



ISWI Space Weather Report China

Prepared by:

Siqing Liu

National Space Science Centre

Chinese Academy of Sciences

International Meridian Circle Program

- The International Meridian Circle Program (IMCP) is a multilateral international big science research plan initiated by China, focusing on understanding the global behavior of the Earth space system and multi-sphere coupling.
- Based on China's major science and technology infrastructure Meridian Project (Phase I and II), IMCP uses the only land-closed meridian circle along the 120° E+ 60° W longitudes and ally with countries and regions along the meridian, to develop a multi-stationed, networked and multidisciplined capacity for coordinated observation and monitoring, establish an international platform for data sharing and HQP training, promote research on the global behavior of the Earth space, increase our ability to cope with traditional and non-traditional natural disasters, strengthen China's international influence and weight of opinion in Earth space system science, support initiative such as "One Belt One Road", with the ultimate outcome being that, by 2035, China will find itself in the first tier of international players in this area.

International Meridian Circle Program

At present, there are about 1000 instruments deployed along the 120° E - 60° W meridian of which about 300 belong to China's Meridian (CM) Project. IMCP, in the first instance, consists in intelligent networking of the existing instruments, and then on this basis, build new capacities to enhance the science output.



Status



国际子午圈大科学计划
International Meridian Circle Program

One of candidates considered for the **International Big Science Initiative** administered by the Chinese Ministry of Science and Technology.

Government of Beijing has provided funding for a 8,000 m² HQ building for IMCP
Headquarters of IMCP is under construction in **2019**.

Current under Phase 0 study with a 5 M CNY budget.

Phase A funding of 35 M CNY under application in **2020**.

Expected start time (if selected), **2022**.

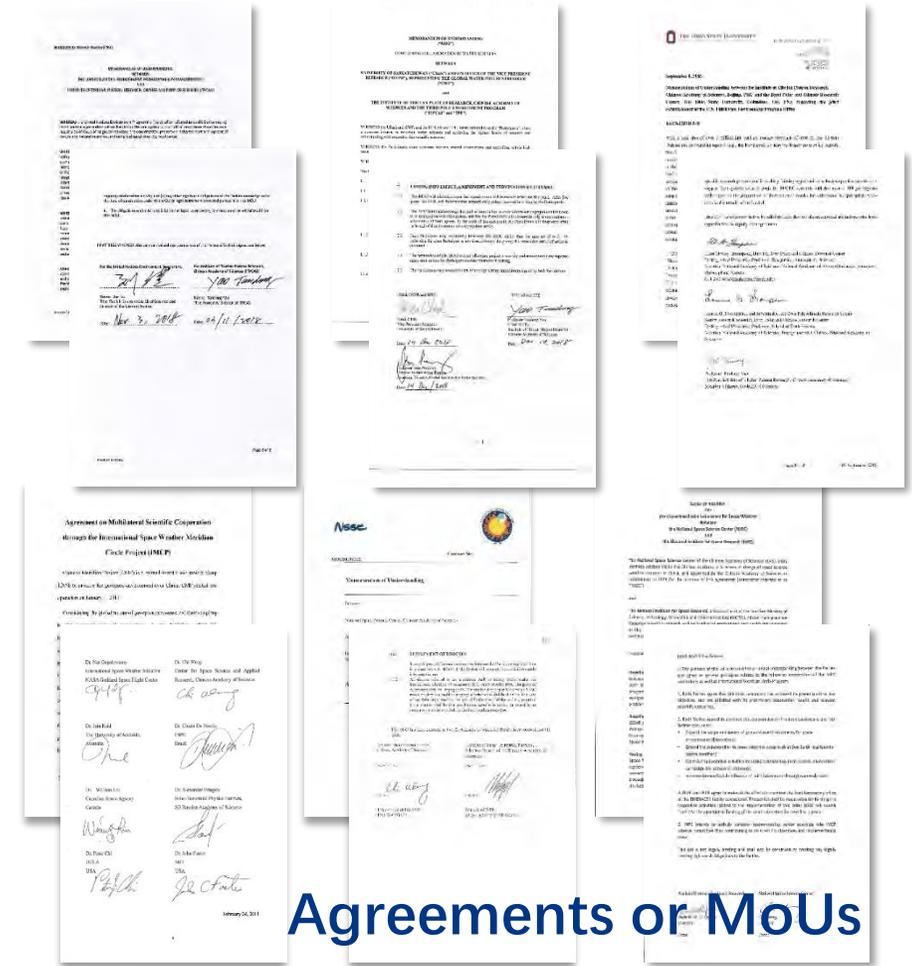
Expected Chinese funding: **~20 B CNY** over 10 years (~US\$3 B)

