



**Office for Outer Space Affairs**  
United Nations Office at Vienna



## **12th International Symposium on Equatorial Aeronomy**

**International Committee on  
Global Navigation Satellite Systems (ICG)**

***World-wide Ground-based Instrument Arrays***

**ICG Secretariat**

**United Nations Office for Outer Space Affairs**

18 – 24 May 2008  
Heraklion, Crete, Greece



## Outline of the Presentation

- ◆ UNCOPUOS, IHY2007, IYA2009
- ◆ UN/ESA/NASA/JAXA Workshops
- ◆ IHY Instrument Arrays
- ◆ Coordinated Investigation Programmes
- ◆ International Committee on GNSS (ICG) – *a forum to discuss Global Navigation Satellite Systems to benefit people around the world*



**Office for Outer Space Affairs**  
United Nations Office at Vienna



## **United Nations Committee on the Peaceful Uses of Outer Space**

- ◆ **UN (192 MS): UN General Assembly**
- ◆ **UNCOPUOS (69 MS): Scientific and Technical Subcommittee, Legal Subcommittee**
- ◆ **OOSA: Committee Service and Research Section, Space Applications Section**
  - ◆ **Programme of OOSA: space science, space technology, space law**
  - ◆ **Applications, education, training, research, policy making**
- ◆ **UNCOPUOS: three-year workplan 2006-2008 (extended to 2009), UN GA 60/99, 2005**



## **Action IHY 2007 Preparations started in 2004**

- ◆ **Session** of UNCOPUOS in 2004 called for addressing solar-terrestrial interaction: global climate, space weather, Sun-Earth-heliosphere-system
- ◆ **Workshop** on Distributed Arrays of Small Instruments, 8-9 June 2004, National Academies' Johnson Centre, Woods Hole, Massachusetts, USA

(Report published by The National Academies Press, Washington, D.C. 2004)

- ◆ **Meeting** between NASA and UNOOSA, 19-21 October 2004, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA

(Report on-line at <http://ihy2007.org/observatory/observatory.shtml>)

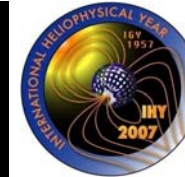


**Office for Outer Space Affairs**  
United Nations Office at Vienna



## International Heliophysical Year (IHY 2007)

- ♦ **Advancing understanding of the heliospherical processes that govern the Sun, Earth, and Heliosphere**
- ♦ **Demonstrating the beauty, relevance, and significance of space and Earth science to the world**
- ♦ **Continuing a tradition of international Collaboration on the 50th anniversary of IGY 1957**
- ♦ **IHY website: <http://ihy2007.org/>**
  - ♦ **International Advisory Committee, International Steering Committee, Regional Coordinators, National Coordinators, National Outreach Coordinators, IHY Secretariat**
- ♦ **UN/ESA/NASA/JAXA workshops: UAE 2005, India 2006, Japan 2007, Bulgaria 2008, South Korea 2009**
- ♦ **Regions: Africa, Asia and the Pacific, Latin America and the Caribbean, Western Asia, Europe**



## International Heliophysical Year (IHY 2007)

- ◆ **IHY Outreach**

- ◆ Workshop Reports (UN documents)
- ◆ Flyers
- ◆ Posters
- ◆ Brochures
- ◆ Booklets

- ◆ **IHY Follow-up Projects**

- ◆ Low-cost, ground-based world-wide instrument arrays
- ◆ ADS
- ◆ Virtual Observatories
- ◆ BSS TRIPOD → IHY TRIPOD
- ◆ GNSS on board of instrument arrays ?

**UN Basic Space Science Initiative for the International Heliophysical Year**

**What is IHY?**  
In 1957 a program of international research, inspired by the International Polar Years of 1957-59 and 1962-63, was organized by the International Geophysical Year (IGY) endorsed by the United Nations. Its main goal was to study the Earth and the Solar System. The IGY involved about 60,000 scientists from 65 nations, working at thousands of stations, both poles to poles to study atmospheric, geophysical, oceanic and space and marine. There has never been anything like that. The IGY anniversary of 50th will occur in 2007. We propose to organize an international program of scientific cooperation for the 50th year called the International Heliophysical Year (IHY) involving scientists and engineers from all 191 Member States of the United Nations, and all focus on the problem of solar variability and its connection to heliospheric effects in Earth and Space.

