2015 International Geophysical Calendar (FINAL)

Cooperative programs pertaining to solar activity and the Earth's environment

Go to the ftp site for past calendars.

The International Geophysical Calendar contains information about:

- 2015 Solar Eclipses
- 2015 Meteor Showers

and recommended scientific programs for

- Airglow and Aurora Phenomena
- Atmospheric Electricity
- Geomagnetic Phenomena
- Ionospheric Phenomena
- Vertical Incidence sounding program
- Incoherent Scatter observation program
- Meteorology
- Global Atmosphere Watch (GAW)
- Solar Phenomena
- Variability of the Sun and Its Terrestrial Impact (VarSITI)
- Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy
- Meteor Showers

2015 FINAL Calendar -- PDF version

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.

The Calendar provides links to many international programs, giving an opportunity for scientists to become involved with data monitoring and research efforts. International scientists are

encouraged to contact the key people and join the worldwide community effort to understand the Sun-Earth environment.

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. World Geophysical Intervals (WGI) are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 2015 the WGI are February, May, August, and November. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the WGI.

The 2015 FINAL Calendar is available in PDF format.

2015 Solar Eclipses:

There will be a total solar eclipse visible only in the Arctic, with partial phases throughout Europe, on 20 March 2015, and a partial solar eclipse visible only in Antarctica and southernmost Africa on 13 September 2015. Maps are accessible through http://www.eclipses.info, the site for the International Astronomical Union's Working Group on Eclipses.

a. **20 March 2015**. A total solar eclipse will start over the northern Atlantic Ocean and proceed north, passing first the Faroe Islands, an autonomous country within Denmark, and then the Svalbard Archipelago, which is controlled by Norway under a 1920 treaty. In the Faroes, which are at the eastern edge of totality, the eclipse will last about 2 m 15 s centered at 9:42 UTC at an altitude of about 20°. The path will be 443 km wide and the Moon will subtend an angle 4% larger than that of the Sun. Iceland will be to the west of the path by about 100 km at its closest point, with 97% of the solar diameter covered at Reykjavik. On the Spitsbergen island of Svalbard, the eclipse will last about 2 m 23 s at an altitude of about 11° but with slightly better weather statistics based on past satellite imaging (available from meteorologist Jay Anderson at http://eclipser.ca). The eclipse will be centered at 10:12 UTC; the path width at that time will be 407 km. The partial phases will be visible throughout Europe as well as from the western half of Asia and northwestern Africa. London will have an 87% eclipse, Paris an 80% eclipse centered at 9:30 UTC in the midst of 2 h 18 min of partials, and Moscow a 65% eclipse at the midst of 2 h 50 m of partials centered on 10:20 UTC. In Africa and extending eastward, the southern limit of the partial eclipse will extend from Guinea on the west through Burkina Faso, southern Nigeria, northern Chad, the midst of Egypt, northern Saudi Arabia, mid-Iraq, northern Iran, southern Turkmenistan, southern Uzbekistan, southern Kyrgyzstan, extreme northwestern China, and western Mongolia. On the western limit, the eclipse will be barely visible in easternmost Newfoundland and Labrador and on St. Pierre et Miquelon.
    - Map of total solar eclipse 20 March 2015 (by Fred Espenak)
    - Interactive Google map of total solar eclipse 20 March 2015 (by Xavier Jubier)

b. **13 September 2015**. A partial eclipse will be visible, with up to 78% coverage, from the side of Antarctica facing northward toward Africa and Asia over to Australia. Only southernmost Africa will see partial phases other than those visible from Antarctica. At 5:43 UTC, 42% of the solar diameter will be covered as seen from Cape Town, South Africa, in the midst of 2 h 5 m of partial phases, at an altitude of 10° in the east. Gabarone, Botswana will have 23% coverage; Windhoek, Namibia, 19% coverage; Harare, Zimbabwe 7% coverage; Lusaka, Zambia, only 2% coverage; and minimal coverage in southernmost Malawi, Mozambique, and Madagascar. The northern limit passes through Reunion Island; Mauritius is north of the limit. The French Southern & Antarctic Lands as well as Heard Island & McDonald Islands will have about 40% coverage with the sun 32° high in the sky. Also in mid-Ocean, Marion Island and Prince Edward Island have about 56% coverage at an altitufde of 25°.
    - Map of partial solar eclipse 13 September 2015 (by Fred Espenak)
    - Interactive Google map of partial solar eclipse 13 September 2015 (by Xavier Jubier)