- International match funding of 30% expected

International Cooperation



International Forum



Agreements or MoUs

- International forum on IMCP has been held in Beijing on Sept 23-25, 2019.
- Agreements Including Institute of Solar-Terrestrial Physics(Russia), Polar Geophysics Institute (Russia), INPE(Brazil), MIT Haystack(US), EISCAT(EU), SCOSTEP, Observatoire Midi-Pyrénées(France), Observatoire de Paris(France).

Headquarters of IMCP



The headquarters project is planned to build the IMCP Headquarters, data center, operation control center, training room and other required office accommodation in Huairou Science City of Beijing, with a new construction area of 8000 square meters. This construction started in July 31, 2019.



Philippine ISWI Annual Report 2019

by Quirino Sugon Jr [1,2,3], Clint Bennett[1,2], James Bernard O. Simpas[1,2],
and Daniel J. McNamara [1,2,3]

1. Manila Observatory, Loyola Heights, Quezon City, Philippines
2. Department of Physics, School of Science and Engineering, Ateneo de Manila University, Quezon City, Philippines
3. Department of Aerospace Engineering, School of Engineering and Architecture, Ateneo de Davao University, Davao City, Philippines

VIPIR Ionosonde

University of Colorado Boulder

NOAA National Oceanic and Atmospheric Administration
U.S. Department of Commerce



ATENEO DE MANILA UNIVERSITY



MANILA OBSERVATORY

Ionospheric Sounding for Earth-Space Environment Science

Schedule: Wednesday, 23 Oct 2019, 10:00 AM
Venue: Heyden Hall, Manila Observatory

Ionosondes are radar instruments that measure the ionosphere. They are the first radar systems, dating back to the 1920's. The Manila Observatory has operated such an instrument since the 1950's. A new digital receiver ionosonde has just been installed at Manila Observatory. This new instrument, the Vertical Incidence Pulse Ionosphere Radar or VIPIR, is built for scientific discovery and is used in the US, South America, Japan, Korea and Antarctica.



Terrence Bullet, PhD

1. Research Associate, University of Colorado Cooperative Institute for Research in Environmental Sciences (CIRES), 2. Chief Engineer, World Data Center A Ionosonde Program



MAGDAS Magnetometer (MUN)



Last 29 March 2019, a team of students from Kyushu University led by Dr. Shuji Abe performed a system maintenance on the MAGDAS MUN station at NAMRIA Magnetic Observatory at Muntinlupa, Philippines. At the back from left to right: Mr. Alex Algaba, Mr. Clint Bennett, Dr. Shuji Abe, Dr. Quirino Sugon Jr, and P/Ens Marck Daniel Santos. In front: students from Kyushu University.



