

IAU COMMISSION E1 “SOLAR RADIATION AND STRUCTURE”

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OVERVIEW

The IAU Commission E1 “Solar Radiation and Structure” (CE1) covers observational and theoretical aspects of the Sun’s radiation, structure, and variability under quiet-Sun conditions. These differ from the state established by the impulsive and eruptive processes of the solar plasma covered by the IAU Commission E2 “Solar activity”.

CE1 focuses on the study and understanding of the solar composition, the interior structure and dynamics, the mechanism of the solar magnetic cycles, the physics of sunspots, facular, magnetic network, the structure and dynamics of the solar atmosphere, the sources of solar irradiance and long-term variability. CE1 topics include synoptic observing programs, observational, data analysis and modeling techniques, coordination of international observing campaigns, space and ground-based observations.

CE1 includes two Inter-Commission Working Groups:

- Inter-Division B-E WG “Coordination of Synoptic Observations of the Sun,”
- Inter-Division C-E WG “Solar Eclipses”,

that present their activities in separate reports.

CE1 presently consists of 172 members (including 8 young members). Since August 2021, CE1 has a new President and new Organizing Committee members for the current term.

DEVELOPMENTS

In 2021, developments at present major infrastructures for solar and heliophysics research opened to the provision of new data that will transform our knowledge of the Sun’s radiation and structure in the years to come. These developments include the start of the Operations Commissioning Phase for the 4-m class Daniel K. Inouye Solar Telescope (DKIST) and of the nominal mission for the Solar Orbiter spacecraft, the first passage through the solar corona by the Parker Solar Probe (PSP) satellite, as well as the continued operation and revamp of other space- and ground-based facilities, as e.g. the Interface Region Imaging Spectrograph (IRIS), Solar Dynamics Observatory (SDO), HINODE, Atacama Large Millimeter Array (ALMA), and GREGOR. Besides the advancements in the observations, noteworthy progress has been made in the magneto-hydro-dynamics (MHD) modelling of the solar plasma, with e.g. the MURaM and Bifrost numerical simulations, and in the inversion and processing of polarimetric data with new codes, e.g. the DeSIRE , Bayesian Stokes inversions, and SSRED codes. Moreover, several new databases of solar data have been publicly released. These include results from coordinated observing campaigns involving space- and ground-based telescopes, as e.g. IRIS and the Swedish Solar

Telescope, ALMA and the GRIS and IBIS instruments, as well as results from MHD modelling, with e.g. the Bifrost simulations.

It is worth noting that the above list of achievements does not mean to be complete but just an indication of the recent developments on the topics of CE1 interest.

ACTIVITIES

In 2021, the COVID-19 pandemics lead to cancellation and postponement of conferences of CE1 interest, e.g. the Cambridge Workshop 21 on Cool Stars, Stellar Systems and the Sun, or for short Cool Stars 21 meeting. Moreover, travel restrictions limited the mobility with strong effects on visiting programs and organization of training schools for young researchers. Nevertheless, several conferences and meetings on topics relevant to CE1 took place, as e.g. the 43rd COSPAR Scientific Assembly (January 2021), European Geoscience Union General Assembly (April 2021), Parker Solar Probe Conference (June 2021), 16th European Solar Physics Meeting (September 2021), HINODE-14/IRIS-11 Meeting (October 2021), and AGU Fall meeting 2021 (December 2021). The above events attracted several hundreds of scientists each. CE1 members actively participated in the organization and attendance at the above events, and at other national and international meetings. During the reported period CE1 members also contributed to organization of schools for young researchers, e.g. the training schools organized by HAO-NSO and by the SOLARNET and PSP projects. Most of the events were hosted in a virtual environment online, but a few ones that adopted a hybrid format with both online and in-person attendance.

The CE1 organizing committee still has to discuss the CE1 future activities. However, these most likely will include the upgrade of the CE1 webpage, the launch of seminar series to cover recent developments in observational and theoretical research relevant to CE1, the coordination with Inter-Commission WGs of CE1 interest, the creation of working groups on topics of interest, and actions required in response to the recent tragic events in Ukraine. A virtual meeting of the CE1 organizing committee to discuss CE1 future activities will be arranged soon.

Ilaria Ermolli

President of the Commission E1