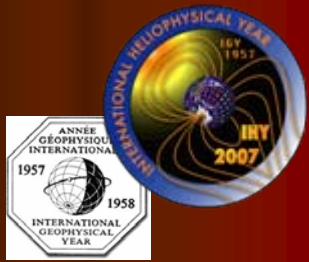


United Nations Basic Space Sciences Initiative and IHY

N. Gopalswamy

NASA Goddard Space Flight Center

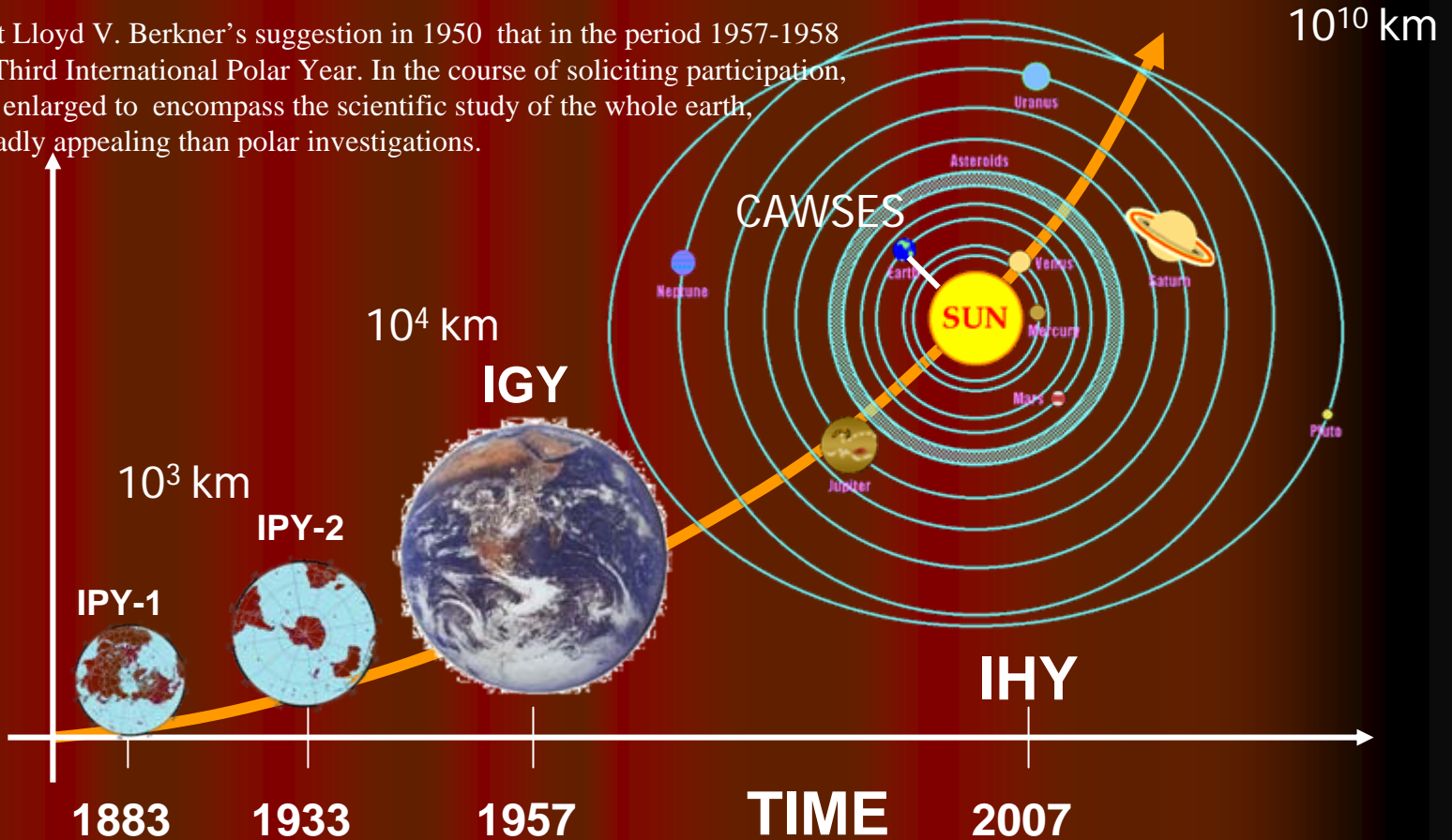
<http://ihy2007.org>



Evolution of System Studies

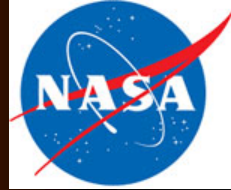
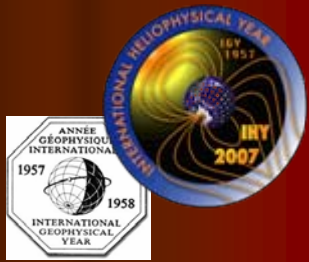
IGY 1957 grew out Lloyd V. Berkner's suggestion in 1950 that in the period 1957-1958 there should be a Third International Polar Year. In the course of soliciting participation, the enterprise was enlarged to encompass the scientific study of the whole earth, a subject more broadly appealing than polar investigations.

Size Scale Studied



Birth of NASA
 Birth of COSPAR
 Birth of Space Science

During the period between the orbiting of Sputnik-I and the creation of NASA, these activities-scientific research in the high atmosphere and outer space-began to be thought of as space science. ... Homer E. Newell, "Beyond the Atmosphere: Early Years of Space Science," N. Gopalswamy

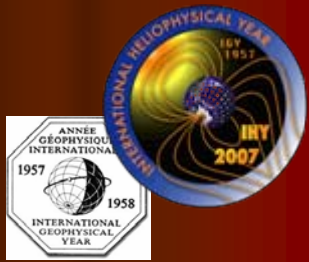


IHY Goals

- Develop the basic science of heliophysics through cross-disciplinary studies of universal processes.
- Determine the response of terrestrial and planetary magnetospheres and atmospheres to external drivers.
- Promote research on the Sun-heliosphere system outward to the local interstellar medium - the new frontier.
- Foster international scientific cooperation in the study of heliophysical phenomena now and in the future.
- Preserve the history and legacy of the IGY on its 50th Anniversary.
- Communicate unique IHY results to the scientific community and the general public.

