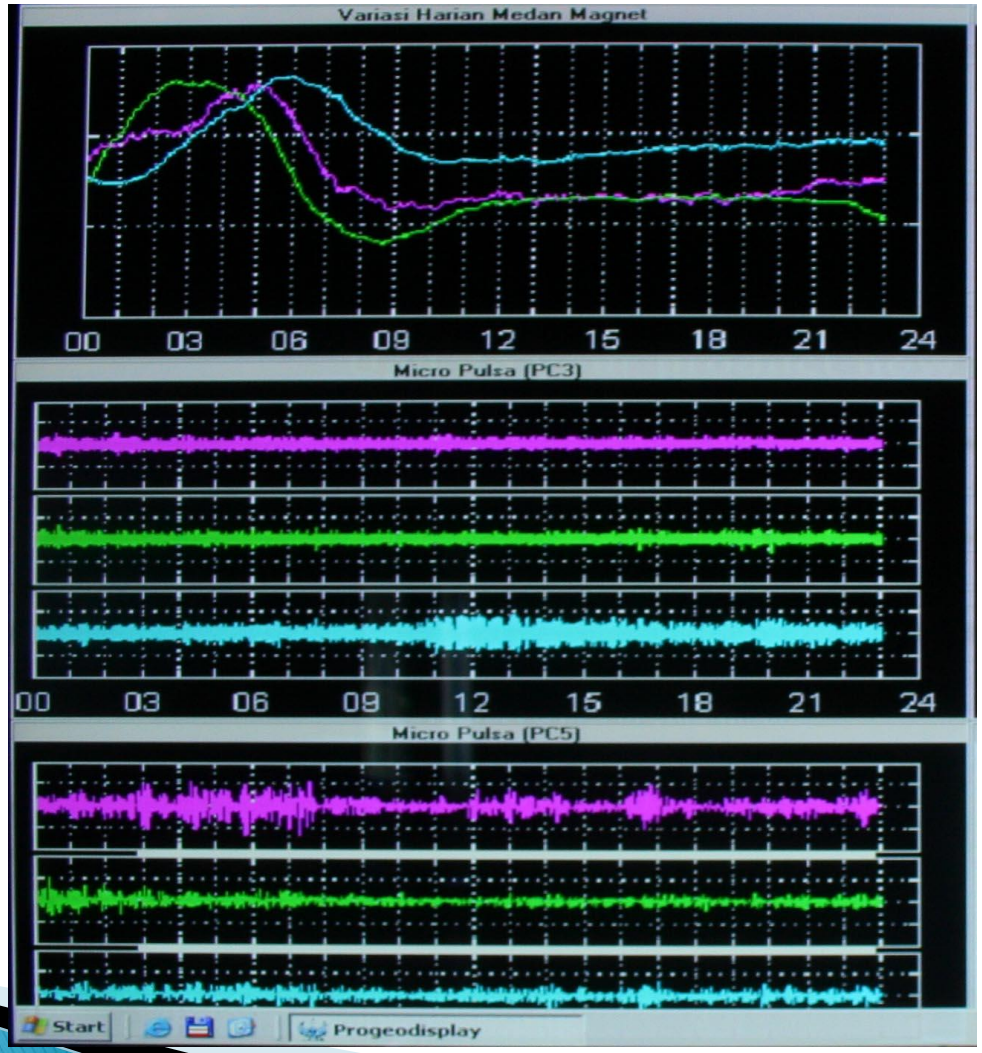


- Frequency CALLISTO Sumedang 45-80 MHz, 120-500 MHz, and 800-870 MHz based on the interference measurement on site
- High interference for frequency < 180 MHz
- The best frequencies: 45-80 MHz, and 185-400 MHz

Geomagnetic Observation

- Magnetometer: 11
- (LAPAN, MAGDAS/ICSWSE, STEL)
  Sumedang, Pameungpeuk, Watukosek, Kototabang, Biak, Pontianak, Manado, Parepare, Kupang, Jayapura, Bali

