Fachverband Extraterrestrische Physik (EP)

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Übersicht der Hauptvorträge und Fachsitzungen

(Hörsäle HS 9 und SR 113; Poster OG)

Hauptvorträge

EP 1.1	Mo	14:00–14:30	HS 9	**Probing quasars with large surveys and long-term monitoring programs** — •Helmut Meusinger
EP 2.3	Mo	17:00–17:30	HS 9	**Space Weather: Forecast, Hindcast or Nowcast?** — •May-Britt Kallenrode
EP 2.4	Mo	17:30–18:00	HS 9	**Zeitgemäße technische Umsetzung eines bodengestützten solaren Röntgen Flare Monitoring Netzwerkes** — Thomas Bayer, •Michael Danielides
EP 3.3	Di	14:30–15:00	HS 9	**Exoplanetary Systems** — •Artie Hatzes
EP 5.1	Mi	16:30–17:00	HS 9	**Die Rolle der Stratosphäre im Klimasystem** — •Martin Dameris
EP 5.4	Mi	17:30–18:00	HS 9	**Progress and challenges in understanding magnetosphere-atmosphere coupling on Giant Planets** — •Ingo Müller-Wodarg, Luke Moore, Marina Galand, Steve Miller, Michael Mendillo
EP 6.1	Mi	14:00–14:30	HS 9	**Schritte zum Leben: präbiotisch-chemische Evolution auf erdähnlichen Planeten** — •Henry Strasdeit
EP 6.6	Mi	15:30–16:00	HS 9	**Atmospheric coupling processes by internal gravity waves** — •Andreas Dörnbrack
EP 11.1	Fr	11:15–11:45	HS 9	**State and future of coronal seismology** — •Erwin Verwichte

Hauptvorträge des fachübergreifenden Symposiums SYPA

Das vollständige Programm dieses Symposiums ist unter SYPA aufgeführt.

SYPA 1.1	Di	16:30–17:00	HS 2	**Magnetic Reconnection and Stochastic Plasmoid Chains in High-Lundquist-number Plasmas** — •Nuno Loureiro
SYPA 1.2	Di	17:00–17:30	HS 2	**Self-regulated evolution of the multi-phase interstellar medium in galaxies** — •Andreas Burkert
SYPA 1.3	Di	17:30–18:00	HS 2	**Turbulence in the Circumgalactic and Intergalactic Medium** — •Jens Niemeyer
SYPA 1.4	Di	18:00–18:30	HS 2	**Contributions of the VKS experiment to dynamo research** — •Jean-François Pinton

Hauptvorträge des fachübergreifenden Symposiums SYES

Das vollständige Programm dieses Symposiums ist unter SYES aufgeführt.

SYES 1.1	Do	14:00–14:30	HS 2	**Solar irradiance variability** — •Sami Solanki
SYES 1.2	Do	14:30–15:00	HS 2	**Influence of Galactic Cosmic Rays and solar variability on aerosols, clouds and climate: Results from the CLOUD experiment at CERN** — •Joachim Curtius
SYES 1.3	Do	15:00–15:30	HS 2	**NO_x - the energetic particle - climate connection?** — •Thomas Reddmann
SYES 1.4	Do	15:30–16:00	HS 2	**Impact of the solar 11-year and 27-day cycles on the Earth's middle atmosphere** — •Christian von Savigny

Hauptvorträge des fachübergreifenden Symposiums SYNU

Das vollständige Programm dieses Symposiums ist unter SYNU aufgeführt.

SYNU 1.1	Do	16:30–17:00	HS 2	**Trends in Numerical Mathematics** — •Wolfgang Hackbusch
SYNU 1.2	Do	17:00–17:30	HS 2	**Challenges in Numerical Astrophysics: Modeling the Formation of Stars** — •Ralf Klessen
SYNU 1.3	Do	17:30–18:00	HS 2	**Black Holes on the Computer** — •Thomas Baumgarte
SYNU 1.4	Do	18:00–18:30	HS 2	**Astrophysical simulations of gas dynamics with ionising radiation transport** — •Jonathan Mackey

