ABSTRACTS OF GM PRESENTATIONS

SEPS - reconstruction of the EUV fluxes from photo-electron currents

R. Brunner, M. Pfeifer

Due to the complexity of theoretical modelling, we developed and tested an empirical method. It is based on a serious measurements conducted at the BESSY electron synchrotron generating photo electrons from monochromatic EUV fluxes of known intensity. In addition, first results of photo electron currents from EUV spectra measured at Fraunhofer IPM are shown. The reconstructed spectral distribution of the EUV flux at defined nodes is discussed.

Development of solar extreme ultraviolet (EUV) spectral characterization and methods for prediction of solar EUV irradiance based on EUV data analysis

R. Brunner, G. Schmidtke

A good progress was recently made in measuring and deriving solar EUV spectral irradiance data. The general importance of these data has been acknowledged by the five nations organizing the operation of the International Space Station by maneuvering the ISS to an attitude allowing the payload SOLAR with SolACES to perform continuous measurements during a full solar rotation. The period lasted from 21st November to 23rd December 2012. The corresponding spectra are available in 1 nm bins. The comparison of SSI values in the spectral interval from 16 to 30 nm from SolACES with those from the SDO/EVE instrument shows a strong agreement, which was never achieved by any two EUV instruments in the past. Moreover, the inter-comparison of SDO/EVE spectral data with SolACES calibration measurements as extended from the solar bridging period back to the beginning operation of SDO in 2010 do agree well with each other, too. The progress made can be demonstrated by comparing the errors in EUV data of the past between 20 to 25 % with the recent data having errors less than 5 %. The range from 16 to 30 nm has been selected, because it is a critical one with respect to degradation of EUV instrumentation. The other EUV spectral ranges do agree with each other as well.

STAFF: The Solar Timelines viewer for AFFects

V. Malisse, C. Verbeeck

STAFF, the Solar Timelines viewer for AFFects (www.staff.oma.be) is a powerful, fast and easy tool for viewing, combining and exporting a whole range of timelines related to solar activity and space weather. Timelines include the International Sunspot Number, the four Lyra EUV channels, the GOES X ray curves, GOES electrons and protons, ACE solar wind parameters and Interplanetary Magnetic field measurements, F10.7 radio flux and various K and A indices. In this presentation, the various possibilities and options of STAFF will be presented.

Real-time determination and monitoring of the auroral electrojet boundaries
M. G. Johnsen

A method for nowcasting of the auroral electrojet location from real-time geomagnetic data in the European sector is presented. Along the auroral ovals strong electrojet currents are flowing. The variation in the geomagnetic field caused by these auroral electrojets are observed on a routine basis at high latitudes using ground-based magnetometers. From latitude profiles of the vertical component of these variations it is possible to identify the boundaries of the electrojets. Using real-time data from ground magnetometer chains is the only existing method for continuous monitoring and nowcasting of the location and strength of the auroral electrojets in a given sector. This is an important aspect of any space weather program.
The method for obtaining the electrojet boundaries is described and assessed in a controlled environment using modelling. Furthermore a provisional, real-time electrojet tracker for the European sector based on data from the Tromsø Geophyiscal Observatory magnetometer chain is presented.
The relationship between the electrojet and the diffuse auroral oval is discussed, and it is concluded that although there may exist time dependent differences in boundary locations, there exist a general coincidence. Furthermore, it is pointed out that knowledge about the latitudinal location of the geomagnetic activity, that is the electrojets, is more critical for space weather sensitive, ground-based technology than the location of the aurora.

Solar Demon: Near real-time dimming and EUV wave detection on SDO-AIA
E. Kraaikamp, C. Verbeeck

Solar Demon is a near real time dimming and EUV wave detector on quicklook SDO-AIA data. As dimmings and EUV waves are often the precursors of CMEs, careful detection and characterization of these features will aid space weather forecasters, leading to more accurate forecasts.

Parametrization of CMEs with the Graduated Cylindrical Shell Model
E. Bosman, V. Bothmer, J. Hesemann, M. Venzmer

Since launch of the STEREO mission in October 2006, 1071 large-scale CMEs were identified in STEREO/SECCHI/COR2 observations between January 2007 and December 2011. Based on their white-light appearance in the COR2 field of view 242 CMEs were selected and analyzed with the Graduated Cylindrical Shell Modeling Technique developed by Thernisien, Vourlidas and Howard. The presentation introduces to the GCS Model and summarizes the modeling results of 3D parameterized CME events for future CME forecast purpose.

CAT CME parametrization
J. Hesemann, G. Millward, V. Bothmer, E. Bosman

The CME Analysis Tool (CAT) is a modelling tool of NOAA-SWPC developed by G. Millward et al. using a rotationally symmetric cone approach. We present implications of using such a geometric shape for real-time modelling if compared to the GCS geometric approach.

