Extended Text for use in Journals:

EXPLANATIONS

This Calendar continues the series begun for the IGY years 1957-58, and is issued annually to recommend dates for solar and geophysical observations, which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to World Data Centers (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Space Environment Service (ISES) with the advice of spokesmen for the various scientific disciplines. For some programs, greater detail concerning recommendations appears from time to time published in IAGA News, IUGG Chronicle, URSI Information Bulletin and other scientific journals or newsletters. For on-line information, see http://www.ises-spaceweather.org.

The definitions of the designated days remain as described on previous Calendars. Universal Time (UT) is the standard time for all world days. Regular Geophysical Days (RGD) are each Wednesday. Regular World Days (RWD) are three consecutive days each month (always Tuesday, Wednesday and Thursday near the middle of the month). Priority Regular World Days (PRWD) are the RWD which fall on Wednesdays. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the World Geophysical Intervals (WGI). The WGI are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 2004 the WGI are March, June, September and December.

The Solar Eclipses are:

Unusually, 2004 has no total or annular eclipses of the Sun.

- **19 April 2004 (partial) eclipse** will be visible from the southern part of Africa and from the coast of Antarctica facing it. The peak coverage of 75% will occur in the ocean off Antarctica. Cape Town, South Africa, will have a 60% eclipse, and the partiality will diminish to zero at a line going across the northern coast of Angola and the northeastern tip of Madagascar
- **14 October 2004 (partial) eclipse** will be visible in northeastern Asia and the northern Pacific Ocean. The eclipse will also be visible in western Alaska, and the point of greatest partiality, 93% coverage, occurs in Alaska at the terminator. The limit of 0% coverage slices across Asia from northern Siberia to the southwest through mid-Mongolia, and passes the southern tips of Korea and Japan. Tokyo will have about 20% coverage and Seoul about 10% coverage. The limit of 0% coverage extends as far south as the equator near the International Dateline. The top of the Kamchatka Peninsula will see about 80% coverage.

Observers should take note of the transit of Venus across the face of the Sun on June 8, 2004. It will be the first transit of Venus visible from Earth since 1882.

Description by Dr. Jay Pasachoff, Williams College, Chair of IAU WG on Solar Eclipses, jmp@williams.edu, based on maps from Fred Espenak, NASA GSFC.

Web Sites: http://sunearth.gsfc.nasa.gov/eclipse/SEcat/SEdecade2001.html
International Astronomical Union Working Group on Eclipses:
http://www.williams.edu/Astronomy/IAU_eclipses

International Astronomical Union Program Group on Public Education at the Times of Eclipses: http://www.eclipses.info

References:

o Fred Espenak, Fifty Year Canon of Solar Eclipses: 1986-2035, NASA Reference Publication 1178 Revised, July 1987.
o Leon Golub and Jay M. Pasachoff, The Solar Corona, Cambridge University Press, 1998. http://www.williams.edu/Astronomy/corona
o Jay M. Pasachoff and Alex Filippenko, The Cosmos: Astronomy in the New Millennium, Brooks/Cole Publishers, 2004. http://info.brookscole.com/pasachoff
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o Leon Golub and Jay M. Pasachoff, Nearest Star: The Exciting Science of Our Sun, Harvard University Press, 2001. http://www.williams.edu/astronomy/neareststar
o Jay M. Pasachoff, The Complete Idiot's Guide to the Sun, Alpha Books, 2003

Meteor Showers (selected by R. Hawkes, Mount Allison Univ, Canada, rhawkes@mta.ca) include the most prominent regular showers. The dates (based on UT) for Northern Hemisphere meteor showers are: Jan 4 (Quadrantid); Apr 21-23 (Lyrid); May 4-5 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Aug 11-13 (Perseid); Oct 21-22 (Orionid); Dec 13-15 (Geminid); Dec 21-23, 2004 (Ursid). The dates for Southern Hemisphere meteor showers are: May 4-5 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Jul 27-Aug 2 (S. Delta-Aquarid, Alpha-Aurigid); Oct 21-22 (Orionid); and Dec 13-15, 2004 (Geminid).