Fachsitzungen

EP 1.1–1.7	Mo	14:00–16:00	HS 9	**Astrophysik**
EP 2.1–2.5	Mo	16:30–18:15	HS 9	**Astrophysik / ISWI**
EP 3.1–3.7	Di	14:00–16:00	HS 9	**Astrophysik/Astrobiologie**
EP 4.1–4.43	Di	11:15–12:45	Poster OG	**Poster Session**
EP 5.1–5.6	Mi	16:30–18:30	HS 9	**Erdnaher Weltraum und Planeten**
EP 6.1–6.6	Mi	14:00–16:00	HS 9	**Astrobiologie/Erdnaher Weltraum**
EP 7.1–7.6	Do	11:15–12:45	HS 9	**Planeten-II**
EP 8.1–8.6	Do	11:15–12:45	SR 113	**Sonne und Heliosphäre I**
EP 9.1–9.6	Fr	9:30–11:00	HS 9	**Sonne und Heliosphäre II**
EP 10.1–10.5	Fr	9:30–10:45	SR 113	**Planeten-III**
EP 11.1–11.7	Fr	11:15–13:15	HS 9	**Sonne und Heliosphäre III**

Mitgliederversammlung des Fachverbands Extraterrestrische Physik

Donnerstag 13:00–14:00 HS 9

- Begrüßung
- Feststellung der Beschlussfähigkeit
- Kenntnisnahme des Protokolls der Mitgliederversammlung 2012 (Anlage 1)
- Bericht des Vorstandes
- Bericht des Schatzmeisters (AEF)
- Entlastung des Vorstandes (AEF)
- Wahlen der Komissionsvorsitzenden
- Komissionstruktur
- Abstimmung zur Sektionsbildung (Anlage 2)
- Verleihung des Posterpreises der AEF
- Internationale Weltraumwetterinitiative ISWI
- Höhepunkte und Veranstaltungen 2013-14-15
- Antrag zur Umstrukturierung des Journals ASTRA (siehe Anlgae 3)
- Jahresbeitrag AEF (siehe Anlage 4)
- Webseite
- Sonstiges
  - Zusammenarbeit mit anderen Verbänden
  - Nationale Raumfahrtstrategie/Stellungnahme zur bemannten Raumfahrt

EP 1: Astrophysik

Zeit: Montag 14:00–16:00 Raum: HS 9

Hauptvortrag EP 1.1 Mo 14:00 HS 9

Probing quasars with large surveys and long-term monitoring programs — •Helmut Meusinger — Thueringer Landessternwarte, Tautenburg, Germany

50 years after the discovery of quasars, the active galactic nuclei (AGN) community is in the midst of a flood of high-quality data from large surveys. AGNs are efficiently selected in the mid-IR, radio, and X-ray domain and optical surveys provide spectra for huge numbers of (largely unobscured) high-luminosity AGNs. A major contribution comes from the Sloan Digital Sky Survey (SDSS) with its excellent photometric and spectroscopic data, including multi-epoch photometry. Variations of the optical/UV flux density over time, one of the key characteristics of AGNs, have long been considered to provide insight into the geometry and physics of quasars. Statistical trends seem to support a picture where accretion in a standard disk is the dominant underlying process for the UV/optical quasar variability. Quantitative discrepancies between observed and predicted trends, however, imply modifications beyond the simplest model. Moreover, other processes contribute to the observed variability as well, including those on longer timescales. Extreme deviations from the mean quasar spectrum indicate peculiar spectral types that may hold important clues to quasar structure and evolution. Using a neural network for the selection of peculiar spectra and combining the results with near-IR, mid-IR, and radio data, the SDSS is shown to be uniquely suited to collect and study substantial samples of unusual and hitherto unknown quasar types.

EP 1.2 Mo 14:30 HS 9

Hadronic modeling of AGN variability — •Matthias Weidinger[1] and Felix Spanier[2] — [1]Theoretische Physik IV, Ruhr-Universität Bochum — [2]ITPA, Universität Würzburg

While synchrotron emission being responsible for the first peak in the typical double-humped spectral energy distribution of blazars is beyond question, the situation in the very high energy regime is still a matter of debate. Compton up-scattering of internal (jet) photons works well for many, but - by far - not for all blazars. Either external radiation fields or non-thermal protons within the jet need to be present to explain the broadband emission of e.g. flat spectrum radio quasars consistently. A time-dependent hybrid emission model is introduced here. With the available contemporaneous data increasing steadily the information extracted from short time variability can be used to distinguish between the different models, without relying neutrino detections. The principle is explained using the blazar 1ES1011+496.