We thank Fred Espenak (Arizona) and Xavier Jubier (Paris) for their data and maps. Espenak's new *Thousand Year Canon of Solar Eclipses 1501 to 2500* is available from www.astropixels.com/pubs, and is the successor to earlier Canons and the NASA website that he ran. It and other work of Espenak, much of it formerly on the NASA website, is now available at www.EclipseWise.com.

Information assembled by Jay M. Pasachoff, Williams College (Williamstown, Massachusetts), Chair, International Astronomical Union's Working Group on Eclipses, with thanks to Fred Espenak (Arizona; NASA's Goddard Space Flight Center, ret.) and Xavier Jubier (Paris) for their data and maps.

- **Eclipse References:**
    - Fred Espenak, Thousand Year Canon of Solar Eclipses 1501 to 2500, 2014 (ISBN-10: 194 1983006); www.astropixels.com/pubs
    - Fred Espenak, Five Millennium Canon of Solar Eclipses: -1999 to +3000, 2006 (NASA/TP-2006-214141); http://eclipse.gsfc.nasa.gov; http://eclipse.gsfc.nasa.gov/OH/OH2014.html
    - Leon Golub and Jay M. Pasachoff, The Solar Corona, 2nd ed., Cambridge University Press, 2010 (ISBN-10: 052188201X).
    - Jay M. Pasachoff and Alex Filippenko, The Cosmos: Astronomy in the New Millennium, 4th ed., Cambridge University Press, 2014 (ISBN-10: 049501303X).
    - Leon Golub and Jay M. Pasachoff,Nearest Star: The Surprising Science of Our Sun, 2nd edition, Cambridge University Press, 2014 (ISBN-10: 1107672643).
    - Jay M. Pasachoff, The Complete Idiot's Guide to the Sun, Alpha Books,2003 (ISBN-10: 1592570747).

2015 Meteor Showers

(Selected from data compiled by Alastair McBeath for the International Meteor Organization Shower Calendar):

a. **Meteor outbursts** are unusual showers (often of short duration) from the crossing of relatively recent comet ejecta. Dates are for the year 2015.
    - February 08, possibility of a fresh outburst for α-Centaurids at 11h28m.
    - October 6, possibility of short lived outbursts for the October 5/6 meteors, sometimes called the October Camelopardalids, between 07h10m and 14h30m.
    - October-November, possibility for a return of the Taurid 'swarm' of larger particles from about October 29 to November 10.

b. **Annual meteor showers liable to have geophysical effects:** Dates (based on UT in year 2015) are:

Dates	Peak Time (UT)	Name
Dec 28-Jan 12	Jan 04 01h55m	Quadrantids (QUA)
Jan 28-Feb 21	Feb 08 12h30m	α-Centaurids (ACE)
Apr 16-Apr 25	Apr 22 23h55m	Lyrids (LYR)[1]
Apr 19-May 28	May 06 13h25m	η-Aquariids (ETA)
May 14-Jun 24	Jun 08 00h	Daytime Arietids (Ari)
May 20-Jul 05	Jun 10 00h	Daytime ζ-Perseids (Zeta Per)
Jun 05-Jul 17	Jun 28 23h	Daytime β-Taurids (Beta Tau)[2]
Jul 12-Aug 23	Jul 30 (possibly Jul 28-30)	Southern δ-Aquariids (SDA)
Jul 17-Aug 24	Aug 13 06h25m to 08h55m	Perseids (PER)[3]
Sep 09-Oct 09	Sep 27 23h (Possibly Sep 29)	Daytime Sextantids (Sex)
Oct 02-Nov 07	Oct 21-22 (possible strong sub-peak Oct 17-18)	Orionids (ORI)
Nov 06-Nov 30	Nov 18 04h05m (possibly Nov 17 21h)	Leonids (LEO)
Dec 04-Dec 17	Dec 14 01h30m - 22h45m	Geminids (GEM)
Dec 17-Dec 26	Dec 23 02h25m	Ursids (URS)

