Japan's Contribution to the ISWI

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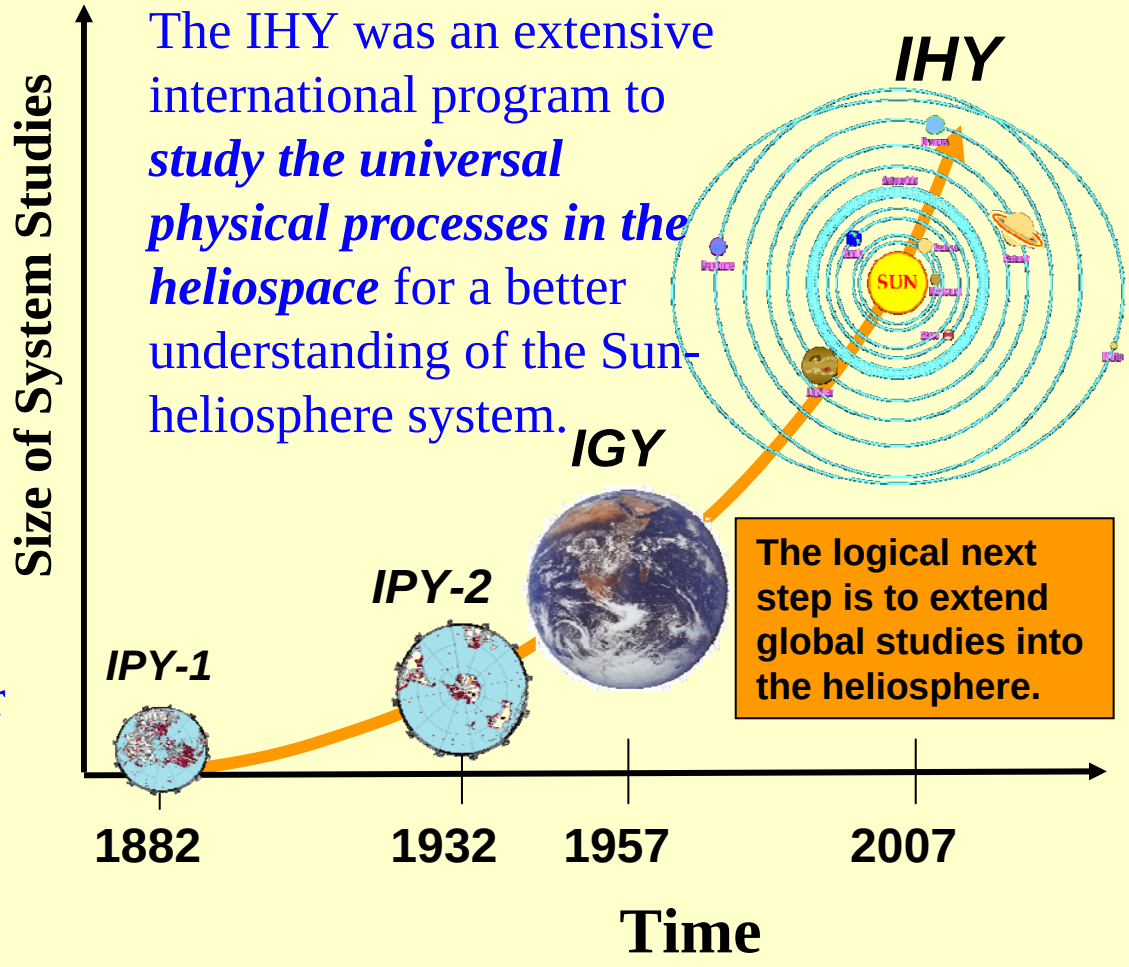
1) SERC, Kyushu Univ., 2) NICT, 3) JAXA, 4) SCJ

International Space Weather Initiative (ISWI; 2010-2012)

Content

The IHY was an extensive international program to ***study the universal physical processes in the heliospace*** for a better understanding of the Sun-heliosphere system.



1.1 Objectives of ISWI

from Report on the Fifth UN/ESA/NASA/JAXA Workshop on BSS & IHY 2007 September 21 – 25, 2009 Daejeon, Korea

The objectives of ISWI are to develop the scientific insight necessary to understand the solar-terrestrial physical relationships inherent in space weather, to reconstruct and forecast near-Earth space weather and to communicate this knowledge to scientists and to the general public. This would be accomplished by (a) continuing to expand and deploy new and existing **instrument arrays**, following the successful practices of the International Heliophysical Year (IHY) 2007, (b) promoting **data coordination and analysis** to develop predictive models using ISWI data from the instrument arrays to improve scientific knowledge and to enable future space weather prediction services and (c) continuing to promote knowledge of heliophysics through **training, education and public outreach**.

1.2 Principles of the Instrument Array Program

- **The lead scientist or principle investigator funded by his/her country provides instrumentation (or fabrication plans) and data distribution**
- **The host country provides the workforce, facilities, and operational support, typically at a local university**
- **Host scientists become part of the science team**
- **All data and data analysis activity is shared**
- **All scientists participate in publications and scientific meetings where possible**

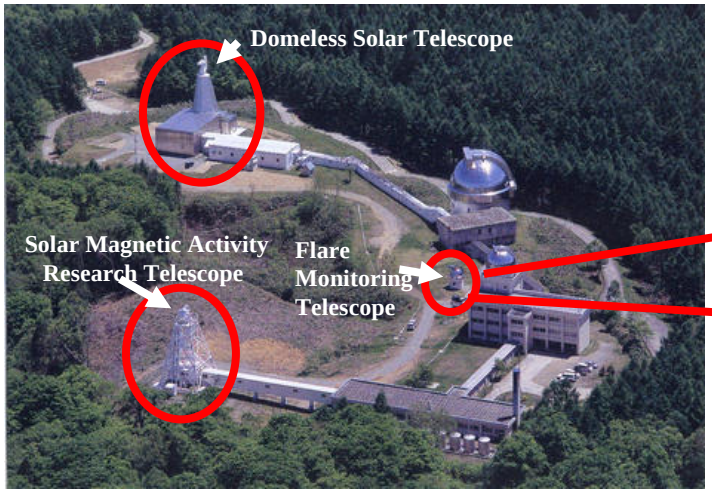
2. Instrument Array Program in Japan

	INSTRUMENT	Lead Scientist	Objective
1	Continuous H-alpha Imaging Network (CHAIN)	Dr. Satoru Ueno, Prof. Kazunari Shibata (Kyoto U)	Time variation and 3D velocity field of solar activity, flares, filament eruptions and shock waves (Morton waves) by using multi-wavelength H-alpha images of the full-disk Sun.
2	Global Muon Detector Network (GMDN)	Prof. Kazuki Munakata (Shinshu U)	To identify the precursory decrease of cosmic ray intensity that takes place more than one day prior to the Earth-arrival of shock driven by an interplanetary coronal mass ejection
3	Magnetic Data Acquisition System (MAGDAS)	Prof. Kiyohumi Yumoto (Kyushu U)	Study of dynamics of geospace plasma changes during magnetic storms and auroral substorms, the electromagnetic response of iono-magnetosphere to various solar wind changes, and the penetration and propagation mechanisms of DP2-ULF range disturbances
4	Optical Mesosphere Thermosphere Imagers (OMTIs)	Prof. Kazuo Shiokawa (Nagoya U)	Dynamics of the upper atmosphere through nocturnal airglow emissions
5	South-East Asia Low - Latitude Ionodonde Network (SEALION)	Dr. Tsutomu Nagatsuma (NICT)	Monitoring and study on ionospheric disturbances occurred in the equatorial region by ionospheric and geomagnetic field observations.

