Fachverband Extraterrestrische Physik (EP)

Thomas Wiegelmann
MPI für Sonnensystemforschung
Justus-von-Liebig-Weg 3
37077 Göttingen
wiegelmann@mps.mpg.de

Übersicht der Hauptvorträge und Fachsitzungen

(Hörsaal GW2 B2880; Poster GW2 2.OG)

Hauptvorträge

EP 2.1	Mo	14:00–15:00	GW2 B2880	**Stossfreie Schockwellen in Weltraumplasmen: Stuktur und Teilchenbeschleunigung** — •Manfred Scholer
EP 2.2	Mo	15:00–15:25	GW2 B2880	**The Jovian Source as an investigation tool for charged particle transport** — •Adrian Vogt, Phillip Dunzlaff, Roelf Du Toit Strauss, Bernd Heber, Andreas Kopp, Patrick Kühl, Marius Potgieter
EP 2.3	Mo	15:25–15:50	GW2 B2880	**Aurora on Brown Dwarfs** — •Christian Fischer, Joachim Saur
EP 4.1	Di	14:00–14:30	GW2 B2880	**A new view of the solar atmosphere through IRIS** — •Hardi Peter
EP 7.1	Mi	8:30– 9:00	GW2 B2880	**Observations of the Sun with the novel radio telescope LOFAR** — •Gottfried Mann
EP 10.1	Do	8:30– 9:00	GW2 B2880	**Sounding the interior of Jupiter's moons through observations of their atmospheric emissions** — •Lorenz Roth
EP 12.1	Do	15:00–15:30	GW2 B2880	**The Gravity Field of 67P/Churyumov-Gerasimenko from the Rosetta Radio Science Experiment** — Martin Pätzold, •Matthias Hahn, Tom Andert, Sami Asmar, Jean-Pierre Barriot, Michael Bird, Bernd Häusler, Kerstin Peter, Silvia Tellmann, Eberhard Grün, Paul Weissman
EP 13.1	Do	16:30–17:00	GW2 B2880	**Is there a solar 27-day signature in tropospheric clouds?** — •Christian von Savigny, Kai-Uwe Eichmann, Christoph Hoffmann, Martin Langowski
EP 13.4	Do	17:30–18:00	GW2 B2880	**Magnetospheric current systems during magnetic storms** — •Hermann Lühr
EP 15.1	Fr	11:00–11:30	GW2 B2880	**The PLATO Mission** — •Heike Rauer

Hauptvorträge des fachübergreifenden Symposiums SYPS

Das vollständige Programm dieses Symposiums ist unter SYPS aufgeführt.

SYPS 1.1	Mi	14:00–14:30	SFG 0140	**Magnetospheric Physics – Basic Processes and Open Questions** — •Antonius Otto
SYPS 1.2	Mi	14:30–15:00	SFG 0140	**GRACE/GRACE-FO and LAGEOS/LARES in Geodesy, Earth Observation and Relativity** — •Rolf König, Ignazio Ciufolini, Frank Flechtner, Antonio Paolozzi
SYPS 1.3	Mi	15:00–15:30	SFG 0140	**LISA and LISA Pathfinder** — •Gerhard Heinzel
SYPS 1.4	Mi	15:30–16:00	SFG 0140	**Promises and challenges of Gaia astrometry** — •Sergei Klioner

Hauptvorträge des fachübergreifenden Symposiums SYAK

Das vollständige Programm dieses Symposiums ist unter SYAK aufgeführt.

SYAK 1.1	Fr	8:30– 9:00	GW2 B2880	**Solar Irradiance Variation** — •Natalie Krivova
SYAK 1.2	Fr	9:00– 9:30	GW2 B2880	**Cosmic rays and ground level enhancements** — •Bernd Heber

SYAK 1.3	Fr	9:30–10:00	GW2 B2880	**Impact of precursor gases and ions on new particle formation and climate** — •Urs Baltensperger
SYAK 1.4	Fr	10:00–10:30	GW2 B2880	**Regional Influence of Solar Variability on European Climate** — •Katja Matthes

Fachsitzungen

EP 1.1–1.1	Mo	11:00–11:45	HS 2010	**Plenarvortrag Dieter Breitschwerdt**
EP 2.1–2.3	Mo	14:00–15:50	GW2 B2880	**Preissitzung mit Arne Richter Lecture**
EP 3.1–3.8	Mo	16:30–18:30	GW2 B2880	**Astrophysik**
EP 4.1–4.7	Di	14:00–16:00	GW2 B2880	**Sonne und Heliosphäre I**
EP 5.1–5.13	Di	16:30–18:00	GW2 2.OG	**Postersitzung I**
EP 6.1–6.1	Di	18:20–18:50	HS 2010	**Spezialvortrag Stefan Krückeberg**
EP 7.1–7.7	Mi	8:30–10:30	GW2 B2880	**Sonne und Heliosphäre II**
EP 8.1–8.4	Mi	14:00–16:00	SFG 0140	**Symposium Fundamental Physics in Space**
EP 9	Mi	16:30–18:00	GW2 2.OG	**Postersitzung II**
EP 10.1–10.6	Do	8:30–10:15	GW2 B2880	**Planeten und kleine Körper I**
EP 11	Do	12:30–14:00	GW2 B2880	**Hauptversammlung AEF und DPG-EP**
EP 12.1–12.3	Do	15:00–16:00	GW2 B2880	**Planeten und kleine Körper II**
EP 13.1–13.6	Do	16:30–18:30	GW2 B2880	**Erdnaher Weltraum**
EP 14.1–14.4	Fr	8:30–10:30	GW2 B2880	**Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre**
EP 15.1–15.4	Fr	11:00–12:15	GW2 B2880	**Exoplaneten und Astrobiologie**

Mitgliederversammlung Fachverband Extraterrestrische Physik

Donnerstag 12:30–14:00 Raum: GW2 B2880

Einladung zur Mitgliederversammlung der AEF und DPG-EP

Liebe Mitglieder und Freunde der extraterrestrischen Forschung,

im Namen des Vorstands lade ich Sie hiermit herzlich zur Teilnahme an unserer diesjährigen Mitgliederversammlung am Donnerstag 16.03.2017 um 12:30 in unserem Tagungshörsaal (Raum: GW2 B2880) auf der DPG-Tagung in Bremen ein.

Die Tagesordnung ist:

- Begrüßung
- Feststellung der Beschlussfähigkeit
- Kenntnisnahme des Protokolls der Mitgliederversammlung 2016 (siehe http://aef-ev.de/wp-content/uploads/2016/01/protokoll_muenster_2016.pdf)
- Bericht des Vorstandes
- Bericht des Schatzmeisters (AEF)
- Entlastung des Vorstandes (AEF)
- Höhepunkte und Veranstaltungen 2016,2017
- Bericht aus DPG und der DPG-Sektion Materie und Kosmos (SMuK).
- Bericht aus den Kommissionen
- Internationale Weltraumwetterinitiative ISWI
- Kommissionsstruktur
- Wahlen: 1 x stellvertretender Vorsitz AEF und DPG-EP,5 x Kommissionsvorsitz, Vertretung bei ISWI
- Abstimmung über Tagungsorte 2019 und 2020 (AEF und DPG-EP).
- Webseite und Mitgliederverwaltung (AEF)
- Social Media in DPG

- Sonstiges

Über Ihr Erscheinen würde ich mich sehr freuen, mit freundlichen Grüßen,

Thomas Wiegelmann für den Vorstand

EP 1: Plenarvortrag Dieter Breitschwerdt

Zeit: Montag 11:00–11:45 Raum: HS 2010

Plenarvortrag EP 1.1 Mo 11:00 HS 2010

Where and when did recent supernovae near Earth explode? — •Dieter Breitschwerdt[1], Jenny Feige[1], Michael Schulreich[1], Miguel Avillez[2], and Christian Dettbarn[3] — [1]Zentrum für Astronomie und Astrophysik, TU Berlin — [2]Deparment of Mathematics, University of Evora, Portugal — [3]ARI, Zentrum für Astronomie Heidelberg

Radioactive isotopes like ^{60}Fe (half-life time 2.6 million years), found in the deep-sea ferromanganese crust and sediments, give information on supernovae that exploded near Earth during the last 15 million years. ^{60}Fe is produced in AGB stars and during explosive nucleosynthesis, and incorporated in dust grains, travelling through interstellar space. Since all terrestrial ^{60}Fe has decayed long ago, all recently detected signals in various ocean samples, the moon, in magnetotactic bacteria, and in cosmic rays must stem from nearby core-collapse supernovae. These measurements point to a significant peak in the ^{60}Fe fluence at about 2.2 million years ago. We have performed analytical and numerical hydrodynamical high resolution simulations that can explain both the ^{60}Fe fluence as well as the formation and evolution of the Local Bubble (harbouring the solar system), as the result of supernovae exploding in a nearby moving group. It will be shown how many explosions should have occurred and when, and where their most probable sites are found. The effects of these explosions will also be discussed briefly.

EP 2: Preissitzung mit Arne Richter Lecture

Zeit: Montag 14:00–15:50 Raum: GW2 B2880

Hauptvortrag EP 2.1 Mo 14:00 GW2 B2880

Stossfreie Schockwellen in Weltraumplasmen: Stuktur und Teilchenbeschleunigung — •Manfred Scholer — Max-Planck-Institut f. extraterrestrische Physik, Garching, Germany

Stossfreie Schockwellen sind wichtige Strukturen im Sonnenwind und in astrophysikalischen Plasmen, in denen die durch die Strömungsgeschwindigkeit gegebene Energie in thermische Energie transformiert wird. Auf Grund der Stossfreiheit der Plasmen sind kollektive Prozesse (Welle-Teilchen-Wechselwirkung) für die Energieumsetzung wesentlich. Ausser der Thermalisierung werden an stossfreien Schockwellen Ionen und Elekronen zu hohen Energien beschleunigt. Es werden in dem Vortrag die verchiedenen Schockwellen im Sonnensystem vorgestellt und die in den letzten Jahren auf Grund von in situ Beobachtungen und numerischen Simulationen gewonnenen Ergebnisse zur Struktur der Schockwellen, zu den Thermalisierungsprozessen, und zur Telchenbeschleunigung, diskutiert.

Hauptvortrag EP 2.2 Mo 15:00 GW2 B2880

The Jovian Source as an investigation tool for charged particle transport — •Adrian Vogt[1], Phillip Dunzlaff[1], Roelf Du Toit Strauss[2], Bernd Heber[1], Andreas Kopp[3], Patrick Kühl[1], and Marius Potgieter[2] — [1]Christian-Albrechts-Universität, Kiel, Deutschland — [2]North-West-University, Potchefstroom, South Africa — [3]Université Libre de Bruxelles, Brüssel, Belgien

Since the Pioneer 10 flyby it is well known that the Jovian magnetosphere is a source of electrons. Because these Jovian electrons seem to dominate the electrons population in the low MeV range throughout the inner Heliosphere, they are often utilized as test particles for charged particle transport. Presenting a new suggestion for the source spectrum, we would like to emphasize the possibilities of our modelling approach as well as the investigation of Jovian electrons in general.