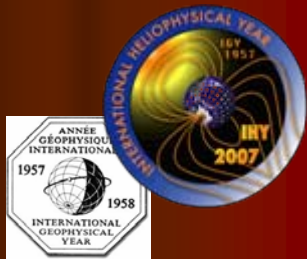


Science Capacity Building History Outreach



IHY & UN

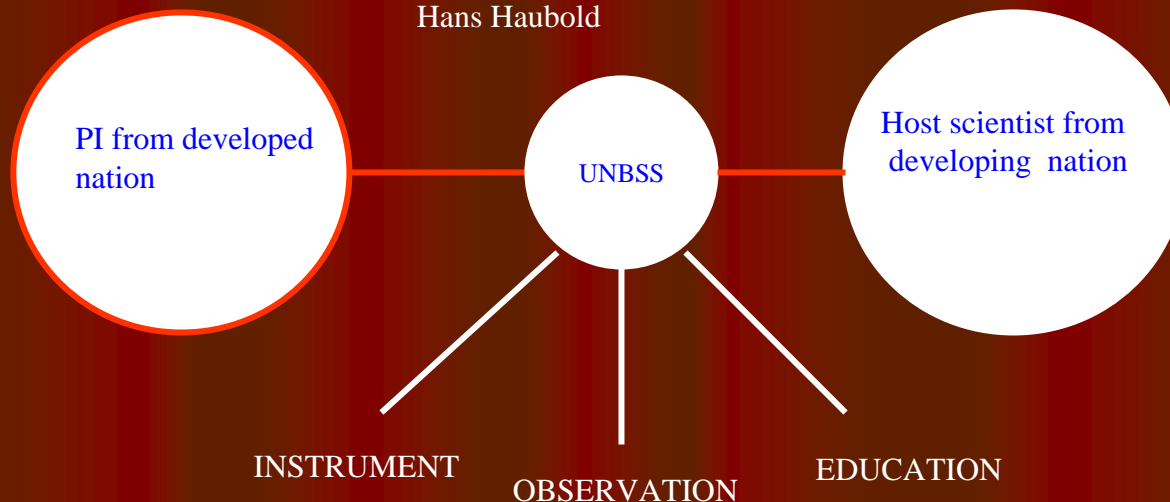
- The IGY 1957 was one of the driving events to establish the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS)
- The IHY instrument deployment program is directly relevant to the goals of the United Nations Office for Outer Space Affairs (UNOOSA):
 1. To promote international cooperation in the use of space technology
 2. To strengthen the capacity of developing countries to use space technology
- IHY instrument deployment program to match the UN Tripod concept, viz., instrument, observation, and education in developing nations.



UN & IHY

UN Office for Outer Space Affairs
Hans Haubold

New: Data Analysis
Projects

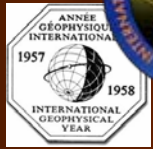


1991-2004 Astronomy
2005 - IHY

UN TRIPOD

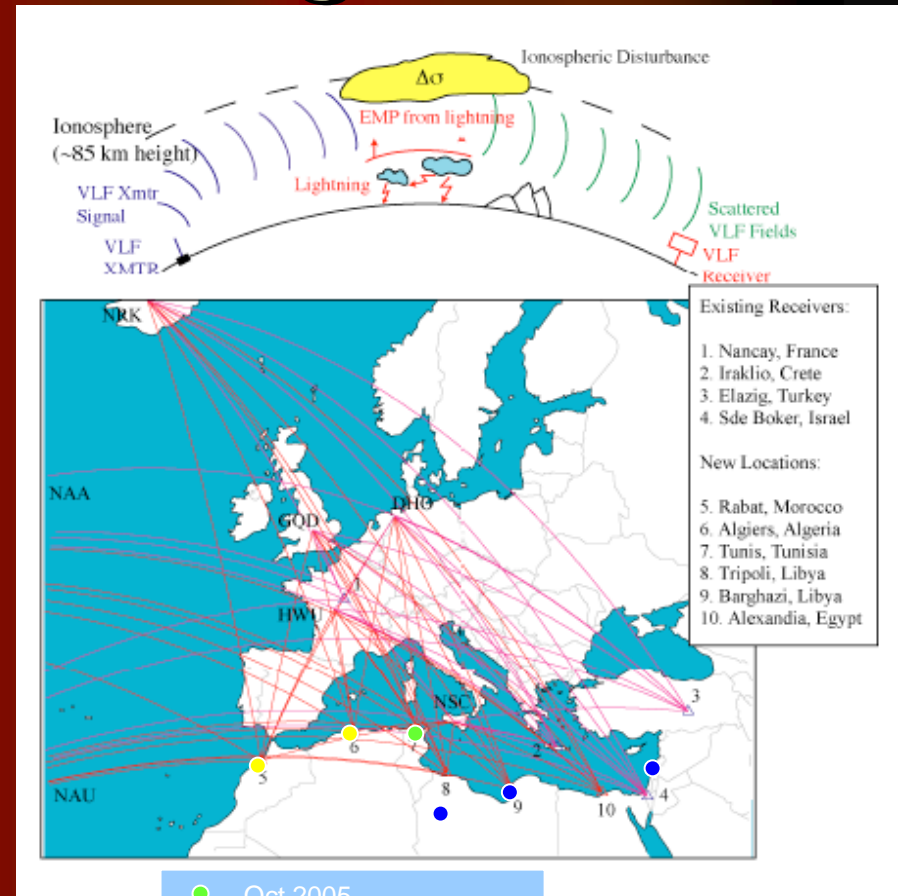
- Radio Network: US – Switzerland-India – Japan – (Mexico)?
- GPS/Scintillation US - Africa
- Magnetometers US-Brazil
- H-alpha Network France – Iran – Angola; ISOON; IHY-CAWSES
- Neutron monitors: Finland – Ethiopia-South Africa
- Muon detectors: Japan – Middle East
- IPS network: Japan-India-Mexico-UK

More instruments will be considered for the 2006-2009. Some maybe IHY legacy instruments used beyond IHY 2007