2.1 Continuous H-alpha Imaging Network (CHAIN)

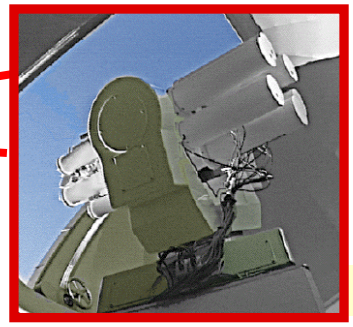
Kwasan & Hida Observatories, Kyoto University

*Telescopes at Hida Observatory



PI: Dr. S. Ueno and Prof. K. Shibata

Flare Monitoring Telescope (FMT)



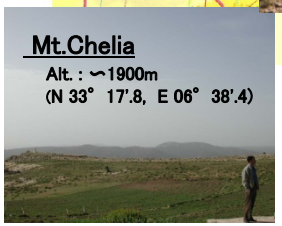
The Continuous H-alpha Imaging Network (CHAIN) project was planned to monitor solar flares and erupting filaments continuously by using several types of telescopes.

Map of CHAIN

Main three observatories of CHAIN-project. We are currently planning to install flare monitoring telescopes (FMT) in Peru & Algeria.

Observatories or institutes that volunteered to participate in the Chain project.

Algeria

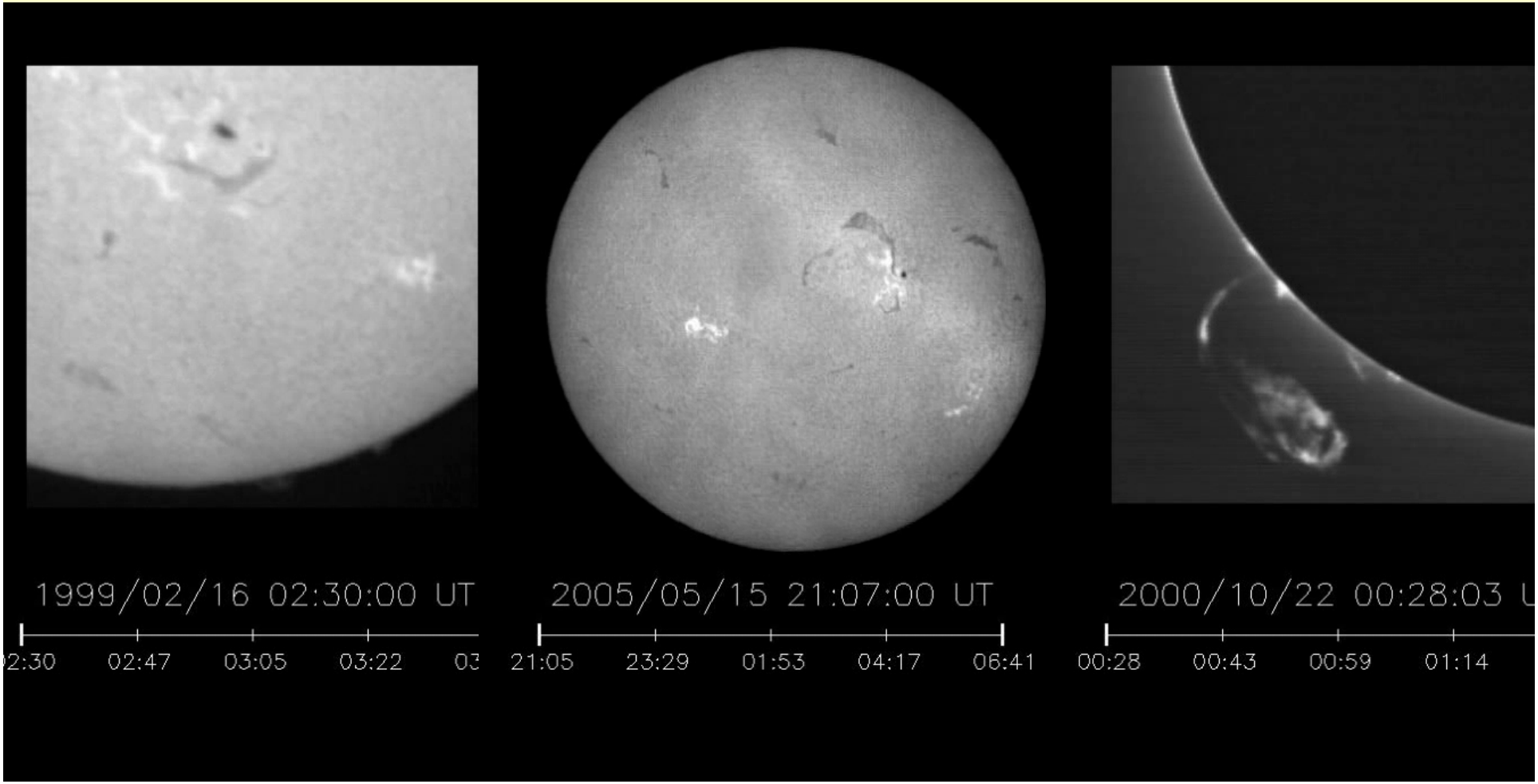


Final tests of candidate sites for the new observatory are being performed in Aures area, Algeria.

FMT will be Installed in "Solar Station" of Ica Univ. in March 2010

2.1-2 Typical Example of Solar Images Obtained from Flare Monitoring Telescope

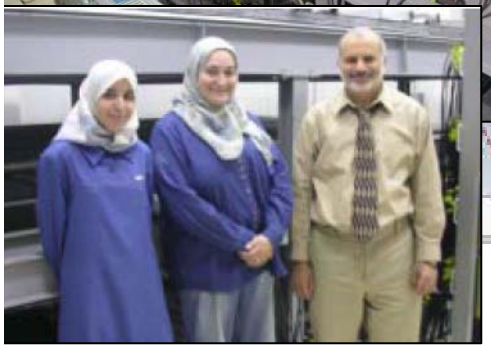
Flare **Filament** **Prominence**



2.2 Grand Muon Detector Network

PI: Prof. K. Munakata
Shinshu Univ.

