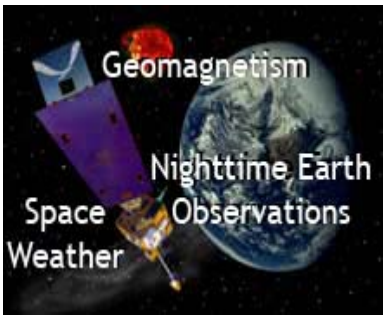

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Sunspot Numbers

Today, much more sophisticated measurements of solar activity are made routinely, but none has the link with the past that sunspot numbers have. -- J.A. McKinnon

1. **International Sunspot Number** - Brief Description

   sunspot maximum and minimum 1610-present; annual numbers 1700-present; monthly numbers 1749-present; daily values 1818-present; and sunspot numbers by north and south hemisphere. The McNish-Lincoln sunspot prediction is also included. ---- Download data

   Relative Sunspot Numbers -- The collection of sunspot numbers provided here contains several kinds of tables -- tables that give spot counts averaged over different time intervals. Professor M. Waldmeier, Director of the Swiss Federal Observatory in Zurich, Switzerland, published these observations in 1961 as a book entitled THE SUNSPOT-ACTIVITY IN THE YEARS 1610-1960 (Zurich Schulthess and Company AG) and updated more recently by the Royal Observatory of Belgium's Solar Influences Data Analysis Center.

   The relative sunspot number is an index of the activity of the entire visible disk of the Sun. It is determined each day without reference to preceding days. Each isolated cluster of sunspots is termed a sunspot group, and it may consist of one or a large number of distinct spots whose size can range from 10 or more square degrees of the solar surface down to the limit of resolution (e.g., 1/25 square degree). The relative sunspot number is defined as $R = K (10g + s)$, where g is the number of sunspot groups and s is the total number of distinct spots. The scale factor K (usually less than unity) depends on the observer and is intended to effect the conversion to the scale originated by Wolf.

   The provisional daily Zurich relative sunspot numbers, Rz, were based upon observations made at Zurich and its two branch stations in Arosa and Locarno and communicated by M. Waldmeier of the Swiss Federal Observatory. Beginning January 1, 1981, the Zurich relative sunspot number program is replaced by the Solar Influences Data Analysis Center (formerly the Sunspot Index Data Center) (c/o Dr. R. Van der Linden, 3 av. Circulaire, B-118 Bruxelles, Belgium). The determination of the provisional International Sunspot Numbers Ri results from a

statistical treatment of the data originating from more than twenty-five observing stations. These stations constitute an international network, with the Locarno (Switzerland) station as the reference station, to guarantee continuity with the past Zurich series of Rz. The definitive International Sunspot Numbers Ri are evaluated by a similar method based on a network of observing stations selected for their high number of observations, their continuity during the whole year and an existing series of observations during the last years. Also taken into account is the stability of the K monthly factors with reference to the Locarno station. These relative sunspot numbers are now designated Ri (International) instead of Rz (Zurich).

The international sunspot number is produced by the Solar Influences Data Analysis Center (SIDC), World Data Center for the Sunspot Index, at the Royal Observatory of Belgium. NGDC kindly requests that you acknowledge the SIDC when using these data. Please refer to the SIDC site for additional information. The SIDC requests users of the data to credit: SIDC, RWC Belgium, World Data Center for the Sunspot Index, Royal Observatory of Belgium, `year(s)-of-data'.

2. **Sunspot Numbers by Hemisphere.(1992-1996)** ---- Download Data
3. **American Relative Sunspot Numbers** ---- Download Data

   Beginning with 1951, the observations collected by the Solar Division, AAVSO, have been reduced according to a new procedure, such that only high quality observations of experienced observers are combined into RA'. Observatory co- efficients for each of the 23 selected observers were recomputed on data for 1948-1950, years when there was a wide range of solar activity. Otherwise, the procedure is that outlined in "Publication of the Astronomical Society of the Pacific," "61," 13, 1949. The scale of the American numbers in 1951 will differ from that of the reports for earlier years because of these changes, and the new series is designated RA' rather than RA.

4. **Ancient sunspot data 165 B.C. to 1684 A.D.**
   - A Catalogue of sunspot observations from 165 BC to AD 1684 (text) -- Abstract
   - Catalogue of Naked-Eye Sunspot Observations and Large Sunspots (text)
   - Estimated annual mean sunspot number, R, from 1610-1715 (text)
5. **Group Sunspot Numbers (Doug Hoyt re-evaluation) 1610-1995**
   - Descriptive text about data files -- print before viewing data for data formats
     - Files can be grouped into five categories -- input, means,

standard deviations, number of observations, and documentation files

- 4a. Input files -- alldata (raw daily input data for 463 observers) and filldata (raw data data with some missing days filled by linear interpolation)
  - 4aa. alldata
  - 4ab. filldata
- 4b. Means files -- dailyrg.dat, monthrg.dat and yearrg.dat
  - 4ba. dailyrg.dat -- contains daily values of the Group Sunspot Numbers for 1610 to 1995
  - 4bb. monthrg.dat -- contains monthly means of Rg with the number of days used to form the means and the standard deviation of the means
  - 4bc. yearrg.dat -- contains yearly means of Rg with the number of days used to form the means and the standard deviation of the means
- 4c. Standard deviation files -- dailysd.dat, monthsd.dat and yearsd.dat
  - 4ca. dailysd.dat -- contains daily standard deviations of the Group Sunspot Numbers for 1610 to 1995. These numbers represent the random errors in the daily means.
  - 4cb. monthsd.dat -- contains the monthly means of daily standard deviations in dailysd.dat.
  - 4cc. yearsd.dat -- contains the yearly means of monthly standard deviations in monthsd.dat.
- 4d. Number of observations files -- dailynum.dat, monthnum.dat and yearnum.dat
  - 4da. dailynum.dat -- contains the daily number of observations per day used in forming the daily means.
  - 4db. monthnum.dat -- contains the monthly average number of observations per day used in forming the daily means.
  - 4dc. yearnum.dat -- contains the yearly average number of observations per day used in forming the daily means.
- 4e. Documentation files -- invent.dat, list1.dat, bibliogr.txt and alllevel.dat
  - 4ea. invent.dat -- An inventory file listing the observer number, his observation year, and

number of days of observations.

- 4eb. list1.dat -- A summary of the 463 observers used to reconstruct solar activity.
- 4ec. bibliogr.txt -- A bibliography listing the literature source of each observer used along with appropriate comments. Also listed are some observers identified but not used for one reason or another.
- 4ed. alllevel.dat -- A list of the calculated observer correction factors used to place the observer on the Royal Greenwich Observatory (RGO) scale. These factors make all the observers as self-consistent as possible.