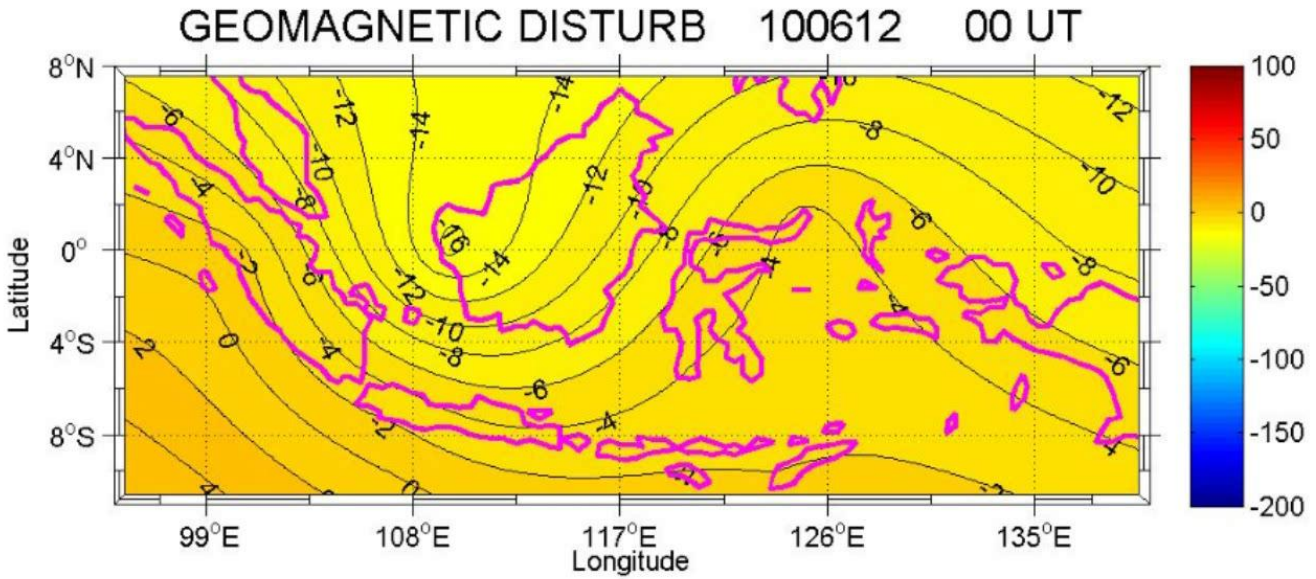
Near real time monitoring



Geo and Space Magnetism Research

- Research on magnetic pulses as the precursor of geomagnetic storm/substorm
- Identification of magnetic pulse, characteristics and occurence
- To predict the occurence of geomagnetic storm/substorm
- Study of the relation of geomagnetic storm with Geomagnetic Induced Current (GIC)

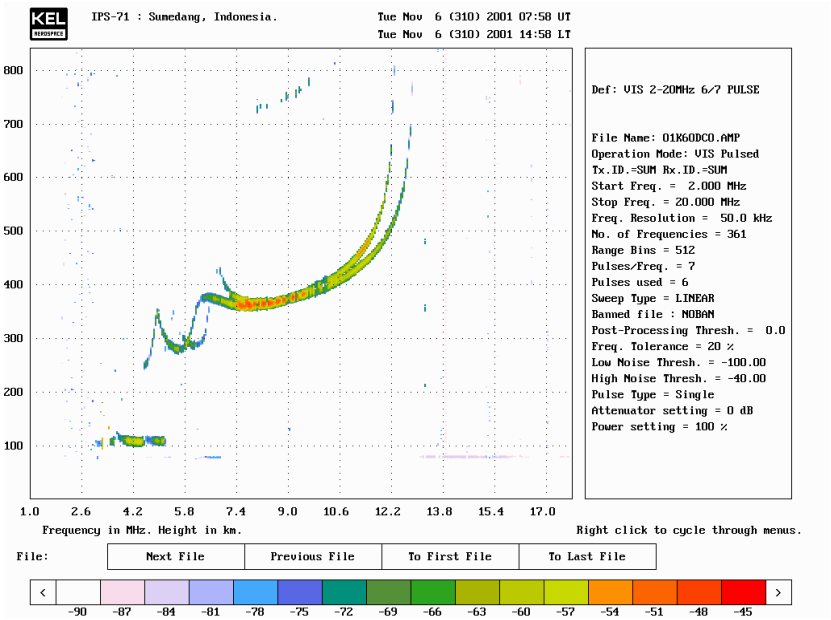
Modelling and mapping the variation of diurnal regional magnetic disturbances