Kuwait, constructed in Mar. 2006



Sao Martinho

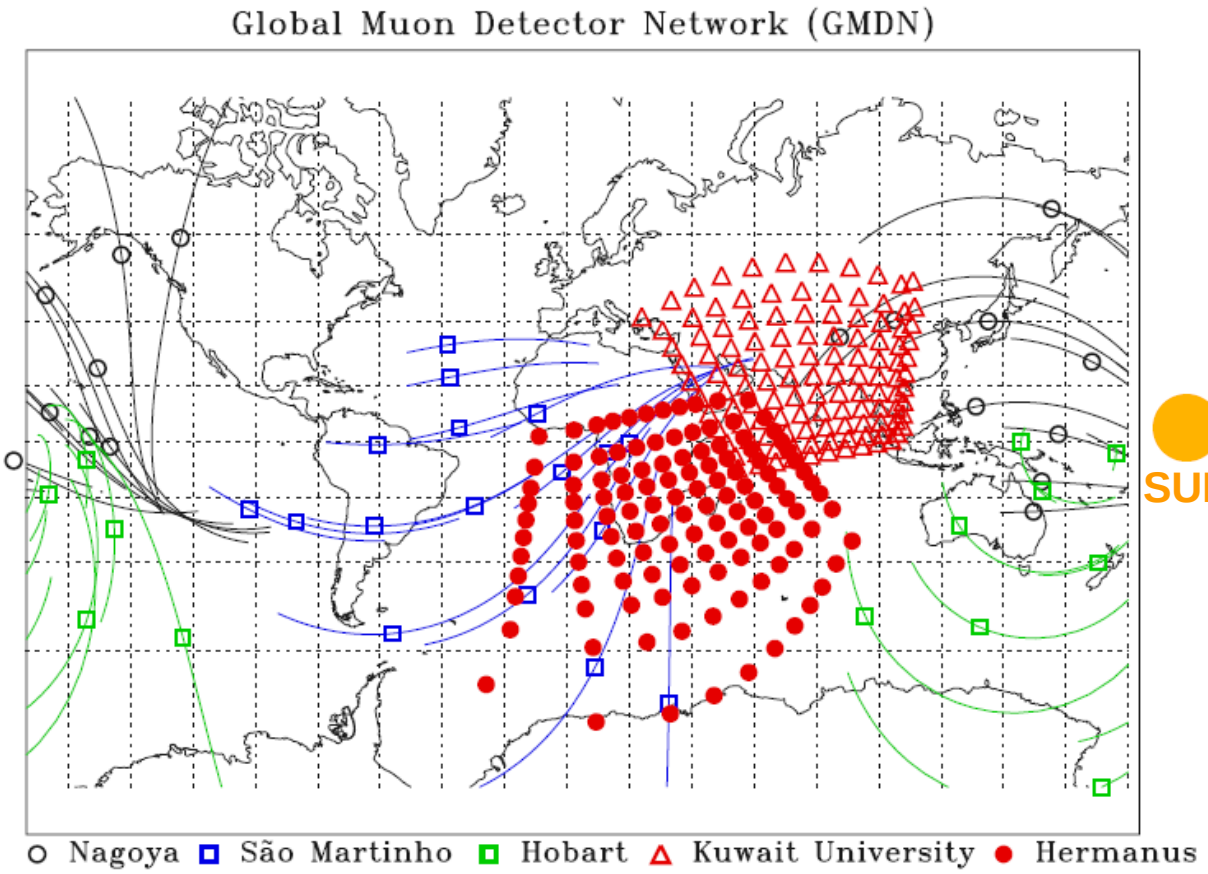
Magnetic Equator

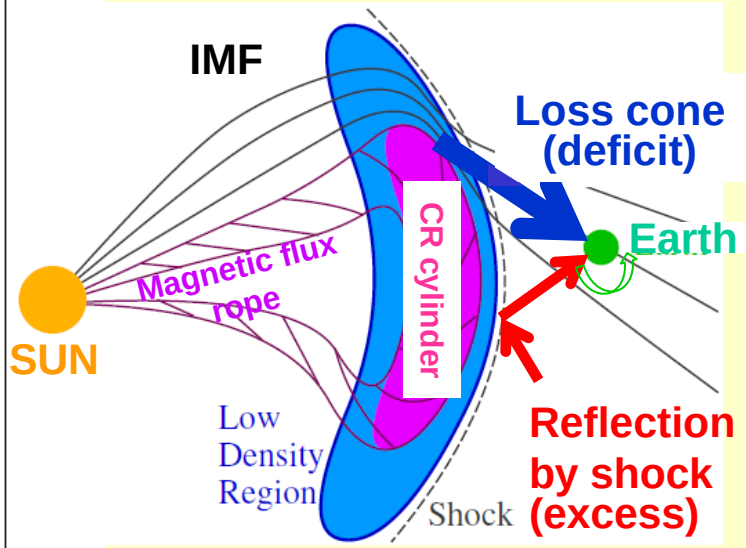
Consisting of 9 institutes from 7 countries.

- Nagoya
- Aragats
- Hobart
- Kuwait
- Sao Martinho
- Greifswald

Japan
USA
Australia
Brazil
Kuwait
Armenia
Germany

2.2-2 Cosmic Ray Precursors of CME Arrival at Earth





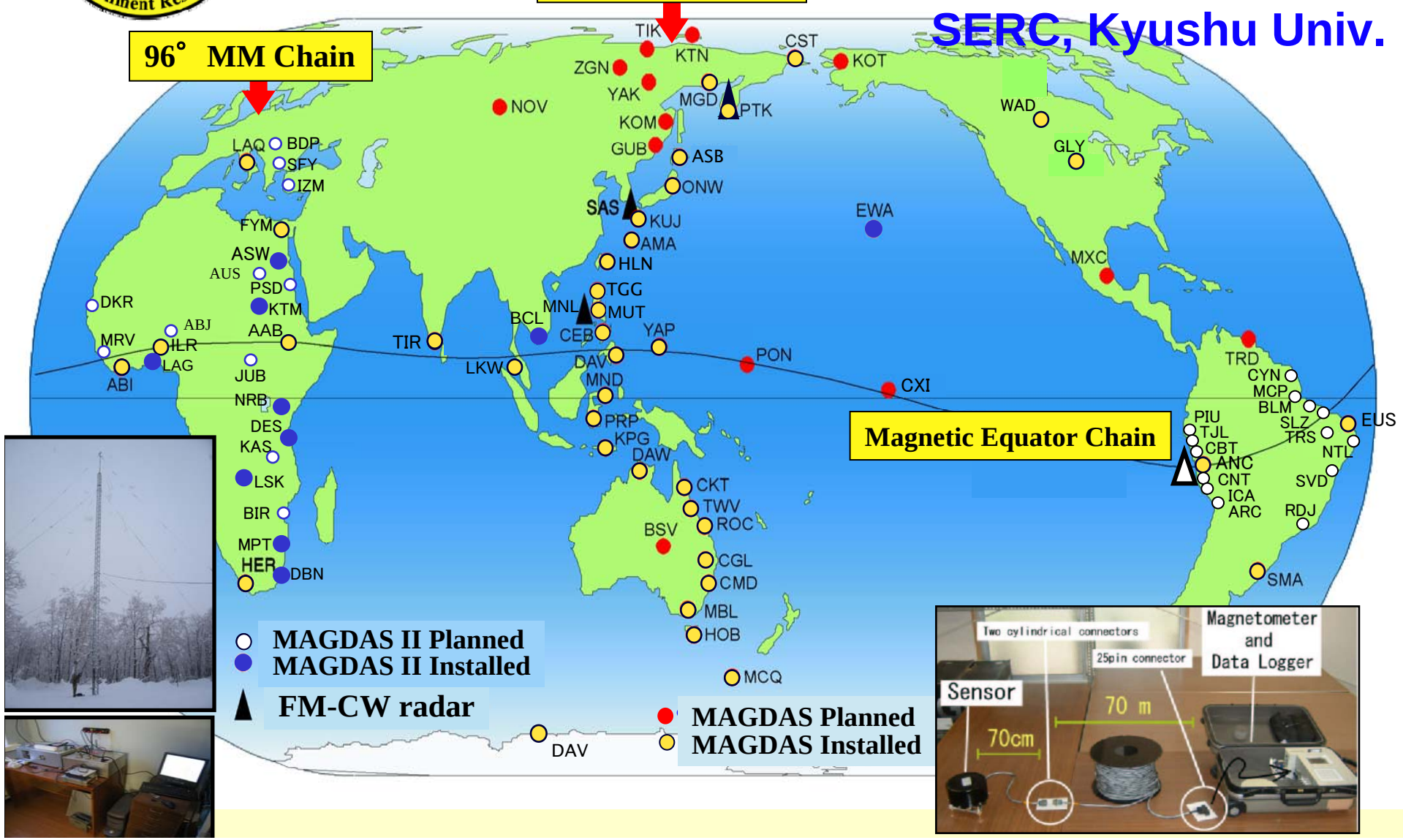
Fushishita et al., Proc. 31st Internat. Cosmic Ray Conf., paper ID 502, 2009 (astro-ph 0909.1028)

They are planning the following for improving sky-coverage with the GMDN

- Expansions of the detection area of each detector
  - Hobart (Australia), from current 3x3m^2 to 4x4m^2
  - Sao Martinho (Brazil), from current 4x7m^2 to 4x9m^2
  - Kuwait University muon hodoscope (Kuwait), from current 3x3m^2 to 5x5m^2
- Deployments of new detectors
  - A new type of detector on the high-altitude mountain in Sierra-Negra (Mexico)
  - A new muon hodoscope in the Hermanus Magnetic Observatory, Hermanus (South Africa)