EP 1.3 Mo 14:45 HS 9

Cosmic Rays and Magnetic Fields in Halos of Spiral Galaxies — •Ralf-Juergen Dettmar — Ruhr-Universitaet Bochum

The distribution of cosmic rays and the structure of magnetic fields in halos of galaxies can be deduced from radiocontinuum polarization observations of the synchrotron radiation caused by cosmic ray electrons gyrating in the interstellar magnetic field. Recent advances in radioastronomical receiver technology have allowed for significant upgrades of major radio facilities such as the Westerbork Synthesis Radio Telescope (WSRT) or the Jansky Very Large Array (JVLA).

We report first results from observations of edge-on galaxies obtained with the new broad-band receivers. These new receivers not only provide higher sensitivity due to the increase in bandwidth, the large number of available frequency channels in the different bandpasses also allows for new analyses methods such as "Rotation Measure (RM) Synthesis".

The results for some prototypical galaxies with extended gaseous halos like NGC4631, M82, and NGC3079 will be presented and discussed in the context of cosmic ray propagation and magnetic field structure and generation.

EP 1.4 Mo 15:00 HS 9

Anisotropic diffusion of Galactic cosmic ray protons and their steady-state azimuthal distribution — •Frederic Effenberger, Horst Fichtner, Klaus Scherer, and Ingo Büsching — Theoretische Physik IV, Ruhr-Universität Bochum

Galactic transport models for cosmic rays involve the diffusive motion of these particles in the interstellar medium. Owing to the large-scale structured Galactic magnetic field, this diffusion is anisotropic with respect to the local field direction. We included this transport effect along with continuous loss processes in a quantitative model of Galactic propagation for cosmic ray protons that is based on stochastic differential equations. We calculated energy spectra at different positions along the Sun's Galactic orbit and compared them to the isotropic diffusion case. The results show that a larger amplitude of variation and different spectral shapes are obtained in the introduced anisotropic diffusion scenario, which in turn emphasizes the need for accurate Galactic magnetic field models.

EP 1.5 Mo 15:15 HS 9

Herschel's "Cold Debris Disks" — •Alexander Krivov[1] and Herschel DUNES consortium[2] — [1]Astrophysikalisches Institut und Universitäts-Sternwarte, FSU, Schillergäßchen 2-3, 07745 Jena — [2]Everywhere in the world

Infrared excesses associated with debris disk host stars detected so far, peak at wavelengths of ~100μm or shorter. However, six out of 31 excess sources in the Herschel OTKP DUNES have been seen to show little or no excesses at 100μm, but instead, significant - and in some cases extended - excess emission at 160μm. This excess emission has been suggested to stem from debris disks colder than those known previously. We re-consider whether some or even all of the candidates may be associated with unrelated galactic or extragalactic emission and conclude that it is highly unlikely that none of the candidates represents a true circumstellar disk. For true disks, both the dust temperatures inferred from the spectral energy distributions and the disk radii estimated from the images suggest that the dust is nearly as cold as a blackbody. This requires the grains to be larger than ~100μm, regardless of their material composition. To explain the dearth of small grains, we suggest that the cold disks are composed of unstirred primordial macroscopic grains. We show that such disks can survive for gigayears, largely preserving the primordial size distribution. They should be composed of solids larger than millimeters, but smaller than kilometers in size. Thus planetesimal formation, at least in the outer regions of the systems, has stopped before "cometary" or "asteroidal" sizes were reached.

EP 1.6 Mo 15:30 HS 9

The role of reprocessing in the pulse shape formation in binary X-ray pulsars — •Ute Kraus and Corvin Zahn — Institut für Physik, Universität Hildesheim

High-energy radiation from binary X-ray pulsars originates from accretion onto a strongly magnetized neutron star. It is observed pulsed due to the rotation of the star. The pulse shapes are characteristic for each source and in many cases are strongly dependent on photon energy. We model the energy-dependent pulse profiles of medium-luminosity X-ray pulsars taking full account of relativistic effects. In particular, we study the effects of reprocessing of radiation on the neutron star and in the upper accretion stream. We find that reprocessing in the stream may dominate the high-energy pulses. The energy-dependence of the model is in good qualitative agreement with observations.