[1]Lyrids (LYR): Esko Lyytinen has suggested that Lyrid rates could be somewhat enhanced in 2015, although from his theoretical modelling, the chances of this seem better - if still uncertain - for 2016 and 2017. The 2015 possibility is heavily dependent on what dust trails other than that established from the one observed return of the shower's parent comet, C/1861 G1 Thatcher, may pass closer to the Earth, something which cannot be modelled. So, there are no predictions for when this may occur (other than probably during the interval the normal maximum should take place), just that meteor rates could be above normal.

[2]Taurid "swarm" return: David Asher has been in touch to say his table suggesting there may be a daytime Taurid "swarm" return in 2015 June is wrong, and that the event will actually be a potential night-time Taurid "swarm" return in 2015 late October to early (perhaps even mid) November instead, so much more likely to be observed from Earth.

[3]Perseids (PER): Jérémie Vaubaillon anticipates from his theoretical modelling that the dust trail from parent comet 109P/Swift-Tuttle's 1862 return should pass closest to the Earth (the separation is about 0.00053 astronomical units) at 18h39m UT on August 12, ahead of the nodal peak (which should still happen as expected too), although its likely activity levels are uncertain. Enhanced rates, if they happen at all from this additional maximum, may persist for several hours.

c. **Annual meteor showers which may have geophysical effects:** Dates (based on UT in year 2015) are:

Dates	Peak Time (UT)	Name
Apr 15-Apr 28	April 24 04h55m	η-Puppids(PPU)
Jun 22-Jul 02	June 27 21h20m	June Bootids (JBO)
Aug 28-Sep 05	Sep 1 13h45m	α-Aurigids (AUR)
Sep 05-Sep 21	Sep 9 22h15m	September ε-Perseids(SPE)
Oct 06-Oct 10	Oct 9 05h40m	Draconids (DRA)
Nov 15-Nov 25	Nov 22 04h25m	α-Monocerotids (AMO)

Meteor Shower Websites:

- Shower activity near-real time reports -- International Meteor Organization
- Meteor shower activity forecast from your own location -- Meteor Shower Flux Estimator
- Shower names and data -- IAU Meteor Data Center
- Announcements and reports of meteor outbursts -- IAU Minor Planet Center
- Shower outburst activity forecast -- Institut de Mecanique celeste et de calcul des ephemerides (IMCCE)

Meteor Shower References:

- Handbook for Meteor Observers, edited by Jürgen Rendtel and Rainer Arlt, IMO, 2008.
- • A Comprehensive List of Meteor Showers Obtained from 10 Years of Observations with the IMO Video Meteor Network, by Sirko Molau and Jürgen Rendtel (WGN, the Journal of the IMO 37:4, 2009, pp. 98-121).
- Peter Jenniskens, Meteor showers and their parent comets. Cambridge University Press, 2006, 790 pp.

Real Time Space Weather and Earth Effects

The occurrence of **unusual solar or geophysical conditions** is announced or forecast by ISES through various types of geophysical **"Alerts"** (which are widely distributed via the internet on a current schedule). Stratospheric warmings (STRATWARM) were also designated for many years. The meteorological telecommunications network coordinated by the World Meteorological Organization (WMO) carries these worldwide Alerts once daily soon after 0400 UT. For definitions of Alerts see ISES URSIgram Codes.

RECOMMENDED SCIENTIFIC PROGRAMS (FINAL EDITION)

(The following material was reviewed in 2014 by the ISES committee with the advice of representatives from the various scientific disciplines and programs represented as suitable for coordinated geophysical programs in 2015.)

