THE INTERNATIONAL SPACE WEATHER INITIATIVE (ISWI)

A FOLLOW-ON TO THE INTERNATIONAL HELIOPHYSICAL YEAR (IHY)

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Additional Information: http://iswi-secretariat.org, http://ihy2007.org

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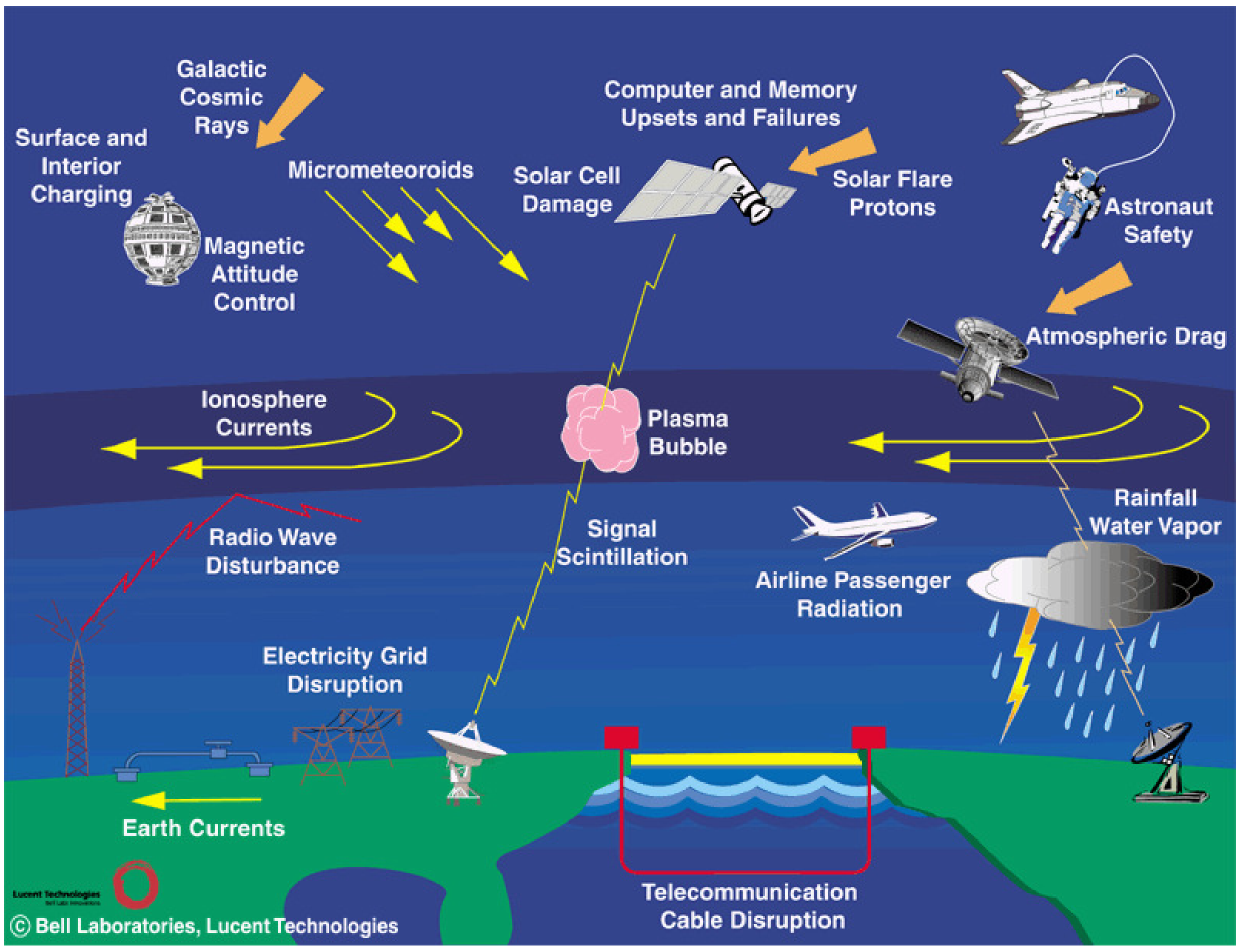
Year 2 Summary