ISWI Space Weather Report Kazakhstan

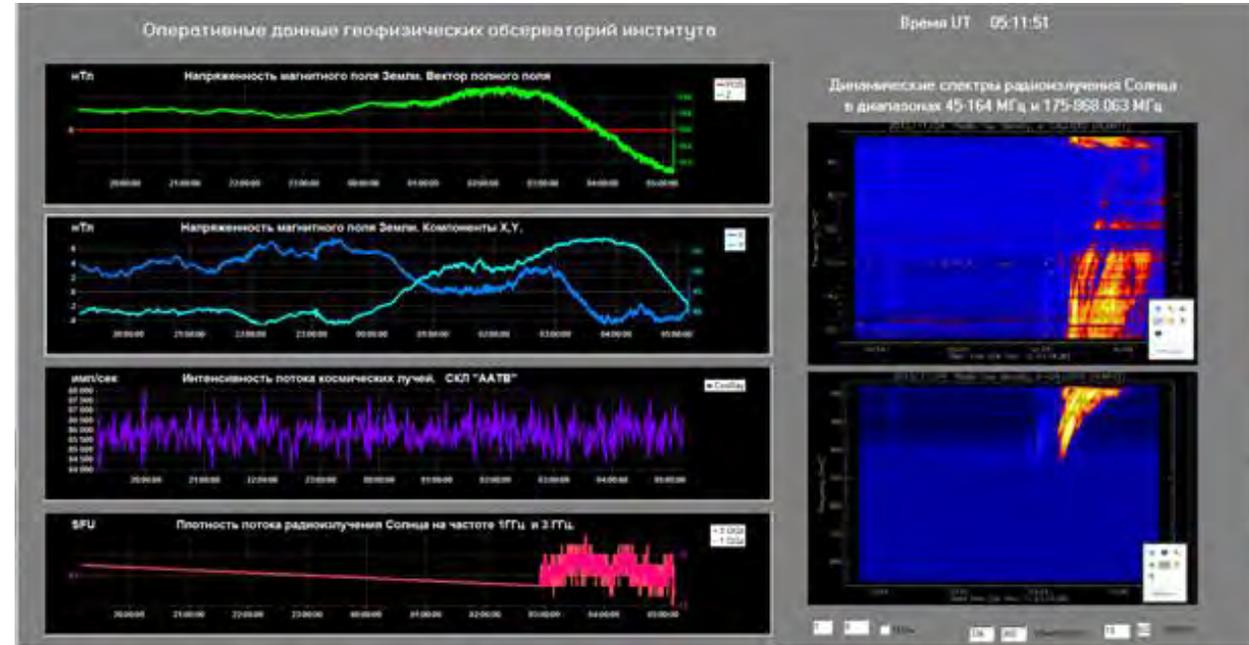
Prepared by:

Olga Kryakunova,

Institute of Ionosphere,

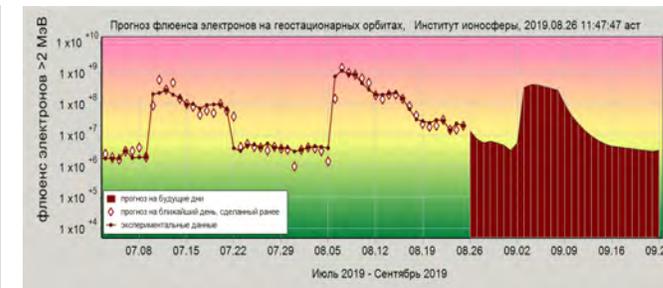
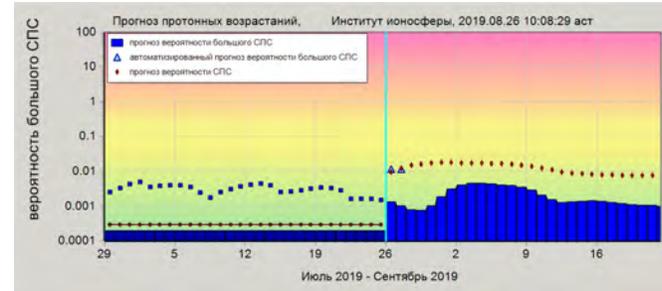
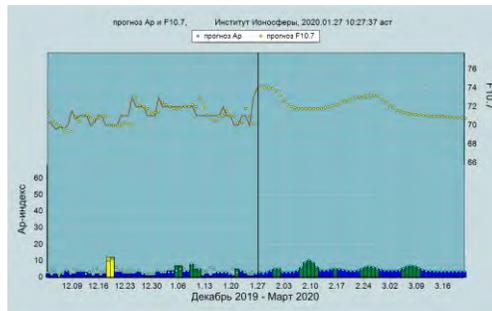
Almaty, Kazakhstan