EP 1.7 Mo 15:45 HS 9

Investigating the link between an iron-60 anomaly in the deep ocean's crust and the origin of the Local Bubble — •Michael Schulreich and Dieter Breitschwerdt — Zentrum für Astronomie und Astrophysik, TU Berlin, Berlin, Germany

Supernova explosions responsible for the creation of the Local Bubble (LB) and its associated HI cavity should have caused geological isotope anomalies via deposition of debris on Earth. The discovery of a highly significant increase of ^{60}Fe (a radionuclide that is exclusively produced in explosive nucleosynthesis) in layers of a deep sea ferromanganese crust corresponding to a time of 2.2 Myr before present, appears very promising in this context. We report on our progress in relating these measurements to the formation of the LB by means of 3D hydrodynamical adaptive mesh refinement simulations of the turbulent interstellar medium in the solar neighborhood. Our calculations are based on a sophisticated selection procedure for the LB's progenitor stars and take advantage of passive scalars for following the chemical mixing process.

EP 2: Astrophysik / ISWI

Zeit: Montag 16:30–18:15 Raum: HS 9

EP 2.1 Mo 16:30 HS 9

The LISA Mission: A Window on the Dark Universe — •Simon Barke, Gerhard Heinzel, and Karsten Danzmann — Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut) Hannover

To understand the Universe astronomers rely almost completely on electromagnetic radiation. Unfortunately many exciting objects do not emit any light at all. But according to Einstein's general relativity, all accelerated masses produce gravitational waves - perturbations of spacetime propagating at the speed of light. The detection of these gravitational waves will provide astronomers with an entirely new sense.

The planned LISA mission will be the first gravitational wave detector in space and hence not limited by seismic noise like its ground-based counterparts. With LISA's unprecedented sensitivity at very low frequencies it will be able to trace the formation, growth, and merger history of massive black holes throughout the Universe as well as survey compact stellar-mass binaries, and study the structure of our own Galaxy.

LISA is under intensive study for more than a decade. This talk will give an overview of the mission design, its current status, and present new developments due to the programmatic situation at NASA and ESA.

EP 2.2 Mo 16:45 HS 9

Gamma-ray diagnostics of Type Ia supernovae — •Alexander Summa, Alexei Ulyanov, Markus Kromer, Sonja Boyer, Friedrich K. Röpke, Stuart A. Sim, Ivo R. Seitenzahl, Michael Fink, Karl Mannheim, Rüdiger Pakmor, Franco Ciaraldi-Schoolmann, Roland Diehl, Keiichi Maeda, and Wolfgang Hillebrandt — Institut für Theoretische Physik und Astrophysik, Universität Würzburg, and other institutes

Although the question of progenitor systems and detailed explosion mechanisms still remains a matter of discussion, it is commonly believed that Type Ia supernovae (SNe Ia) are production sites of large amounts of radioactive nuclei. Besides the fact that the gamma-ray emission due to radioactive decays is responsible for powering the light curves of SNe Ia, gamma rays themselves are of particular interest as a diagnostic tool because they provide a direct way to obtain deeper insights into the nucleosynthesis and the kinematics of these explosion events. Focusing on two of the most broadly discussed SN Ia progenitor scenarios – a delayed detonation in a Chandrasekhar-mass white dwarf (WD) and a violent merger of two WDs – we use three-dimensional explosion models and perform radiative transfer simulations to obtain synthetic gamma-ray spectra. We examine the different spectra with respect to their distinct features and draw connections to certain characteristics of the explosion models. Applying diagnostics, such as line and hardness ratios, the detection prospects for future gamma-ray missions with higher sensitivities in the MeV energy range are discussed.