Real-time CME, Kp, Aurora, GPS error forecast
V. Bothmer, J. Hesemann, M. Venzmer, E. Bosman

We present our first version of a forecasting tool developed at University of Göttingen which is capable of inferring both CME arrival times and geomagnetic parameters (Kp and Aurora boundary) from real-time geometric modelling using GCS or CAT tools. The tool under development is modular and different methods can be used on each step of the forecast.
The essential ingredients of the forecast base on correlated analysis of solar remote sensing and in-situ solar wind data, including theoretical models for CME and solar wind propagation in the inner heliosphere.

Regression modelling and near real time forecasting of space weather proxies
Aleksei Parnowski

The main problem inhibiting the progress in space weather forecasting is the lack of understanding of associated physical processes. The classical approach to model such processes from the first principles proved to be not very effective due to high complexity of such processes. For this reason, a different approach was taken when the magnetosphere, which is the most complex link in the solar-terrestrial chain of interaction, is considered a black box with a limited number of inputs (solar wind parameters) and outputs (geomagnetic indices).
Using large volumes of archived solar wind and geomagnetic data, it is possible to construct models, which reproduce the same values of the geomagnetic indices the real magnetosphere would provide given the same solar wind inputs. Such models can serve two purposes: they can be used for nowcasting and forecasting space weather; in addition, their structure contains certain information about the physical processes leading to space weather phenomena.
One of the best such models are provided by the regression modelling method. Recently this method became mature enough to be used in real time applications. It provides forecasts of the Dst index up to 4 hours in advance and of the Kp index 3 hours in advance. It can be also used to fill the gaps in solar wind data and to forecast other quantities, for example TEC.
In the presentation this method will be briefly described and its application to space weather forecasting will be discussed in detail.

L1 solar wind, aurora, Kp and GNSS error alerts
M. Venzmer, V. Bothmer, J. Hesemann, E. Bosman

L1 based short-term warnings of extreme space weather and of severe space weather effects (solar wind, Kp, aurora, GNSS error). L1 in-situ real-time ACE data is used to provide warnings by RSS feeds. Every time specified thresholds of solar wind parameters are exceeded a warning is produced.

Forecast of Total Electron Content over Europe for disturbed ionospheric conditions
J. Berdermann

A general picture of the occurrence of ionospheric storms as function of local time, season and location is known from numerous studies over the past 50 years. Nevertheless, it is not yet possible to say how the ionosphere will actually respond to a given space weather event because the measurements of the onset time, location of maximum perturbation, amplitude and type of storm (positive or negative) deviate much from the climatology. However, statistical analysis of numerous storm events observed in the Total Electron Content (TEC)

since 1995 enable to estimate and predict a most probable upcoming perturbed TEC over Europe based on forecasts of geomagnetic activity.
A first approach will be presented here. The forecast of perturbed TEC is part of the Forecast System Ionosphere build under the umbrella of the FP7 project AFFECTS (Advanced Forecast For Ensuring Communications Through Space). It aims to help users mitigating the impact on communication systems.

Verification analysis of space weather forecasts at the Regional Warning Center in Belgium
A. Devos, C. Verbeeck, E. Robbrecht, P. Vanlommel

ROB has performed a verification analysis of the space weather forecasts from its Regional Warning Center in Belgium. A detailed evaluation of ROB's F10.7 and geomagnetic forecasts will be presented. The performance of forecasts is compared to that of common numeric models such as persistence, recurrence and linear regression models. The analysis aids to identify the strong and weak points of RWC forecasting as well as those of the models considered. As such, it creates the opportunity to continuously reevaluate and increase the reliability of space weather forecasting.

Forecast System Ionosphere: a new system for predicting space weather effects in Europe
J. Berdermann, H. Barkmann

A Forecast System Ionosphere (FSI) is developed as part of the FP7 AFFECTS project (Advanced Forecast For Ensuring Communications Through Space, http://www.affects-fp7.eu/), led by University Göttingen. It is intended to help European citizens mitigating the impact of space weather events on its communications systems. For this purpose the FSI will operationally provide a prediction of space weather related geomagnetic and ionospheric perturbations for Europe. Solar observations and measurements are used for forecasting of geomagnetic activity and Total Electron Content (TEC). Additionally, high latitude geomagnetic monitoring and early warning for GNSS users is incorporated in the FSI. The FSI is developed as a subsystem of the Space Weather Application Center - Ionosphere (SWACI) service (http://swaciweb.dlr.de/), running at the DLR in Neustrelitz, using its approved infrastructure.
AFFECTS partners are contributing to the FSI either by provision of data or by delivering processing modules. Here we present the layout and system architecture of the FSI, describing the data input, processing, checking, archiving and output of the FSI.