REPORT OF ISWI RELATED ACTIVITIES FOR 2019 IN KAZAKHSTAN



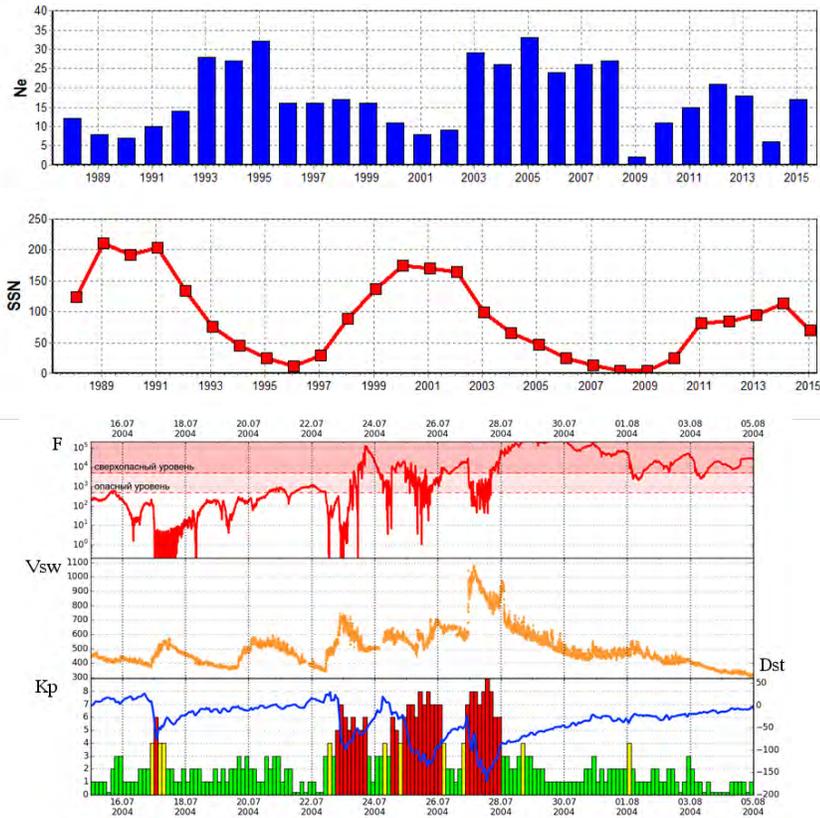
Measurements of the solar radio spectra of the Sun in the range of 40 - 800 MHz from the CALLISTO spectrometer in Almaty are included in a common information system that displays real-time measurements with high resolution of the solar radio emission flux density at frequencies of 1.08 GHz and 2.8 GHz, data from a cosmic-ray station (18NM64 neutron supermonitor), data of magnetic observatory "Alma-Ata".

KAZAKHSTAN SPACE WEATHER PREDICTION CENTER



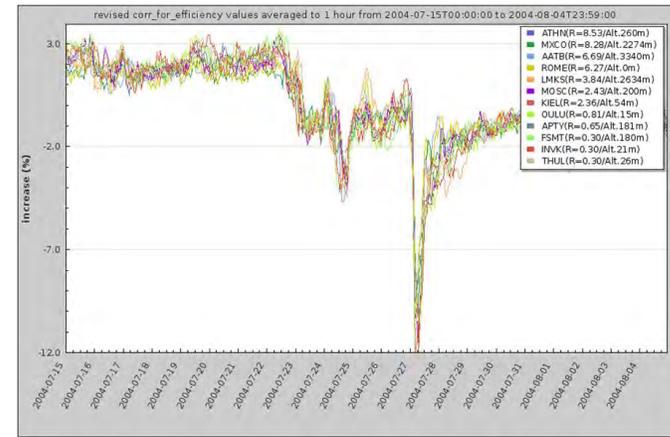
Kazakhstan Space Weather Prediction Center works daily. We issue the short-term and long-term forecasts of the magnetic activities (Ap-indexes) and solar activity (F10.7) for 55 days, the forecast of probability of a large proton enhancement for 28 days and the forecast of fluence of magnetospheric electrons with energy > 2 MeV at geostationary orbit for 28 days. We provide this information to all interested organizations in Kazakhstan.

The study of the behavior of high-energy magnetospheric electron fluence at geostationary orbit in 1986 - 2017



The maximum fluence for all years of measurements was observed on July 29, 2004 during the declining phase of the solar activity and it was equal to 9.3×10^9 electron $(\text{sm}^2 \text{sr day})^{-1}$

The maximum number of electron enhancements ($E > 2$ MeV) for 22-24 solar cycles occurs during the declining phases of the solar activity.



During this event a series of Forbush effects was observed according to a global network of neutron monitors with a maximum amplitude of about 14% (nmdb.eu).