Ionospheric Observation

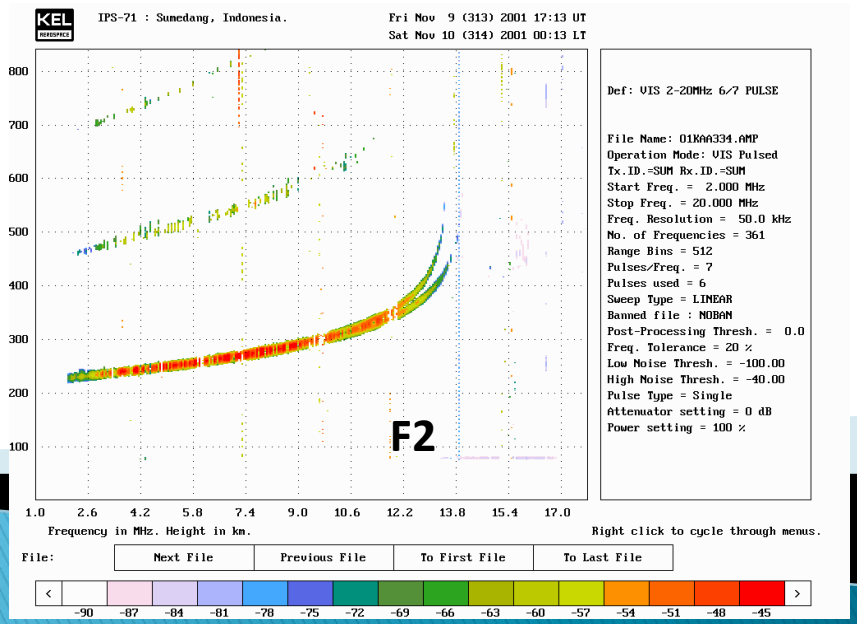
- Ionosonda: 7 (1 NICT)
  Kototabang, Sumedang, Pameungpeuk, Pontianak, Manado, Kupang, Biak
- GPS-TEC: 5
  Sumedang, Pontianak, Manado, Kupang, Biak
- GRBR: 7
  Kototabang, Sumedang, Yogyakarta, Watukosek,Pontianak, Manado, Biak.
- MF radar, Meteor Wind radar