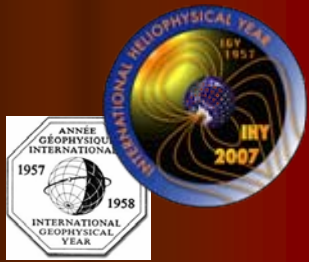


IHY/UNBSS Distributed Instrument Program

- Placing small inexpensive instruments in new geographical locations can provide new science
- Distributed observatories can provide long term data
- UN-BSS dedicated to the program at least thru 2009

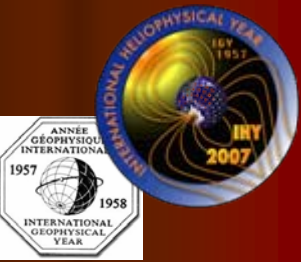


- Oct 2005
- August 2006
- Fall 2006-Spring 2007

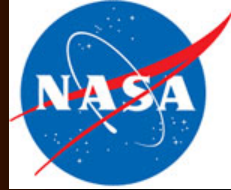


IHY Efforts in Africa

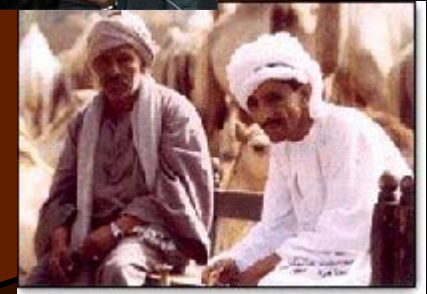
- SCINDA (Scintillation Network Decision Aid) (K. Groves)
- AWESOME (Atmospheric Weather Educational System for Observation and Modeling of Effects) (U. Inan)
- CARISMA (Canadian Array for Realtime Investigations of Magnetic Activity) (I. Mann)
- RENOIR (Remote Equatorial Nighttime Observatory for Ionospheric Regions) (J. Makela)
- MAGDAS: Magnetic Data Acquisition System Project (PI K. Yumoto)

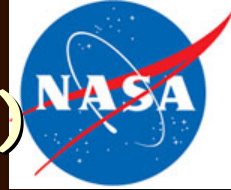
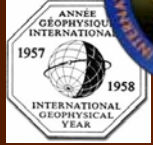


1st Workshop succeeded “...beyond expectations!”



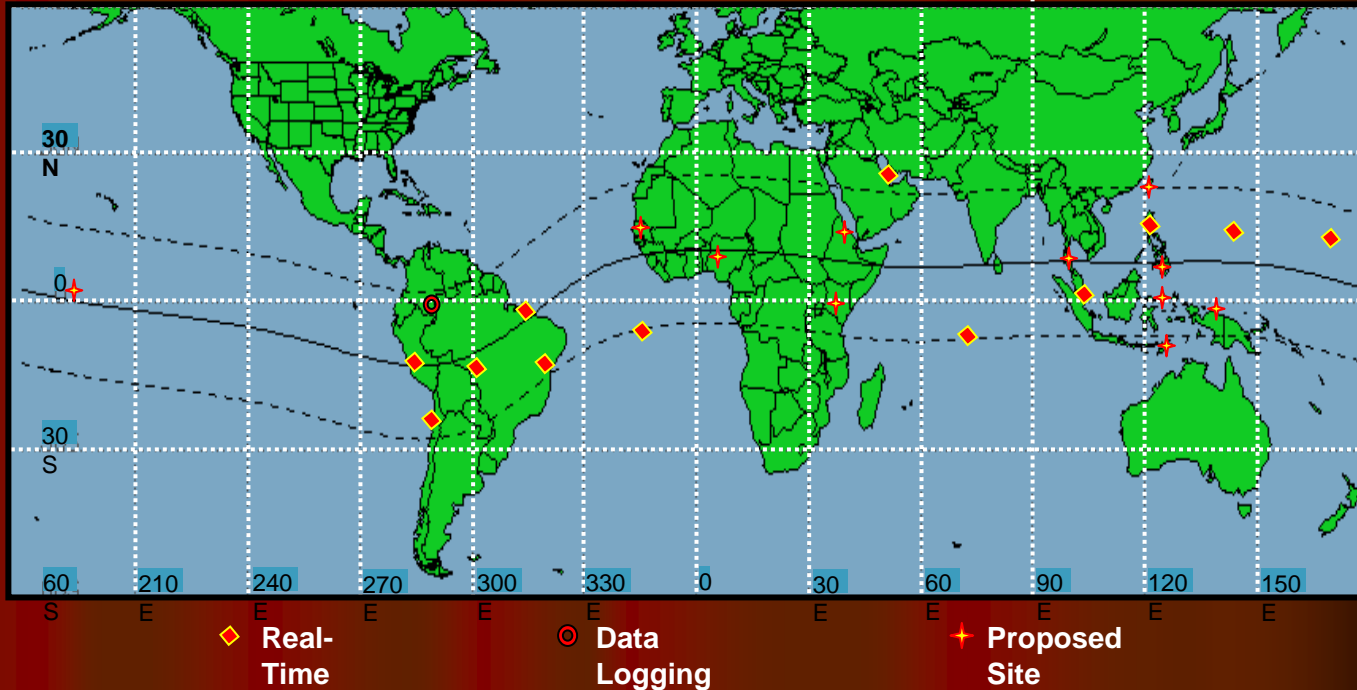
- **UN, ESA, NASA, and UAE Government sponsored**, attendance by His Highness Sheikh Al-Nahayan Minister of Education and the Chancellor of the UAE University
- **Instrument Donors Attending:** USA, Canada, UK, Switzerland, Japan, Brazil, Armenia, Russia
- **Potential Hosts Attending:** Georgia, India, Pakistan, Indonesia, Malaysia, Iraq, Iran, Sudan, Saudi Arabia, Algeria, Egypt, Libya, Cape Verde, Jordan, Ivory Coast, Cameroon, Nigeria, Eritrea, South Africa, ...
- **Local African meeting in Cape Verde planned for SCINDA**
- **2nd Workshop planned for Nov 2006, at Indian Institute for Astrophysics in Bangalore, India!**
- **3rd Workshop Oct-Nov 2007 in either Mexico or Libya**



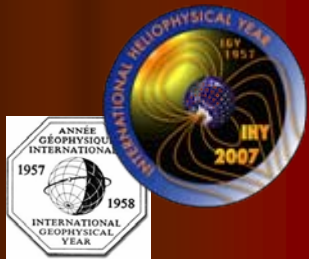


SCINDA: (Scintillation Network Decision Aid)

PI: Keith Groves



- The most intense natural scintillation events occur during nighttime hours within 20° of the earth's magnetic equator.
- GPS receivers are subject to significant errors during severe scintillation events
- SCINDA observations in this 20° belt on either side of the magnetic equator are sought.
- The goal is to have accurate GPS navigation error products available to support the operations before the next solar maximum.