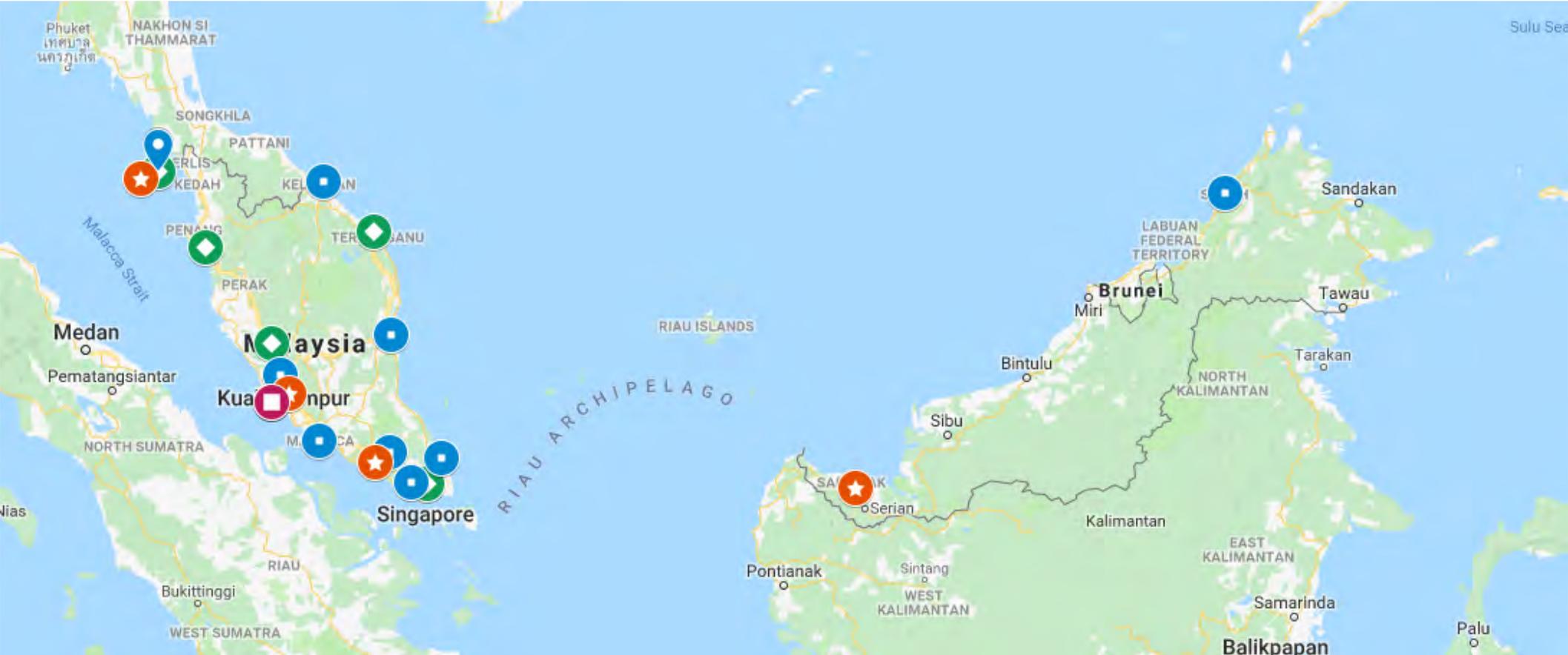
ISWI Space Weather Report Malaysia

Prepared by: ZAHIRA MOHD RADZI
Exploration and Space Science Division
Malaysia Space Agency (MYSA)

Short Brief Report

- In 2018-2019, Malaysia focused on development of infrastructures for measuring magnetic field using magnetometer namely MAGDAS (Magnetic Data Acquisition System). This instrumentation is part of global network installed and led by the International Center for Space Weather Science and Education (ICSWSE) Kyushu University, Japan together with ANGKASA & local universities.
- List of equipment available as in next slides. We invite researchers to use our data for their research

DISTRIBUTION OF SPACE WEATHER INSTRUMENTATION IN MALAYSIA



 GISTM

 GPS Receiver

 MAGDAS

 CALLISTO

List of equipment & data available

Instrument	Location (Lat, Long)	Data Availability	Owner	Note/Reference
Ionosonde	1° 51' N, 105° 5' E	2004 – 2009	UTHM	Discontinue [Zain et al]
MyRTKnet	Peninsular (57 stations) and Sabah Sarawak (21 stations)	2003 -	JUPEM	https://ebiz.jupem.gov.my/v1/GeodeticProduct.aspx
GISTM	2.92°N, 101.78 ° E (UKM)	2010 -	UKM	Bahari et al. (2015)
	6.19° N, 99.51 ° E (Langkawi)	2011 -	UKM	Bahari et al. (2015)
	1.47°N, 110.42 ° E (UNIMAS, Sarawak)	2011 -	UKM	Bahari et al. (2015)
	1° 51' N, 105° 5' E		UTHM	http://fkee.uthm.edu.my/waras/FACILITIES.html
	2.31° N, 102.32° E	2014 -	UTEM	Aon et al. (2014)
GPS-UKM	2.92°N, 101.78 ° E (UKM)	2005 -	UKM	http://www.ukm.my/angka/kemudahan/