Hauptvortrag EP 2.3 Mo 15:25 GW2 B2880

Aurora on Brown Dwarfs — •Christian Fischer and Joachim Saur — Institute for Geophysics and Meteorology, University of Cologne, Germany

The first detection of aurora outside our solar system through observations at radio and Hα-line emissions of the Brown Dwarf LSR J1835+3259 was recently reported by Hallinan et al. (2015). The observed emissions exhibit a periodicity with the rotation period of LSR J1835+3259 and indicate magnetospheric current systems that create the aurora. The aurora is estimated to be several orders of magnitude stronger than Jupiters aurora. In our presentation we discuss and model possible generator mechanisms that power the aurora, such as an exoplanet or magnetic braking. We quantitatively compare our model results with the observed auroral fluxes.

Die Preissitzung besteht aus der Arne Richter Lecture und Vorträgen der Gewinner des Talkpreises und Posterpreises der letztjährigen Tagung

EP 3: Astrophysik

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

EP 3.1 Mo 16:30 GW2 B2880

Proton and Helium Injection Into First Order Fermi Acceleration at Shocks: Hybrid Simulation and Analysis — •Adrian Hanusch[1], Mikhail Malkov[2], and Tatyana Liseykina[1] — [1]Universität Rostock — [2]University of California, San Diego

The problem of cosmic ray (CR) origin is more than a hundred-year-old. Most likely, their acceleration occurs at collisionless shocks in supernova remnants by diffusive shock acceleration (DSA). By this mechanism, charged particles gain energy by crossing the shock front occasionally, while being scattered by magnetic perturbations in the shock vicinity.

The mechanism is physically simple and robust, but some important aspects are still not well understood. One difficulty is connected already with its start, when the shock must select a tiny fraction of particles to keep on crossing its front and gaining energy continuously. This initial phase of the DSA is referred to as "injection." Recent measurements of PAMELA [1] and AMS-02 [2] show a difference between He^{2+} and proton spectra. The elemental composition of galactic CR might hold the key to their origin. A comparison of injection rates of particles with different mass to charge ratio is a powerful tool for studying the injection process and the DSA in general.

We performed a series of one dimensional hybrid simulations and analyzed the impact of He^{2+} admixture on the injection of both protons and helium.

[1] O. Adriani *et al.*, Science, 332, 69 (2011).
[2] M. Aguilar *et al.*, Phys. Rev. Lett. 115, 211101 (2015).

EP 3.2 Mo 16:45 GW2 B2880

HAWC High Energy Upgrade with a Sparse Array — •Vikas Joshi — Max Planck Institute for Nuclear Physics, Saupfercheckweg 1, 69117 Heidelberg, Germany

The High Altitude Water Cherenkov (HAWC) gamma-ray observatory has been fully operational since March 2015. It is situated on the flanks of Sierra Negra (Mexico) at an altitude of 4100 m above the sea level. HAWC consists of 300 Water Cherenkov Detectors, each containing 200 ktons of purified water and 4 PMT's (three 8" and one 10"), that cover a total surface area of 20,000 m^2. HAWC observes gamma rays in the 0.1-100 TeV energy range and has a sensitivity to TeV-scale gamma-ray sources an order of magnitude better than previous air-shower arrays. Its two steradians field-of-view and $>$ 90% duty cycle

make HAWC an ideal instrument for surveying the high-energy sky.

HAWC collects multi-TeV gamma rays with an effective area of 10^5 m^2, but many of them are not well-reconstructed because the shower core falls outside the main array. An upgrade that increases the present fraction of well reconstructed multi-TeV showers by a factor of 3-4 can be done with a sparse outrigger array of small water Cherenkov detectors that pinpoint the core position and by that improve the angular resolution of the reconstructed showers. Such an outrigger array would be of the order of ∼300 small water Cherenkov detectors of 2.5 m^3 equipped with one 8" PMT, placed over an area four times larger than HAWC. In this contribution, we will discuss the different outrigger array components and the simulation results to optimize it.

EP 3.3 Mo 17:00 GW2 B2880

Astrophysikalische MHD-Schockstrukturen am Beispiel von λ Cephei — •Lennart Robin Baalmann — Ruhr-Universität Bochum, Deutschland

Der Einfluss des Magnetfeldes auf die Wechselwirkung zwischen supersonischem, super-Alfvénischem Sternwind und supersonischem, super-Alfvénischem interstellarem Wind wird anhand von numerischen Einfluid-MHD-Simulationen untersucht. Die stationären MHD-Modelle einer Astrosphäre werden in Vergleich zu ihren hydrodynamischen Gegenstücken betrachtet; sowohl der Fall ohne als auch der mit Kühl- und Heizfunktion werden untersucht. Es stellt sich heraus, dass die schnelle magnetosonische Schockstruktur der sonischen ähnelt und eine Alfvénische sowie eine langsame magnetosonische Schockstruktur von geringer Ausdehnung im äußeren Astrosheath existieren.

EP 3.4 Mo 17:15 GW2 B2880

An improved analytical model of the local interstellar magnetic field: The extension to compressibility — •Jens Kleimann[1], Christian Röken[2], and Horst Fichtner[1] — [1]Theoretische Physik IV, Ruhr-Universität Bochum, Germany — [2]Fakultät für Mathematik, Universität Regensburg, Germany

The analytical magnetohydrodynamic (MHD) model for the local interstellar magnetic field in the vicinity of the heliopause by Röken et al. (2015) is an exact solution to the induction equation of ideal MHD for an interstellar magnetic field being passively advected in a Rankine-type heliospheric velocity field. I will first review basic properties of this model, and then present a recent generalization from incompressible to compressible flow. Both the exact solution and realistic approximations to the resulting density structure will be discussed. The usefulness of this still analytical solution as an approximation to self-consistent magnetic field configurations obtained numerically from the full MHD equations is illustrated by quantitative comparisons.

EP 3.5 Mo 17:30 GW2 B2880

Linear Disturbances in the Local Interstellar Medium: The Plasma-Gas Interaction in the Two-Fluid Approximation — •Lukas Westrich — Institut für theoretische Physik IV, Ruhr-Universität Bochum, Deutschland

In this scientific presentation, linear disturbances in the local interstellar medium (LISM) are examined. Background is a scenario which proposes a local density enhancement in the LISM as the cause of the IBEX ribbon. Therefore must be probed whether such an increase in the LISM can exist. For this purpose, the plasma-gas mixture of LISMs is described with a two-fluid model, in order to subsequently apply the linear perturbation theory. In addition, is examined with this model, what processes take place inside the heliosphere with these density waves as precisely as possible to get an idea of how realistic this scenario of the local density enhancement is. The result is that such a density wave can propagate without damping after its creation along the interstellar magnetic field and is damped only in the heliosphere. The damping within the termination shock is stronger than outside.

EP 3.6 Mo 17:45 GW2 B2880

What matter(s) at the Event Horizon? Radio Interferometry at highest resolution — •Silke Britzen[1], Anton Zensus[1], Christian Fendt[2], Andreas Eckart[1,3], and Vladimir Karas[4] — [1]Max-Planck-Institut für Radioastronomie, Bonn, Germany — [2]Max-Planck-Institut für Astronomie, Heidelberg, Germany — [3]I. Physikalisches Institut der Universität zu Köln, Germany — [4]Astronomical Institute, Academy of Sciences, Prague, Czech Republic

M87 is the central elliptical galaxy in the Virgo cluster and at a distance of 16.7 Mpc the closest active black hole to our galaxy. The bright jet and counter-jet have been studied intensively in all wavelength regimes (radio to TeV). Most detailed information for this show-case jet has been obtained in the radio regime with increasing observing frequencies and resolution in recent years. This source is a prime object to be studied in exquisite detail with the upcoming Event Horizon Telescope (EHT) observations since it promises to allow a direct view on the jet launching process itself. I will present our most recent results based on an analysis of 16 years of radio interferometric monitoring data which reveal for the first time details concerning the physical processes of the jet loading of M87. I will discuss the implications for the jet launching mechanism. In addition, I will present the current status of the EHT-observations to image the photon sphere around the event horizon of M87 (and Sgr A*)and possible tests of General Relativity (GR).

EP 3.7 Mo 18:00 GW2 B2880

Validierung des Flussmodells zur Charakterisierung der Strahlungsumgebung im interplanetaren Raum anhand aktueller Rosetta-Daten — •Vanessa Wyrwoll[1], Sascha Lüdeke[1], Hugh Evans[2] und Björn Poppe[1] — [1]Carl von Ossietzky Universität Oldenburg — [2]ESA/ESTEC, Noordwijk, The Netherlands

Das relevante Energiespektrum der hochenergetischen Teilchenstrahlung im Weltall reicht von wenigen MeV bis zu einigen hundert MeV. Die Rosetta Mission der ESA stellt auf Grund ihrer einzigartigen Flugbahn eine hervorragende Möglichkeit dar, Teilchenstrahlung bzw. den Teilchenfluss im interplanetaren Raum zu untersuchen. Hierfür wurde Rosetta mit einem Strahlungsdetektor SREM (Standard Radiation Environment Monitor) ausgerüstet. In dieser Arbeit soll überprüft werden, ob trotz der relativ einfachen Detektorlogik des Monitors (15 energiediskriminierende Kanäle) eine Überprüfung galaktischer Teilchenflussmodelle, wie etwa dem Iso 15390 möglich ist.

Hierfür wurden zunächst für Ionen von Wasserstoff bis Sauerstoff Ansprechfunktionen für den SREM Detektor auf Rosetta für den Energiebereich 5 MeV bis 100 GeV unter Zuhilfenahme der Monte-Carlo Umgebung Geant4 (Version 10.01) /Gras (Version 03.04) berechnet. Mithilfe des ISO-Modells wurde dann eine zeitaufgelöste theoretische Teilchenverteilung am Ort der Sonde berechnet und mittels der gewonnenen Ansprechfunktionen die erwartete Zählrate bestimmt.

Aus diesen Ergebnissen kann dann durch Vergleich mit realen Zählratenmessungen die Übereinstimmung der beiden Methoden verifiziert werden. In der Arbeit werden erste Ergebnisse präsentiert.