The occurrence of *unusual solar or geophysical conditions* is announced or forecast by the ISES through various types of geophysical *"Alerts"* (which are widely distributed by telegram and radio broadcast on a current schedule). Stratospheric warmings (STRATWARM) are also designated. The meteorological telecommunications network coordinated by WMO carries these worldwide Alerts once daily soon after 0400 UT. For definitions of Alerts see ISES "Synoptic Codes for Solar and Geophysical Data", March 1990 and its amendments (http://ises-spaceweather.org). Retrospective World Intervals are selected and announced by MONSEE and elsewhere to provide additional analyzed data for particular events studied in the ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) programs.

RECOMMENDED SCIENTIFIC PROGRAMS

FINAL EDITION

(The following material was reviewed in 2003 by spokesmen of IAGA, WMO and URSI as suitable for coordinated geophysical programs in 2004.)

Airglow and Aurora Phenomena. Airglow and auroral observatories operate with their full capacity around the New Moon periods. However, for progress in understanding the mechanism of many phenomena, such as low latitude aurora, the coordinated use of all available techniques, optical and radio, from the ground and in space is required. Thus, for the airglow and aurora 7-day periods on the Calendar, ionosonde, incoherent scatter, special satellite or balloon observations, etc., are especially encouraged. Periods of approximately one weeks' duration centered on the New Moon are proposed for high resolution of ionospheric, auroral and magnetospheric observations at high latitudes during northern winter.

Atmospheric Electricity. Non-continuous measurements and data reduction for continuous measurements of atmospheric electric current density, field, conductivities, space charges, ion number densities, ionosphere potentials, condensation nuclei, etc.; both at ground as well as with radiosondes, aircraft, rockets; should be done with first priority on the RGD each Wednesday, beginning on 7 January 2004 at 0000 UT, 14 January at 0600 UT, 21 January at 1200 UT, 28 January at 1800 UT, etc. (beginning hour shifts six hours each week, but is always on Wednesday). Minimum program is at the same time on PRWD beginning with 21 January at 1200 UT. Data reduction for continuous measurements should be extended, if possible, to cover at least the full RGD including, in addition, at least 6 hours prior to indicated beginning time. Measurements prohibited by bad weather should be done 24 hours later. Results on sferics and ELF are wanted with first priority for the same hours, short-period measurements centered around the minutes 35-50 of the hours indicated. Priority Weeks are the weeks that contain a PRWD; minimum priority weeks are the ones with a QWD. The World Data Centre for Atmospheric Electricity, 7 Karbysheva, St. Petersburg 194018, USSR, is the collection point for data and information on measurements.

Geomagnetic Phenomena. It has always been a leading principle for geomagnetic observatories that operations should be as continuous as possible and the great majority of stations undertake the same program without regard to the Calendar.

Stations equipped for making magnetic observations, but which cannot carry out such observations and reductions on a continuous schedule are encouraged to carry out such work at least on RWD (and during times of MAGSTORM Alert).

Ionospheric Phenomena. Special attention is continuing on particular events that cannot be forecast in advance with reasonable certainty. These will be identified by Retrospective World Intervals. The importance of obtaining full observational coverage is therefore stressed even if it is possible to analyze the detailed data only for the chosen events. In the case of vertical incidence sounding, the need to obtain quarter-hourly ionograms at as many stations as possible is particularly stressed and takes priority over recommendation (a) below when both are not practical.

For the **vertical incidence (VI) sounding program**, the summary recommendations are:
(a) All stations should make soundings on the hour and every quarter hour;
(b) On RWDs, ionogram soundings should be made at least every quarter hour and preferably every five minutes or more frequently, particularly at high latitudes;
(c) All stations are encouraged to make f-plots on RWDs; f-plots should be made for high latitude stations, and for so-called "representative" stations at lower latitudes for all days (i.e., including RWDs and WGIs) (Continuous records of ionospheric parameters are acceptable in place of f-plots at temperate and low latitude stations);
(d) Copies of all ionogram scaled parameters, in digital form if possible, be sent to WDCs; (e) Stations in the eclipse zone and its conjugate area should take continuous observations on solar eclipse days and special observations on adjacent days. See also recommendations under Airglow and Aurora Phenomena.