MAGDAS	6.19°N,99.51°E(Langkawi)	2004 – 2007 and continue 2008 -	UKM and ANGKASA	Hamid et al (2015)
	6.02°N, 116.07 ° E (Sabah)	2013 -		http://magdas.serc.kyushu-u.ac.jp/station/index.htm
	3.72° N, 101.53° E (Perak)	2016 -		http://magdas.serc.kyushu-u.ac.jp/station/index.htm
	2.78°N,101.51°E (Banting)	2016 -		http://magdas.serc.kyushu-u.ac.jp/station/index.htm
AWESOME	UKM	2009 -	UKM	Salut et al. (2012)
CALLISTO	ANGKASA	2012	ANGKASA	Abidin et.al (2015)
ISKANDARnet	Malaysia (7 stations)	2012-	UTM	Musa et al (2012)
Solar telescope system	6.19°N,99.51°E(Langkawi)	2007 -	LNO, ANGKASA	

Future Plan

- Working towards establishment of space weather monitoring





ISWI Space Weather Report Australia

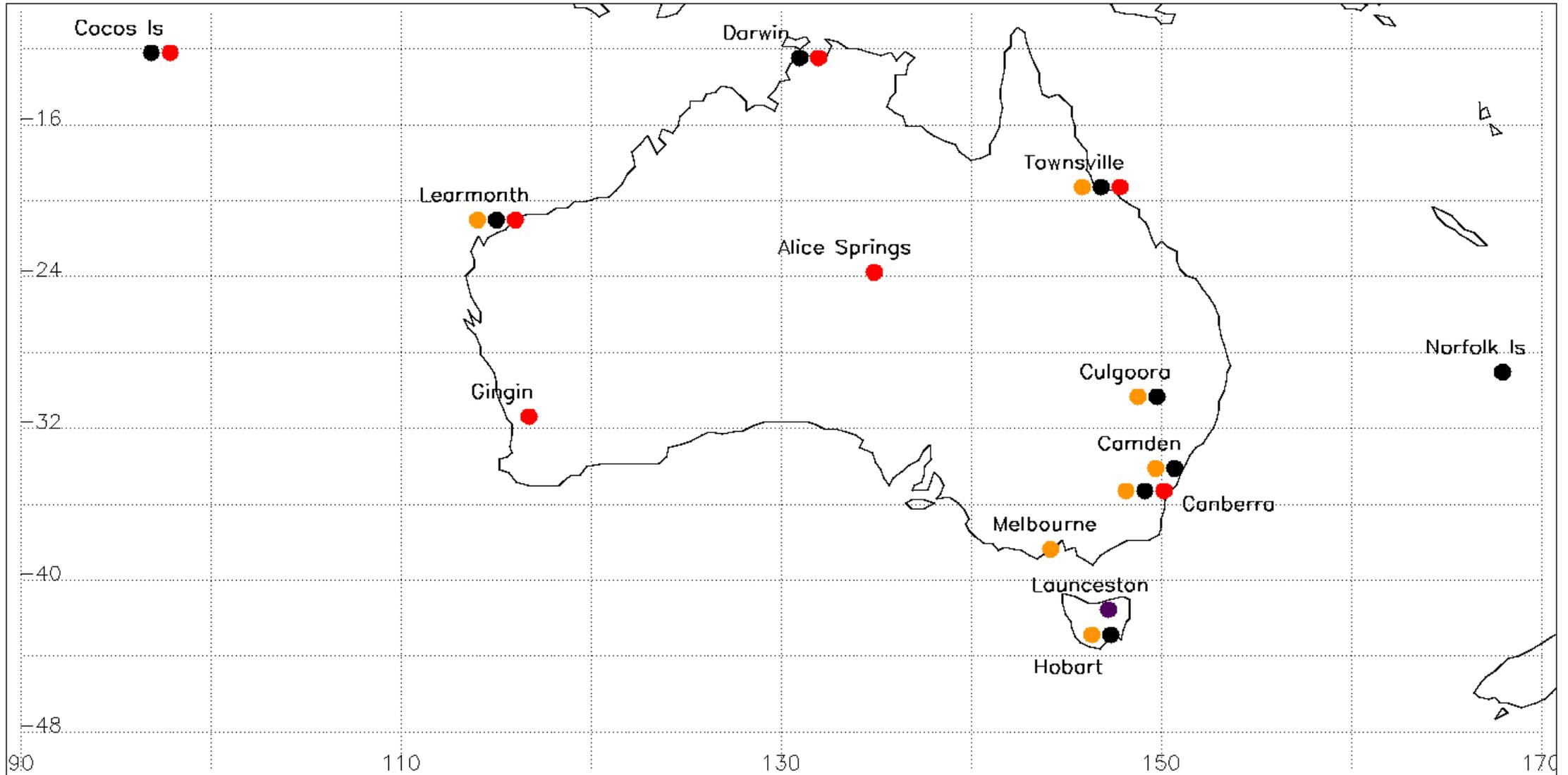
Prepared by:

Richard Marshall

Bureau of Meteorology

MAGDAS Installations at Bureau locations

(denoted by orange circles)



- Australia is part of ACFJ consortium (Aus, Canada, France and Japan) which is one of the global centres for provision of SW advisory service for ICAO – live 7 Nov 2019
- The 19th Australian Space Research Conference, a national science-based event, for the first time was combined with the Australian Space Forum, an industry event, in August 2019. Between 800-1000 delegates attended joint activities, and over 300 the stand-alone ASRC days.
- Preparations have been taking place throughout 2019 for the 43rd COSPAR Scientific Assembly which will be held in Sydney in August 2020. The program will include several panel sessions on space weather topics.
- University of Newcastle are developing a new data product for AMPERE - full sphere delta-B maps, and continued studies on remote sensing plasma mass density in the magnetosphere from ground magnetometer data (JGR paper submitted).
- RMIT Melbourne are commencing a new Bachelor of Space Science in 2020 that includes components of space weather (see next slides)

OPEN DAY 2019

Bachelor of Space Science



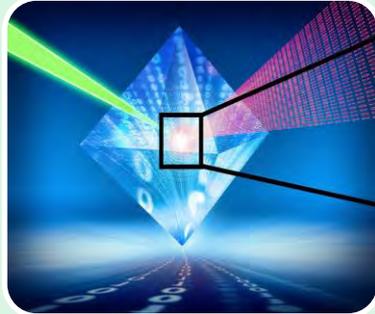
Dr Gail Iles

Program Coordinator, Space Science, Physics
School of Science

Dr Brett Carter

Course Coordinator, Space Science, SPACE Research Centre
School of Science

What you will study



PHYSICS

Mechanics
Electro-
magnetism
Astrophysics

ENGINEERING

Signals
Electrical
Systems
Spaceflight

GEOSPATIAL SCIENCE

Remote
sensing
Imaging
Data
processing

SPACE SCIENCE

Exploration
Satellites
Space debris
Rocket science
Microgravity

BP330 BSc Space Science

Degree structure

		1	2	3	4
Year 1	Sem 1	PHYS 2182 Space Exploration	PHYS 2122 Mechanics	MATH 1142 Calculus and Analysis 1	COSC 2676 Programming Fundamentals for Scientists
	Sem 2	GEOM 2160 Satellites and Space Debris	PHYS 2123 Modern Physics	MATH 1144 Calculus and Analysis 2	AERO 2355 Systems Engineering
Year 2	Sem 1	MATH 2382 Data Preprocessing	PHYS 2178 Classical and Quantum Mechanics	XXXX xxxx Student Elective	EEET 2248 Electrical Engineering Analysis
	Sem 2	PHYS 2183 Rocket Science	PHYS 2127 Thermodynamics & Electromagnetism	GEOM 2084 Remote Sensing and Photo	AERO 2406 Spaceflight Systems Design
Year 3	Sem 1	ONPS 2335 Professional Scientist	XXXX xxxx Student Elective	GEOM 2086 Imaging Solutions	EEET 2369 Signal and Systems 1
	Sem 2	PHYS 2184 Microgravity Science	PHYS 2180 Optics & Photonics	PHYS 2067 Astrophysics and Cosmology	ONPS 2186 Science Project

Broad range of courses to cover broad range of areas within Australia's space industry, including;

- Space Situational Awareness
- Orbital mechanics
- Space weather / space physics
- Microgravity science (e.g., experiments on board the ISS)

Beginning in 2020