EP 3.8 Mo 18:15 GW2 B2880

Response Functions to High Energetic Particle Radiation of the Standard Radiation Monitor (SREM) On-board the Rosetta Mission — •Sascha Lüdeke[1], Vanessa Wyrwoll[1], Hugh Evans[2], and Björn Poppe[1] — [1]University of Oldenburg, Germany — [2]ESA/ESTEC, Noordwijk, The Netherlands

To study the flux and composition of galactic cosmic rays and to monitor the radiation burden many space missions are equipped with radiation monitors. One of these monitors is the Standard Radiation Environment Monitor (SREM) on-board the Rosetta Mission. Measurements of these monitors can only be evaluated in detail when the response functions of the monitors are known. They can be determined by measurements, which is impractical considering the energy range of galactic cosmic rays, or simulation, as done in this work. At first the monitor geometry was implemented for use in a Monte-Carlo simulation environment based on Geant4(10.01)/GRAS(03.04). Then a setup to simulate an isotropic radiation environment was implemented and response functions to protons calculated. The radiation environment is comprised of 648 individual planar sources, approximating an omnidirectional spherical source radiating inwards. The response of the SREM channels to each planar source is determined and combined into an omnidirectional response function by summing with a weight corresponding to the solid angle. After benchmarking, the simulations were extended for galactic cosmic ray particles from Helium to Oxygen with energies up to 100GeV/u. Future work will characterize the influence of the Rosetta orbiter on the response of the SREM to GCR radiation.

EP 4: Sonne und Heliosphäre I

Zeit: Dienstag 14:00–16:00 Raum: GW2 B2880

Hauptvortrag EP 4.1 Di 14:00 GW2 B2880

A new view of the solar atmosphere through IRIS — •Hardi Peter — Max Planck Institute for Solar System Research, Göttingen, Germany, peter@mps.mpg.de

The magnetic and dynamic connection through the different regimes of the solar atmosphere provides one of the major challenges in solar physics. Covering temperatures from below ten thousand to above ten million degrees, NASA's Interface Region Imaging Spectrograph (IRIS) is optimized to follow the fast processes in the solar atmosphere at unprecedented resolution in the near and far ultraviolet. IRIS provided new insights over a range of topics, ranging from small-scale transient energetic events in the chromosphere, magnetic and helical structures in the upper solar atmosphere, non-thermal particle acceleration in active regions to the dynamics in flares. Spectroscopic observations highlight the role of reconnection and its nature in the chromosphere and transition region. In particular, the important role of plasmoids in reconnection events has been emphasized and very strong heating of chromospheric plasma was found that provides new evidence on an atmospheric structure that is more complex than thought before. In combination with numerical modeling it became clear that many of the observed spectra can only be understood if the energetic particles are produced in small-scale reconnection events, which then excite the observed transition region lines. In this and other areas, IRIS has been very successful in providing new insight into a range of open issues in solar atmospheric physics, and poses new questions that motivate new theoretical and observational work.

EP 4.2 Di 14:30 GW2 B2880

SCIAMACHY Solar Reference Spectrum — •Tina Hilbig[1], Klaus Bramstedt[1], Mark Weber[1], Matthijs Krijger[2], Ralph Snel[2], and John P. Burrows[1] — [1]Institute of Environmental Physics, University of Bremen, Germany — [2]SRON Netherlands Institute for Space Research, Utrecht, the Netherlands

SCIAMACHY (Scanning Imaging Absorption spectroMeter for Atmospheric CHartographY) aboard ESA*s environmental satellite ENVISAT is a double monochromator designed to measure the radiance backscattered from the Earth to study atmospheric trace gas species. It was operating from 2002 until 2012.

Furthermore, SCIAMACHY performed daily sun observations via a diffuser. Solar spectra in the wavelength range from 212 nm to 1760 nm and two narrow bands from 1930 to 2040 nm and 2260 to 2380 nm are measured with a spectral resolution of 0,2 to 1,5 nm in 8 spectral channels.

Recent developments in the SCIAMACHY calibration (e.g. a physical model of the scanner unit including degradation effects, and an on-ground to in-flight correction using the on-board white light source (WLS)) are used for the generation of a new SCIAMACHY solar reference spectrum as a first step towards a 10-year time series of solar spectral irradiance (SSI) data. For validation comparisons with other solar reference spectra are performed.

EP 4.3 Di 14:45 GW2 B2880

Nonlinear force-free coronal magnetic stereoscopy — •Iulia Chifu[1,2], Thomas Wiegelmann[1], and Bernd Inhester[1] — [1]MPI für Sonnensystemforschung, Justus-von-Liebig-weg 3, 37077, Goettingen,Germany — [2]Astronomical Institute of Romanian Academy, Cutitul de Argint 5, Bucharest, Romania

Getting insights into the 3D structure of the solar coronal magnetic field have been done in the past by two completely different approaches: (1.) Nonlinear force-free field (NLFFF) extrapolations, which use photospheric vector magnetograms as boundary condition. (2.) Stereoscopy of coronal magnetic loops observed in EUV coronal images from different vantage points. Both approaches have their strength and weaknesses. Within this work we present an extension of a NLFFF method which includes the 3D stereoscopic reconstructions of the coronal loops. We apply the newly developed code to a combined data-set from SDO/HMI, SDO/AIA and the two STEREO spacecraft. We find that prescribing the 3D stereoscopically reconstructed coronal loops the S-NLFFF method leads to an agreement between the modelled field and the stereoscopically reconstructed one. It leads also to a decrease in the angle between the current and the magnetic field which indicates an improvement in the force-free solution by a factor of two.

EP 4.4 Di 15:00 GW2 B2880

Coronal active region modelling based on SDO data — •Stephan Barra — MPI für Sonnensystemforschung — Ruhr-Universität Bochum, TP IV

The heating of the solar corona, which has a temperature of order of 10^6 K compared to 5000K in the photosphere, is yet a puzzling problem. Many models have been introduced to describe the corona and its behavior. Especially coronal loops, individual hoses of magnetically confined plasma, have been subject to research. Multispectral imagers like NASA's SDO/AIA, in principle, allow for thermal analysis of such loops. The magnetic field in the corona can be obtained by extrapolating magnetic field measured on the solar surface. We describe an iterative method which deploys both observations from a multispectral imager and magnetic field extrapolations to model density and temperature along the field lines. This could help getting a deeper insight into the processes occurring in the solar corona since the 3D configuration of the physical parameters of the plasma could be tracked.

EP 4.5 Di 15:15 GW2 B2880

Current filamentation induced by 3D plasma flows in the solar corona — •Dieter Nickeler[1], Thomas Wiegelmann[2], Marian Karlicky[1], and Michaela Kraus[1,3] — [1]Astronomical Institute AVCR, Ondrejov, Czech Republic — [2]Max-Planck Institut fuer Sonnensystemforschung, Goettingen, Deutschland — [3]Tartu Observatory, Toravere, Estonia

Many magnetic structures in the solar atmosphere evolve rather slowly so that they can be assumed as (quasi-)static or (quasi-)steady and represented via magneto-hydrostatic (MHS) or magneto-hydrodynamic (MHD) equilibria, respectively. While exact 3D solutions would be desired, they are extremely difficult to find in steady MHD. We construct solutions with magnetic and flow vector fields that have three components depending on all three coordinates. We show that the non-canonical transformation method produces quasi-3D solutions of steady MHD by mapping 2D or 2.5D MHS equilibria to strongly related steady-MHD states. These steady-MHD states exist on magnetic flux surfaces of the original 2D MHS-states. Although the flux surfaces and therefore also the equilibria have a 2D character, these steady MHD-states depend on all three coordinates and display highly complex currents. The existence of geometrically complex 3D currents within symmetric field-line structures provide the base for efficient dissipation of the magnetic energy in the solar corona by Ohmic heating. We also discuss the possibility of achieving force-free fields, and find that they only arise under severe restrictions of the field-line geometry and of the magnetic flux density distribution.

EP 4.6 Di 15:30 GW2 B2880

Semi-Analytical Calculation of Interplanetary Magnetic Field Configurations — •Sophie Aerdker — Ruhr-Universität-Bochum, Lehrstuhl für Weltraum- und Astrophysik

A model from Giacalone et. al. (2002) is introduced, which describes disturbances in the magnetic field of the Sun. Those disturbances are caused by interaction between the slow and fast solar wind leading to compression regions in the solar wind and the magnetic field near the sun. Once the model is presented, the possibility to visualize various regions of perturbation will be analyzed by variation of parameters. Additionally a parametrisation by time allows the representation of time dependent magnetic fields, so that magnetic fields of coronal mass ejections and temporal profiles of solar wind velocities and magnetic field strenghts can be quantified, illustrated and analyzed. Finally the model will be enhanced by a second perturbation region where also temporal dependences are considered. The mainly analytical model is applicable as an easy input for numerical calculation of solution of transport equations. This, in particular, makes it possible to simulate the propagation of particles in interplanetary space especially within 2 AU where shocks are not formed yet.

EP 4.7 Di 15:45 GW2 B2880

An empirical model to describe the modulation of galactic cosmic rays close to Earth — Jan Gieseler, •Bernd Heber, Konstantin Herbst, and Patrick Kühl — IEAP, University of Kiel, Germany

On their way through the heliosphere, Galactic Cosmic Rays (GCRs)

are modulated by various effects before they can be detected at Earth. This process can be described by the Parker equation, which calculates the phase space distribution of GCRs depending on the main modulation processes: convection, drifts, diffusion and adiabatic energy changes. A first order approximation of this equation is the force field approach, reducing it to a one-parameter dependency, the solar modulation potential ϕ. Utilizing this approach, it is possible to reconstruct ϕ from ground based and spacecraft measurements. However, it has been shown previously that ϕ depends not only on the Local Interstellar Spectrum (LIS) but also on the energy range of interest. We have investigated this energy dependence further, using published proton intensity spectra obtained by PAMELA and SOHO/EPHIN as well as heavier nuclei measurements from IMP-8 and ACE/CRIS. Our results show severe limitations at lower energies including a strong dependence on the solar magnetic epoch. Based on these findings, we will outline a new tool to describe GCR proton spectra in the energy range from a few hundred MeV to tens of GeV over the last solar cycles.