IONOGRAM

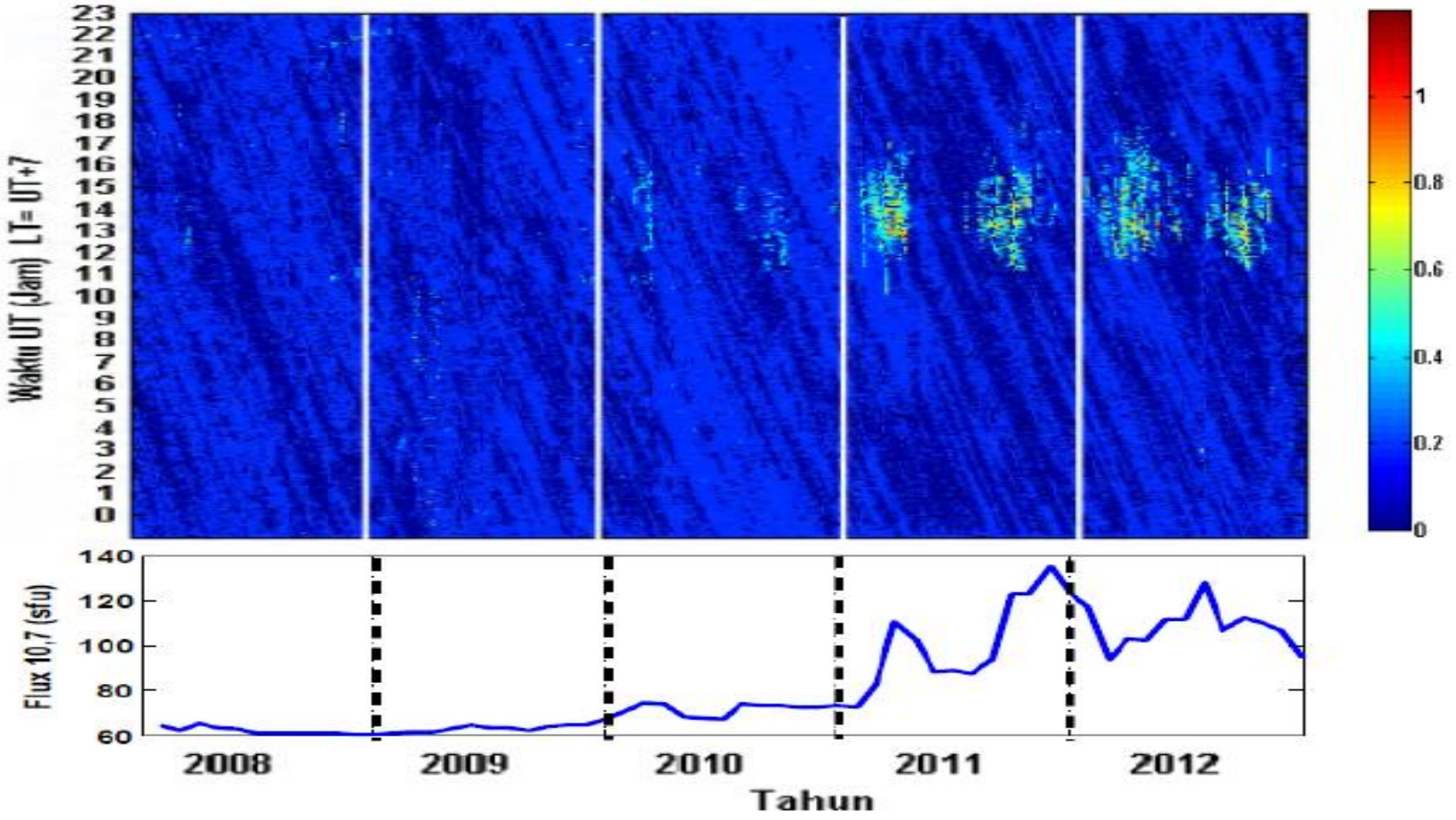


Day

Night

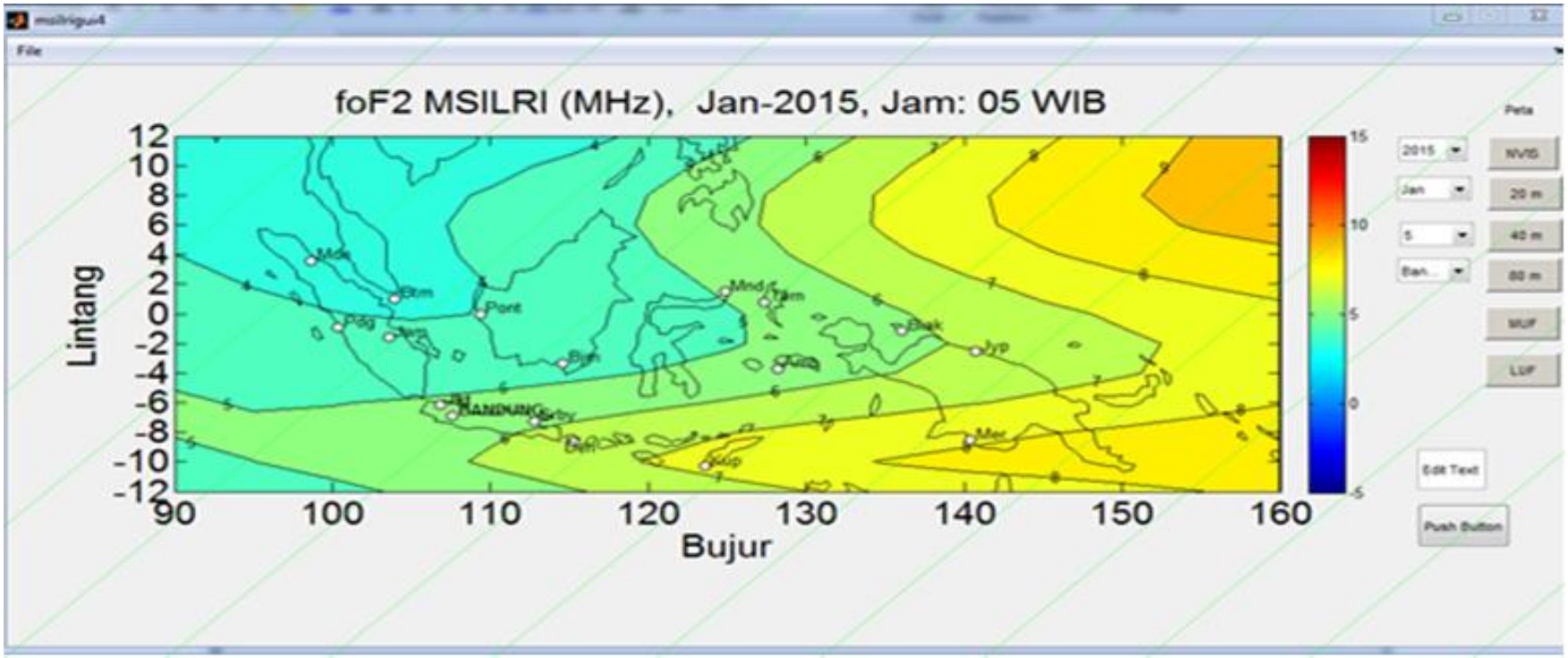


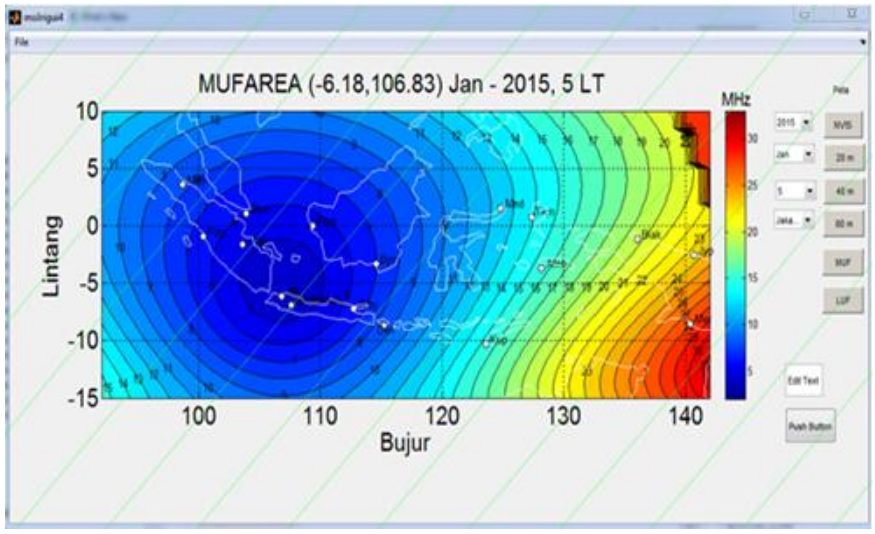
Scintillation occurence

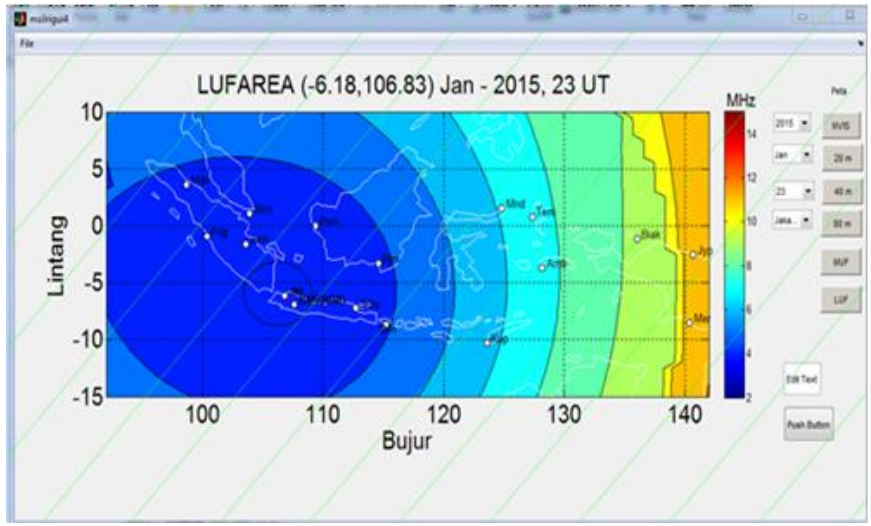


Simple Model of Indonesia Low-Latitude Ionosphere

MSiLRI Software


File
foF2 MSILRI (MHz), Jan-2015, Jam: 05 WIB
Lintang
Bujur
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
90
100
110
120
130
140
150
160
15
10
5
0
-5
Peta
2015
Jan
5
NVIS
20 m
40 m
80 m
MUF
LUF
Edit Text
Push Button


File
MUFAREA (-6.18,106.83) Jan - 2015, 5 LT
Lintang
Bujur
10
5
0
-5
-10
-15
100
110
120
130
140
MHz
30
25
20
15
10
5
Peta
2015
Jan
5
NVIS
20 m
40 m
80 m
MUF
LUF
Edit Text
Push Button


File
LUFAREA (-6.18,106.83) Jan - 2015, 23 UT