For the **incoherent scatter observation program**, every effort should be made to obtain measurements at least on the Incoherent Scatter Coordinated Observation Days, and intensive series should be attempted whenever possible in WGIs, on Dark Moon Geophysical Days (DMGD) or the Airglow and Aurora Periods. The need for collateral VI observations with not more than quarter-hourly spacing at least during all observation periods is stressed. Special programs include:
C/NOFS – Communications/Navigation Outage Forecasting System – to forecast ionospheric irregularities that adversely impact communication and navigation systems (O. delaBeaujardiere – Odile.delaBeaujardiere@hanscom.af.mil);
CPEA – Coupling Processes in the Equatorial Atmosphere, from troposphere through thermosphere and ionosphere, especially centered around Indonesian Equatorial Atmospheric Radar (EAR) (S. Fukao – fukao@kurasc.kyoto-u.ac.jp)
See http://www.kurasc.kyoto-u.ac.jp/~yamamoto/CPEA-panf2.pdf
LTCS -- Lower Thermosphere Coupling Study – tidal structures in winds and temperatures during declining phase of solar activity (L. Goncharenko – lpg@haystack.mit.edu);
M-I Coupling – Magnetosphere-Ionosphere Coupling: Storm and Substorm Effects on Middle- and Low Latitude Ionosphere (C. Huang – cshuang@haystack.mit.edu);
MST – Coordinated D- and E-region campaigns focusing on lower altitudes, with JRO in high resolution MST mode – gravity wave momentum fluxes (J. Chao – chau@jro.igp.gob.pe);
Synoptic – Wide coverage of the F-region, augmented with topside or E-region measurements – broad latitudinal coverage (W. Swartz – wes@ece.cornell.edu).
Special programs: Dr. Wesley E. Swartz, 316 Rhodes Hall, School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853 USA. Tel. 607-255-7120; Fax 607-255-6236; e-mail: wes@ece.cornell.edu; URSI Working Group G.5.
See http://people.ece.cornell.edu/wes/URSI_ISWG/2004WDschedule.htm for complete definitions.

For the ionospheric drift or wind measurement by the various radio techniques, observations are recommended to be concentrated on the weeks including RWDs.

For traveling ionosphere disturbances, propose special periods for coordinated measurements of gravity waves induced by magnetospheric activity, probably on selected PRWD and RWD.

For the ionospheric absorption program half-hourly observations are made at least on all RWDs and half-hourly tabulations sent to WDCs. Observations should be continuous on solar eclipse days for stations in eclipse zone and in its conjugate area. Special efforts should be made to obtain daily absorption measurements at temperate latitude stations during the period of Absorption Winter Anomaly, particularly on days of abnormally high or abnormally low absorption (approximately October-March, Northern Hemisphere; April-September, Southern Hemisphere).

For back-scatter and forward scatter programs, observations should be made and analyzed at least on all RWDs.

For synoptic observations of mesospheric (D region) electron densities, several groups have agreed on using the RGD for the hours around noon.

For ELF noise measurements involving the earth-ionosphere cavity resonances any special effort should be concentrated during the WGIs.

It is recommended that more intensive observations in all programs be considered on days of unusual meteor activity.

Meteorology. Particular efforts should be made to carry out an intensified program on the RGD -- each Wednesday, UT. A desirable goal would be the scheduling of meteorological rocketsondes, ozone sondes and radiometer sondes on these days, together with maximum-altitude rawinsonde ascents at both 0000 and 1200 UT.

During **WGI and STRATWARM Alert Intervals**, intensified programs are also desirable, preferably by the implementation of RGD-type programs (see above) on Mondays and Fridays, as well as on Wednesdays.