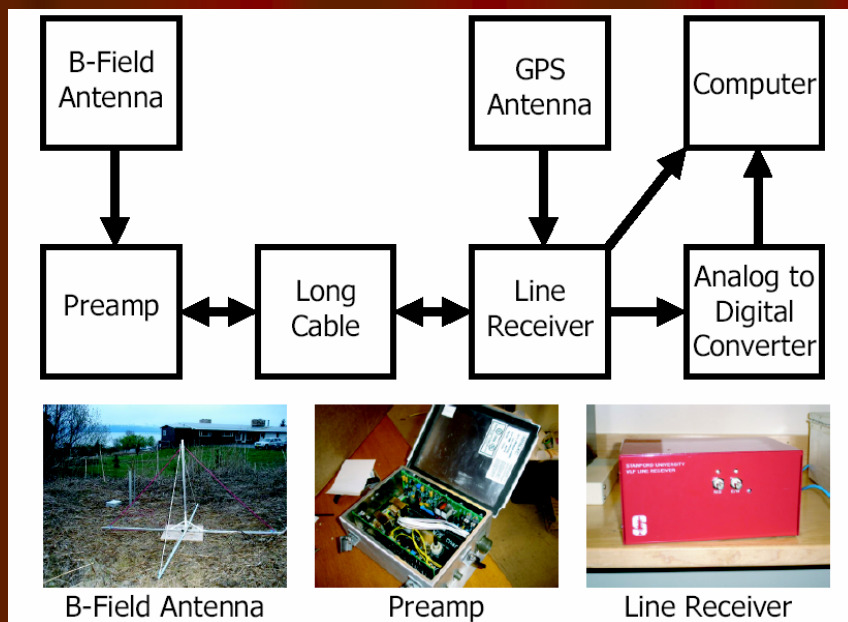


AWESOME

(Atmospheric Weather Educational System for Observation and Modeling of Effects)

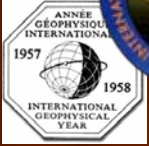
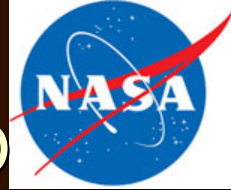
PI. Umran Inan, Stanford University

- Monitors the signal strength from distant VLF transmitters as the waves bounce off the ionosphere and hence tracks the solar disturbances causing the changes.
- One AWESOME monitor has recently been deployed in Tunisia. Host: Prof. Zohra Ben Lakhdar (University of Tunis). Soon to be deployed in Morocco and Algeria



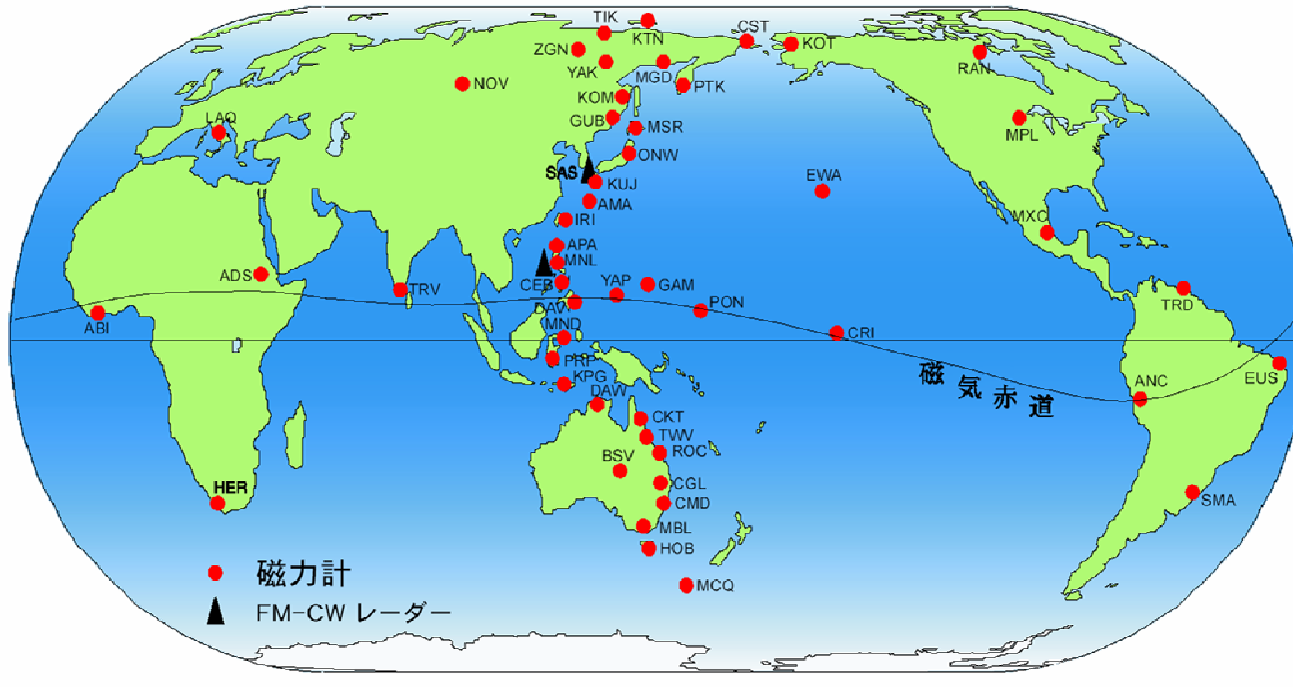
MAGDAS (Magnetic Data Acquisition System)

Project PI: K. Yumoto



MAGDAS/CPMN

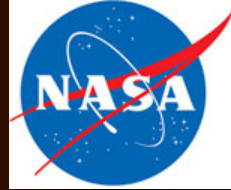
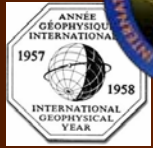
(MAGnetic Data Acquisition System/Circum-pan Pacific Magnetometer Network)



Study of dynamics of geospace plasma changes during magnetic storms and auroral substorms, the electro-magnetic response of iono-magnetosphere to various solar wind changes

The MAGDAS will utilize the Circum-Pan Pacific Magnetometer Network involving several countries around the globe (Japan, Philippines, Taiwan, USA, Russia, Indonesia, and Australia).