- ISWI is starting the 3rd year of the current 3-year plan studying Space Weather
- Organized and held 2 UN-BSS Workshops on ISWI (Egypt, Nigeria)
- Planning is proceeding on 3rd Workshop in Equador later this year
- Organized 5 Space Science training schools this year (Slovakia, Nigeria, India, Morocco, DRC)
- Added 15th instrument array

ISWI


Galactic
Cosmic
Rays
Surface and
Interior
Charging
Micrometeoroids
Computer and Memory
Upsets and Failures
Solar Cell
Damage
Solar Flare
Protons
Astronaut
Safety
Magnetic
Attitude
Control
Atmospheric Drag
Ionosphere
Currents
Plasma
Bubble
Rainfall
Water Vapor
Radio Wave
Disturbance
Signal
Scintillation
Airline Passenger
Radiation
Electricity Grid
Disruption
Earth Currents
Telecommunication
Cable Disruption
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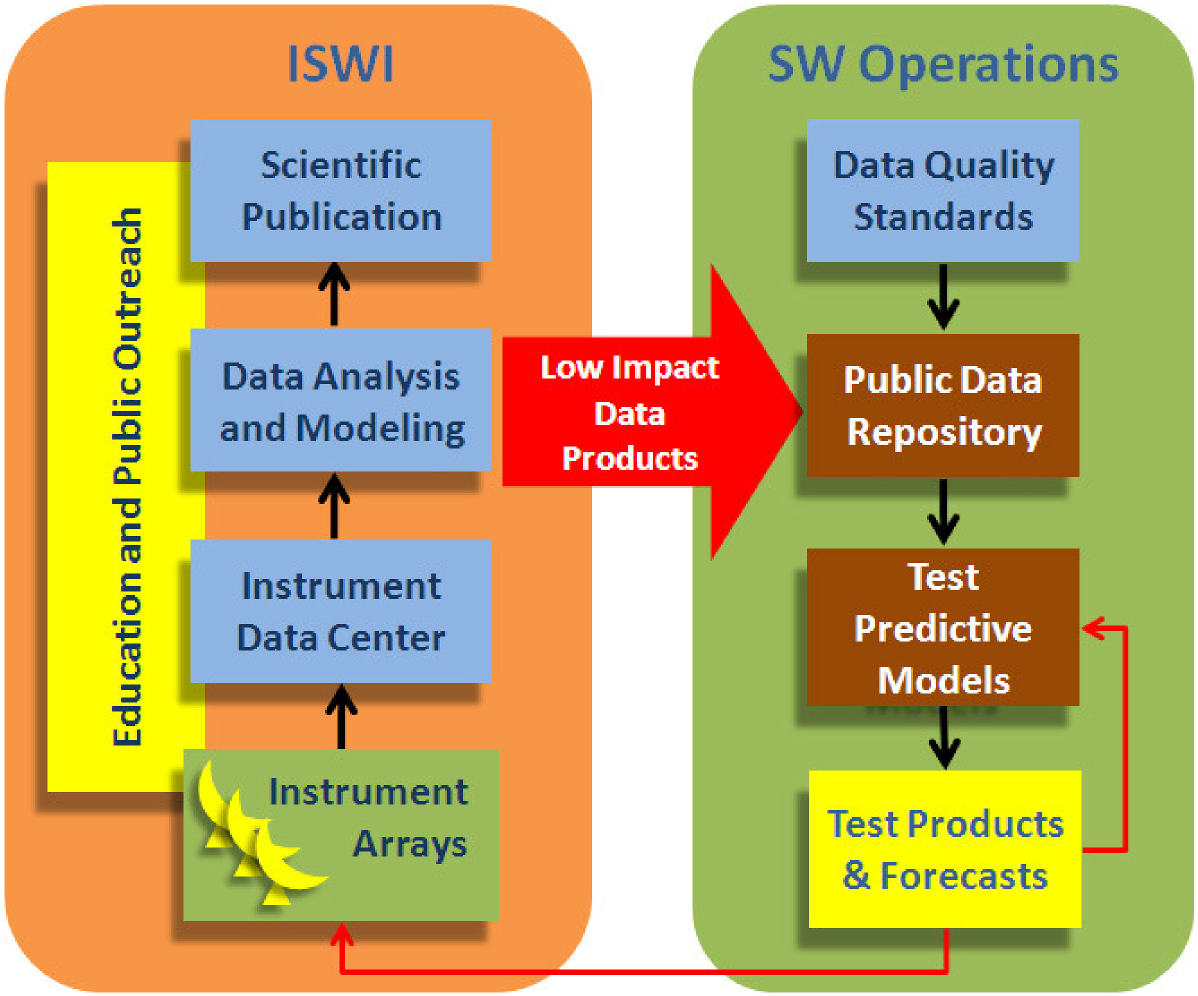
ISWI Objectives