EP 5: Postersitzung I

Zeit: Dienstag 16:30–18:00 Raum: GW2 2.OG

EP 5.1 Di 16:30 GW2 2.OG

On the optimum use of the Mg II Index as a proxy for UV solar spectral irradiance variations — •Neda Darvishsefat[1,2], Mark Weber[1], and John P. Burrows[1] — [1]IUP Institute of Environmental Physics, University of Bremen — [2]AWI Alfred Wegner Institute, Bremerhaven

The Mg II index is a useful proxy to model solar spectral irradiances (SSI) in the UV spectral region. In order to confirm how suitable the use of this proxy is, the correlation of the Mg II index composite with available SSI satellite data from SORCE SOLSTICE (2003-present), UARS SOLSTICE (1991-2001) and UARS SUSIM (1991-2005) has been analyzed. The observation periods of each of these instruments cover solar minima and maxima of the 11-year solar cycle. The spectral range investigated is from 115 to 300 nm in the UV. The SSI sensitivity with respect to changes in the Mg II index has been obtained and its stability over the 11-year solar cycle is discussed. The results show for all three instruments in most parts, stability of the sensitivity within its uncertainty range through the observation time, particularly for the lower wavelengths in the UV region. For higher wavelengths above about 250 nm additional parameters like sunspots have to be considered in the linear regression in order to achieve better results.

EP 5.2 Di 16:30 GW2 2.OG

Long-lasting solar energetic electron injection during the 26 Dec 2013 widespread SEP event — •Nina Dresing[1], Raúl Gómez-Herrero[2], Bernd Heber[1], Andreas Klassen[1], Manuela Temmer[3], and Astrid Veronig[3] — [1]IEAP, University of Kiel, Germany — [2]SRG, Universidad de Alcalá, Spain — [3]Institute of Physics, University of Graz, Austria

The solar energetic particle (SEP) event on 26 Dec 2013 was observed all around the Sun by the two STEREO spacecraft and close to Earth. A remarkable feature of the in-situ observations is the long-lasting anisotropy observed at all three viewpoints lasting for many hours at Wind and up to more than a day at STEREO B. Also the near-relativistic electron intensities show long-lasting rises over many hours. To explain such observations a temporally extended injection scenario is required which could be realized by the associated CME-driven shock. Because energetic electron events were previously assumed to be purely flare-ralated, it is important to characterize the possible role of shocks for solar energetic electrons. Especially in the context of widespread SEP events the role of efficient perpendicular transport vs. an extended source region is discussed controversially. We analyze remote-sensing and in-situ observations and discuss the role of the shock for the energetic electron event as well as its limitations.

EP 5.3 Di 16:30 GW2 2.OG

GEANT 4 Simulation of the Solar Electron Proton Telescope aboard the STEREO mission — Stefan Wraase, •Bernd Heber, Stephan Böttcher, Nina Dresing, Andreas Klassen, and Patrick Kühl — Christian-Albrechts-Universität, 24118 Kiel, Germany

The Solar Electron and Proton Telescope (SEPT), one of four instruments of the Solar Energetic Particle (SEP) suite for the IMPACT investigation, is designed to provide the three-dimensional distribution of energetic electrons and protons with good energy and time resolution. It consists of two dual double-ended magnet/foil particle telescopes which cleanly separate and measure electrons in the energy range from 30-400 keV and protons from 60 - 7000 keV. Anisotropy information on a non spinning spacecraft is provided by the two separate telescopes: SEPT-E looking in the ecliptic plane along the Parker spiral magnetic field both towards and away from the Sun, and SEPT-NS looking vertical to the ecliptic plane towards North and South. The dual set-up refers to two adjacent sensor apertures for each of the four view directions: one for protons, one for electrons. In this contribution a simulation of SEPT utilizing GEANT 4 has been set up with an extended instrument model in order to calculate improved response functions of the four different telescopes. This will help to understand and correct instrumental effects in the measurements.

EP 5.4 Di 16:30 GW2 2.OG

The not so standard Neutron Monitor: An initiative for standardization — •Christian Steigies[1] and Christos Sarlanis[2] — [1]Christian-Albrechts-Universität zu Kiel — [2]ISNet Co, Athens, Greece

Neutron Monitors (NM) are standardized ground-based cosmic ray detectors. The IGY type has been in use since the International Geophysical Year 1957. In 1964 it has been succeeded by the NM64, which provides better count-rate statistics. Although most stations of the worldwide Neutron Monitor network are of the NM64 type, some IGY NMs are still in use today. Since the beginning NMs deliver hourly count-rates to the World Data Center for Cosmic Rays (WDC-C) in a standardized format. With the creation of NMDB.eu also a standard data format for high-resolution measurements is in place. However, the data processing of NMs, that is determination of count-rates of the whole monitor (which consists of typically 18 individual counter tubes), is not standardized. Single tubes may produce errors (spikes, dropouts, drifts, snow or wind effect) which deteriorate the high-precision measurement if this data is not properly corrected. Different NM stations experience different kinds of problems, so each station has developed their own algorithms to correct data, ie a simple sum algorithm, different median editors, or the so called super editor. In a world where we are trying to standardize NM data from the detection system all the way to the database, data correction should be standardized as well. Thus we are working on a software package which will be used to study and compare the different algorithms using actual data provided by different NM stations.

EP 5.5 Di 16:30 GW2 2.OG

Neutron monitor measurements on the German research vessel Polarstern — •Bernd Heber[1], Dennis Galsdorf[1], Konstantin Herbst[1], Helena Krüger[2], Hendrik Krüger[2], and Michael Walter[3] — [1]Christian-Albrechts-Universität, 24118 Kiel, Germany — [2]Center for Space Research, North-West University, Potchefstroom 2520, South Africa — [3]Deutsches Elektronen-Synchrotron DESY, D-15738 Zeuthen

Neutron monitors and muon telescopes are ground-based devices to measure the variation of galactic cosmic ray intensities. Since their measurements are influenced by the variable Earth magnetic field and the atmospheric conditions close to its position a detailed knowledge of the instrument sensitivity with geomagnetic latitude (rigidity) and atmospheric pressure is essential. The rigidity dependence is determined experimentally by utilizing several so called latitude scans. The Polarstern is currently one of the most sophisticated polar research vessels in the world that spends almost 310 days a year at sea. Between November and March it usually sails to and around the waters of the Antarctic, while the northern summer months are spent in Arctic waters. In other words the vessel scans twice a year the rigidity range below the atmospheric threshold and above 10 GV. One mini neutron monitor, constructed by the North West University campus Potchefstroom, and muon telescope, constructed by DESY Zeuthen,

are measuring the variation of galactic cosmic rays with respect to the position of the vessel. In this presentation the measurements of the neutron moinitor over the last years are presented.

EP 5.6 Di 16:30 GW2 2.OG

The search for Europa plume signatures in Galileo in-situ data — •Hans Huybrighs[1,2,3], Elias Roussos[1], Norbert Krupp[1], Markus Fränz[1], Yoshifumi Futaana[2], Stas Barabash[2], and Karl-Heinz Glassmeier[1,3] — [1]Max Planck Institute for Solar System Research, Göttingen, Germany — [2]Swedish Institute of Space Physics, Kiruna, Sweden — [3]Institut für Geophysik und extraterrestrische Physik, Technische Universität Braunschweig, Braunschweig, Germany

Hubble observations obtained in recent years indicate the existence of water vapour plumes originating from the surface of Jupiter's moon Europa. The first opportunity to study these plumes in-situ will arise when ESA's JUICE mission or NASA's Europa Mission will arrive there. However, it has been suggested that the past Galileo mission could have encountered these plumes already. In particular it has been suggested that high plasma densities and anomalous magnetic fields measured during the E12 flyby could be linked to plume activity. Here we present an overview of Galileo in-situ data obtained during the Europa flybys and compare the data in the context of the search from Europa plumes. Focus is in particular on the data obtained with the plasma instrument PLS.

EP 5.7 Di 16:30 GW2 2.OG

Long Term Stability of a 1 GHz Laser Frequency Comb — •Michael Debus and Philipp Huke — Institut für Astrophysik, Universität Göttingen, Deutschland

One part of the instrumentation plan of the E-ELT is a high resolution spectrograph (HIRES). For the calibration unit of HIRES a laser frequency comb (LFC) may be used. We are investigating the stability of a 1 GHz LFC. The whole setup is referenced to the GPS-frequency attaining a stability of $8 \cdot 10^{-12}$. One frequency generator is used to stabilize the repetition rate of the LFC, a second one is used to stabilize the offset frequency. Both are GPS-referenced. The stability of the frequency generators and the corresponding electronics is crucial to the overall performance of the LFC. The behavior of the frequency generators was characterized both on and off the GPS-reference as well as the stability of the electronic circuits. It is also important to know the inherent drift of the offset frequency in order to stabilize it over an extended period of time.

We have reached a relative stability of $1.2 \cdot 10^{-11}$ over 6 hours. Currently we are aiming to keep the LFC in lock for at least 12 hours. Additionally we are investigating other parameters like spectral amplitude stability, polarization and the behavior in a fibre coupling.

EP 5.8 Di 16:30 GW2 2.OG

Modeling particle induced atmospheric ionization after 2010 — •Jan Maik Wissing[1], Alexander Mizuk[1], and Olesya Yakovchuk[1,2] — [1]Institute of Environmental Systems Research, University of Osnabrück — [2]Skobeltsyn Institute of Nuclear Physics, Moscow State University, Moscow, Russia

The Atmospheric Ionization Module OSnabrück (AIMOS) calculates a global 3D ionization profile based on data from the NOAA GOES and POES satellites that can be used e.g. in climate models. Due to a discontinuation of both input data sets the model was restricted to the years 2001 to 2010. In this work we will describe how the model has been extended to 2016.

During the extension a couple of problems in the satellite data became obvious that may also impact other studies based on GOES or POES data, e.g. the new GOES satellites have different energy ranges even though the instument is identical to the older ones (e.g. P7 old 165.–500.MeV, P7 new 110.–900.MeV). Finally it turned out that the energy ranges are simply not known or at least subject of severe uncertainties, which is good to know as this satellite data is widely used for 20 years now. We will present our attempt to overcome this limitation by recalculating the energy thresholds based on the shifted center energy with variing steepness of the flux spectrum.

In case that newer satellite data shows significant flux differences as e.g. in the magnetospheric energies, the impact on atmospheric ionization will be discussed.

EP 5.9 Di 16:30 GW2 2.OG

Effects of Key GCR and SEP Shower Parameters in Earth-like Atmospheres — •Markus Scheucher[1], John Lee Grenfell[2], and Heike Rauer[1,2] — [1]Department of Astronomy and Astrophysics (ZAA), Berlin Institute of Technology (TUB), Hardenbergstr. 35, 10623 Berlin, Germany — [2]Department of Extrasolar Planets and Atmospheres (EPA), German Aerospace Center (DLR), Rutherfordstr. 2, 12489 Berlin, Germany

To investigate the habitability of planets having Earth-like (N2-O2 dominated) atmospheres orbiting in the Habitable Zone of quiet and active M-dwarf stars, it is necessary to determine the effect of stellar radiation and the incoming energetic particle fluxes upon atmospheric composition and temperature. Planetary atmospheres are constantly bombarded by Galactic Cosmic Rays (GCRs) and Stellar Energetic Particles (SEPs), which can create showers of secondary particles down to the surface. We perform a study investigating the influence of key particle shower parameters, by varying secondary particles production profiles, NOx and HOx production efficiencies, and model their effects upon atmospheric composition and temperature in a cloud-free 1D climate-chemistry model.