Hauptvortrag EP 2.3 Mo 17:00 HS 9

Space Weather: Forecast, Hindcast or Nowcast? — •May-Britt Kallenrode — Universität Osnabrück, Fachbereich Physik, Barbarastr. 7, 49080 Osnabrück, Deutschland

Different effects of the Sun and the interplanetary medium on Earth's natural and technical environment are summarized under the term Space Weather. As with ordinary weather, science tries to observe and understand in real time (nowcast), tries to make predictions on different spatial and temporal scales (forecast), and tries to understand long term evolutions in the sense of a space climatology (hindcast). This talk will try to sort our present understanding of space weather in terms of physical processes and statistical observations. With the complexity of different players in space weather in mind, the possibilities and limitations of a space weather forecast will be explored.

Hauptvortrag EP 2.4 Mo 17:30 HS 9

Zeitgemäße technische Umsetzung eines bodengestützten solaren Röntgen Flare Monitoring Netzwerkes — Thomas Bayer[1] und •Michael Danielides[2] — [1]Hungerstorf 40, 17139 Faulenrost — [2]E.-M. Arndt- Strasse 11, 17129 Bentzin

Schon lange bevor über Weltraumwetter gesprochen wurde, war den Funkern bewusst, dass die Sonne unsere Hochatmosphäre verändert und somit die Ausbreitung der Funkwellen maßgeblich beeinflusst. Neben den sich regelmäßig wiederholenden Effekten wie die Änderung der Ionisationsrate der Hochatmosphäre zur Tages- und Nachtzeit oder auch der Einfluss des Sonnenfleckenzyklus, gibt es eher plötzlich und noch nicht einfach vorhersagbare Effekte, die einen gravierenden Einfluss auf die Übertragung der Funkwellen haben.

Das hier vorgestellte InFlaMo(Indirekter solarer Röntgen Flare Monitor)- System ist eine zeitgemäße technische Umsetzung eines bodengestützten Beobachtungssystems, welches die Auswirkungen der solaren Röntgenstrahlung auf die Ionosphäre detektiert, aufzeichnet und die Daten an ein projekteigenes Portal sendet. Mit diesen Informationen besteht die Möglichkeit zeitnah, z.B. die HF- Ausbreitungsvorhersagen oder in die Navigationsfehlerkorrekturen zu aktualisieren. Dies bietet einen signifikanten Mehrwert für Wissenschaftler, Funkamateure und Funkdienste.

EP 2.5 Mo 18:00 HS 9

Quasi-stable radiation belt in the slot region, measurements of MATROSHKA / DOSTEL — •Johannes Labrenz[1], Sönke Burmeister[1], Thomas Berger[2], Rudolf Beaujean[1], Bernd Heber[1], and Günther Reitz[2] — [1]Christian Albrechts Universität zu Kiel — [2]German Aerospace Center, DLR, Institute of Aerospace Medicine, Radiation Biology Department, Cologne

MATROSHKA (MTR) is an ESA experiment facility under the science and project lead of DLR Cologne. The radiation exposure inside a human phantom is measured by active and passive detectors. The DOSimetry TELescope (DOSTEL), built at CAU Kiel in cooperation with DLR Cologne, is a particle telescope consisting of two Si-semiconductor detectors. Count rates as well as energy deposition spectra are measured by this instrument. The active instruments were operating during the first mission phase (MTR-1) where the phantom was mounted outside the Zvzeda module (Service Module SM) of the ISS from Feb. 2004 to Aug. 2005. In 2008 the active instruments were operating again during the third mission phase (MTR-2B) inside the SM of the ISS. The DOSTEL measurements showed the expected enhanced dose rates during transits through the inner radiation belt (SAA) over the South Atlantic and transits through the outer radiation belt at the highest magnetic latitudes. In Sept. and Oct. 2004, during the MTR-1 phase, an additional radiation belt in the so called slot region appeared. In this work the measurements of this quasi stable slot region belt will be presented.