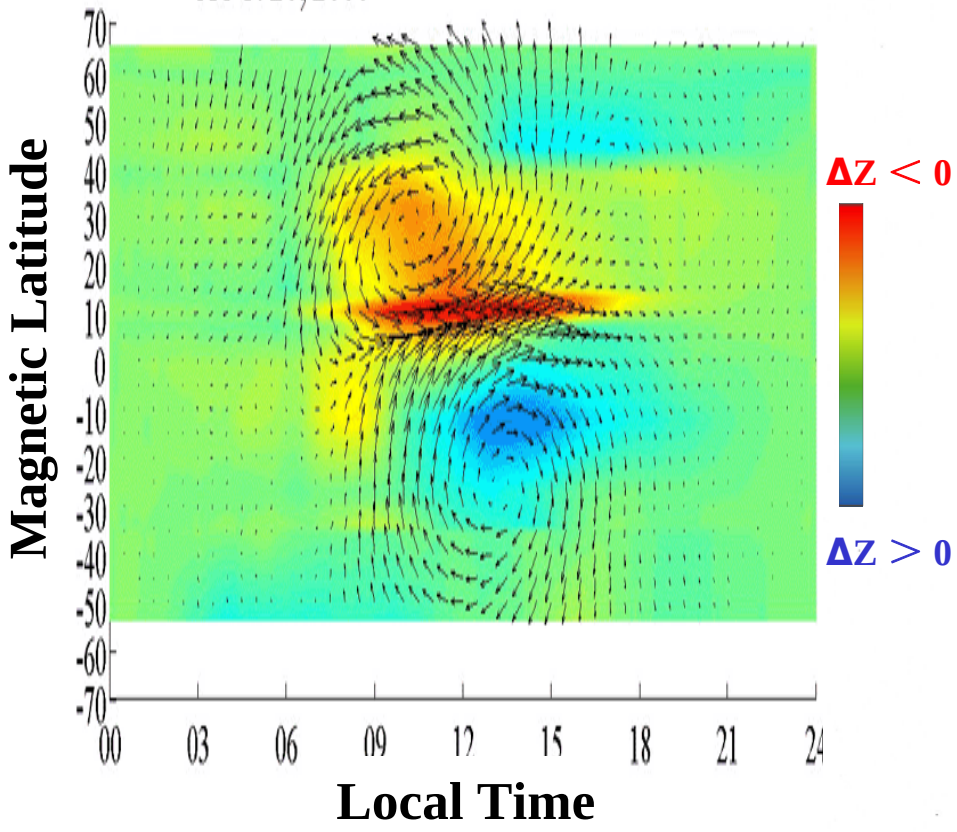
2.3 MAGDAS (MAGnetic Data Acquisition System) Network

PI: Prof. K. Yumoto
SERC, Kyushu Univ.

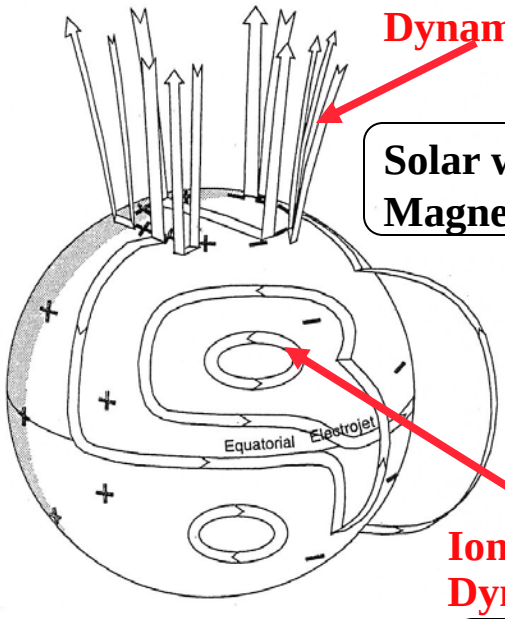


2.3-2 Space Weather Study on Coupling of Solar Wind-Magnetosphere-Ionosphere-Atmosphere

Iono. Sq Current



3-D Current System



Solar wind-Magnetosphere Dynamo Current

Solar wind - Earth's Magnetic Field Interaction

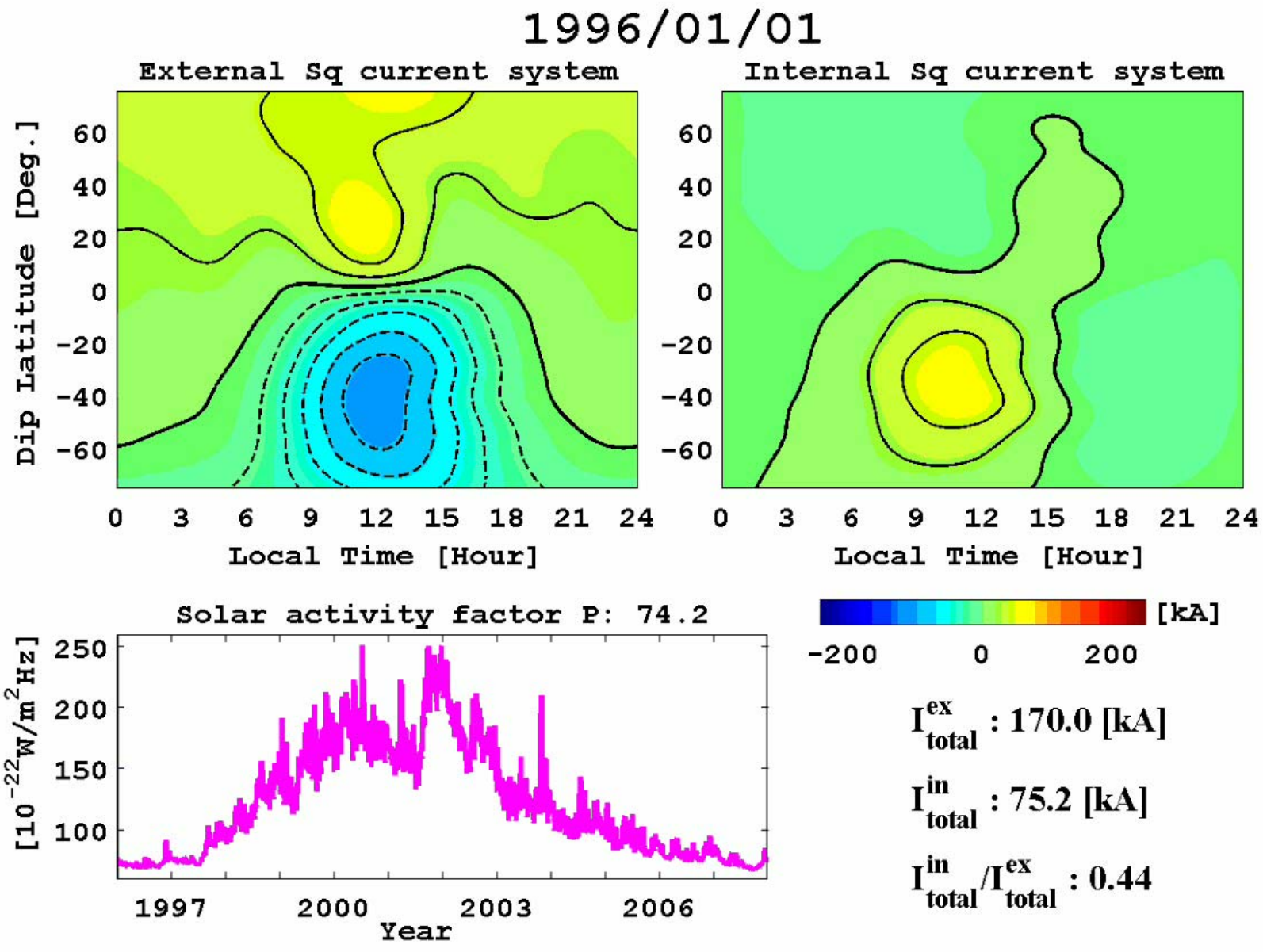
Ionosphere-Atmosphere Dynamo Current

Ionospheric Plasma-Atmospheric Neutral Particle Interaction

(left) Global equivalent ionospheric current pattern obtained by the ordinary MAGDAS/CPMN data.