Additional locations where the magnetometers can be deployed are: FSM, Peru, Brazil, Mexico, Canada, India, South Africa, Cote D'Ivoire, Ethiopia, and Trinidad/Tobago.



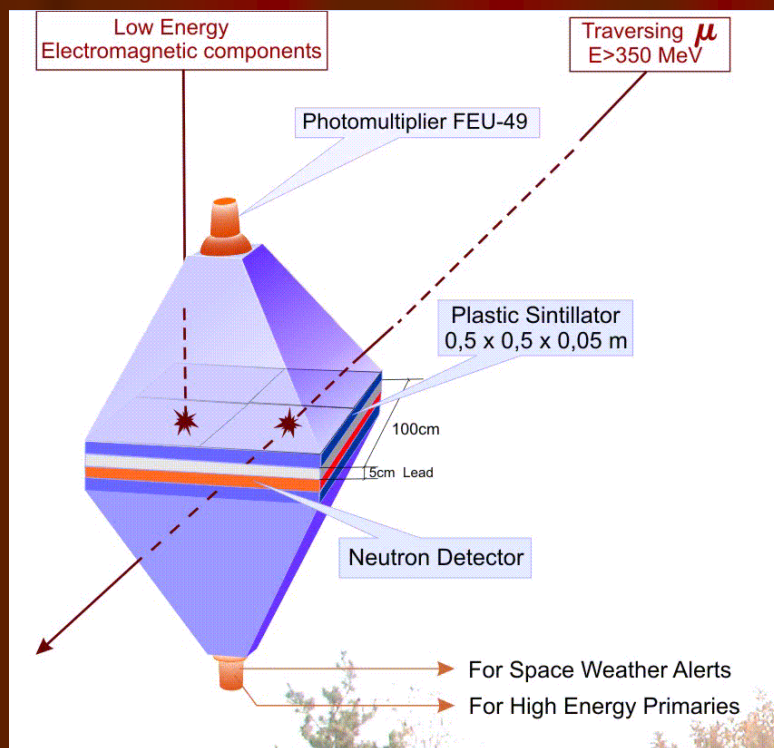
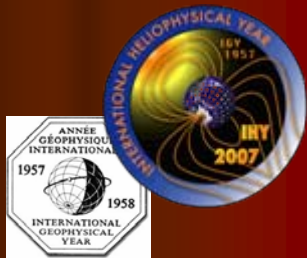
Remote Equatorial Nighttime Observatory of Ionospheric Regions (RENOIR)

PI. J. Makela

- RENOIR station has instruments that provide data on the ionospheric irregularities and thermosphere-ionosphere coupling.
- The equipment at a single RENOIR station will consist of:
 - one wide-field ionospheric imaging system (630.0 and 777.4 nm)
 - two miniaturized Fabry-Perot interferometers (FPI)
 - a dual-frequency GPS receiver
 - an array of five single-frequency GPS scintillation monitors
- Ideally, the RENOIR stations would be fielded in Africa at a longitude of approximately 7 degrees from the magnetic equator
- Cape Verde Deployment planned

Space Weather Forecasting Network

PI: Ashot Chilingarian

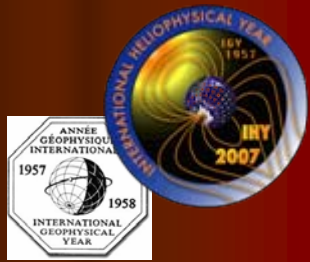


Measure, simulate and compare: (1) time series of neutrons, low energy charged component (mostly electrons and muons), high energy muons), (2) the correlation between changing fluxes of various secondary particles, and (3) directional information.

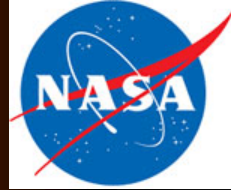
Predict geomagnetic storms hours before the ICME arrival at L1

Potential hosts: Georgia, Turkey, Iran, Azerbaijan, United Arab Emirates, Kuwait, and Israel.

Additional deployments in Bulgaria and Croatia are possible.



CALLISTO (Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and

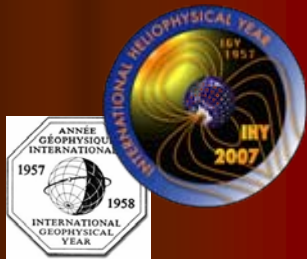


Transportable Observatory) PI. A. Benz



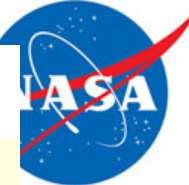
CALLISTO, is a dual-channel frequency-agile receiver based on commercially available consumer electronics. The low cost for hardware and software, and the short assembly time make this an ideal instrument for the UNBSS program.

- 24 hour coverage of solar activity
- Detect shocks driven by CMEs
- Existing in Switzerland, US
- Being deployed in India
- Network with Hiraisto?