EP 3: Astrophysik/Astrobiologie

Zeit: Dienstag 14:00–16:00 Raum: HS 9

EP 3.1 Di 14:00 HS 9

Atoms in the strong magnetic fields of magnetic white dwarfs and neutron stars — •Christoph Schimeczek and Günter Wunner — 1. Institut für Theoretische Physik, Universität Stuttgart, 70550 Stuttgart

The analysis of high resolution magnetic white dwarf spectra (Sloan Digital Sky Survey) and neutron star spectra (Chandra & XMM-Newton) sets the demand for precise atomic data of atoms and ions from hydrogen to iron at magnetic field strengths ranging from 10^2 T to 10^{10} T. We present values for transition energies and oscillator strengths obtained with our fast and precise tools for arbitrary magnetic field strengths and atomic states, reaching a relative precision of 10^{-6} for hydrogen and 10^{-2} for heavier elements up to iron. This provides an important contribution to the understanding of these fascinating objects.

EP 3.2 Di 14:15 HS 9

Dust in the Outer Solar System — Christian Vitense[1], •Alexander Krivov[1], Hiroshi Kobayashi[1,2], and Torsten Löhne[1] — [1]Astrophysikalisches Institut, Friedrich-Schiller-Universität Jena, Germany — [2]Nagoya University, Japan

Dust close to stars is either primordial and represent building material for planets or is secondary being produced in mutual collisions of planetesimals. In the latter case these so-called debris dust is detected via infrared excess or in resolved images. The link between the dust and the dust-producing planetesimal belt can then be established by modelers. Here we show, using the example of the Kuiper belt, that this link is not always unique. It may not be possible to infer properties of planetesimals from dust or vice versa, because it is unseen mid-sized objects that set the properties of the dust distribution. In the model presented here we found in the Kuiper belt that only objects smaller than a hundred meters are responsible for the dust production, while larger objects are not yet part of the collisional cascade. Staying consistent with dust impact and thermal emission measurements, we show that it is still possible to have different size distributions for the dust, using the same population of transneptunian objects as parent bodies. Furthermore, we present a new piece of evidence that the parent bodies (planetesimals) must have born big, which is based on the analysis of the amount of dust in the EKB region. We find that the EKBOs smaller than a few tens of kilometers in size must be strongly underabundant. In other words, there has to be a pronounced break in the size distribution for objects at those sizes.

Hauptvortrag EP 3.3 Di 14:30 HS 9

Exoplanetary Systems — •Artie Hatzes — Thüringer Landessternwarte Tautenburg

We are in the "Golden Era" of Exoplanet studies. To date almost 900 exoplanets have been discovered around other stars and over 120 of these are in multiple systems. Astronomers have also started to characterize these worlds in terms of their mass, radius, density, and surface temperature. Atmospheric features in exoplanets have also been detected. At the forefront of these characterization studies are CoRoT and Kepler, the first space telescopes devoted to the finding exoplanets via the transit method. Together these two space missions have discovered over 100 transiting exoplanets as well as thousands of more candidates that await confirmation. I will review the current status of our knowledge on exoplanetary systems focusing on the exciting results from the CoRoT and Kepler space missions. I will also discuss the prospects of finding the "Holy Grail" of exoplanets: terrestrial planets in the habitable zone of other stars.

EP 3.4 Di 15:00 HS 9

Anwendung der wavelet-basierten Filtermethode VARLET zur Detektion von Exoplaneten in variablen Lichtkurven der Weltraummissionen CoRoT und Kepler. — •Sascha Grziwa, Judith Korth und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung an der Universität zu Köln, Deutschland

Der Einsatz dedizierter Weltraumteleskope wie CoRoT und Kepler haben die Anzahl der bestätigten Exoplaneten stark gesteigert. Tausende weitere Kandidaten warten auf eine Bestätigung durch bodengestützte Nachbeobachtung. Eine statistisch signifikante Anzahl von Exoplaneten aus verschiedenen Teilen unserer Milchstraße verhilft uns zu neuen Erkenntnissen über die Verteilung und Entstehung von Planetensystemen. Unsere Detektionspipeline EXOTRANS wird seit 2006 erfolgreich für die Weltraummission CoRoT und seit 2011 zur Verarbeitung der öffentlich zugänglichen Daten des Weltraumteleskops Kepler eingesetzt. Variationen des beobachteten Sterns erschweren die Detektion von Exoplaneten in hochaufgelösten Lichtkurven erheblich.