- **Develop the scientific insight necessary to understand the science, and to reconstruct and forecast near-Earth space weather**
  - Instrumentation
    - Expand and continue deployment of new and existing instrument arrays
  - Data analysis
    - Expand data analysis effort for instrument arrays and existing data bases
  - Coordinate data products to provide input for physical modeling
    - Input instrument array data into physical models of heliospheric processes
    - Develop data products that reconstruct past conditions in order to facilitate assessment of problems attributed to space weather effects
  - Coordinate data products to allow predictive relationships to be developed
    - Develop data products to allow predictive relationships that enable the forecasting of Space Weather to be established
    - Develop data products that can easily be assimilated into real-time or near real-time predictive models
- **Education, Training, and Public Outreach**
  - University and Graduate Schools
    - Encourage and support space science courses and curricula in Universities that provide instrument support
  - Public Outreach
    - Develop public outreach materials unique to the ISWI, and coordinate the distribution

ISWI Contributes to Space Weather Studies



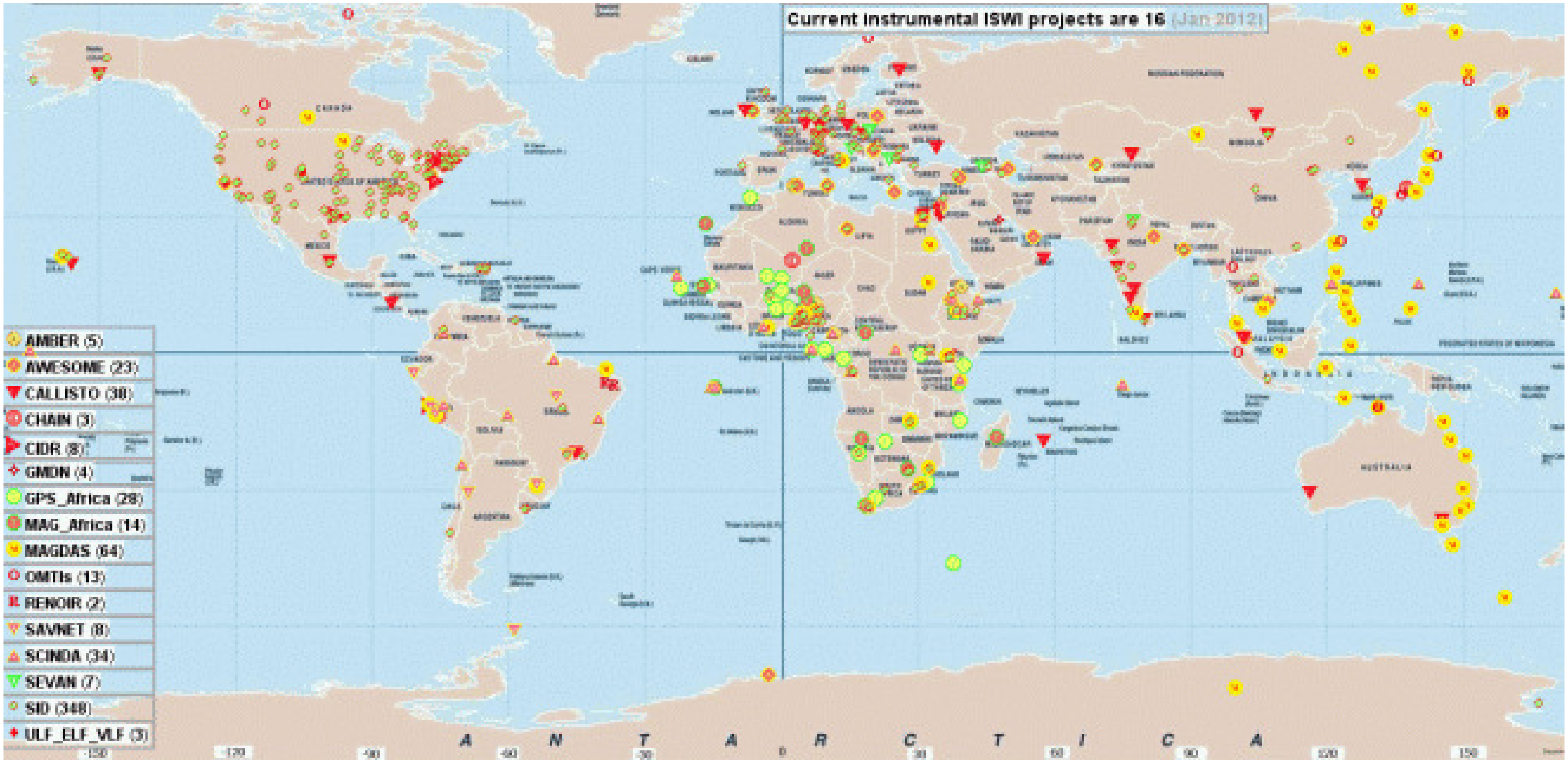
Principles of the ISWI Instrument Program

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

Scientific Benefits: Why do this?

- By observing in new geographical regions, a more global picture of Earth's response to solar wind inputs can be obtained
- 24/7 solar observing in radio and H-alpha
- Arrays provide 3D information that can be used in tomographic reconstructions
- Long term these networks will provide real-time data valuable for forecasting and nowcasting
- Modeling improvements will allow better exploitation of existing data sets

Y Participation (Jan 2012)



- 14 Distributed instrument teams observatory program
- ~1000 participating locations