IHY

IHY 2007 Campaign Database



Start Date:

Day Month 2007

End Date:

Day Month 2007

Observatory:

ACE
GOES12/SXI
HXRS
INTERBALL-Tail

Instrument:

SWPC
SWEPAM
EUVI
COR2
COSI

Data classification(s):

Image Spectrum Lightcurve Scan

Data type(s):

Sub-type(s):
Gamma-ray
Hard X-ray
Soft X-ray
Full-Disk
Partial-Disk
Magnetograms (line of sight)

Data format(s):

FITS
Binary (non-FITS)
ASCII

IHY 2007 Observing Campaign:

IHY-016: 3-D Heliospheric Interaction with Planetary Magnetospheres
IHY-032: Solar Eruptions Producing Magnetic Clouds at Earth and 1AU
IHY-021: Magnetotail Microphysics
IHY-014: 3-D Dynamic Streamer Modeling
IHY-003: Driven Magnetosphere-Ionosphere Coupling

Method for identifying observations:

NOAA ACTIVE REGION NUMBER
GOES EVENT LIST
GEO-B EVENT RECORD
TECTONOPHYSICS DATA REGISTER

(Please wait for pop-up window to appear)

Contact name:

Contact e-mail:

Data URL (http:// or ftp://):

Additional information to assist with obtaining data:



Observation Database

Joint IHY-CAUSES Observation Database

Registrant Information

Name: Email:

Observation Information

Date: Short Description:

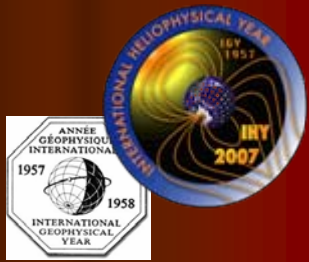
Contact Name: Contact Email: URL:

Longer Description

Something like: My data is really cool it has groovy numbers about many groovy things.

Observatory: Instrument:

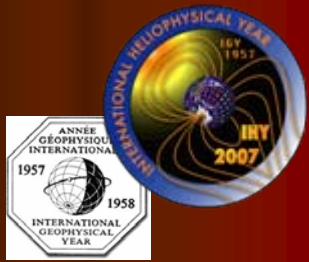
This is a prototype: Joint IHY-CAUSES Observation Database "Registration Page."



IHY Schools

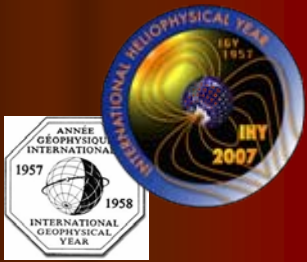
- Provide advanced training in heliophysics to young researchers
- Students will acquire working knowledge on the universal processes in the heliosphere
- The schools will facilitate the development of a diverse, globally-engaged scientific community that recognizes the increasing relevance of heliophysics
- Young researchers participating in the Coordinated Investigation Programs (CIPs) and the United Nations Basic Space Science IHY program will greatly benefit from the schools
- Currently 4 schools planned: North America, South America, Asia-Pacific, ICTP (Trieste)
- More?
- Shared curriculum, local lecturers
- Hands-on sessions: UNBSS Data Projects (3.3)

Contact: D Webb (Chair), I Roussev, N Gopalswamy (IHY International Coordinator),
C Rabello Soares (IHY EPO coordinator), and Thompson (IHY Dir. of Operations).



Conclusions

- IHY/UNBSS has done a lot over the past 2 years
- Lot more to be done
- Projects at Various stages of evolution
- Many to be completed by 2007
- Some to be deployed after 2007 as legacy instruments
- UN tripod will be strengthened
- The I in IHY will be firmly installed

