EP 1: Near Earth Space

Time: Monday 16:30–18:00 Location: H-HS VIII

Invited Talk EP 1.1 Mon 16:30 H-HS VIII

Erforschung des Weltraumwetters am DLR Institut für Solar-Terrestrische Physik — •Jens Berdermann — DLR Institut für Solar-Terrestrische Physik, Kalkhorstweg 53, 17235 Neustrelitz

Das Weltraumwetter hat einen erheblichen Einfluss auf die Leistung und Zuverlässigkeit von weltraumgestützten und bodengestützten technologischen Systemen und kann hierdurch auch indirekt Menschenleben gefährden. Angesichts der wachsenden Bedeutung von Weltraumwetterinformationen ist 2019 die Gründung eines neuen DLR-Instituts am Standort Neustrelitz erfolgt. Das Institut für Solarterrestrische Physik (SO) befindet sich aktuell in der Aufbauphase und forscht im Bereich Weltraumwetter von den Grundlagen bis zur Anwendung. SO untersucht zeitlich variable Bedingungen auf der Sonne und im Sonnenwind sowie deren Wirkung auf das gekoppelte Ionosphären-Thermosphären-Magnetosphären-System und analysiert Weltraumwettereffekte auf betroffene Technologien in den Bereichen Kommunikation, Navigation, Luftfahrt, Satellitenbetrieb, bemannte Raumfahrt, elektrischer Netzbetrieb und Landvermessung. SO wird mit seinen Forschungsergebnissen zu wissenschaftlichen und technologischen Anwendungen z.B. im Bereich der Satellitenkommunikation und Navigation, der Erdbeobachtung, des Krisenmanagements, der Kommunikation für die Luftfahrt und der automatisierten Mobilität beitragen. Im Vortrag wird ein Überblick über die existierenden und geplanten Aktivitäten zum Thema Weltraumwetter am DLR Institut für Solar-Terrestrische Physik, sowie deren Einbindung in internationale Weltraumwetteraktivitäten gegeben.

EP 1.2 Mon 17:00 H-HS VIII

Yield function of the DOSTEL count and dose rates aboard the International Space Station — •Bernd Heber, Maximillian Brüdern, Sönke Burmeister, Anna Caprotti, Dennis Galsdorf, and Konstantin Herbst — Christian-Albrechts-Universität Kiel

The Earth is constantly hit by cosmic rays that have their origin in the galaxy. These GCRs contribute substantially to the radiation dose measured by particle detectors in space. Astronauts on the ISS are partially shielded by the Earth magnetic field. In addition the material of the ISS absorbs several tenth of MeV ions. The DOSTEL is part of the DOSIS 3D experiments and has been installed on board the ISS in 2009. The radiation field is a product of primary energetic particles and particles that are generated by the interaction of the primaries with the surrounding material. Since modeling of this environment is challenging we determined the instruments yield function by analyzing the count rate as well as the dose rate during the latitude scans of the ISS. In order to determine the yield function we utilized published AMS proton and Helium spectra and compute the cut-off rigidity using PLANETOCOSMICS. Here we will present and discuss the first results obtained during moderate solar activity from 2014 to 2017.

EP 1.3 Mon 17:15 H-HS VIII

Middle atmosphere ionization from particle precipitation derived from the SSUSI satellite UV observations — •Stefan Bender and Patrick Espy — Norwegian University of Science and Technology, Trondheim, Norway

Solar, auroral, and radiation belt electrons enter the atmosphere at polar regions leading to ionization and affecting its chemistry. Climate models usually parametrize this ionization and the related changes in chemistry based on satellite particle measurements. Precise measurements of the particle and energy influx into the upper atmosphere are difficult because they vary substantially in location and time. Widely used particle data are derived from the POES and GOES satellite measurements which provide in-situ ($\approx$ 800 km and geostationary) electron and proton spectra.

We present electron energy and flux measurements from the Special Sensor Ultraviolet Spectrographic Imagers (SSUSI) satellite instruments. This formation of satellites directly observes the auroral zone in the UV from which electron energies and fluxes are inferred. We use these observed electron energies and fluxes to calculate ionization rates and electron densities in the mesosphere and lower thermosphere. We compare the calculated electron densities to those measured by the EISCAT radars in order to validate the SSUSI derived energies and fluxes as well as the atmospheric ionization models. The validated SSUSI data will help to improve the auroral particle parametrizations used for climate models.

Invited Talk EP 1.4 Mon 17:30 H-HS VIII

Using multiple radar stations to examine atmospheric tides and their variability — •Patrick Espy[1,2], Willem van Caspel[1,2], and Robert Hibbins[1,2] — [1]Norwegian University of Science and Technology, Trondheim, Norway — [2]Birkeland Centre for Space Science, Bergen, Norway

Atmospheric tides and planetary waves (PWs) play an important role in shaping the day-to-day and seasonal variability of the Mesosphere-Lower-Thermosphere (MLT). Measurements of tidal and PW variability in the mid-latitude MLT have however remained sparse. This study uses a new analysis technique on the meteor radar winds from a longitudinal array of SuperDARN radars. These provide hourly measurements of the meridional wind at ~95km altitude from which we are able to investigate tides and PWs in the MLT at 65 degrees North. Using the array of SuperDARNs, we can identify east and westward traveling S1, S2 and S3 wave components over a broad range of frequencies spanning tidal to planetary wave oscillations. We present a study of the variability of the migrating and non-migrating tides and the longitudinal variability resulting from their interaction. Additionally we examine the variability of the 2 and 5-day waves in the MLT, and their interaction with tides during stratospheric warming events.