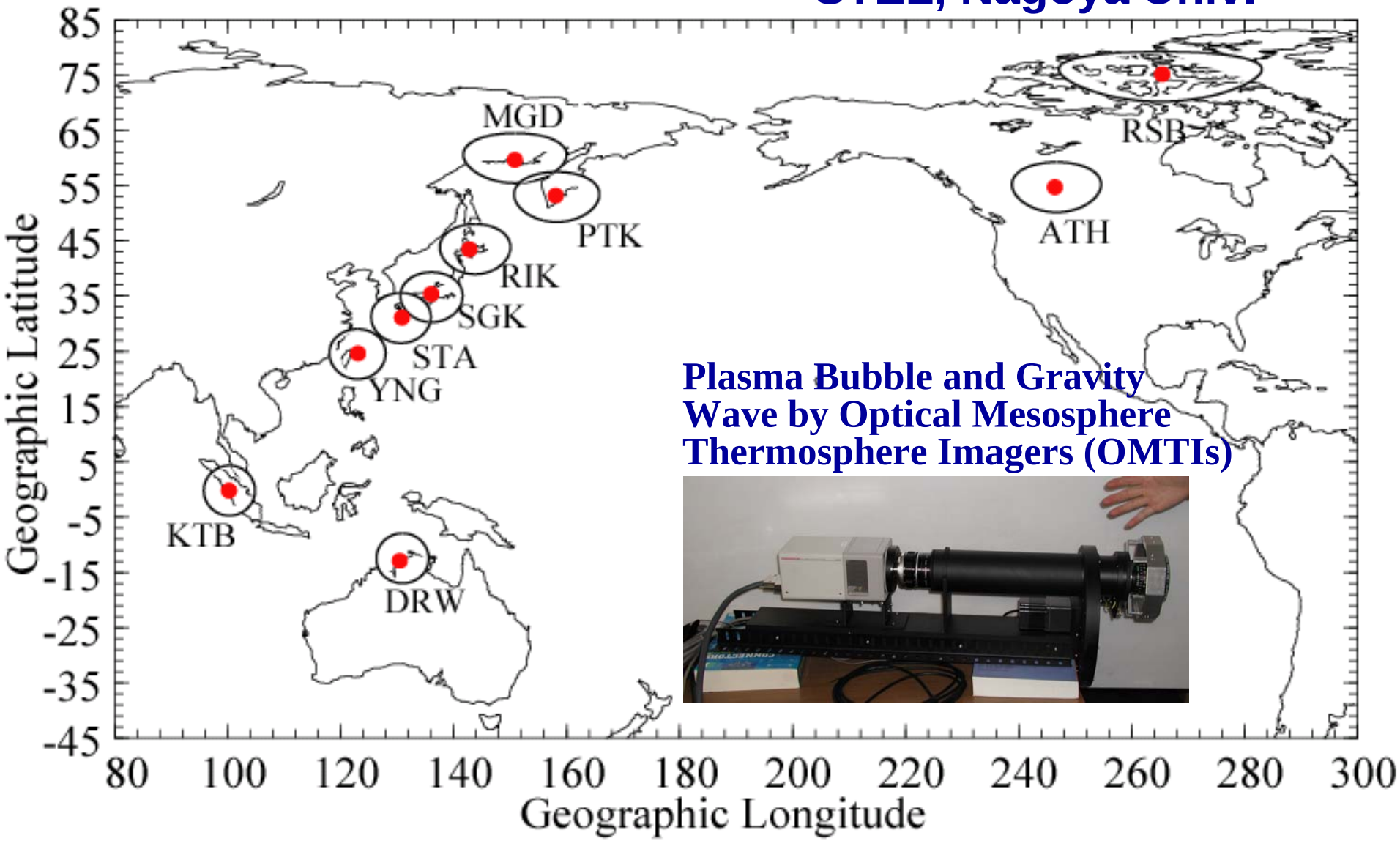
(right) Three-dimensional current system in geo-space.

2.3-3 Sq Currents in the Ionosphere and Lithosphere as a function of Solar Cycle Activity (F10.7)



2.4 OMTIs Network

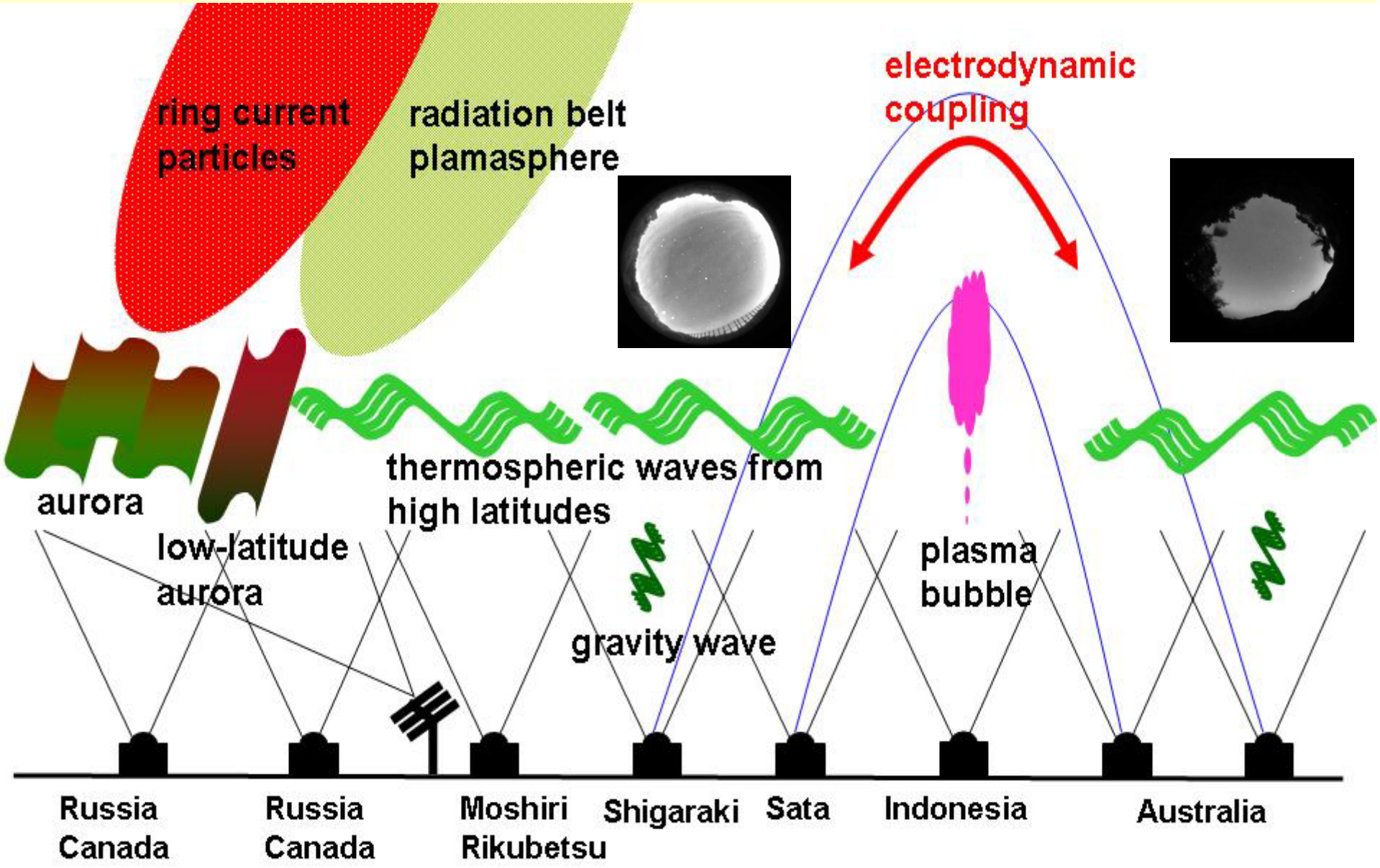
PI: Prof. K. Shiokawa
STEL, Nagoya Univ.