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 07 January 2015 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 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. The importance of obtaining full observational coverage is therefore stressed even if it is only possible to analyze the detailed data 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 2015 **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:

- **Sudden Stratospheric Warming (StratWarm)**: Dynamics, electrodynamics, temperature and electron density in the lower and upper thermosphere and ionosphere during sudden stratospheric warming.

- **Key objectives**:
  - To extend studies of stratospheric warming effects to the lower and upper thermosphere and their coupling to the ionosphere;
  - To document variations in multiple thermospheric and ionospheric parameters in response to different stratospheric sudden warming events and determine the mechanisms responsible;
  - To compare variations in temperatures and winds to the mesospheric response as given by MF and meteor radars and lidars.
- **Background condition**: The observations need to be made before and during the sudden stratospheric warming. A 10-day campaign is requested.
- **Primary parameters to measure**: LTCS mode - electron and ion temperatures from lowest possible altitudes throughout the F-region, zonal and meridional components of the neutral wind in the lower thermosphere (95-140km), ExB drift, F-region meridional wind. Temporal resolution can be sacrificed and data integration period increased in order to obtain data at lower altitudes.
- **Need for simultaneous data**: The idea is to measure how variations in temperatures, electric field and winds associated with sudden stratospheric warming change with latitude and altitude and relate to variations in electron density.
- **Principal investigator**: Larisa P. Goncharenko (MIT Haystack Observatory, USA), lpg@haystack.mit.edu. Larisa is responsible for issuing the alert and will provide five days' notice.
- **Co-investigators**: Jorge Chau (Leibniz-Institute for Atmospheric Physics, Rostock University, Germany), Hanli Liu (NCAR, USA).

- **Gravity Wave Coupling with Winds and Tides**
  - **Key objectives**: Allow the investigation of wave propagation into the thermosphere and potential coupling with winds and tides, as well as studying whether low-altitude generated gravity waves are important for scintillation patches and the generation of TIDs.
  - **Conditions required**: Quiet conditions to restrict contamination from geomagnetic effects. Observations over several contiguous days in January are desired. This request will be satisfied by the StratWarm run.
  - **Principal investigator**: Andrew Kavanagh (British Antarctic Survey, UK), andkav@bas.ac.uk.

- **Solar Eclipse**
  - **Key objective**: To study the ionospheric response to a total solar eclipse.
  - **Conditions required**: The day of the eclipse, 20 March, plus a day or two of quiet conditions on either side of the eclipse. This experiment has priority in case of conflict with the Merino world day run.
  - **Principal investigators**: Owen Roberts (Aberystwyth University, UK), owr6@aber.ac.uk; and Ingemar Häggström (EISCAT Scientific Association), ingemar@eiscat.se.

- **Meridional Circle (Merino)**
  - **Key objective**: To determine the latitudinal variations and their east-west hemispheric differences during solar storms and/or under quiet magnetic conditions.
  - **Need for simultaneous data**: This coordinated observation involves ISR world day participants as well as the Chinese Meridian Project facilities. This major Chinese project provides comprehensive ground-based space weather observing in the Eastern Hemisphere, in particular along the 120E longitude where 15 observatories, including an ISR, distributed from northern China to the South Pole, are established. They are equipped with, among other instruments, ionospheric radio sensors (digisonds, GPS receivers, MF radars, coherent radars, etc) and optical sensors (Lidars, FPIs, all-sky imagers). For this campaign, intensive observational modes will be adopted for most of the instruments.
  - **Principal investigator**: Shunrong Zhang (MIT Haystack Observatory, USA), shunrong@haystack.mit.edu.
  - **Co-investigators**: Guotao Yang and Zhaohui Huang (National Space Science Center, China), and John Foster (MIT Haystack Observatory, USA).
  - **Time**: Four days in the alert period from 13-27 March. Shunrong will be responsible for issuing the alert notice, which will be at least five days in advance of the experiment start. Please note, the Eclipse mode has priority in case of conflict.
  - **Modes**: Synoptic for all radars, except for Millstone Hill where low elevation azimuth scans are preferred.