EP 5.10 Di 16:30 GW2 2.OG

The role of energetic particles in an exoplanetary atmosphere - a GEANT 4 based simulation tool — •Sasa Banjac, Konstantin Herbst, and Bernd Heber — Christian-Albrechts-Universität, 24118 Kiel, Germany

In the near future it can be expected to detect more rocky exoplanets in the habitable zone of M- and K-dwarf stars The harsh stellar radiation environment and a possible tidal locking of these planets could outweigh the observational advantages by destroying biosignatures such as ozone (O3) ("false negative") or by producing biosignatures abiotically ("false positiv") and by affecting the habitability, e.g. in the form of an enhanced UV exposure, but also an enhanced flux of energetic particles (measured in the form of the dose rate) on the (exo-)planetary surface. In order to determine the radiation environment in a exoplanetary atmosphere we developed a tool based on the GEANT 4 library package that allows to calculate not only the ion-pair production but also the radiation dose on the surface of an exoplanet. The development aims for high flexibility in the specification of not only atmospheric and soil composition, but also of the radiation environment. Therefore, it will be applicable to the Solar system. In this contribution the setup and first results are presented.

EP 5.11 Di 16:30 GW2 2.OG

Photochemical Responses induced by Stellar Energetic Particles for Earth-like Planets in the Habitable Zone of M-dwarf Stars — •John Lee Grenfell[1], Markus Scheucher[2], and Heike Rauer[1,2] — [1]Dept. Extrasolar Planets and Atmospheres (EPA), German Aerospace Centre (DLR), Berlin Adlershof, Germany — [2]Centre for Astronomy and Astrophysics (ZAA), Berlin Institute of Technology (TUB), Berlin, Germany

We apply a coupled climate-convective chemistry column model to Earth-like planets (i.e. planets assuming Earth's development, biomass emissions and an atmosphere dominated by molecular nitrogen and oxygen) orbiting in the Habitable Zone of an M-dwarf star. Using an air shower approach for incoming stellar energetic particles we analyse photochemical responses induced by the resulting secondary electrons which break up molecular nitrogen and oxygen in the atmosphere. We present an analysis of the intra-family partitioning of the resulting nitrogen-oxides (NOx) and hydrogen-oxides (HOx)(and their reservoir molecules) which are responsible for destroying the biosignature species ozone assuming different levels of stellar activity.

EP 5.12 Di 16:30 GW2 2.OG

TLS participation in the MPC NEOCP program — •Bringfried Stecklum — Thüringer Landessternwarte, 07778 Tautenburg, Deutschland

The Thueringer Landessternwarte (TLS) has a long-standing tradition for what concerns the discovery of minor planets. Recently, it joined the Near Earth Object Confirmation Program (NEOCP) of the Minor Planet Center (MPC). The contribution provides on overview on the observational capabilities and prospects. The results of the astrometric measurements will be summarized. This effort is carried out as part of the EURONEAR initiative.

EP 5.13 Di 16:30 GW2 2.OG

Untersuchungen zum Einfluss von geomagnetischer Aktivität auf Zusammensetzung und Zirkulation der Thermosphäre und deren Kopplung in die mittlere und obere At-

mosphäre — •Sabine Barthlott[1], Miriam Sinnhuber[1], Thomas Reddmann[1], Stefan Versick[1], Holger Nieder[2] und Alexey Vlasov[2] — [1]Karlsruher Institut für Technologie (KIT), Karlsruhe, Deutschland — [2]ehemals KIT

Geomagnetische Aktivität beeinflusst die Zusammensetzung und Zirkulation der unteren Thermosphäre. Die wesentlichen Prozesse hierbei sind Photoionisation, Teilchenionisation und Joule-Heizen. Die hierdurch verursachten Änderungen in der Thermosphäre wirken sich auch auf andere Atmosphärenschichten aus. Durch Ionisation in der Aurora erhöhtes Stickstoffmonoxid (NO) führt durch Absinken zu Änderungen in den darunterliegenden Atmosphärenschichten (z. B. Ozonschicht). Die in der unteren Thermosphäre z. B. durch geomagnetische Stürme angeregten Schwerewellen können sich nach oben bis in die Umgebung von Satelliten mit erdnaher Umlaufbahn auswirken.

Um diese Kopplungen in Modellen korrekt wiederzugeben, ist es wichtig, die Prozesse in der unteren Thermosphäre möglichst genau zu beschreiben. Im Rahmen des SPP Projekts 'Dynamic Earth' wird das gekoppelte Chemie-Klimamodell EMAC (hier in einer erweiterten Version bis ∼170 km) weiterentwickelt und oben genannte Prozesse (z. B. Photoionisation) implementiert. Am Beispiel Winter 2008/2009 werden erste Ergebnisse der Weiterentwicklung mit Standardsimulationen und Beobachtungen verglichen.

Teil II der Postersitzung findet am Mittwoch 16:30-18:00 statt. Die Autoren werden gebeten an beiden Postersitzungen teilzunehmen.

EP 6: Spezialvortrag Stefan Krückeberg

Zeit: Dienstag 18:20–18:50 Raum: HS 2010

Spezialvortrag EP 6.1 Di 18:20 HS 2010

Funding Programmes of the DFG with special emphasis on Programmes for Early Career Researchers — •Stefan Krückeberg — Deutsche Forschungsgemeinschaft, Kennedyallee 40, 53175 Bonn

This talk will give an overview over the funding programmes of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). Special emphasis is given to programmes that are of relevance for early career researchers.

EP 7: Sonne und Heliosphäre II

Zeit: Mittwoch 8:30–10:30 Raum: GW2 B2880

Hauptvortrag EP 7.1 Mi 8:30 GW2 B2880

Observations of the Sun with the novel radio telescope LOFAR — •Gottfried Mann — Leibniz-Institut fuer Astrophysik Potsdam, Potsdam, Germany

The Sun's activity appears not only in the well-known 11-year sunspot cycle but also in eruptive events like e. g. flares and coronal mass ejections, as well as radio bursts. All these events are accompanied with an enhanced radio emission. Therefore the study of the Sun's radio radiation provides important information on plasma processes associated with the Sun's activity.

LOFAR (Low Frequency Array) is a novel radio interferometer originally designed for the frequency range 10-240 MHz at ASTRON in the Netherlands. It presently consists of 50 stations distributed over central Europe.

Since the radio emission of active processes of the Sun appears in LOFAR's frequency range and because of LOFAR's imaging and spectroscopic capabilities, LOFAR is highly interesting for the solar physics community for observing flares, coronal mass ejections and related phenomena in the corona.

We report on first observations of the Sun with LOFAR and demonstrate that LOFAR is really able to work as a dynamic spectroscopic radio imager of the Sun. For instance, this allows for the first time to track fast moving electron beams in the corona and density measurements in the outer corona. That provides a better understanding of the nature of type III radio bursts.

EP 7.2 Mi 9:00 GW2 B2880

Solar Energetic Particle Events with Protons above 500 MeV between 1995 and 2015 Measured with SOHO/EPHIN — Patrick Kühl, Nina Dresing, •Bernd Heber, and Andreas Klassen — Christian-Albrechts-Universität zu Kiel, Kiel, Germany

The Sun is an effective particle accelerator producing solar energetic particle (SEP) events during which particles up to several GeVs can be observed. Those events observed at Earth with the neutron monitor network are called ground level enhancements (GLEs). In this work, SEP events with protons accelerated to above 500 MeV have been identified using data from the Electron Proton Helium Instrument (EPHIN) aboard the Solar and Heliospheric Observatory (SOHO) between 1995 and 2015. The compliled list of 42 SEP events is discussed based on the fitted spectral slopes and absolute intensities with special emphasis on whether or not an event has been observed as GLE. Furthermore, a correlation between the derived intensity at 500 MeV and the observed increase in neutron monitor count rate has been found for a subset of events.

EP 7.3 Mi 9:15 GW2 B2880

A generalized two-component model of solar wind turbulence — •Horst Fichtner[1], Tobias Wiengarten[1], Sean Oughton[2], Eugene Engelbrecht[3], Jens Kleimann[1], and Klaus Scherer[1] — [1]Ruhr-Universitaet Bochum, Institut fuer Theoretische Physik IV — [2]University of Waikato, Hamilton, New Zealand — [3]Space Research Centre, North-West University, Potchefstroom, South Africa

We extend a two-component model for the evolution of fluctuations in the solar wind plasma so that it is fully three-dimensional and also coupled self-consistently to the large-scale magnetohydrodynamic equations describing the background solar wind. The two classes of fluctuations considered are a high-frequency parallel propagating wave-like piece and a low-frequency quasi-two-dimensional component. For both components, the nonlinear dynamics is dominated by quasi-perpendicular spectral cascades of energy. Driving of the fluctuations by, for example, velocity shear and pickup ions is included. Numerical solutions to the new model are obtained using the CRONOS framework, and validated against previous simpler models. Comparing results from the new model with spacecraft measurements, we find improved agreement relative to earlier models that employ prescribed background solar wind fields. Finally, the new results for the wave-like and quasi-twodimensional fluctuations are used to calculate ab initio diffusion mean-free paths and drift lengthscales for the transport of cosmic rays in the turbulent solar wind.

EP 7.4 Mi 9:30 GW2 B2880

The uncertainty of local background magnetic field orientation in anisotropic plasma turbulence — •Felix Gerick, Joachim Saur, and Michael von Papen — Institute of Geophysics and Meteorology, University of Cologne, Cologne, Germany

In order to resolve and characterize anisotropy in turbulent plasma flows a proper estimation of the background magnetic field is crucially important. Various approaches to calculate the background magnetic fields, ranging from local fields to globally averaged fields, are commonly used in the analysis of turbulent data. Here we investigate how the uncertainty in the orientation of a scale dependent background magnetic field influences the ability to resolve anisotropy. Therefore we introduce a quantitative measure, the uncertainty angle, which characterizes the uncertainty of the orientation of the background magnetic field turbulent structures are exposed to. The angle uncertainty can be used as a condition to estimate the ability to resolve anisotropy with certain accuracy. We apply our description to resolve spectral anisotropy in fast solar wind data. We show that if the uncertainty angle grows too large, the power of the turbulent fluctuations is at-

tributed to false local magnetic field angles, which affects the spectral anisotropy. However, the anisotropy in the spectral index remains intact until very large averaging widths due to unequal change of power depending on the frequency. The frequency dependent angle uncertainty is a measure which can be applied to any turbulent system.