Plasma Bubble and Gravity Wave by Optical Mesosphere Thermosphere Imagers (OMTIs)

homepage: http://stdb2.stelab.nagoya-u.ac.jp/omti/index.html

2.4-2 Imaging of ITD by OMTIs

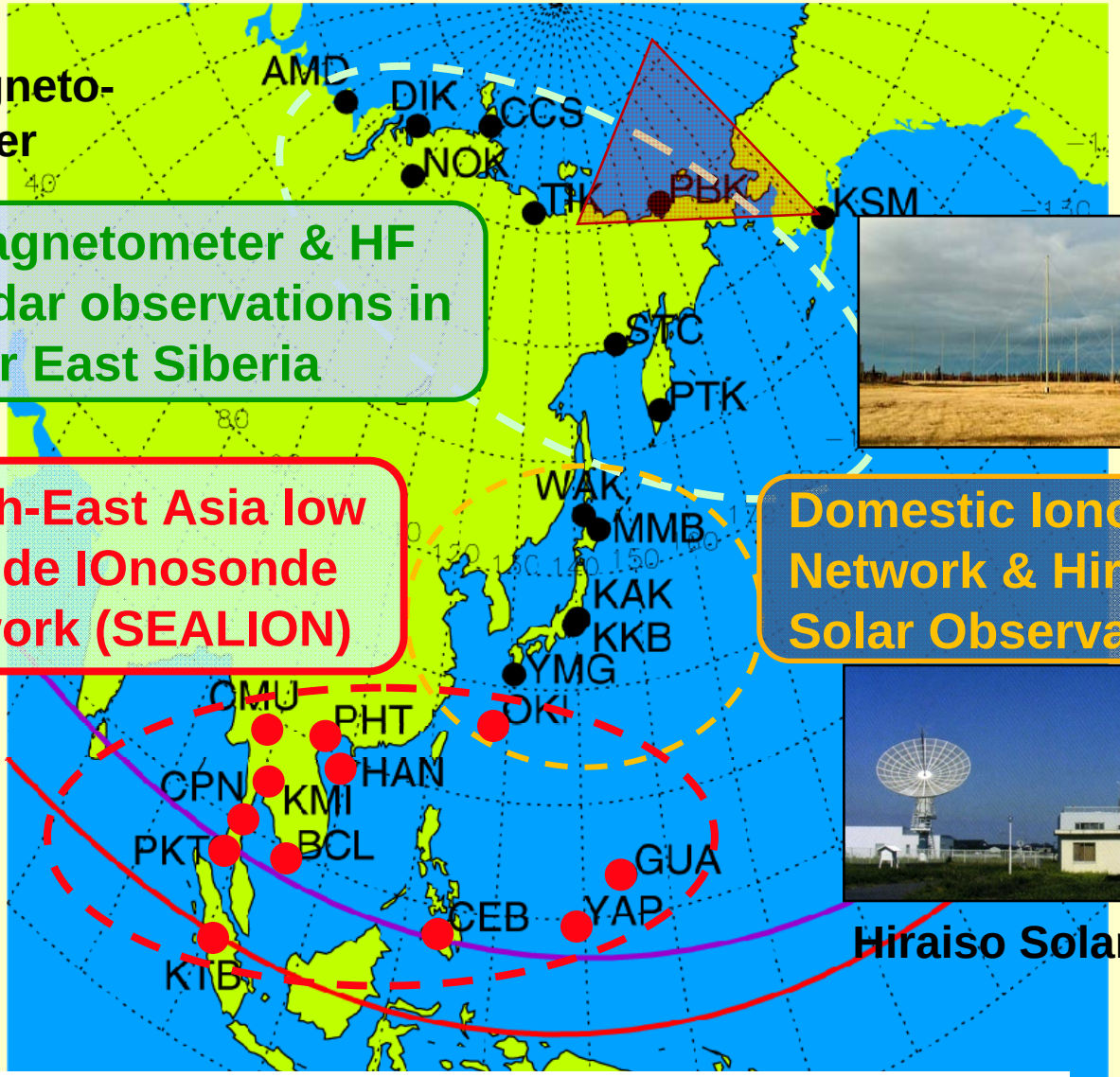


2.5 SEALION Network

PI: Dr. T. Nagatsuma
NiCT

Magneto-meter

Ionosonde



Magnetometer & HF radar observations in Far East Siberia

South-East Asia low latitude IOnosonde Network (SEALION)

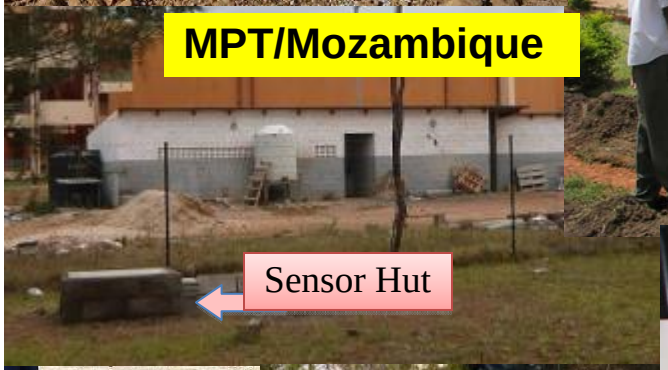
HF radar

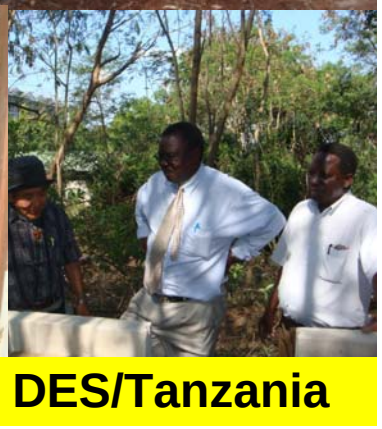
Domestic Ionosonde Network & Hiraiso Solar Observatory

Hiraiso Solar Observatory

3.1 Field Training of MAGDAS Installations in Africa

(8/30-9/30, 2008)





