
COMMITTEE ON THE PEACEFUL USES OF
OUTER SPACE

Scientific and Technical Subcommittee

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Agenda item 4

General exchange of views

Note by the Secretariat

The present document contains information submitted by the International Astronomical Union on its activities and views with regard to the issues considered by the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space.



Information
presented by the International Astronomical Union
to the Scientific and Technical Subcommittee
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NEAR EARTH OBJECTS

The issue of forecasting and potentially mitigating future impacts of asteroids on Earth has been before this Subcommittee repeatedly in the past. In recent years, there has been an increasing awareness of the hazard posed by Near-Earth objects (NEOs) to the Earth and its inhabitants.

NEOs can be asteroids or comets, whose motions can bring them into the Earth's neighbourhood. Planetary perturbations cause small changes to orbits and, if the initial orbit is well-determined, the future behaviour can be calculated and future collisions predicted. Thus, the initial goal of the Spaceguard project in 1992 was to discover, and obtain orbits of, 90% of all NEOs greater than 1 km. Excellent progress has been made towards achieving this goal.

The IAU is not directly involved in any search program, though of course individual members of the Union are. However, to be valuable, the orbital data for all discoveries have to be verified, confirmed and catalogued. It is on this aspect that the IAU plays a vital role. When an NEO is discovered, the information is sent to the IAU Minor Planet Center (MPC) at the Smithsonian Astrophysical Observatory in Cambridge, MA, USA. This information must give the position of the body in the sky and the time for each observation made. The NEO orbit that is made public comes from calculations made at the MPC.

Naturally, NEOs are far easier to detect when close to the Earth and thus appear to move very fast against the background, and, unless additional observations are obtained very quickly, the body may be lost. In this event, the MPC may become proactive and solicit observations from known observers, or release a preliminary orbit, so that other observers can conduct a search for it. Sometimes it is found in archival records. At the completion of this process the object and its orbit are then archived by the MPC, and the orbit improved when new observations emerge.

This is a big task that is increasing with time. For example in the mid-nineties, about 20 Apollo-type asteroids per year were recorded. By the turn of the century, this had increased to 150 per year, and the current number is 300 per year, while this family represents only a small fraction of the total number of discoveries. Archiving and updating the data is an area that needs serious international consideration, and coordination by the IAU.

PRESERVATION OF THE SPACE ENVIRONMENT: PROTECTION OF ASTRONOMICAL OBSERVATIONS.

The concern of international astronomy for the preservation of the space environment is well known to this Subcommittee, and the IAU appreciates the attention it gives to all aspects of this problem.

Light pollution is a growing concern for astronomers and all human beings alike. Man-made orbital debris is a significant issue for all people on Earth on a roughly 50-year timescale, as natural twilight and dawn will brighten from reflected sunlight. "Advances" in lighting technology become an issue on a 10-year timescale unless attitudes can be changed. Laser communications become an issue for astronomy on a 5-10 year timescale. Light pollution is a world-wide problem, involving literally billions of dollars per year worth of precious light energy wasted uselessly into the sky and space, while gradually removing mankind's view of the stars. As a result, a large fraction of the world population can no longer see the Milky Way from their homes and observational astronomy is suffering enormously from this man-made phenomenon.

Active measures by the IAU aimed at preserving observing conditions for ground-based observatories are covered at the web pages of IAU Commission 50 on "Protection of Existing and Potential Observatory Sites", notably its Working Group for "Controlling Light Pollution", those of the International Dark-Sky Association (IDA), and those of the Scientific Committee on Problems of the Environment (SCOPE). It is gratifying to see awareness and progress in measures by local authorities at some major observatory sites:

Chile: Much progress has recently been made in the application of the so-called "Decreto Supremo 686", which is the legal norm that controls the outdoor lighting in the 2nd, 3rd, and 4th regions of northern Chile, where major astronomical observatories are located. DS686 was promulgated in 1998 and became a law in 1999, with a grace period of five years for commercial and private outdoor lighting, and six years for public lighting. In October 2005 that period ran out and, in principle, all outdoor lightings should now comply with this legislation. In practice, about 70% of all fixtures have now been replaced by units that comply with the present legislation.

Argentina: In Malargue, in the south of the province of Mendoza, an ordinance was adopted on April 14, 2005, to protect the sky from pollution.

Spain: Since 1988 the "Ley del Cielo" (Law of Heavens) protects the astronomical observatories on the Canary Islands from excess light pollution. In April 2005, the autonomous government of the Balearic Islands approved the law "Protection against light pollution" with the stated aims of: (i) maintaining as much as possible the natural night time environment; (ii) to promote energy efficient street lighting; (iii) to avoid obtrusive light in the domestic environment; and (iv) to prevent and reduce the negative effects of light pollution on the view of the night sky. The autonomous governments of Andalucia, Cantabria, and Cataluna are working on similar legislation.