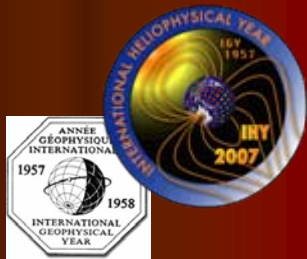


“IGY Gold” Initiatives

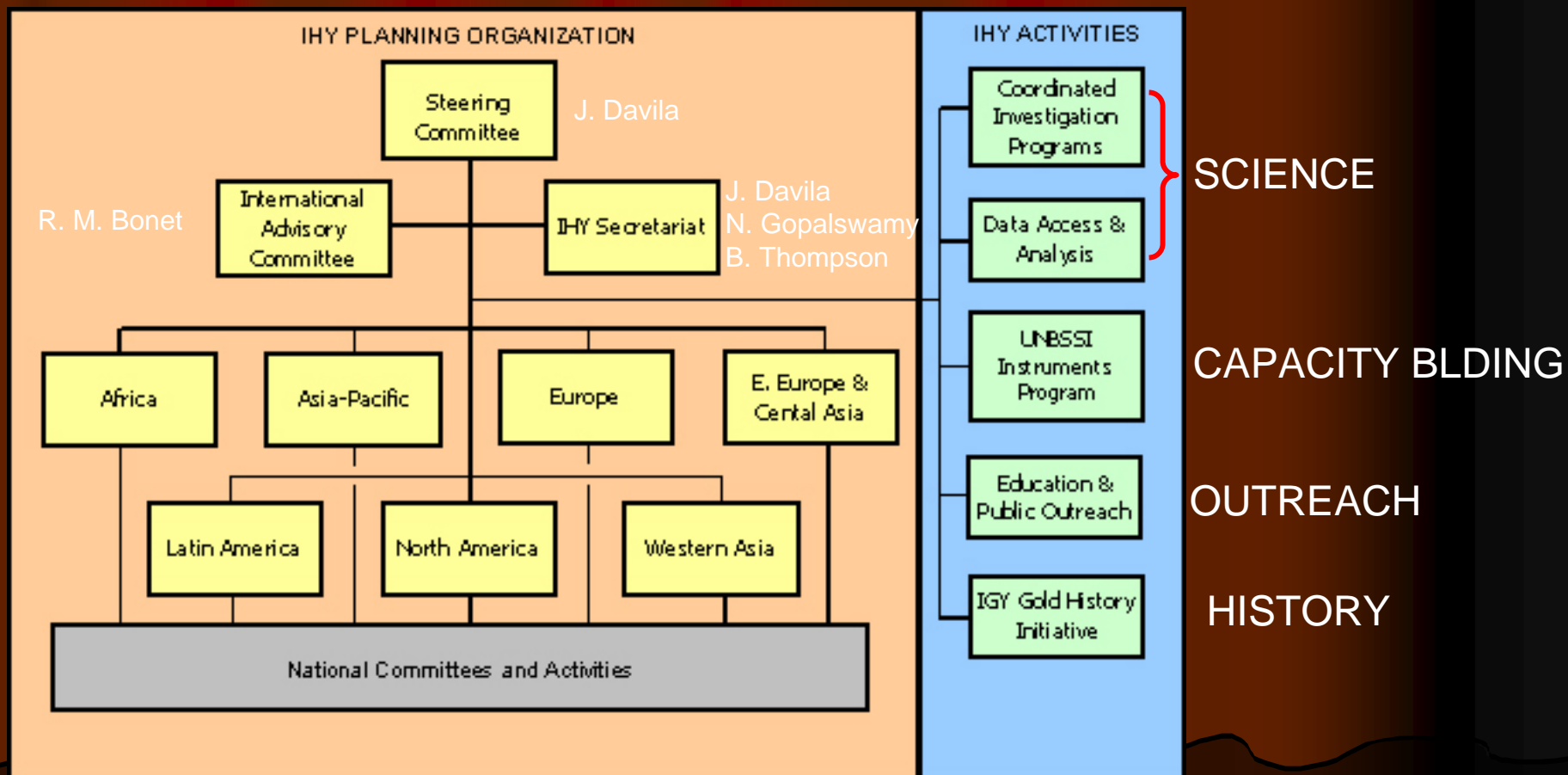


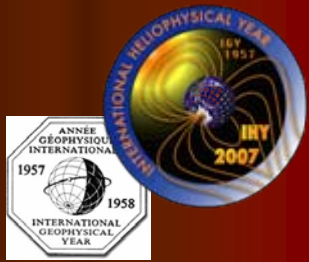
James Van Allen who discovered the radiation belts using EXPLORER 1 during IGY— receives “IGY Gold” award at the University of Iowa’s Physics Department

IHY will strive to identify As many IGYers as Possible during IHY 2007



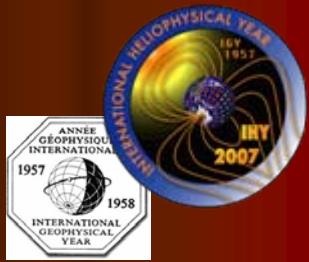
IHY Organization





Elements of IHY

- 1. Science: Coordinated Investigation Programs (CIPs)
- 2. Distributed small instrument program: UN/BSS
- 3. Public outreach
- 4. History preservation: IGY Gold



