THE SIDC: WORLD DATA CENTER FOR THE SUNSPOT INDEX

P. VANLOMMEL, P. CUGNON†, R. A. M. VAN DER LINDEN,
D. BERGHMANS and F. CLETTE
SIDC-Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium
(e-mail: petra.vanlommel@oma.be)

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Abstract. Since January 1981, the Royal Observatory of Belgium (ROB) has operated the Sunspot Index Data Center (SIDC), the World Data Center for the Sunspot Index. From 2000, the SIDC obtained the status of Regional Warning Center (RWC) of the International Space Environment Service (ISES) and became the ‘Solar Influences Data analysis Center’. As a data analysis service of the Federation of Astronomical and Geophysical data analysis Services (FAGS), the SIDC collects monthly observations from worldwide stations in order to calculate the International Sunspot Number, \( R_i \). The center broadcasts the daily, monthly, yearly sunspot numbers, with middle-range predictions (up to 12 months). Since August 1992, hemispheric sunspot numbers are also provided.

1. Introduction

The sunspot number is the oldest solar activity index. Although its short-term variations may give some insight, e.g. on solar differential rotation, its main interest results from its long-term behaviour and the length of its series. For a long time, it was the only index representative of the solar cycle, and many studies on the cyclical behaviour of the Sun were led using the sunspot number. That is the reason why the international scientific community, through the International Council of Scientific Unions, has renewed many times the expression of its high interest in this index and committed its computation to a specific service like the SIDC.

The Sunspot Index Data Center (SIDC) was founded in 1981 to continue the work of the Zürich Observatory, when this institution decided to stop computing and publishing the sunspot number. From January 1981, the SIDC started with the production of a sunspot index, called the International Sunspot Number, \( R_i \). The continuity and coherence with the former index of Zürich was assured through the use of Locarno (one of the three main stations of the Zürich network) as a reference station. The extended and valuable historical archive of \( R_i \) is now maintained by the SIDC.

Since January 1, 2000, the SIDC acts also as a Regional Warning Center in the framework of ISES and became the ‘Solar Influences Data analysis Center’ (SIDC). Daily solar activity reports and forecasts of the status of the space environment based on near real-time satellite and ground-based data, are provided. Our team has in this sense a special interest in space weather research and is involved in ongoing and in nearby future missions like SOHO, STEREO and PROBA-2. Industrial as

†Deceased.
well as commercial assets – both in space and on the ground – are affected by space weather. Space-weather research, permanent solar activity monitoring and forecasting turn out to be crucial; hence our involvement in the ESA Space Weather Application Pilot Project also.

2. Sunspot-Number-Related Products

As far as $R_s$ is concerned, two messages are sent to a primary network of customers, the 1st of every month. The first one, sent by fax and e-mail, includes the computed daily $R_s$, their monthly mean and the 12-months-ahead predictions from the current date (18 months from the last calculated monthly smoothed sunspot number). The second one is an e-mail message containing the total and north and south hemispheric sunspot numbers. Apart from the Web consultations, we receive also requests for data and more specific products from scientists and questions from students of different levels and amateurs.

Our publications are the monthly Sunspot Bulletin containing the provisional indices, and the quarterly SIDC News, in which the definitive $R_s$ are published. The monthly Sunspot Bulletin presents: the provisional daily total, north and south sunspot numbers, provisional monthly and smoothed monthly sunspot number and its 12 months prediction (see Figure 1); the radio fluxes at 600 MHz from Humain (radio-astronomical station of the Royal Observatory of Belgium (ROB)) and at 2800 MHz from the National Research Council of Canada; the cosmic-ray index from Kerguelen (when available); the geomagnetic $K$ index from Wingst; information on solar X-ray radiation; the sudden enhancement of atmospherics observed at Uccle and Humain; the Prompt Photometric Sunspot Index, this is an estimate of the negative contribution of sunspots to the mean solar irradiance; data on the sunspots as observed at Uccle and Humain; the solar and geomagnetic activity. The quarterly SIDC News contains the definitive daily total, north and south sunspot numbers, definitive monthly mean sunspot number and, if the definitive sunspot numbers of the whole year are available, the yearly sunspot number.

The bulletins and reports of the SIDC are all freely available for the scientific and general public on the internet: http://sidc.oma.be. One can subscribe to receive them by e-mail, by regular post or fax.

The SIDC also contributes to the Quarterly Bulletin on Solar Activity (QBSA, Japan) and to Solar Geophysical Data (NOAA, USA). These contributions are, for both, the total and hemispheric definitive sunspot numbers, and for the QBSA only, the total daily and monthly spotted areas and the central zone sunspot number (defined by the sunspot content of a central half solar-radius disk).

2.1. Daily, Monthly and Smoothed Monthly Sunspot Number

Each sunspot number mentioned in the section title covers another time scale and serves another purpose. This is made clear with the following example concerning