United Kingdom: UK now has legislation that makes light pollution a "Statutory Nuisance", bringing it into the same category as other accepted nuisances, such as noise and chemical pollution. The UK-based Institution of Lighting Engineers (ILE) has updated its "Guidance Notes for the Reduction of Obtrusive Light 2005".

United States of America: A high-resolution night-time image of the island of Hawaii was obtained by astronaut Ed Lu on the International Space Station (ISS). This image has allowed the major light sources on the Big Island to be identified, and allowed quantitative measures of the amount of light emitted at all locations across the island. The brightest sources of light included airports, ports, and car sales areas. Efforts are underway at the Federal, State and County level to improve shielding of lights on the island of Hawaii.

The radio spectrum is a finite, and increasingly precious, resource for astronomical and space research. In order to obtain data of sufficiently high quality, observations must be free of harmful interference, such as RFI, emitted by other radio spectrum users. In order to attain this goal, regulatory protection measures, such as limits on RFI emission levels, need to be determined and introduced into legislation.

The organization that represents the requirements of the worldwide astronomical community in these regulatory matters is the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (IUCAF), which is an interdisciplinary committee of the International Council for Science (ICSU). The IAU, together with COSPAR and the International Union of Radio Science (URSI) are its sponsoring scientific Unions. IUCAF is active at different levels: local, national, regional and global, notably within the International Telecommunication Union (ITU) and the Space Frequencies Coordination Group (SFCG).

Current issues within the brief of IUCAF, that are of particular interest within the COPUOS framework, are the protection of astronomical observations at optical and infrared wavelengths from space-born communication lasers, the protection of astronomical observations at radio wavelengths from space, and the protection of the Shielded Zone of the Moon, the ultimate quiet zone for radio astronomy.

EDUCATION AND CAPACITY BUILDING

Education and capacity building are a high priority for the IAU and IAU supports the work of Action Team 17, led by Japan, with enthusiasm. The IAU is also pleased to continue its co-sponsoring of the series of successful educational workshops in Basic Space Science organized by COSPAR, in addition to its own range of educational initiatives.

THE INTERNATIONAL HELIOPHYSICAL YEAR - 2007 (IHY-2007), AND THE IAU

The International Heliophysical Year (IHY) is an international program of scientific research and collaboration to understand the external drivers of the space environment and climate, being organized for the time period centred on 2007: the 50th anniversary of the International Geophysical Year. The IHY will involve utilizing the existing assets from space and ground as a distributed Great Observatory, the deployment of new instrumentation, new observations from the ground and in space, and public education.

The IHY is being organized through science working groups that coordinate analysis and modelling efforts, and are responsible for planning IHY meetings, symposia and

workshops through three major thrusts: scientific observing campaigns known as the Coordinated Investigation Programs (CIPs), data analysis workshops, scientific meetings and publications, and public outreach. The IHY Secretariat, in Washington, D.C., USA, provides international coordination, produces newsletters, maintains the IHY website at <www.ihy2007.org/>, writes articles, coordinates media affairs, and develops outreach products.

Within the IAU, coordination of IHY activities is under IAU Division II on “Sun and Heliosphere”. Dr. David Webb, current President of IAU Division II, is also the IAU representative to the IHY. Prof. Hans J. Haubold of the UN Office for Outer Space Affairs is leading the IHY effort for the United Nations under the auspices of UN-COPUOS and the UN Basic Space Science (UN-BSS) program.

At the 42nd session of this Subcommittee, February 2005, the IAU expressed in its statement support for the IHY program and for proclaiming 2007 as the International Geophysical and Heliophysical Year.

In the ensuing year much progress has been made in planning for IHY activities. Internationally, planning for the IHY is organized into seven regions: North America, South America, Africa, Europe, Western Asia, Russian Federation, and Asia-Pacific. Each of these regions has formed a regional planning committee to coordinate regional IHY participation.

Representatives from each of these regions met in Toulouse, France, in July 2005 to begin the joint planning process. The second North American planning meeting was held in Boulder, CO, USA, in February 2005. The European region had its first planning meeting in Paris, France, in January 2006. The Balkan region will have a planning meeting in Turkey in Spring 2006. The Asia-Pacific regional meeting will be held in Beijing, China, in October 2006.

A key aspect of the IHY program is the cooperative initiative with the UN-BSS program. Through this program the IHY is planning to deploy arrays of small instruments to make global measurements. The program provides meaningful participation for developing nations and facilitates contacts between the instrument providers and university groups from potential host nations. The UN-BSS program has a 3-year work plan through 2008, approved by UN-COPUOS and the UN General Assembly, that is providing the IHY links to developing nations. The program has already facilitated over 2000 scientist contacts in almost 200 countries, many of which are eager to participate in international space science activities.