Lintang
Bujur
10
5
0
-5
-10
-15
100
110
120
130
140
MHz
14
12
10
8
6
4
2
Peta
2015
Jan
23
NVIS
20 m
40 m
80 m
MUF
LUF
Edit Text
Push Button


Kototabang (-0,3°; 100,35°)
Ionosphere:
1. Ionosonda FMCW
2. Airglow Monitor
3. VHF Radar
4. ISM (sintilasi)
5. ALE
Geomagnet:
1. Magnetometer
LAUT CHINA SELATAN
Pontianak (-0,03°; 09,35°)
Ionosphere:
1.Ionosonda CADI
2. GISTM
3. MF-radar
4. VHF/HF Wind Radio
5.Radio
Geomagnet
1. Magnetometer (Magdas 9)
Manado (1,34°; 24,82°)
Ionosphere:
1. Ionosonda CADI.
2. GISTM
3. ALE
Geomagnet:
1. Magnetometer (Magdas II)
LAUT SULAWESI
Biak (-1,0°; 136,0°)
Ionosphere
1. Ionosonda CADI
2. GISTM
3. MWR
4. ALE
Geomagnet:
1. Magnetometer (Magdas II)
SAMUDRA PASIFIK
Pameungpeuk
(-7,65°; 107,96°)
Ionosphere:
1. Ionosonda IPS51
2. Radio
Geomagnt
1. Magnetometer (Fluksgate Magnetometer, Magson)
LAUT MALUKU
Bandung (-6,90°; 107,60°)
Ionosphere:
1. GISTM
2. GPS Leica
3. VHF/HF Wind Radio
4. Komdat Radio
5. ALE
6. VLF-Reciever
Pare Pare (3.98°; 119,65°)
1. Magnetometer (Magdas II)
Jayapura
Magnetometer (Magdas)
Watukosek (-7,57°; 112,68°)
Ionosphere
1. Radio
2. ALE
Geomagnet:
1. Magnetometer)
Solar obs:
1. Optical telescope
LAUT JAWA
LAUT BANDA
SAMUDERA HINDIA
Sumedang (-6,91°; 107,83°)
Ionosphere:
1. Ionosonda
Solar observation:
1. Radio telescope
2. Optical telescope
LAUT FLORES
Kupang (-10,16°; 23,67°)
Ionosphere
1. Ionosonda CADI
2. GISTM
3. ALE
Geomagnet:
1. Magnetometer (Magdas 9)
LAUT ARAFURU
LAUT TIMOR
Nagara, Bali
Magnetometer