3.2 Education on MAGDAS & Space Weather


Training on MAGDAS in Sudan

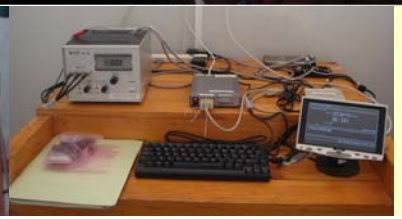


Lecture on Space Weather in Kenya

in Sudan


in Indonesia


in Kenya

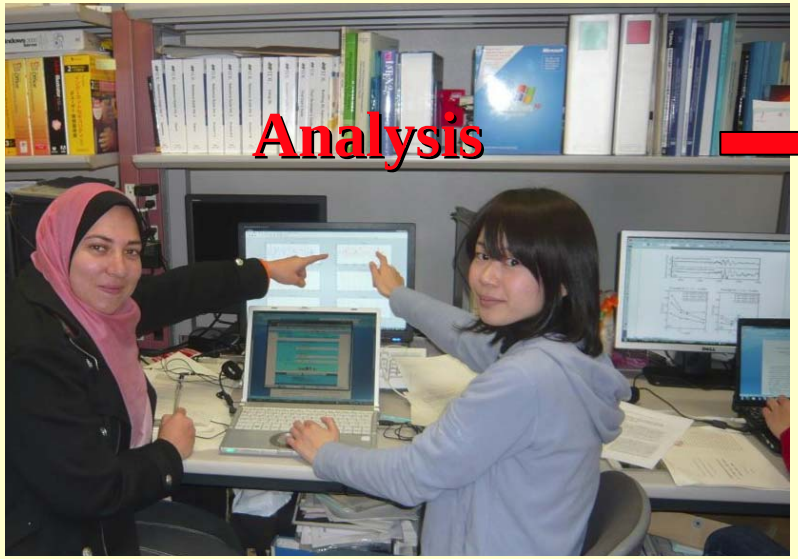



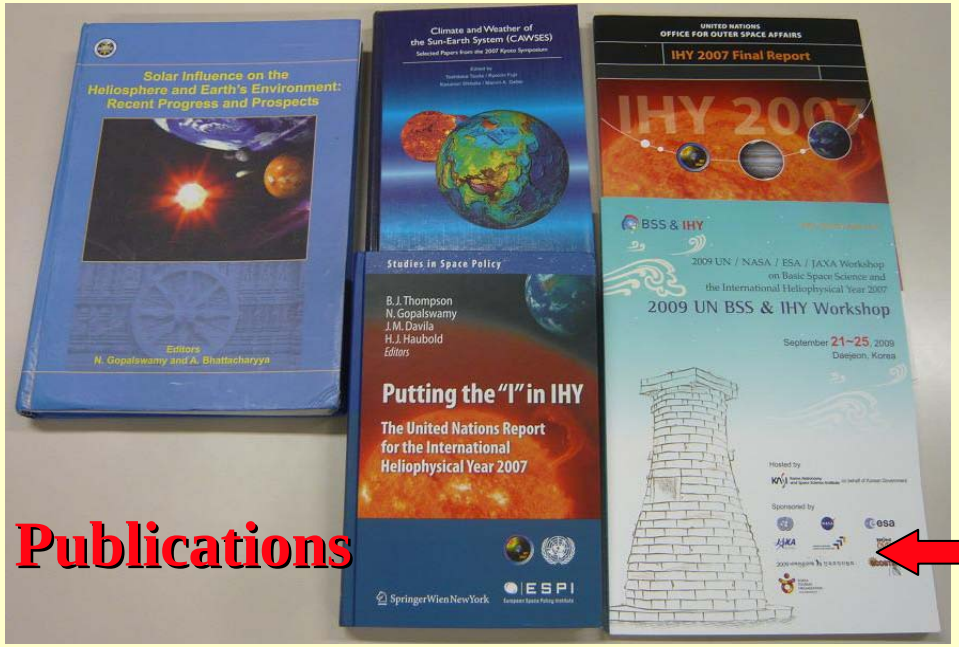
4.1 Data Coordination in Japan

Database Item	Agency/University	CoP (Contact Person)
Solar Wind Data	Solar Terrestrial Environment Laboratory, Nagoya University (STEL)	Prof. Munetoshi Tokumaru
Space Environment Data (Satellite Measerements)	Japan Aerospace Exploration Agency (JAXA)	Dr. Takahiro Obara
Geomagnetic Field Data	WDC for Geomagnetism, Kyoto University	Prof. Toshihiko Iyemori
Space Weather Data	National Institute of Information and Communi-cations Technology (NiCT)	Dr. Shinichi Watari
CHAIN, GMDN, MAGDAS, OMTIs, SEALION Data	Kyoto U., Shinshu U., SERC, STEL, NiCT	S. Ueno, K. Munakata, K. Yumoto, K. Shiokawa, T. Nagatsuma

To create awareness of ISWI in Japan, the STPP sub-committee is organizing a “ISWI-Japan Kick-Off Meeting” at Kyushu University that will take place in March of 2010. Soon after that, the “ISWI-Japan International Symposium” will be held at Makuhari in May of 2010 with the help of the Japan Geophysical Union (JpGU). This symposium will be held every year in Japan during ISWI (2010 through 2012).

4.2 Data Analysis & Publications





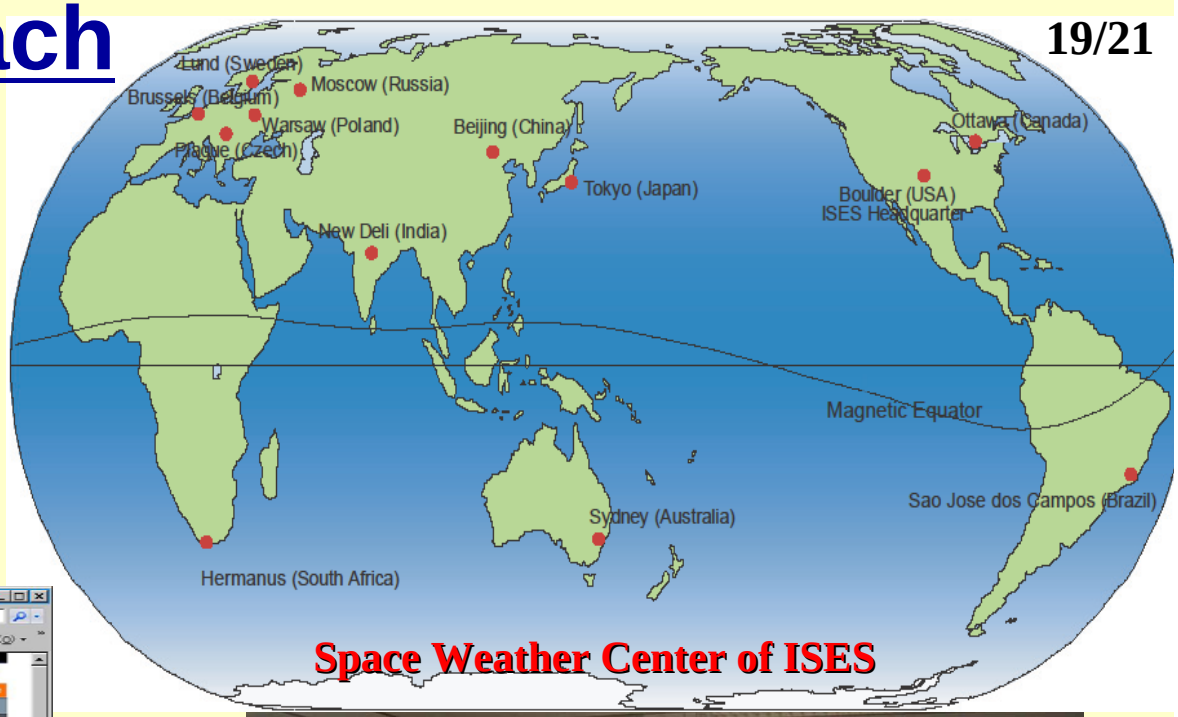
Publications

Presentation

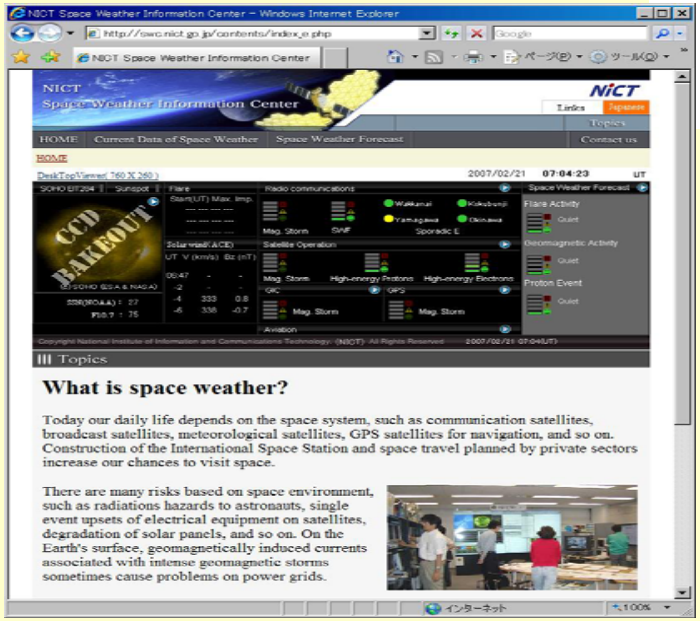
5.1 Int'l Space Environment Service (ISES) for Public Outreach

