EP 13: Erdnaher Weltraum

Zeit: Donnerstag 16:30–18:30 Raum: GW2 B2880

Hauptvortrag EP 13.1 Do 16:30 GW2 B2880

Is there a solar 27-day signature in tropospheric clouds? — •Christian von Savigny[1], Kai-Uwe Eichmann[2], Christoph Hoffmann[1], and Martin Langowski[1] — [1]Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald, Greifswald, Germany — [2]Institut für Umweltphysik, Universität Bremen, Bremen, Germany

Solar 27-day signatures have been identified in many different middle atmospheric parameters. In contrast, little is known about potential solar-driven 27-day signatures in the troposphere. Recent studies suggest the existence of a solar-driven 27-day signature in outgoing longwave radiation (OLR) - particularly in the tropical pacific region - and attribute it to a 27-day signature in tropospheric clouds. In this contribution we employ OLR data in combination with tropospheric cloud top height observations with the SCIAMACHY instrument on the Envisat satellite to investigate the presence of potential solar-driven 27-day variations. We concentrate on low latitudes, where earlier studies identified potential 27-day signatures. We find OLR and cloud top altitudes generally to be highly anti-correlated, as expected. We also find coherent variations in cloud top height in the Indian and Pacific Ocean region with amplitudes of up to 2 km and with periods generally in the 30 - 60 day range. These periods are indicative of the Madden-Julian-Oscillation (MJO). Although we cannot entirely rule out the possibility that part of the observed variability is related to the solar 27-day cycle, it appears more likely that quasi 27-day signatures in OLR and cloud parameters are driven by the MJO.

EP 13.2 Do 17:00 GW2 B2880

New calibration of the group sunspot number series using a non-linear non-parametric method — •Theodosios Chatzistergos[1], Ilya G. Usoskin[2,3], Gennady A. Kovaltsov[4], Natalie A. Krivova[1], and Sami K. Solanki[1,5] — [1]Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany — [2]Space Climate Research Unit, University of Oulu, Finland — [3]Sodankylä Geophysical Observatory, University of Oulu, Finland — [4]Ioffe Physical-Technical Institute, St.Petersburg, Russia — [5]School of Space Research, Kyung Hee University, Yongin, Republic of Korea

Sunspot observations provide a critical insight into the changes in solar activity and variability on decadal to centennial timescales. This is essential to understand the solar influence on Earth's climate. Such data have been recorded almost continuously since 1610. However the observations have been done by different observers, with different instruments and techniques, that need to be calibrated to a reference set. Numerous attempts have been made to calibrate these data, mostly employing a simple linear scaling, which is however known to be not appropriate. We present here a revisited calibration of the group sunspot number series based on a direct non-parametric non-linear method. We selected a number of long and stable records as backbones, and calibrated all other individual observers of the corresponding periods to these backbones using direct probability distribution functions. Using a similar approach, the backbones were then merged into the final record, which is calibrated to the reference data set. The final series supports the existence of the Modern Grand Maximum.

EP 13.3 Do 17:15 GW2 B2880

Reconstruction of Solar Irradiance from Cosmogenic Isotope Data — •Chi-Ju Wu[1], Natalie A. Krivova[1], Ilya G. Usoskin[2], and Sami K. Solanki[3] — [1]Max Planck for Solar System Research, Goettingen, Germany — [2]Physics Department, Oulu University, Finland — [3]Kyung-Hee University, South Korea

Assessment of the solar irradiance changes, especially on long timescales, is crucial since the Sun is the main energy source to Earth*s climate system. Solar irradiance on timescales of 11-year or shorter is measured by space-based experiments while past variations have to be reconstructed from the available proxies with the help of suitable models. The sunspot number is commonly used as proxy of solar activity back to the Maunder Minimum, while only cosmogenic isotope data, such as 14C and 10Be, are available for the earlier times. In this talk we will present the latest solar irradiance reconstructions derived from the most up-to-date cosmogenic isotope data and the geomagnetic field model.