EP 7.5 Mi 9:45 GW2 B2880

Model for Reduced Power Spectra of Critically Balanced Solar Wind Turbulence with Damping by Kinetic Alfvén Waves — •Anne Schreiner[1], Joachim Saur[1], Michael von Papen[1], Olga Alexandrova[2], and Catherine Lacombe[2] — [1]Universität zu Köln, Institut für Geophysik und Meteorologie — [2]Paris Observatory Meudon

The observed spectral structure of magnetic turbulence at electrons scales in the solar wind is still not sufficiently understood. Analytical dissipation models for solar wind turbulence are usually derived in the three-dimensional wavenumber space. However, in-situ observations of magnetic fluctuations are obtained in a one-dimensional reduced form in the spacecraft frame, where various wavevectors contribute to the spectral energy density at a certain frequency. Based on a forward modeling approach by von Papen & Saur (2015), we calculate reduced spectral energy densities from a three-dimensional energy distribution in wavenumber space under the assumption of critically balanced turbulence and damping via wave-particle interactions of kinetic Alfvén waves. The damping is described through the imaginary part of the kinetic Alfvén wave frequency, which we obtain from linear Vlasov theory. We compare the spectral energy densities to a set of observations obtained from one-dimensional magnetic field measurements of the Cluster spacecraft analyzed in Alexandrova et al. (2012).

EP 7.6 Mi 10:00 GW2 B2880

The role of electron-scale turbulence in 3D guide field magnetic reconnection — •Patricio Muñoz and Jörg Büchner — Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany

The role of plasma turbulence in magnetic reconnection is fundamental to understand energy dissipation in laboratory, space and astrophysical plasmas. Previous studies have mostly focused in Alfvénic/low-frequency turbulence, but the effects of self-consistently generated turbulence by kinetic electron-scale instabilities in collisionless plasmas have remained mostly unknown.

We aim to explain features of the high frequency turbulence which develops during magnetic reconnection in laboratory experiments like MRX and VINETA-II, as well as of current in-situ measurements in the Earth's magnetosphere by the MMS spacecraft.

For this sake, we carried out 3D fully-kinetic Particle-in-Cell (PiC) code numerical simulations of force free current sheets with a guide magnetic field, a common situation in the plasma environments of interest. We show that the dynamically evolving kinetic turbulence spectra in reconnecting current sheets is broadband and develops starting from the lower-hybrid frequency to the kinetic electron-scale. The evolution of the turbulence spectra correlates with the growth and rate of magnetic reconnection and can be explained by (kinetic) streaming instabilities and waves, mostly due to the electron current.

EP 7.7 Mi 10:15 GW2 B2880

How hot is the heliosheath? — •Klaus Scherer[1], Hans-Jörg Fahr[2], Horst Fichtner[1], Adama Sylla[1], and John Richardson[3] — [1]Theoretische Physik IV, Ruhr Universität Bochum — [2]Argelander Institut, Universität Bonn — [3]MIT

The temperatures along the Voyager 2 trajectory are determined by assuming an underlying Maxwellian distribution function. It was recently discussed that the underlying distribution function is most probably a kappa distribution. The temperatures determined with a kappa distribution can largely differ to those given by a Maxwellian. We discuss here that the "temperature" is not unique, but depends on the assumed distribution function. Moreover, for the kappa-distribution we give a simple straightforward formula which connects the Maxwellian and kappa temperatures, only depending on the kappa index. Thus knowing a variable kappa index along the Voyager 2 trajectory we can easily estimate the respective temperatures. We demonstrate that using a model in which the kappa indices are calculated.

EP 8: Symposium Fundamental Physics in Space

Zeit: Mittwoch 14:00–16:00 Raum: SFG 0140

Hauptvortrag EP 8.1 Mi 14:00 SFG 0140

Magnetospheric Physics – Basic Processes and Open Questions — •Antonius Otto — Geophysical Institute, Univ. of Alaska, Fairbanks

The terrestrial magnetosphere is a unique laboratory to study fundamental plasma physics because it allows the in-situ study of basic processes that are important in many astrophysical plasma environments. Although basic magnetospheric configuration is very simple – a magnetic dipole with an inner boundary at the upper atmosphere and an outer boundary subjected to the solar wind – the detailed physics is extremely rich. Magnetospheres allow the study of different types of shock physics, various macro- and microscopic boundary layer processes, plasma transport across boundaries, wave propagation, energy storage and release, current sheet formation, and magnetic reconnection. This presentation will address several selected topics motivated by the enormous progress that has been achieved in magnetospheric physics during the past decades. We have now a much better understanding of the role of Kelvin-Helmholtz waves and magnetic reconnection for the plasma transport at magnetospheric boundaries and the nature of transient events at the bow shock. Observations have provided a new framework for the energy storage and release during geomagnetic substorms. New evidence suggests that reconnection occurs almost always in bursty individual events. However, there are still basic open questions including fundamental topics such as the cause for the auroral acceleration, the physics of non-adiabatic plasma heating, and the micro-physics of magnetic reconnection.

Hauptvortrag EP 8.2 Mi 14:30 SFG 0140

GRACE/GRACE-FO and LAGEOS/LARES in Geodesy, Earth Observation and Relativity — •Rolf König[1], Ignazio Ciufolini[2], Frank Flechtner[1], and Antonio Paolozzi[3] — [1]Deutsches GeoForschungsZentrum GFZ, Telegrafenberg, 14473 Potsdam — [2]University Salento and Centro Fermi, Italien — [3]Sapienza Universita Roma and Centro Fermi, Italien

GRACE, launched in 2002, and its continuation GRACE-FO, to be launched end of 2017, are dedicated missions for the measurement of the time variable gravity field. We will briefly summarize the major achievements of GRACE in Earth observation so far. In 2004 the early GRACE static gravity field models firstly allowed to measure frame-dragging or the Lense-Thirring (LT) effect by Satellite Laser Ranging (SLR) observations to the LAGEOS satellites with an accuracy of 10%. In 2012 the LARES satellite was launched to complement the LAGEOS constellation, goal of the mission is to improve the accuracy of the LT measurement by one order of magnitude. We will briefly summarize the impact of LARES into geodesy before we focus on the relativity aspect. First results on the LT measurements with LARES are published reporting an accuracy of about 5%. We will independently repeat the LT analysis with a longer data span based on a suite of new gravity field models.

Hauptvortrag EP 8.3 Mi 15:00 SFG 0140

LISA and LISA Pathfinder — •Gerhard Heinzel — Max-Planck-Institut fuer Gravitationsphysik (Albert-Einstein-Inst.) Hannover

This presentation will summarize the status of the planned gravitational wave observatory LISA, and the latest results from its precursor mission LISA Pathfinder which is in orbit now.

Hauptvortrag EP 8.4 Mi 15:30 SFG 0140

Promises and challenges of Gaia astrometry — •Sergei Klioner — Lohrmann-Observatory, Technische Universität Dresden, 01062 Dresden, Germany

ESA's second space astrometry mission Gaia was launched in December 2013 and after an extended commissioning period started its scientific operations in July 2014. During its routine science operations Gaia has already delivered an immense data set of high-accuracy positional observations. In spite of some unexpected difficulties with the

instrument, Gaia Data Processing and Analysis Consortium published the first Gaia Data Release in September 2016 and is working towards the second Gaia Data Release in the first half of 2018.

High-accuracy astrometric survey being made by Gaia opens a new window for specific research in the field of fundamental physics. This research window ranges from weak-field tests of General Relativity and its foundations in the gravitational field of the solar system to estimates of energy flux for gravitational wave background in certain frequency domains. These promises of space astrometry will be critically reviewed. The interrelation between astrometric solution, the resulting reference frame and the assumptions on fundamental physical laws made during data processing will be discussed.

EP 9: Postersitzung II

Zeit: Mittwoch 16:30–18:00 Raum: GW2 2.OG

Diese Sitzung dient der zusätzlichen Diskussionszeit der Poster aus Postersitzung EP 5

EP 10: Planeten und kleine Körper I

Zeit: Donnerstag 8:30–10:15 Raum: GW2 B2880

Hauptvortrag EP 10.1 Do 8:30 GW2 B2880

Sounding the interior of Jupiter's moons through observations of their atmospheric emissions — •Lorenz Roth — KTH Royal Institute of Technology, Stockholm, Sweden

Magnetic field measurements by the Galileo spacecraft were used to probe the subsurface water oceans on Jupiter's moons Europa and Callisto through electromagnetic induction. In addition to in-situ spacecraft measurements, electromagnetic induction at Jupiter's moons can also be investigated through observations of auroral emission from the tenuous moon atmospheres. This is possible, because the morphology of the aurora, excited by the interaction of magnetospheric plasma with the atmospheres, is controlled by the magnetic field. In the case of Ganymede, magnetic fields induced in the subsurface ocean effectively suppress oscillations of the moon's auroral ovals, which was observed by the Hubble Space Telescope (HST). Magnetic induction in Europa's ocean might similarly affect its auroral emissions, but the effects could not be measured or determined yet, although the aurora has been extensively studied by HST. Observations of strongly oscillating auroral spots at the volcanic moon Io contradict the existence of a conductive magma ocean, postulated earlier based on in-situ measurements. I present an overview on our groups recent work on the aurora observations of Jupiter's moons Io, Europa and Ganymede and their interpretation with respect to electromagnetic induction inside the moons.

EP 10.2 Do 9:00 GW2 B2880

Io's plasma interaction with Jupiter's magnetosphere: Influence of global asymmetries in Io's atmosphere and volcanic plumes on the plasma environment — •Aljona Blöcker[1], Joachim Saur[1], and Lorenz Roth[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln — [2]KTH Royal Institute of Technology, Stockholm, Sweden

Io's atmosphere is supported by sublimation of SO2 surface frost and by direct volcanic outgassing of SO2, where the detailed longitudinal and latitudinal structure is not fully known. We apply a 3D MHD model to analyze the effects of an asymmetric atmosphere and the role of volcanic plumes on the plasma interaction. Therefore, we use different atmosphere models with longitudinal and latitudinal dependencies. We compare our model results with Io's magnetic field environment measured with the Magnetometer of the Galileo spacecraft. We demonstrate that significant parts of the magnetic field perturbations, associated with the induction signals by Khurana et al. (Science 2011) can alternatively be explained by considering global asymmetries of the atmosphere without induced fields from a subsurface magma ocean.