- More than 100 Countries participating

Current Instrument Arrays

ID	INSTRUMENT	Lead Scientist	Country	Objective
1	Scintillation Network Decision Aid (SCINDA)	K. Groves keith.groves@hanscom.af.mil (Hanscom AFRL)	USA	Study equatorial ionospheric disturbances to aid in the specification and prediction of communications degradation due to ionospheric scintillation in the Earth's equatorial region
2	Ionospheric Tomography Network of Egypt (ITNE) Coherent Ionospheric Doppler Receiver (CIDR)	A. Mahrous amahrous@helwan.edu.eg (Helwan University) T. Garner garner@arlut.utexas.edu (University of Texas)	USA	To tomographically reconstruct the ionosphere and to provide input to data assimilation models
3	Atmospheric Weather Education System for Observation and Modeling of Effects (AWESOME) and Sudden Ionospheric Disturbance monitor (SID)	U. Inan inan@stanford.edu M. Cohen mcohen@stanford.edu D. Scherrer deborah@solar2.stanford.edu (Stanford University)	USA	Lightning, sprites, elves, relation to terrestrial gamma ray flashes, whistler induced electron precipitation, conjugate studies. Education and public outreach.
4	Remote Equatorial Nighttime Observatory for Ionospheric Regions (RENOIR)	J. Makela jmakela@illinois.edu (University of Illinois)	USA	Study the equatorial/low-latitude ionosphere/thermosphere system, its response to storms, and the irregularities that can be present on a daily basis
5	African GPS Receivers for Equatorial Electrodynamics Studies (AGREES)	E. Yizengaw (Boston College) ekassie@igpp.ucla.edu M. Moldwin (University Mich)	USA	Understand unique structures in equatorial ionosphere, low/mid latitude plasma production, effect of ionospheric and plasmaspheric irregularities on communications
6	African Meridian B-field Education and Research (AMBER)	M. Moldwin (University Mich) mmoldwin@igpp.ucla.edu E. Yizengaw (Boston College)	USA	Understand low latitude electrodynamics, ULF pulsations, effect of Pc5 ULF on MeV electron population in inner radiation belts