- **Synoptic**
  - **Key objectives**: Synoptic experiments are intended to emphasize wide coverage of the F region, with some augmented coverage of the topside or E region to fill in areas of the databases that have relatively little data.
  - **Investigators**: Jan Sojka (Utah State University, USA) sojka@usu.edu; and Ian McCrea (Rutherford Appleton Laboratory, UK), ian.mccrea@stfc.ac.uk.

- **Northern Deep Polar Winter Observations**
  - **Key objectives**: Because of the optical conditions near solstice, this is a unique opportunity to capitalize on northern high-latitude measurements by optical instruments. This could be a prime time to study:
    - The formation, evolution, and decay of SAPS (Sub-Auroral Polarization Streams) and SED (Storm-Enhanced Densities) by measuring the penetration electric fields at low latitudes, the formation of SAPS electric fields and SED at mid-latitudes, and the motion of enhanced electron densities across the polar cap at high latitudes;
    - Meso-scale polar cap phenomena such as patches, reversed flow events, flow channel propagation (Dåbakk);
    - The evolution of polar cap aurora and patches (Dahlgren and Semeter);
    - Polar cap patch transit, decay rates and large-scale changes within patch structures (Wood); and
    - Global trans-polar coupling and sun-aligned arcs (Carlson).

This period is historically in high demand at the high-latitude ISRs and the facilities will run modes that will satisfy the multiple investigators.

- **Conditions required**: Operating the ISRs for four continuous days centered on the December New Moon should maximize the likelihood of the optical instruments getting good measurements during clear, dark skies.
- **Principal investigators**: Herb Carlson (US Air Force Research Laboratories, USA), herbert.c.carlson@gmail.com; Yvonne Dåbakk (University of Alaska-Fairbanks, USA), y.r.dabakk@fys.uio.no; Hanna Dahlgren (Royal Institute of Technology, KTH, Sweden), hannad@kth.se; K. Oksavik (University of Bergen, Norway), kjellmar.oksavik@uib.no; Joshua Semeter (Boston University, USA), jls@bu.edu; and Alan Wood (Nottingham Trent University, UK), alan.wood@ntu.ac.uk.
- **Need for simultaneous data**: Geomagnetic storms are known to impact the ionosphere on a global scale. Penetration electric fields occur at low latitudes, enhanced SAPS flows occur at mid-latitudes, the plasma flow is enhanced in the polar cap, and dense F-region plasma is transported from lower latitudes into and across the polar cap. Therefore, all radars should be operating at the same time.

- AO -- Arecibo Observatory

- JRO -- Jicamarca Radio Observatory.

Special programs: Ian McCrea, Rutherford Appleton Laboratory, UK; tel:+44(0)1235 44 6513; Fax:+44(0)1235 44 5848; email: ian.mccrea@stfc.ac.uk, chair of URSI ISWG (Commission G). See the 2015 Incoherent Scatter Coordinated Observation Days (URSI-ISWG) webpage for complete 2015 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 **travelling ionosphere disturbances**, propose special periods for coordinated measurements of gravity waves induced by magnetospheric activity, probably on selected PRWDs and RWDs.

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 the 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 of earth-ionosphere cavity resonances** any special effort should be concentrated during 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 Organization (WMO) Global Atmosphere Watch (GAW) integrates many monitoring and research activities involving measurement of atmospheric composition, and 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, CH-1211 Geneva 2, Switzerland or wmo@wmo.int.

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.

Variability of the Sun and Its Terrestrial Impact (VarSITI).

Program within the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics): 2014-2018. The VarSITI program will strive for international collaboration in data analysis, modeling, and theory to understand how the solar variability affects Earth. The VarSITI program will have four scientific elements that address solar terrestrial problems keeping the current low solar activity as the common thread: SEE (Solar evolution and Extrema), MiniMax24/ISEST (International Study of Earth-affecting Solar Transients), SPeCIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment), and ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate). Contact is Prof. Marianna Shepherd

(mshepher@yorku.ca), President of SCOSTEP. Co-chairs are Katya Georgieva (SRTI, Bulgaria) and Kazuo Shiokawa (STEL, Japan).

