

**INTER-DIVISION B-E /
WORKING GROUP ON**

**COORDINATION OF SYNOPTIC
OBSERVATIONS OF THE SUN**

*COORDINATION DES OBSERVATIONS
SYNOPTIQUES DU SOLEIL*

**CO-CHAIR
CO-CHAIR**

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TRIENNIAL REPORT 2018-2021

1. Introduction

In late-2015, the WG on Coordination of Synoptic Observations of the Sun was designated as the Inter-Division B-E working group, and in 2016, it became Functional working group. Since 2015, Alexei Pevtsov and Frédéric Clette serve as the co-Chairs.

The mission of this WG is to facilitate international collaboration in synoptic long-term solar observations, which includes past, current, and future synoptic programs, preservation, calibration, and access to synoptic solar data products. The working group provides a forum for discussion of all issues relevant to synoptic observations of the Sun including coordination between synoptic programs in different countries and a proper calibration and preservation of historical data from different sources. The WG includes 53 members from 19 countries.

2. Developments within the Past Triennium

During the 2019-2021 triennium, the WG concentrated on four major issues related to:

- support for continuation of synoptic programs threatened by budget cuts and promoting the broadening of international participation in WG activities,
- preservation and digitization of records of past solar activity,
- verification of existing sunspot number time series and developing a unified sunspot time series, and
- improving access to modern and historical data.

2.1. Working Group activities in 2019

In 2018, the WG spearheaded the development of the IAU Resolution B3: "on preservation, digitization and scientific exploration of historical astronomical data", which was accepted by the General Assembly XXX. As a follow up of this work, in 2019 we initiated the IAU-wide Survey of historical astronomy data, which received information about 115 endangered historical datasets across all fields of astronomy. These submissions have been summarized, and will be made available to the international astronomy community.

The WG continued raising the awareness about the importance of historical astronomy datasets and the urgent need for their preservation. Thus, several members of our WG participated in preparation of two White Papers for US Decadal Survey on Astronomy and Astrophysics 2020 (Lattis et al. 2019, Pevtsov et al. 2019). The ASTRO2020

Decadal Survey aimed at identifying the key priorities in astronomy and astrophysics and developing a comprehensive strategy for US Agencies investments in the upcoming decade.

In 2019, the WG begun close collaboration with the Working Group on the Preservation of Astronomical Heritage (WGPAH) of the American Astronomical Society (AAS).

We also worked with the IAU General Secretary and two IAU Division Presidents to arrange for a letter of endorsement for the World Data Center for Sunspot Index and Long-term Solar Observations (WDC-SILSO) to continue and expand their activity on the production, preservation and dissemination of the international sunspot number. At the occasion of the IUGG/IAGA General Assembly (July 2019), a resolution was submitted by F.Clette and was approved by a general vote of the IAGA community. In this resolution about "the World Data Center SILSO and the international sunspot number", IAGA recognizes the importance of the production and preservation of the long-term sunspot number time series, and urges funding agencies to make all possible efforts to ensure continuous support to WDC SILSO for the continuation of this reference data set. We also arranged for a support letter for a researcher to promote the access and the digitization of Lindener's manuscripts for astronomical observations from the University Archive of Wroclaw, Poland, and helped with establishing contacts in a search for a collection of sunspot drawings from the Archenhold Observatory in Berlin, Germany lost in the aftermath of the WW2.

The members of the WG continued activities aimed at developing a "community consensus" time series of sunspot and group numbers. The discussions continued in the framework of the international team on "Recalibration of the Sunspot Number Series" supported by the International Space Science Institute (ISSI, Bern Switzerland): <https://www.issibern.ch/teams/sunspotnoser/>. The second Team meeting took place in August 2019. Major progress was accomplished in the recovery and digitization of archives. In particular, the long-lost sunspot-number source archives of the Zurich Observatory (1945-1980) were recovered thanks to a collaboration between the World Data Center SILSO in Brussels and the Specola Solare Observatory in Locarno. Those source data tables are now progressively digitized by the library of the ETH Zürich, and will be made publicly accessible on the e-manuscripta.ch Swiss on-line portal. Simultaneously, the systematic digitization of all printed data from the Zurich Observatory, up to 1980 when the Observatory was closed, was continued at the Royal Observatory of Belgium, mostly with the help of summer job students, given the very limited manpower of WDC-SILSO. A consensus has been reached on the validity of the new re-calibrated version of the sunspot number series (Version 2.0) as best current series. On the other hand, some unresolved discrepancies remain for the group sunspot number series. This work forms the base for the next version of the sunspot series (Version 3), which is now in preparation. In addition, several members of the WG had participated in discussion of the "Solar variability and sunspot indices" started by SCOSTEP's Variability of the Sun and Its Terrestrial Impact (VarSITI) program. The purpose of this discussion was to assess the needs and approaches for developing a single "community consensus" time series of sunspot and group numbers.