Global Atmosphere Watch (GAW). The World Meteorological Organizations (WMO) GAW integrates many monitoring and research activities involving measurement of atmospheric composition. Serves as an early warning system to detect further changes in atmospheric concentrations of greenhouse gases, changes in the ozone layer and in the long range transport of pollutants, including acidity and toxicity of rain as well as of atmospheric burden of aerosols (dirt and dust particles). Contact WMO, 7 bis avenue de la Paix, P.O. Box 2300, 1211 Geneva, Switzerland.

Solar Phenomena. Observatories making specialized studies of solar phenomena, particularly using new or complex techniques, such that continuous observation or reporting is impractical, are requested to make special efforts to provide to WDCs data for solar eclipse days, RWDs and during PROTON/FLARE ALERTS. The attention of those recording solar noise spectra, solar magnetic fields and doing specialized optical studies is particularly drawn to this recommendation.

CAWSES (Climate and Weather of the Sun-Earth System). Program within the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics): 2004-2008. Its focus is to mobilize the community to fully utilize past, present, and future data; and to produce improvements in space weather forecasting, the design of space- and Earth-based technological systems, and understanding the role of solar-terrestrial influences on Global Change. Contact is Su. Basu (sbasu@bu.edu), Chair of CAWSES Science Steering Group. Program "theme" areas are: Solar Influence on Climate – M. Lockwood (UK); Space Weather: Science and Applications – J. Kozyra (USA) and K. Shibata (Japan); Atmospheric Coupling Processes – F. Luebken (Germany); Space Climatology – C. Frolich (Switzerland) and J. Sojka (USA); and Capacity Building and Education, M.A. Geller (USA). In 2004 CAWSES is supporting a period of encouraged observations during CPEA, a multi-national, mainly equatorial observing program between Japan and Indonesia. CAWSES encourages ground-based, ship, air, and balloon observations at all latitudes and longitudes possible during the CPEA period so as to have a global complementary database emerge from the international efforts. See http://www.ngdc.noaa.gov/stp/SCOSTEP/CAWSESDraft.html.

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy. Experimenters should take into account that observational effort in other disciplines tends to be intensified on the days marked on the Calendar, and schedule balloon and rocket experiments accordingly if there are no other geophysical reasons for choice. In particular it is desirable to make rocket measurements of ionospheric characteristics on the same day at as many locations as possible; where feasible, experimenters should endeavor to launch rockets to monitor at least normal conditions on the Quarterly World Days (QWD) or on RWDs, since these are also days when there will be maximum support from ground observations. Also, special efforts should be made to assure recording of telemetry on QWD and Airglow and Aurora Periods of experiments on satellites and of experiments on spacecraft in orbit around the Sun.

The **International Space Environment Service (ISES)** is a permanent scientific service of the International Union of Radio Science (URSI), with the participation of the International Astronomical Union and the International Union Geodesy and Geophysics. ISES adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of the International Council of Scientific Unions (ICSU). The ISES coordinates the international aspects of the world days program and rapid data interchange.

This Calendar for 2004 has been drawn up by H.E. Coffey, of the ISES Steering Committee, in association with spokesmen for the various scientific disciplines in SCOSTEP, IAGA and URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications. PDF versions of the past calendars are available online at ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/IGC_CALENDAR.

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Additional copies are available upon request to ISES Chairman, Dr. David Boteler, Geological Survey of Canada, National Geomagnetism Program, #7 Observatory Crescent, Ottawa, Ontario, Canada, K1A 0Y3, FAX (613)824-9803, e-mail Boteler@geolab.NRCan.gc.ca, or ISES Secretary for World Days, Ms. H.E. Coffey, WDC for Solar-Terrestrial Physics, Boulder, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80305, USA FAX number (303)497-6513; e-mail Helen.E.Coffey@noaa.gov.

The calendar is available on-line at http://www.ises-spaceweather.org.