ILWS (International Living With a Star) International effort to stimulate, strengthen, and coordinate space research to understand the governing processes of the connected Sun-Earth System as an integrated entity. Contact info@ilwsonline.org.

ISWI (International Space Weather Initiative) -- a program of international cooperation to advance space weather science by a combination of instrument deployment, analysis and interpretation of space weather data from the deployed instruments in conjunction with space data, and communicate the results to the public and students. The goal of the ISWI is to develop the scientific insight necessary to understand the science, and to reconstruct and forecast near-Earth space weather. This includes instrumentation, data analysis, modelling, education, training, and public outreach. Contact J. Davila at Joseph.M.Davila@nasa.gov.

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy.

Experimenters should take into account that observational efforts in other disciplines tend 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 (QWDs) 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 QWDs and Airglow and Aurora Periods of experiments on satellites and of experiments on spacecraft in orbit around the Sun.

Meteor showers.

Of particular interest are both predicted and unexpected showers from the encounter with recent dust ejecta of comets (meteor outbursts). The period of activity, level of activity, and magnitude distributions need to be determined in order to provide ground truth for comet dust ejection and meteoroid stream dynamics models. Individual orbits of meteoroids can also provide insight into the ejection circumstances. If a new (1-2 hour duration) shower is observed due to the crossing of the 1-revolution dust trail of a (yet unknown) Earth threatening long-period comet, observers should pay particular attention to a correct determination of the radiant and time of peak activity in order to facilitate predictions of future encounters. Observations of meteor outbursts should be reported to the I.A.U. Minor Planet Center (mpc@cfa.harvard.edu) and International Meteor Organization (visual@imo.net). The activity curve, mean orbit, and particle size distribution of minor annual showers need to be characterised in order to understand their relationship to the dormant comets among near-Earth objects. Annual shower observations should be reported to national meteor organizations, or directly to the International Meteor Organization. Meteoroid orbits are collected by the IAU Meteor Data Center.

The International Space Environment Service (ISES) is a space weather service organization currently comprised of 16 Regional Warning Centers around the globe, 4 Associate Warning Centers, and one Collaborative Expert Center (European Space Agency). ISES is a Network Member of the International Council for Science World Data System (ICSU-WDS) and collaborates with the World Meteorological Organization (WMO) and other international organizations, including the Committee on Space Research (COSPAR), the International Union of Radio Science (URSI), and the International Union of Geodesy and Geophysics (IUGG). The mission of ISES is to improve, to coordinate, and to deliver operational space weather services. ISES is organized and operated for the benefit of the international space weather user community.

ISES members share data and forecasts among the Regional Warning Centers (RWCs) and provide space weather services to users in their regions. The RWCs provide a broad range of services, including: forecasts, warnings, and alerts of solar, magnetospheric, and ionospheric conditions; extensive space environment data; customer-focused event analyses; and long-range predictions of the solar cycle. While each RWC concentrates on its own region, ISES serves as a forum to share data, to exchange and compare forecasts, to discuss user needs, and to identify the highest priorities for improving services.

ISES works in close cooperation with the World Meteorological Organization, recognizing the mutual interest in global data acquisition and information exchange, in common application sectors, and in understanding and predicting the coupled Earth-Sun environment.

This Calendar for 2015 has been drawn up by Dr. R. A. D. Fiori of the ISES Steering Committee, in association with spokesmen for the various scientific disciplines in the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP),the International Association of Geomagnetism and Aeronomy (IAGA) , 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.

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Copies are available upon request to ISES Director, Dr. Terry Onsager, NOAA Space Weather Prediction Center, 325 Broadway, Boulder, CO, 80305, USA, telephone +1-303-497-5713, FAX +1-303-497-3645, e-mail Terry.Onsager@noaa.gov, or ISES Secretary for World Days, Dr. Robyn Fiori, Geomagnetic Laboratory, Natural Resources Canada, 2617 Anderson Road, Ottawa, Ontario, Canada, K1A 0E7, telephone +1-613-837-5137, e-mail Robyn.Fiori@NRCan-RNCan.gc.ca. Beginning with the 2008 Calendar, all calendars are available only in digital form.

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