Some of these instrument concepts are mature and ready to be deployed, such as a network of radio telescopes to observe CME-related radio bursts, chains of magnetometer arrays to observe magnetic activity, and hundreds of GPS receivers to observe the ionosphere. These concepts were discussed at the UN/ESA/NASA/UAE Workshop on the International Heliophysical Year IHY-2007, November 20-23, 2005, in Abu Dhabi and Al-Ain, United Arab Emirates. That Workshop brought together instrument providers and interested IHY participants to discuss facilities and requirements for each of ten instrument concepts that were selected. The IAU was pleased to co-sponsor that Workshop.

The IAU and IHY are involved in using the upcoming March 29, 2006, total solar eclipse for astronomical and IHY scientific and outreach activities. The path of the eclipse starts in Brasil, passes through North-Central Africa, then into Turkey, Georgia, and Russia, before ending in Mongolia. Planned activities include establishing viewing centers in each country along the path of totality via the IHY coordinator for that country, providing each viewing center with eclipse kits, consisting of posters, eye glasses, and eclipse literature, establishing networks among expeditions to share images, movies, and webcasts, and establishing an IHY eclipse web site. The IAU activities on solar eclipses are coordinated through its Division II Working Group on “Solar Eclipses” with its website <www.totalsolareclipse.net>. Its tasks are to coordinate eclipse efforts, particularly making liaisons with customs and other officials of countries through which the path of totality passes; and to provide educational information about the safe observation of the eclipse for the wide areas where the total or partial eclipse will be visible.

The IAU is sponsoring several scientific eclipse expeditions, and its IAU Symposium No. 233 on “Solar Activity and its Magnetic Origin” <www.iaus233.edu.eg/>, in Cairo March 31 - April 4, 2006, just after the eclipse. Affiliated with this meeting are a conference on Culture and Astronomy in 2006 on March 26, a training course for young astronomers, and various local outreach activities related to the meeting and the eclipse.

In addition, the IHY program will be discussed at the IAU General Assembly in Prague, Czech Republic, August 14-25, 2006, in two fora: in a Special Session on Astronomy for the Developing World, August 21-22; and in a meeting of the IAU Division II Working Group on International Collaboration on Space Weather, August 24, that will focus on IHY and planning of European and other regional IHY activities.

THE INTERNATIONAL YEAR OF ASTRONOMY - 2009 (IAY-2009), AND THE IAU

At the IAU General Assembly in Sydney, Australia, July 2003, the IAU voted unanimously in favour of a resolution asking the UN to declare the year 2009 as the International Year of Astronomy. This in recognition of the Italian astronomer, physicist and philosopher Galileo Galilei (1564 - 1642), who introduced in 1609 the astronomical telescope. A proclamation was subsequently prepared by the IAU Working Group “2009: Year of Astronomy” and forwarded to the UNESCO Executive Board in 2005.

In October 2005, the UNESCO General Conference recommended to the UN that the UN General Assembly in its 60th session adopts a resolution declaring 2009 as the International Year of Astronomy. In its recommendations to the UN, the General Conference of UNESCO recognizes “... that the study of the universe has led to numerous scientific discoveries that have great influence not only on humankind's understanding of the universe, but also on the technological, social and economic development of society ...”, and “... that astronomy proves to have great implications in the study of science, philosophy, religion and culture ...”.

The IAU is seeking further support from ICSU and its union members in this respect, as well as from national astronomical societies. The IAU hopes and believes that by declaring 2009 the International Year of Astronomy, universities, schools, museums, observatories, societies, and others will be encouraged to increase their efforts to reach the public, especially young people, and to enthuse them about astronomy in particular, and about science in general.

In anticipation of the desired adoption of the declaration by the UN, the IAU will coordinate its continued planning of this important event through its Working Group “2009: Year of Astronomy”, with assistance of its Working Group on “Communication with the Public”, and in close consultation with historians and educators within the IAU.

CONCLUSION

The IAU is gratified to acknowledge the progress which is being made on several issues that are high on the priority list of astronomers worldwide, but also emphasizes its concern in the fields expressed above, both for the sake of our science and for that of the world in which our descendants will live. This Subcommittee, and other international bodies such as the Organisation for Economic Co-operation and Development (OECD), the International Telecommunication Union (ITU), and ICSU, are contributing to this progress within their respective fields. It will help us all, if Delegates would call the attention of their Governments to this spectrum of parallel activities, and to the value of establishing synergy between them.