1. Science

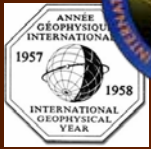
CIPs

Campaigns

Data

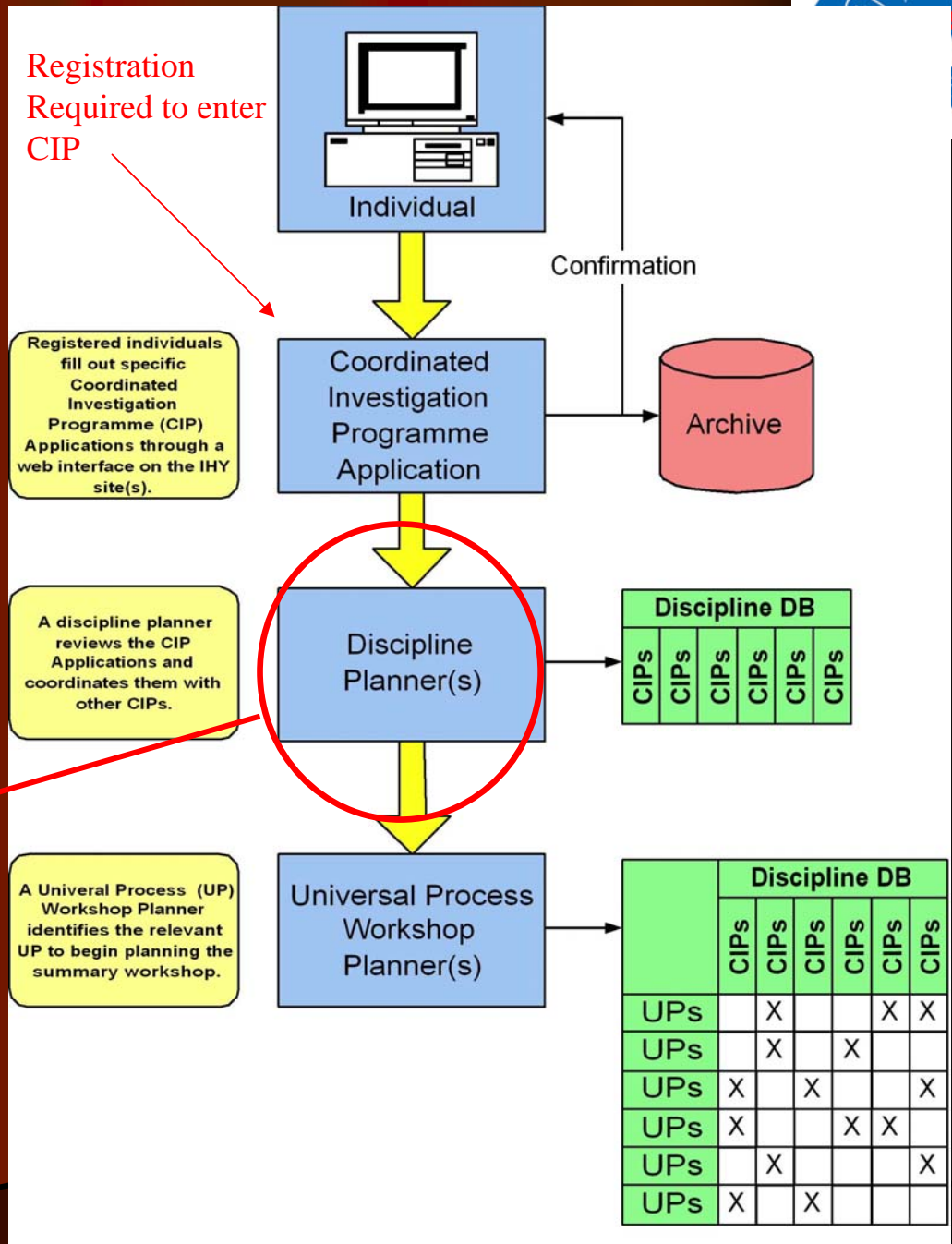
Workshops

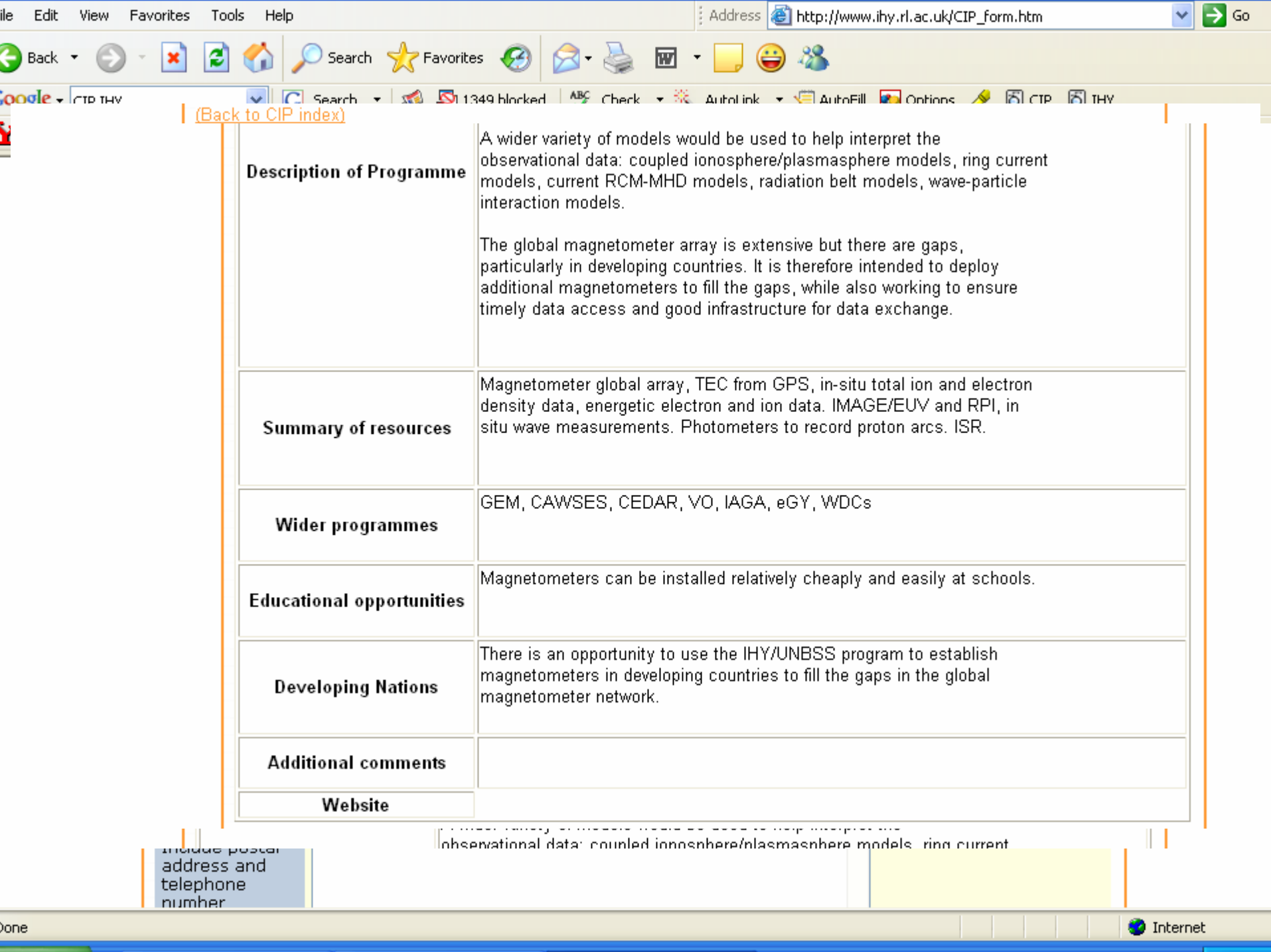
Publication of results



CIPs

- Richard Stamper (RAL) has developed CIP website
- Discipline planners in following categories have been appointed
 - Solar
 - Heliosphere
 - ITM
 - Magnetosphere
 - Climate
 - Heliobiology
- Develop final list of CIPs & begin scheduling the IHY campaigns for 2007-2008



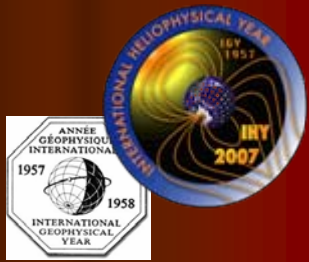


[\(Back to CIP index\)](#)

Description of Programme	<p>A wider variety of models would be used to help interpret the observational data: coupled ionosphere/plasmasphere models, ring current models, current RCM-MHD models, radiation belt models, wave-particle interaction models.</p> <p>The global magnetometer array is extensive but there are gaps, particularly in developing countries. It is therefore intended to deploy additional magnetometers to fill the gaps, while also working to ensure timely data access and good infrastructure for data exchange.</p>
Summary of resources	<p>Magnetometer global array, TEC from GPS, in-situ total ion and electron density data, energetic electron and ion data. IMAGE/EUV and RPI, in situ wave measurements. Photometers to record proton arcs. ISR.</p>
Wider programmes	<p>GEM, CAWSES, CEDAR, VO, IAGA, eGY, WDCs</p>
Educational opportunities	<p>Magnetometers can be installed relatively cheaply and easily at schools.</p>
Developing Nations	<p>There is an opportunity to use the IHY/UNBSS program to establish magnetometers in developing countries to fill the gaps in the global magnetometer network.</p>
Additional comments	
Website	

include postal address and telephone number

observational data: coupled ionosphere/plasmasphere models, ring current



IHY 2007

- Consolidates the 50 years of achievements in Space Science following the IGY 1957 into a knowledge base: Heliophysics
- Heliophysics is a new word coined to reflect the extension of Geophysics to the current physical scale of direct human investigation