Berita Cuaca Antariksa Mingguan: 28 Juni 2013 – 5 Juli 2013

Info Cuaca Antariksa 28 Juni 2013 – 5 Juli 2013

Pada akhir Juni 2013 aktivitas matahari berada pada level rendah. Daerah aktif AR1785 di tepi timur matahari menjadi sumber beberapa peristiwa flare flare kelas C7.1 pada pukul 17:49 UT, C7.2 flare pukul 23:58 UT (rendah) dan beberapa flare C lainnya yang lebih rendah serta terjadi flare kelas M1.5 (menengah) pada tanggal 03 Juli 2013 pukul 07:08 UT yang bersumber dari AR1787. Peristiwa flare M1.5 ini juga menjadi sumber peristiwa prominensa, CME dan diikuti oleh semburan radio tipe II dan beberapa bursts tipe III.

Terjadi badai kuat tanggal 29 Juni 2013 ditunjukkan oleh nilai Dst terendah mencapai -99 dengan nilai Kp 7 sebagai akibat adanya CME pada beberapa hari sebelumnya tanggal 27 Juni 2013. Terjadi aurora pada bagian selatan Bumi,

Indeks T pekan ini normal, berada disekitar indeks T bulanan, hal ini mengindikasikan kondisi Ionosfer diatas wilayah Indonesia pada pekan ini 29 Juni 2013 - 05 Juli 2013 normal, maka Frekuensi HF yang dipantulkan stabil, demikian juga foF2 dan TEC

(Info Lengkap: www.dirgantara-lapan.or.id)

PREDIKSI CUACA ANTARIKSA

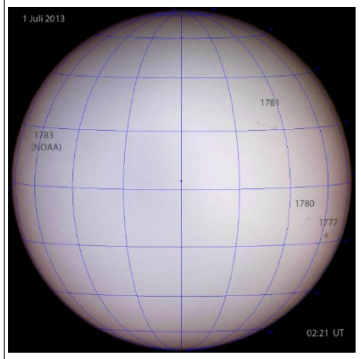
(28 Juni 2013-5 Juli 2013)

Matahari: Menengah dan Kuat

Geomagnet: -

Ionosfer:
Prediksi Indeks T Regional Juli 2013: 77

Hasil Pengamatan Matahari 1 Juli 2013



Daerah Aktif	Lokasi	Klasifikasi Magnetik	Jumlah Bintik	Flare
1777	S18W75	α	1	-
1780	S13W40	β	6	C2.7 C1.3 C2.0
1781	N19W43	βγ	12	-
1783	N04E43	β	2	-

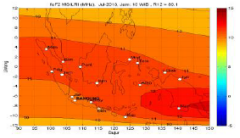
Hasil Pengamatan Geomagnet

- **Nilai Dst terendah -99 dengan indeks Kp 7 (badai kuat) tanggal 29 Juni 2013**