Several WG members participated in some initial discussions about preservation of CaK spectroheliograms from Mount Wilson Observatory. Some of these data were lost, but are restored using copies found in the community. We aim at developing a plan to prevent loss of these data again. If successful, this case may serve as an example for similar data preservation efforts, at least in USA.

We also continued informing the WG members about the relevant activities by other groups. One of these was a call issued by the Digital Preservation Coalition (DPC) to

submit nominations for its 2019 edition of the ‘BitList’ (which digital materials the digital community thinks are most at risk).

Many historical astronomy dataset continue to be at risk, including several solar (helio-physics) datasets. One of the at-risk datasets is the Debrecen Photoheliographic Data (DPD) sunspot catalogue, which since 1972 served as a continuation of Greenwich Photoheliographic Results (GPR). Lack of dedicated funding is the main issue for delaying the rescue of such important datasets. Nevertheless, the digitization activity continues mostly via the dedicated (often, volunteer) efforts of our astronomy colleagues. Thus, for example, in 2019, the datasets of (1917-2016) magnetic field measurements in sunspots and the full disk observations in Ca II K line from the Mount Wilson Observatory have been digitized and made public. H α observations from the Solar Optical Observing Network (SOON) are put in a public domain by Dr. Alan Kiplinger (University of Colorado). There is a continuing effort by the German astronomy community to digitize their extensive collection of the photographic plates including the photographic solar images (Archives of Photographic PLates for Astronomical USE, APLAUSE), and magnetic field measurements in sunspots from 1946-1954. We also note a recent effort to digitize the solar observers’ logs from the Tashkent Astronomical Observatory (now Ulugh Beg Astronomical Institute of the Uzbekistan Academy of Sciences). We plan collecting the links to the digitized archives on a new Historical Solar Data server.

Other events and actions:

- We are saddened to report the death of three WG members: T. Baranyi (Hungary), U.Leiko (Ukraine), and N. Stepanian (Russia).
- The Working Group provided an endorsement letter for the IAU Symposium proposal on “The Sun and Solar Twins: Variability, Planetary Systems, Composition” by A.Shapiro and N.Krivova

2.2. Activities in 2020 and 2021

Due to the outbreak of the COVID-19 pandemic, the WG activities were more limited in 2020 and 2021, in particular because of the cancellation of most conferences, and also due to the reduced mobility which prevented on-site visits to archives.

Regarding the sunspot number series, no further searches in the archives at the ETH Zurich could be continued, due to the COVID-19 confinement and travel ban. However, the digitization of the newly recovered Zurich source tables for 1945-1980 continued at the Library of the ETH Zurich, and by the end of 2020, the entire series of data tables was accessible on line (<https://www.e-manuscripta.ch/>). Likewise, the full digitization of the printed Zurich data could continue at the Royal Observatory of Belgium and was completed in September. A first synthetic survey and chronology of the contributing stations was completed and the result will be published as a paper in the Solar Physics journal in early 2021. A full quality control of the encoded data is in progress. In 2020, a study dedicated to the long-term observational series by Hisako Koyama was also published (archives preserved at the University of Tsukuba, Japan; Hayakawa et al., 2020).

In 2020, several WG members joined an informal group of archivists, librarians, and scientists concerned with the preservation and the digitization of the astronomical glass plates and the observing logs archived at universities and science museums (so called, “glass plates” group).

Other events and actions:

- New members: Svitlana Chornogor (Ukraine) replacement of U.Leiko, Alexander Kutsenko, Crimean Astroph. Obs. (Russia)

3. Motivations for the continuation of this Working Group

A survey of the WG members showed an overwhelming support for continuation of this Working Group. Currently, there are major initiatives in Europe and USA to create a new network for long-term synoptic observations of the Sun. These initiatives also drew interest for possible participation from other countries, e.g. Brazil, China, Japan, India, Russia, South Africa. We also see a growing interest in coordinated projects, which involve large number of observatories across the globe; growing interest in the astronomical community to preserve and explore the historical astronomy data. These developments would benefit greatly from fostering a broader international collaboration, which this WG would provide. There are other aspects that were not fully explored by the current WG such as, for example, broadening the geographic collaboration to include more (younger) astronomers from African continent, South America, Asia. Some of the datasets (e.g., sunspot number time series) are reaching the level of maturity and are used broadly by other research communities, which may require developing standards for their curation. There are continuing issues with closure of synoptic programs in some countries and how to ensure a continuation of important time series/datasets.

We invite all astronomers interested in long-term synoptic observations and preservation of historical data to join the discussion. The Working Group's website can be accessed via https://www.iau.org/science/scientific_bodies/working_groups/255/.

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Co-Chairs of Working Group

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