PI: Dr. S. Watari

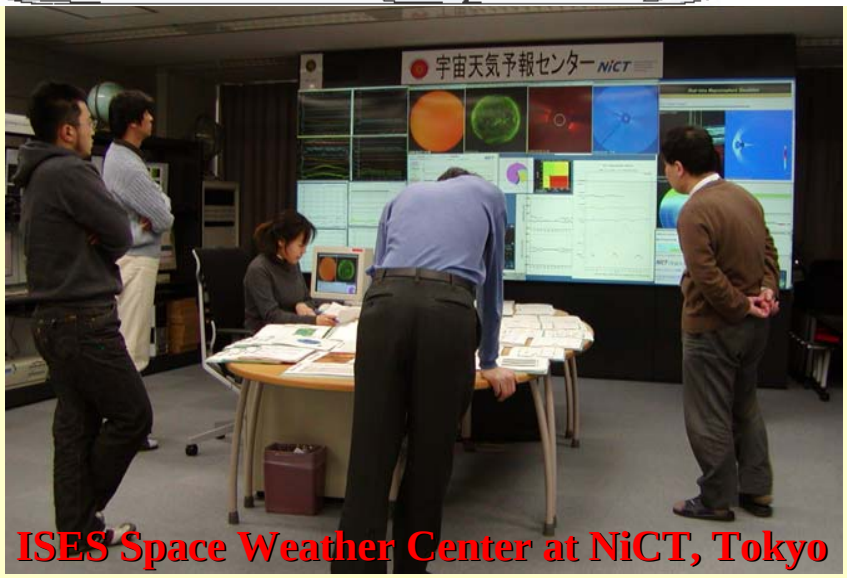
NiCT operates one of thirteen ISES centers. Each center makes forecasts of flares, geomagnetic storms, and high-energy proton events every day.



Space Weather Center of ISES

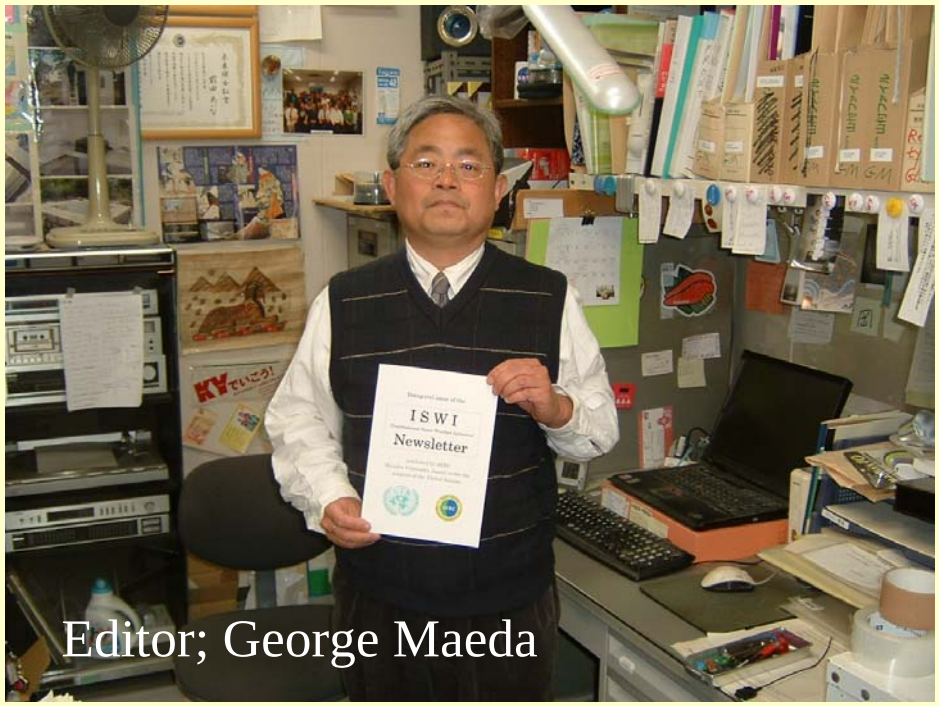


Space weather information service from NiCT (http://swc.nict.go.jp/contents/index_e.php)



ISES Space Weather Center at NiCT, Tokyo

5.2 ISWI Newsletter



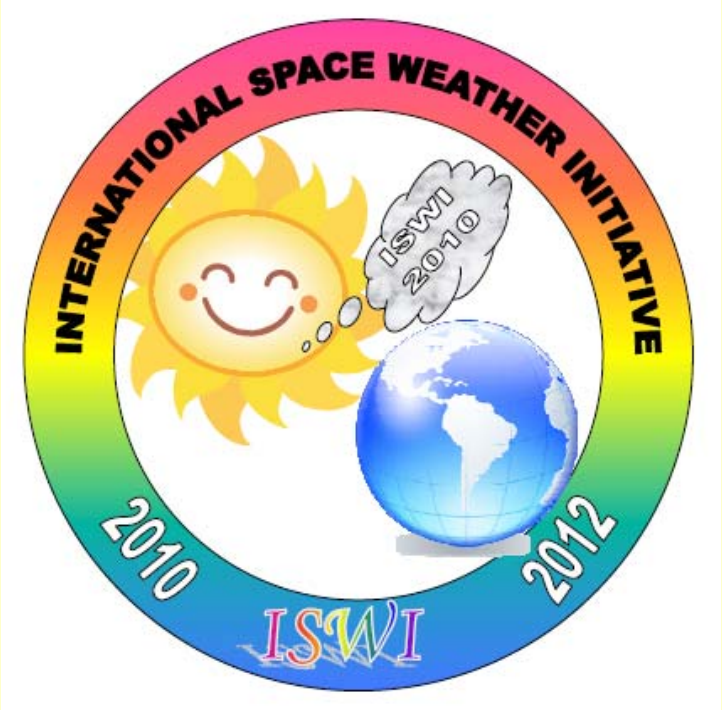
Editor; George Maeda

At the request of UNOOSA (Office for Outer Space Affairs), the Space Environment Research Center (SERC) at Kyushu Univ. (Japan) became the publisher for the ISWI Newsletter. In this photo, the editor of the newsletter is holding the inaugural newsletter at his desk at SERC.

Currently, the newsletter is being distributed via email to over 300 subscribers. The purpose of the newsletter is to deliver timely news and information to all participants of ISWI and is produced separate from the ISWI website. The publisher of the newsletter is the director of SERC, Prof. K. Yumoto.

6. Summary of Japan's ISWI

1. Instrument Array Program
   - 2.1 CHAIN Network
   - 2.2 GMDN Network
   - 2.3 MAGDAS Network
   - 2.4 OMTIs Network
   - 2.5 SEALION Network
2. Training & Education
3. Data Coordination & Analysis
4. Outreach and ISWI Newsletter



Thank you for your attention !!

JAPAN ISWI; http://www2.nict.go.jp/y/y223/sept/ISWI/ISWI.html