Hasil Pengamatan Kondisi Ionosfer di Atas Indonesia

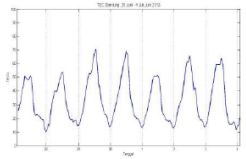
Indeks T Regional 5 Juli 2013 jam 10.00 LT : 70

Prediksi foF2 Juli 2013 diatas wilayah Indonesia maksimum : 12 MHz



Prediksi TEC diatas wilayah Indonesia Juli 2013 : 66 TECU

TEC maksimum pekan ini : 70 TECU



Pusat Sains Antariksa – Lembaga Penerbangan dan Antariksa Nasional - www.bdg.lapan.go.id
Jl. Dr. Djundjunan 133 Bandung 40173 Telp. 022-6012602 Fax
Email: ppid.pussainsa@lapan.go.id

Weekly information:
- Solar activity
- Geomagnetic condition
-T index
Prediction:
-Flare prediction
-Prediction of foF2, TEC, T index

YESTERDAY CONDITIONS		
FLARE ACTIVITY	GEOMAGNETIC ACTIVITY	RADIO BLACKOUT
ERUPTIVE	ACTIVE	QUIET

FORECAST		
Issued: 2015 MAR 02 0800 UTC		(valid for 24 hours)
FLARE ACTIVITY	GEOMAGNETIC ACTIVITY	RADIO BLACKOUT
ERUPTIVE	MINOR STORM	MINOR

DETAILED INFORMATION

SOLAR ACTIVITY
Solar activity level is eruptive for the next 24 hours.
There are 3 event of C Class flares in the past 24 hours originated from AR 2290 with maximum C6.8
AR2290 is going to the backside but still have probability to produce C class flares in the next 24 hours.
There are also probaility of C class flares produce from AR2293 and AR2294 which has magnetic class βγ and β, repectively. AR2292 has increase magnetic class from α to β.
There are no new active region in northern hemisphere will appear in the east limb according to the STEREO/EUV observations.

There is a possibility of C class flares in the next 24 hours from AR2290, AR2292, and AR2293

GEOMAGNETIC ACTIVITY
Geomagnetic activity is active and possibility of minor storm event. The North-South component of the geomagntic field is leading south and the speed is increasing
Solar wind speed was around 490 km/s in the past 24 hours.
Solar wind magnetic field varied from 5 to -10 nT. Geomagnetic activity was active since north-south component of geomagnetic field is -9 nT
There are coronal holes in the southern hemisphere and moving westward making it's geoefective.

IONOSPHERIC ACTIVITY
Minor conditions is expected for radio blackout in the next 24 hours because of M1.0 class flares event

NAVIGATION
Error positioning is expected to be high possibility (>50%) based on equinox period and high value on TEC data observation. High value TEC data observation estimated to make ionospheric delays

HF RADIO COMMUNICATION
SWF is expected to be slightly chances (0-30%) because of quiet level on flare activity (not more than M5 class flare) in the past three days

SATELLITES
Disturbances cause by high energy proton and electron for the next 24 hours is predicted quiet and low, respectively based on observation from GOES

ESSENTIAL SPACE WEATHER COMMUNITIES		
NAVIGATION	HF RADIO COMMUNICATION	SATELLITES
Error Positioning	Shortwave Fadeout	High Energy Proton
HIGH POSSIBILITY (>50%)	SLIGHTLY CHANCES (0-30%)	QUIET
		High Energy Electron
		LOW

Space Science Center - National Institute of Aeronautics and Space (LAPAN)
Jl. Dr. Djundjunan 133 Bandung 40173
Ph./Fax. : (022) 6012602/6014998
swifts@lapan.go.id

Daily information (from March);
1. evaluation of the previous day and prediction for next 24 hours)
-Solar Activity
-Geomagnetic condition
-Radio Blackout

2. Space Weather Communities
-Navigation
-HF communication
-Satellites

http://pussainsa.lapan.go.id/index.php/frontend_forecast
www.swifts.sains.lapan.go.id

THANK YOU