Current Instrument Arrays (continued)

ID	INSTRUMENT	LeadScientist	Country	Objective
7	Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and Transportable Observatory (CALLISTO)	A.Benz benz@astro.phys.ethz.ch C. Monstein monstein@astro.phys.ethz.ch (ETH)	Switzerland	Study of radio flares caused by solar activity in view of space weather and climate change
8	South Atlantic Very Low frequency Network (SAVNET)	J.-P. Raulin raulin@craam.mackenzie.br (University Presbiteriana)	Brazil	Study of the SAMA region at low ionospheric altitudes and its structure and dynamics during geomagnetic perturbations
9	Magnetic Data Acquisition System (MAGDAS)	K. Yumoto yumoto@serc.kyushu-u.ac.jp (Kyushu University)	Japan	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
10	African Dual Frequency GPS Network	C. Amory-Mazaudier christine.amory@lpp.polytechnique.fr (CETP/CNRS)	France	To increase the number of real-time dual-frequency GPS stations worldwide for the study of ionospheric variability, response of the ionospheric total electron content (TEC) during geomagnetic storms over the African sector

Current Instrument Arrays (continued)

ID	INSTRUMENT	LeadScientist	Country	Objective
11	Space Environmental Viewing and Analysis Network (SEVAN)	A.Chillingarian chili@aragats.am (Aragats University)	Armenia	A network of particle detectors that aims to improve fundamental research of the particle acceleration in the vicinity of the Sun and the space environment, as well as to provide forewarnings of dangerous consequences of space storms
12	Global Muon Detector Network (GMDN)	K. Munakata kmuna00@		ecrease of … es place … he Earth- … ejection
13	Flare Moni… Telescopes … the Continu… Imaging Net…	(Kyoto University)		velocity field of solar activity, flares, filament eruptions and shock waves (Moreton waves) by using multi-wavelength H-alpha images of the full-disk Sun.
14	Optical Mesosphere Thermosphere Imagers (OMTIs)	K. Shikawa shiokawa@stelab.nagoya-u.ac.jp (Nagoya University)	Japan	Dynamics of the upper atmosphere through nocturnal airglow emissions http://stdb2.stelab.nagoya-u.ac.jp/omti/index.html

ULF/ELF/VLF network
Lead Scientist: *Prof. Colin Price* (Tel Aviv University) **Israel**
Objective: To monitor geomagnetic storms, ionospheric Alfven resonances, and ULF pulsations

WI Space Science Schools

- First ISWI Space Science School in Bahir Dar University November 2010 in Ethiopia
  - AGU Chapman conference
  - AMISR radar
- This year (2011):
  - Slovakia – Summer
  - Kinshasa, RDC - September
  - Rabat, Morocco – Dec 5-16
  - Lagos, Nigeria – August
  - Mumbai, India (VLF)- Oct
- Indonesia School planned for 2012

What is Next?

- **Identify additional instruments for deployment**
  - **We are interested in adding additional experiments to the current list of 14**

- **Use this new ISWI data for modeling and prediction of Space Weather**

- **Additional information**
  - **http://iswi-secretariat.org**
  - **Twitter: ISWINews**