EP 10.3 Do 9:15 GW2 B2880

A Fluid-Kinetic Model of Callisto's Ionospheric Electrons — •Oliver Hartkorn[1], Joachim Saur[1], and Darrell F. Strobel[2] — [1]Institute of Geophysics and Meteorology, University of Cologne, Pohligstr. 3, 50969 Cologne, Germany — [2]Department of Earth and Planetary Sciences, Johns Hopkins University, MD 21210, Baltimore, USA

We develop a model of the ionospheric electron population of Jupiter's moon Callisto using a prescribed neutral atmosphere composed of O2, CO2 and H2O. A kinetic description of ionospheric suprathermal electrons coupled with a fluid description of ionospheric thermal electrons is well suited to jointly analyze and interpret observations of electron density and atmospheric UV emission. Accordingly, we calculate the electron energy distribution function at each point in the ionosphere by solving the Boltzmann equation for suprathermal electrons and the continuity and energy equation for thermal electrons. We assume a stationary balance between local sources and sinks of electrons and electron energy neglecting electron transport. We consider photoionization, which is the dominant ionospheric electron source, and secondary ionization processes. Our calculations yield electron densities and electron impact generated UV emissions from Callisto's atmosphere. Comparisons between our modeled UV emission intensities and Hubble Space Telescope observations allow to draw conclusions on the atmospheric density of Callisto. Moreover, a joint comparison with HST observations and radio occultation observations of the Galileo spacecraft shows that Callisto's atmosphere possesses a day night asymmetry.

EP 10.4 Do 9:30 GW2 B2880

Cassinibeobachtungen der äußeren Saturnmonde — •Tilmann Denk[1] und Stefano Mottola[2] — [1]FU Berlin — [2]DLR Berlin

Mit der ISS-Kamera an Bord der internationalen Raumsondenmission Cassini-Huygens haben wir insgesamt 25 der 38 bekannten äußeren Saturnmonde beobachtet und über die Messung von Lichtkurven die Rotationsperioden bestimmt. Die schnellste Periode beträgt 5,5 h (Mond Hati), die langsamste 76,24 h (Tarqeq). Die Abwesenheit von schnellen Rotatoren deutet darauf hin, dass die mittleren Dichten der äußeren Saturnmonde deutlich geringer sind als diejenigen von Planetoiden, deren Perioden zum Teil unter 2,5 h liegen. Möglicherweise liegen viele Werte im Bereich von 0,5 g/ccm oder noch darunter, was den Dichten von Kometenkernen entspricht. Die mittlere Periode beträgt 11,0 h.

Elf Monde wurden anhand von Lichtkurvenmerkmalen als Kandidaten für "contact binaries" identifiziert, vier davon könnten sogar echte Doppelobjekte sein. Alle 13 bekannten Monde, deren Bahnen mehr als 27° gegen die Saturnbahn geneigt sind, rotieren langsamer als 10 h, während 3/4 aller gemessenen Objekte mit kleineren Bahnneigungen schneller rotieren. Ebenso gilt, dass alle Objekte, die größer als ~7 km sind, langsamer als 10 h rotieren (mit Ausnahme des großen Mondes Phoebe). Die physikalische Ursache hierfür ist bislang unbekannt.

Die letzte Cassini-Beobachtung eines äußeren Mondes erfolgt am 6.9.2017. Die Cassini-Mission soll am 15.9.2017 enden, wenn die Raumsonde in der Saturnatmosphäre verglüht. T.D. dankt dem Deutschen Zentrum für Luft- und Raumfahrt (DLR) in Bonn für die Unterstützung dieser Forschungsarbeiten (Förderkennzeichen: 50 OH 1503).

EP 10.5 Do 9:45 GW2 B2880

Multi-instrument overview of the 1-hour pulsations in Saturn's magnetosphere — •Benjamin Palmaerts[1,2], Elias Roussos[1], Aikaterini Radioti[2], Norbert Krupp[1], and Denis Grodent[2] — [1]Max-Planck-Institute für Sonnensystemforschung, Göttingen, Germany — [2]Laboratoire de Physique Atmosphérique et Planétaire, Université de Liège, Liège, Belgium

The in-situ exploration of the magnetosphere of Saturn has revealed different periodic processes. Several studies have reported periodicities of about 1 hour in the charged particle fluxes, plasma wave, magnetic field and auroral emission brightness. We made a 10-year survey of the quasi-periodic (QP) 1-hour energetic electron injections observed in the Saturn's outer magnetosphere by the MIMI/LEMMS instrument on board Cassini. These injections appear as pulsations in the

electron fluxes at energies between 100 keV up to several MeV. We investigated also the concomitant signatures of the electron pulsations in the radio emissions and the magnetic field measured by Cassini. The results of the multi-instrument study suggest a high-latitude source for the pulsed electrons. Observations of QP 1-hour brightening of a high-latitude auroral spot associated with the magnetospheric cusp support this scenario. Pulsed dayside magnetopause reconnection is a likely common triggering process for the cusp auroral brightening and the QP pulsations in the high-latitude electron fluxes. Finally, the presence of electron pulsations in the vicinity of the magnetopause is another indication of the involvement of magnetopause reconnection as a triggering process for the QP electron injections.

EP 10.6 Do 10:00 GW2 B2880

In-Situ Staubmessungen im Saturnsystem mit dem Cosmic Dust Analyzer an Bord von Cassini — Thomas Albin[1,2], Jonas Simolka[1], Rachel Soja[1], Björn Poppe[2] und •Ralf Srama[1] — [1]Institut für Raumfahrtsysteme, University of Stuttgart, Stuttgart, Germany — [2]Universitätssternwarte Oldenburg, Institute of Physics and Department of Medical Physics and Acoustics, Carl von Ossietzky University, Oldenburg, Germany

Seit 2004 befindet sich der Cassini Orbiter im Saturnsystem und erfasst verschiedene Eigenschaften des Planetensystems. Mit Hilfe des am Max-Planck-Institutes für Kernphysik entwickelten Cosmic-Dust-Analyzer (CDA) erfolgen in-situ Messungen von saturn-gebundenem, interplanetarem und interstellarem Staub. Das Instrument ist aus zwei Teilen aufgebaut: dem High-Rate-Detector (HRD), bestehend aus zwei PVDF-Folien zur Messung von hohen Einschlagsraten und dem Dust Analyzer (DA) mit dem die Ladung, Geschwindigkeit, Masse und Massenspektrum der Staubteilchen gemessen werden können. In diesem Übersichtsvortrag geht es um die Beschreibung des Instruments, wissenschaftliche Resultate aus den chemischen Analysen des Staubes und der Vorstellung eines neuen Monte-Carlo basierten Codes zur Bestimmung der astro-dynamischen Eigenschaften der gut 2 Millionen Staubteilchen, die bislang erfasst wurden.

EP 11: Hauptversammlung AEF und DPG-EP

Zeit: Donnerstag 12:30–14:00 Raum: GW2 B2880

Siehe gesonderte Einladung zur Hauptversammlung

EP 12: Planeten und kleine Körper II

Zeit: Donnerstag 15:00–16:00 Raum: GW2 B2880

Hauptvortrag EP 12.1 Do 15:00 GW2 B2880

The Gravity Field of 67P/Churyumov-Gerasimenko from the Rosetta Radio Science Experiment — Martin Pätzold[1], •Matthias Hahn[1], Tom Andert[2], Sami Asmar[3], Jean-Pierre Barriot[4], Michael Bird[1], Bernd Häusler[2], Kerstin Peter[1], Silvia Tellmann[1], Eberhard Grün[5], and Paul Weissman[3] — [1]Rheinisches Institut für Umweltforschung an der Universität zu Köln, Cologne, Germany — [2]Universität der Bundeswehr München, Neubiberg, Germany — [3]Jet Propulsion Laboratory, Caltech, Pasadena, CA, USA — [4]Universite de la Polynesie Francaise, Faaa, Tahiti — [5]MPI für Kernphysik, Heidelberg, Germany

The Rosetta spacecraft arrived at its target comet 67P/Churyumov-Gerasimenko in August 2014. The distance to the comet was gradually lowered from 100 to less than 10 km. The mass and the low degree and order gravity field of the nucleus could be determined. That gave insights into the comets interior structure. The nucleus appears to be a low-density, highly porous dusty body. The spacecraft escorted the comet through its perihelion. Strong outgassing pressure forced the spacecraft to remain at relatively large distances. When the comets activity decreased again after perihelion a second determination of its mass and gravity field was possible. The total mass loss due to outgassing could be measured. Using spherical harmonic functions to describe the nucleus gravity field is difficult because of its highly irregular shape. A new technique using a bipolar approach provides a better representation of the nucleus gravity especially at low orbital distances. It was possible to distinguish densities of the two main lobes.

EP 12.2 Do 15:30 GW2 B2880

Abstandsbestimmung von Staubteilchen zu Rosetta unter Verwendung von OSIRIS Kamera Daten — •Theresa Ott[1], Esther Drolshagen[1], Detlef Koschny[2,5], Carsten Güttler[3], Cecilia Tubiana[3], Jessica Agarwal[3], Holger Sierks[3], das OSIRIS Team[4] und Björn Poppe[1] — [1]CvO Universität Oldenburg — [2]ESA/ESTEC, Noordwijk, NL — [3]MPS, Göttingen — [4]diverse — [5]Chair of Astronautics, TU Munich

Nach ihrer zehnjährigen Reise befand sich die ESA-Mission Rosetta von August 2014 bis September 2016 in einer Umlaufbahn um den Kometen 67P/Churyumov-Gerasimenko. OSIRIS (Optical, Spectroscopic, and Infrared Remote Imaging System), das wissenschaftliche Kamerasystem an Bord, umfasst zwei Kameras. In Bildsequenzen, die speziell zur Beobachtung von Staubteilchen in der Koma des Kometen konzipiert wurden, wurden beide Kameras simultan betrieben. Aus diesen Beobachtungen kann die Entfernung der detektierten Staubteilchen zur Raumsonde berechnet werden. Ein Parallaxeneffekt tritt auf, da die Kameras in etwa 70 cm Entfernung voneinander angebracht sind. Befinden sich die Staubteilchen in einem gewissen Entfernungsbereich zu Rosetta, entsteht eine Verschiebung zwischen den Signalen der Teilchen auf den Bildern der beiden Kameras. Aus dieser Verschiebung kann der Abstand des Teilchens zu den Kameras berechnet werden. Im Rahmen dieser Arbeit wurden über 250 Teilchen analysiert. Sie befinden sich in einer Entfernung zur Raumsonde von 200 m - 6000 m. In diesem Vortrag werden die Abstandsbestimmung sowie eine Abstandsverteilung der gefundenen Teilchen präsentiert.