**What are the goals of IHY?**  
The objective of the year is to discover the physical mechanisms of solar activity which couple the atmosphere of the Earth to events that drive space from the heliosphere. The overall goal is to study the connection to the heliosphere of the Sun and to the heliosphere of the Sun and to the heliosphere of the Sun. The following objectives for the year:  
- To design a coordinated set of observations to study, at the largest scale, the solar-generated events which affect the atmosphere and space of Earth.  
- To document and report the observations and provide a forum for the development of new scientific results using these observations.  
- To foster international cooperation in the study of heliospheric phenomena now & in the future.  
- To communicate the unique scientific results of the IGY to the international scientific community and to all peoples of Earth.

**What does "Heliophysical" mean?**  
"Heliophysical" is an extension of the word "geophysical" meaning the connection from Earth to the Sun & interplanetary space. The IGY activities are listed in the minutes of the IGY 50th anniversary of the agency of space-time studies.

**Basic Space Science Initiative (BSSI)**  
The United States Science Mission for the International Heliophysical Year (IHY) is a major effort to study the Sun and its effects on Earth and the heliosphere. The Planning Team for the initiative has been meeting in October 2004. The main goal is to study the Sun and its effects on Earth and the heliosphere. The main goal is to study the Sun and its effects on Earth and the heliosphere. The main goal is to study the Sun and its effects on Earth and the heliosphere.

**UN Basic Space Science Initiative**  
UN Office for Outer Space Affairs  
PO Box 100, A-100 Vienna, Austria  
Phone: +43 1 260040  
Fax: +43 1 2600420  
E-mail: info@un.org  
http://www.un.org/unsd/ospa/

**IHY 2007**

البيان الدولي للبرنامج العلمي للفترة الدولية للهيليوفيزيائية 2007



## **BSS TRIPOD: Telescope, Observing, Teaching**

- ◆ **Government of Japan**
  - ◆ Japanese Cultural Grant Aid
  - ◆ 45 cm reflecting telescope
  - ◆ CCD & computer equipment
  - ◆ Building/ dome/ slide roof/ maintenance provided by local institution
  - ◆ Singapore 1987, Indonesia 1988, Thailand 1989, Sri Lanka 1995, Paraguay 1999, The Philippines 2000, Chile 2001, Mongolia?, India?
  
- ◆ **American Association of Variable Star Observers (AAVSO)**
  - ◆ Hands-on Astrophysics
  - ◆ Setting Up a Variable Star Observing Programme
  - ◆ Astronomy, mathematics, computer science
  
- ◆ **Astrophysics for University Physics Courses**





## **UNBSSI TRIPOD → IHY TRIPOD**

### **◆ UBBSSI TRIPOD**

- ◆ **Equipment: astronomical telescope**
- ◆ **Data taking and analysis: observing programmes**
- ◆ **Teaching: astrophysics for university physics courses**

### **◆ IHY TRIPOD**

- ◆ **Low-cost ground-based world-wide instrument arrays such as broad-band radio receivers (GPS TEC, scintillation, tomography, VLF)**
- ◆ **Passive radar (Intercepted signals from non-dedicated transmitters),**
- ◆ **Magnetospheric monitors (global, high-time-resolution magnetometers, radiometers),**
- ◆ **Active radio (digisonde, small radar),**
- ◆ **Optics (All-sky imagers, interferometers for neutral atmosphere dynamics),**
- ◆ **Radiometers and neutron monitors for particle fluxes, solar monitors, enhanced real-time communications and analysis**

### **◆ Coordinated Investigation Programmes in disciplines**

- ◆ **heliosphere and cosmic rays, solar, magnetospheres, ionized atmospheres, climate, astro/heliobiology**





## Low-cost ground-based world-wide instrument arrays

(A/AC.105/C.1/2008/CRP.6 of 14 February 2008 [STSC UNCOPUOS])

- ◆ **RENOIR** (Remote Equatorial Nighttime Observatory for Ionospheric Regions, USA)
- ◆ **SEVAN** (New type of particle detectors for space weather forecasting network, Armenia)
- ◆ **GPS** (Global Positioning System in Africa, France)
- ◆ **AMBER** (African Meridian B-Field Education and Research, USA)
- ◆ **AWESOME/SIDs** (Climate And Weather of the Sun-Earth System, USA)
- ◆ **CALLISTO** (Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and Transportable Observatory, Switzerland)
- ◆ **MAGDAS** (Magnetic Data Acquisition System, Japan)
- ◆ **SAVNET** (South Atlantic Very-low-frequency NETwork, Brazil)