Hauptvortrag EP 13.4 Do 17:30 GW2 B2880

Magnetospheric current systems during magnetic storms — •Hermann Lühr — Deutsches GeoForschungsZentrum GFZ, Potsdam

During times of enhanced energy and momentum transfer from the solar wind into the magnetosphere the magnetopause is typically displaced inward and the ring current is enhanced. Commonly the Dst index is used as an indicator for storm intensity. But recent observations provide evidence for deficiencies of the Dst index with respect to ring current strength. During the storm main phase an azimuthal asymmetry of the disturbance level appears, larger deflections on the duskside than on the dawnside. This is traditionally attributed to the formation of a partial ring current in the evening sector. However, in-situ current density measurements of the ring current region reveal strongest currents in the post-midnight sector. For reconciling the near-Earth recordings with observations in the magnetosphere an additional storm-time current system is proposed. A possible configuration includes generators in the equatorial plane close to the low-latitude boundary layer both on the dawn and duskside. They drive field-aligned currents (FACs) into the ionosphere on the prenoon and afternoon sides. Currents are routed along the electrojets on both sides, and leave the ionosphere as FACs on the nightside for closing the circuit. The distribution of current between the two hemispheres depends on local season.

EP 13.5 Do 18:00 GW2 B2880

Activities of the International Space Weather Initiative and their instruments in Germany — •Daniela Wenzel, Jens Berdermann, and Norbert Jakowski — German Aerospace Center (DLR), Neustrelitz, Germany

The International Space Weather Initiative (ISWI) is a program inspired by the activities of the International Heliophysical Year (IHY) 2007. It combines space weather issues concerning Hardware and data interpretation associated with space-based measurements in order to bring space weather sciences forward. ISWI aims at establishing of scientific insight which is important for understanding, reconstructing and predicting space weather processes. It covers topics of measuring instruments, data analysis and modelling, as well as education and public outreach.

Currently, ISWI encompasses 17 instruments whereof Germany maintains two of them: the educational project named SOFIE (SOlar Flares detected by Ionospheric Effects) and the global, near real time network called GIFDS (Global Ionospheric Flare Detection System). Both instruments deal with the monitoring of the lower ionosphere and utilise VLF measurements in order to provide information on solar flare impacts. In compliance with ISWI's open data policy, the access to data products is free. After all, the data management and its dissemination form the basis for a good cooperation among all ISWI participants. This presentation will give an overview on the ISWI organization and participating instruments, with a particular focus on German activities.

EP 13.6 Do 18:15 GW2 B2880

Messungen von NO in der Mesosphäre und unteren Thermosphäre mit SCIAMACHY — •Stefan Bender[1], Miriam Sinnhuber[1], John Burrows[2] und Martin Langowski[3] — [1]Karlsruhe Institut für Technologie, Karlsruhe — [2]Institut für Umweltphysik, Universität Bremen, Bremen — [3]Institut für Physik, Ernst-Moritz-Arndt Universität, Greifswald

In der oberen Atmosphäre (≈ 100 km) der Polregionen (55–75°) erzeugen geladene Teilchen des Sonnenwindes Stickstoffmonoxid (NO). Dort ist dieses Spurengas ohne Sonneneinstrahlung (in der Polarnacht) sehr langlebig. Es gelangt dann durch Abwärtstransport im Polarwirbel bis in die Stratosphäre und beeinflusst durch chemische Reaktionen die Ozonschicht und das Klima.

Das Satelliteninstrument SCIAMACHY auf dem Forschungssatelliten Envisat hat unter anderem die NO-Emissionslinien in der Mesosphäre und unteren Thermosphäre (MLT, 50–150 km) annähernd zehn Jahre lang gemessen. Aus diesen UV Spektren berechnen wir die NO Teilchendichte von 60 km bis 160 km. Wir verwenden die Spektren der speziellen MLT Scans (50–150 km) und der nominellen Scans bis 90 km. Von August 2002 bis März 2012 erhalten wir daraus tägliche globale NO Dichten in Höhen von 60 bis 90 km.

Anhand dieser Zeitreihe untersuchen wir den Einfluss der Sonnenaktivität auf die Erdatmosphäre. Die Zusammenhänge mit solaren und geomagnetischen Indizes, z.B. Lyman-α und Kp, erlauben es, Klimamodelle in dieser Hinsicht zu überprüfen und zu verbessern.