EP 12.3 Do 15:45 GW2 B2880

Größenverteilung von Staubteilchen in der Koma des Kometen 67P/Churyumov-Gerasimenko — •Esther Drolshagen[1], Theresa Ott[1], Detlef Koschny[2,5], Carsten Güttler[3], Cecilia Tubiana[3], Jessica Agarwal[3], Holger Sierks[3], das OSIRIS Team[4] und Björn Poppe[1] — [1]CvO Universität Oldenburg — [2]ESA/ESTEC, Noordwijk, NL — [3]MPS, Göttingen — [4]diverse — [5]Chair of Astronautics, TU Munich

Nach einer zehnjährigen Reise erreichte die ESA-Mission Rosetta den Kometen 67P/Churyumov-Gerasimenko im August 2014 und begleitete ihn über zwei Jahre. Die analysierten Daten wurden mit dem wissenschaftlichen Kamerasystem OSIRIS (Optical, Spectroscopic, and Infrared Remote Imaging System) gewonnen, welches zwei Kameras umfasst. Mit Hilfe von simultanen Beobachtungen beider Kameras und dem Parallaxeneffekt, ist es möglich die Entfernung von Staubteilchen zur Raumsonde zu berechnen. Für über 250 Teilchen konnte mit dieser Methode die Entfernung bestimmt werden. Mit dem Abstand des Teilchens und der Helligkeit des Signals ist es anschließend möglich, mit nur wenigen Annahmen die Größe und die Masse der Staubaggregate zu berechnen. Die ermittelte Massenverteilung beinhaltet Teilchen von einigen mg - kg. Die Daten zeigen, dass kleine Teilchen nur detektiert werden, wenn sie keine zu große Entfernung zu den Kameras haben. Demnach werden in zunehmender Entfernung nur noch große Teilchen gesehen. Um eine realistischere Teilchendichte zu errechnen, wurde deshalb ein de-biasing durchgeführt. Die daraus resultierende Teilchendichte wird mit aktuellen Forschungsergebnissen verglichen.

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 ($\approx$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.

EP 14: Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre

Zeit: Freitag 8:30–10:30 Raum: GW2 B2880

Hauptvortrag EP 14.1 Fr 8:30 GW2 B2880

Solar Irradiance Variation — •Natalie Krivova — Max-Planck-Institut für Sonnensystemforschung, Göttingen

The variation of solar irradiance is an important input to Earth's climate and atmosphere models. Direct measurements have been carried out for almost four decades and stimulated the development of models. Irradiance variations on time scales of days to decades and longer, which are of interest to climate and atmospheric studies, are attributed to the ever changing magnetic field pattern on the solar surface. The state-of-the-art models reproduce the existing measurements but some open question remain, which turn to be critical for climate studies. Also, extension of the models into the past is impaired by the deteriorating amount and quality of long-term proxies of solar activity. A review of the latest advances in solar irradiance modelling on time scales of relevance to climate will be given.

Hauptvortrag EP 14.2 Fr 9:00 GW2 B2880

Cosmic rays and ground level enhancements — •Bernd Heber — Christian-Albrechts-Universität zu Kiel, Kiel, Germany

The Sun is both a source of all life on Earth and sporadically of significant hazards. Solar Energetic Particle (SEP) events may provoke extreme space weather near Earth. Space weather causes radiation which may be a hazard for satellites and for the astronauts. Not only can they be measured indirectly by their solar electromagnetic emission, but also directly in space by particle detectors and in extreme cases on Earth by ground based cosmic ray detectors. Solar eruptive events, such as solar flares and Coronal Mass Ejection (CME)s, can accelerate protons and other ions to high energies (>30 MeV). The relative roles of both components and how we can discriminate them remains a key problem in solar and solar-terrestrial physics. Relativistic (>500 MeV) SEPs enter the Earth's atmosphere sporadically and produce cascades, leading to an increase of the intensities recorded by ground based instrumentation i.e. a neutron monitor (NM). These events are known as Ground Level Enhancements (GLEs). The interest in GLEs are manifold and will be discussed in this presentation.

Hauptvortrag EP 14.3 Fr 9:30 GW2 B2880

Impact of precursor gases and ions on new particle formation and climate — •Urs Baltensperger — Paul Scherrer Institute, Villigen, Switzerland

Globally, a significant source of cloud condensation nuclei for cloud formation is thought to originate from new particle formation (aerosol nucleation). With the CLOUD collaboration we investigated the role of nucleating substances such as gaseous sulfuric acid, ammonia, water vapor as well as of ions, produced e.g. by galactic cosmic rays. Using the results in a global model we showed that nearly all nucleation throughout the present-day atmosphere involves ammonia or biogenic organic compounds, in addition to sulfuric acid. A considerable fraction of nucleation involves ions, but the relatively weak dependence on ion concentrations indicates that for the processes studied, variations in cosmic ray intensity do not appreciably affect climate through nucleation in the present-day atmosphere. Recently, we could also show that highly oxygenated molecules (HOMs) produced by the oxidation of biogenic precursors are able to trigger new particle formation on their own, even in the absence of sulfuric acid. We confirmed that this mechanism does occur in today*s lower free troposphere. We also show that this mechanism was important for the formation of additional new particles and cloud condensation nuclei in the preindustrial atmosphere, when sulfur dioxide emissions were substantially lower. This reduces the magnitude of the annual global mean radiative forcing caused by changes of cloud albedo, which implies a reduced climate sensitivity.

Hauptvortrag EP 14.4 Fr 10:00 GW2 B2880

Regional Influence of Solar Variability on European Climate — •Katja Matthes — GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel — Christian-Albrechts-Universität zu Kiel

Solar variability related to irradiance and energetic particle forcing could be an important source of natural climate variations superimposed on the human-induced warming since the late twentieth century in particular on the regional scale. Because of its prominent 11-year cycle, solar variability offers a degree of predictability and could potentially enhance decadal scale predictions. Understanding the influence of solar variability on climate requires knowledge of solar variability, solar-terrestrial interactions and observations, as well as mechanisms determining the response of the Earth's climate system.

The talk will summarize our current understanding of the impact of solar irradiance and energetic particle forcing on the atmosphere with special focus on the regional changes over the North Atlantic and Europe from observational and modeling studies. We will present feedback mechanisms for the solar signal transfer and discuss the importance of the solar cycle for decadal climate predictions.

EP 15: Exoplaneten und Astrobiologie

Zeit: Freitag 11:00–12:15 Raum: GW2 B2880

Hauptvortrag EP 15.1 Fr 11:00 GW2 B2880

The PLATO Mission — •Heike Rauer — Institut fuer Planetenforschung, DLR, Berlin, Germany — Zentrum fuer Astronomie und Astrophysik, TU Berlin, Berlin, Germany

PLATO (PLAnetary Transits and Oscillations of stars) has been selected as ESA M3 mission with launch opportunity end 2025. PLATO will carry out high-precision, long-term photometric and asteroseismic monitoring of a large number of stars. It will provide a large sample of small planets around bright stars, including terrestrial planets in the habitable zone of solar-like stars. PLATO will characterize planets for their radius, mass, and age with high accuracy. The mission will provide the first large-scale catalogue of well-characterized small planets at intermediate orbital periods, which will be an important constraint to planet formation theories and will provide targets for future atmosphere spectroscopy follow-up observations. This data base of bulk characterized small planets will form a solid basis to put the Solar System into a wider context and allow for comparative exo-planetology.

In addition, the precise stellar parameters obtained by asteroseismic studies will open new doors to better understand stellar interiors and allow us to constrain poorly-understood physical processes, like convection, improve our understanding of stellar evolution, and determine precise ages of stars and planetary systems.

EP 15.2 Fr 11:30 GW2 B2880

Modeling the Cosmic Ray Induced Ionization in the Atmosphere of Earth and Earth-Like Planets Around M-Dwarfs — •Konstantin Herbst[1], Bernd Heber[1], Sasa Banjac[1], and Andreas Kopp[2] — [1]Christian-Albrechts-Universität zu Kiel, Institut fü Experimentelle und Angewandte Physik, Germany — [2]Universite Libre de Bruxelles, Service de Physique Statistique et des Plasmas, Belgium

The terrestrial electric field is known to be induced by cosmic rays (CRs) entering the Earth's atmosphere. While in the upper atmosphere CRs mainly lose their energy due to ionization of the ambient matter, with decreasing altitude the probability of an interaction with

the surrounding atmospheric gasses drastically increases. Thereby, CRs are able to initiate secondary particle cascades consisting of, e.g., an electromagnetic component, which instantaneously leads to a further ionization of the middle as well as lower atmosphere. Using PLANETOCOSMICS, a GEANT4- based Monte-Carlo simulation code, we study the altitude-dependent (terrestrial) cosmic ray induced ionization (CRII). By now also eight Earth-like exoplanets orbiting around M-dwarfs (such as e.g., Proxima Centauri, our next stellar neighbor) have been found, we also compute the CRII of an Earth-like exoplanet. Because M-starts most likely have a much stronger stellar activity the computations may strongly differ from what we expect from Earth.

EP 15.3 Fr 11:45 GW2 B2880

The Influence of Stellar Variability on the Atmospheres of Exoplanets Orbiting K- and M-Stars — •Vanessa Schmidt and Miriam Sinnhuber — Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, Hermann-von-Helmholtz-Platz 1, D-76344 Eggenstein-Leopoldshafen, Germany

With the advent of new ground- and space-based observations, it now becomes increasingly possible to observe features of the atmospheric composition of extrasolar planets. In principle, this allows for the detection of atmospheric signatures indicative of life (biosignatures).

An important factor influencing the occurence of these biosignatures is the variable stellar activity of the host star, which alters the incident cosmic ray and stellar ray flux into the atmosphere. Cosmic and stellar rays ionize the atmosphere, starting a chain of very fast ion-chemistry reactions which can significantly affect the chemical composition of the exoplanets' atmosphere.

We develope and apply a detailed ion chemistry model to investigate the impact of stellar activity on the neutral composition of exoplanets of varying atmospheric composition.

In cooperation with the DLR Adlershof and the University of Kiel, this PhD research is part of a DFG-funded project to model the spectra of exoplanetary atmospheres.

EP 15.4 Fr 12:00 GW2 B2880

Instrumental design of the High Resolution Spectrograph (HIRES) for the E-ELT — •Philipp Huke — Institut für Astrophysik, Georg-August Universität Göttingen

The current instrumentation plan for the E-ELT includes a high resolution spectrograph (HIRES). The science cases for this instrument are: the study of extra-solar planets, their atmospheres, Pop-III stars and fundamental physical constants. The resolving power of the spectrograph should be as high as 200.000, depending on the observation modes and the wavelength. The spectral bandwidth shall range from the blue limit of the telescope up to the K-band. It will be covered by four different spectrographs. In this contribution we will present the preliminary design of the spectrograph, the requirements for the calibration unit and *rst solutions how to achieve 1 mm/s at the calibration unit level.