In 2008 the total number of IHY instrument arrays is 17



**Office for Outer Space Affairs**  
United Nations Office at Vienna



## **IHY TRIPOD: Instrument Array, Data, Teaching**

- ◆ **Deploying inexpensive instruments around the world to make global measurements of ionospheric, magnetospheric, and heliospheric phenomena**
- ◆ **Partnership between instrument providers and instrument host nations**
- ◆ **Lead scientist/engineer provides instrumentation  
Host institution provides manpower, facilities, and operational support**
- ◆ **Data taking, sharing, analysis, publication**
- ◆ **Using data in teaching space science at university level**



## **IHY Coordinated Investigation Programmes (CIPs)**

- ◆ **Principle mechanism for coordinating scientific activities for IHY**
- ◆ **Researcher proposes programme for coordinated use of facilities, whether space-based or ground-based instruments, observatories, models or other supporting research activities**
- ◆ **Process for CIPs has three stages: Propose, Coordinate, Review**
- ◆ **Types of activities that can be carried out as CIPs:**
  - ◆ **Programmes of observations from multiple sites and/or multiple instruments**
  - ◆ **Workshops, etc.,**
  - ◆ **Coupling models of different regions/regimes, and**
  - ◆ **Coordinated or distributed data recovery or analysis**



## **IHY Coordinated Investigation Programmes (CIPs) (cont.)**

### **Instrument array / Number of CIPs**

- ◆ **RENOIR: none**
- ◆ **SEVAN: 56**
- ◆ **GPS: 2**
  
- ◆ **AMBER: 4, 45**
- ◆ **AWESOME: 64**
- ◆ **CALLISTO: none**
- ◆ **MAGDAS: 26**
- ◆ **SAVNET: 13**

**In 2008 the total number of CIPs is 71**

**International Heliophysical Year 2007 (IHY2007) to  
International Year of Astronomy 2009 (IYA 2009)  
UNGA 62/200 of 2007**



## **First Meeting of the ICG, UNOV, Vienna, Austria: 2006**

- ◆ **ICG Workplan**
  - ◆ **Compatibility and interoperability**
  - ◆ **Enhancement of performance of GNSS services**
  - ◆ **Information dissemination (UN OOSA)**
  - ◆ **Interaction with international organizations, national, and regional authorities**
  - ◆ **Coordination among service providers**
- ◆ **ICG Information Centres**
  - ◆ **UN-affiliated Regional Centres will act as the ICG Information Centres**

## **Second Meeting of the ICG, ISRO, Bangalore, India: 2007**

### **Providers' Forum**

- ◆ **Within the ICG is the Providers' Forum, consisting of those countries (United States, Russian Federation, European Community, China, India, Japan) operating GNSS systems or with plans to develop one. The Forum provides a venue for coordination and cooperation to improve overall service provision**

## **Third Meeting of the ICG: JPL, Pasadena, USA, December 2008**

## **Fourth Meeting of the ICG: Roscosmos, Russian Federation, 2009**



**Office for Outer Space Affairs**  
United Nations Office at Vienna



**ICG** International Committee on  
Global Navigation Satellite Systems

## **ICG Membership: Members, Associate Members and Observers**

- ◆ 9 nations and the European Community
- ◆ 15 organizations ( UN system entities, IGOs, NGOs)

**ICG participation is open to all countries and entities that are either GNSS providers or users of GNSS services, and are interested and willing to actively engage in ICG activities**

## **Promoting the use of GNSS technologies**

- ◆ UN/Colombia Workshop on the applications of GNSS, 23-27 June, Medellin, Colombia
- ◆ International Workshop on GPS applications, ISEA, 18–24 May, Crete, Greece
- ◆ International Training Course on Satellite Navigation and Location Based Services, CSSTEAP, 18 June-18 July, Ahmedabad, India
- ◆ Combined AFREF, Africa Array, IHY, AMMA-GPS Meeting, 17–19 June, Johannesburg, South Africa, Session on Coordinating GPS and "Geo" instrumentation in Africa
- ◆ ICG Expert Meeting on GNSS systems and services, COSPAR, 15 July, Montreal, Canada



**Office for Outer Space Affairs**  
United Nations Office at Vienna



**Office for Outer Space Affairs, United Nations Office at Vienna**

**Website: [www.icgsecretariat.org](http://www.icgsecretariat.org)**

**Email: [oosa@unvienna.org](mailto:oosa@unvienna.org)**