Das RIU-PF entwickelte die wavelets-basierte modellunabhängige Filtermethode VARLET, welche die Variationen des Zielsterns vollständig separiert. Durch Einsatz dieser Filtermethode lassen sich auch flache Transits in variablen Lichtkurven detektieren. Wir präsentieren die Ergebnisse der Anwendung von VARLET als Teil unserer Detektionspipeline EXOTRANS auf die Lichtkurven der Weltraumteleskope CoRoT und Kepler. Insbesondere fanden wir mehr als 200 bisher unbekannte Kandidaten in den Daten des Weltraumteleskops Kepler.

EP 3.5 Di 15:15 HS 9

The PLATO Mission - revealing extra-solar Earths — •Heike Rauer — Institut für Planetenforschung, DLR, Berlin-Adlershof

This decade is witnessing a rapid increase in our understanding of the nature of extra-solar planet systems and their host stars. Missions such as Corot and Kepler have confirmed that not only are extra-solar planets a common occurrence, but that multiple planetary systems are also the norm. Whilst there has been significant progress in discovery and to some extent understanding of extra solar planets and their host star(s), major questions remain as we seek to reveal the presence of extra-solar planets harbouring life.

PLATO is a proposed ESA M3 mission which will revolutionise our understanding of extra-solar planets, through its discovery of planets around hundreds of thousands of stars, orders of magnitudes more than previously known. Its exquisite sensitivity will ensure that it detects planets to Earth masses up to the 'habitable' zone. PLATO will probe the interiors of both the host star(s) and their orbiting planetary systems.

This presentation will describe the PLATO science yield: detecting rocky planets up to the habitable zone with known radii and masses, including planets orbiting solar-like stars; obtaining statistically significant numbers of characterized small planets at different orbits, around various star types; thus providing a set of well characterised small terrestrial planets around bright stars as targets for future atmosphere spectroscopy.

EP 3.6 Di 15:30 HS 9

How accurate are estimates of planetary bulk composition as inferred from determinations of planet mass and radius? — •Frank Sohl[1], Frank W. Wagner[1], and Heike Rauer[1,2] — [1]DLR Institut für Planetenforschung, Berlin — [2]Zentrum für Astronomie und Astrophysik, Technische Universität Berlin, Germany

Masses and radii of transit planets are provided by radial velocity and photometric observations. The inferred mean density is the main indicator of the bulk composition of solid planets. Structural models of low-mass exoplanet interiors that are consistent with the thermodynamics of the high-pressure limit are compositionally distinct, but they do partly suffer from inherent degeneracy or non-uniqueness problems. These are related to the imperfect knowledge of the internal differentiation state and/or the possible presence of an optically thick atmosphere. We will discuss the role of mass and radius measurement errors for determinations of a planet's mean density and bulk chemical composition using calculated relations between radius and mass of solid exoplanets ranging from super-Earths to mini-Neptunes. It is shown that mass-radius relationships based on numerical models of solid exoplanet interiors are sufficiently robust to infer a planet's bulk composition from accurate determinations of its mean density. Reference: Sohl, F.; F.W. Wagner, H. Rauer (2012), arxiv.org/pdf/1211.3331 .

EP 3.7 Di 15:45 HS 9

Mass determination of young directly imaged planet candidates and brown dwarfs — •Tobias Schmidt[1], Ralph Neuhäuser[1], Andreas Seifahrt[2], and Markus Mugrauer[1] — [1]Astrophysikalisches Institut und Universitäts-Sternwarte, 07745 Jena, Germany — [2]Department of Astronomy and Astrophysics, University of Chicago, USA

About 25 sub-stellar companions with large separations ($>\tilde{}$ 50 AU) are confirmed. The origin and early evolution of these objects is still under debate. While often these sub-stellar companions are regarded as brown dwarfs, they could possibly also be massive planets, mass estimates are very uncertain so far. They are companions to primary stars or brown dwarfs in young associations and star forming regions like Lupus and Chamaeleon, hence their ages and distances are well known, in contrast to free-floating brown dwarfs.

Here we present how mass estimates of such young directly imaged companions can be derived. An empirical classification by medium-resolution spectroscopy is currently not possible, because a spectral sequence that is taking the lower gravity into account, is not existing. This problem leads to an apparent mismatch between spectra of old field type objects and young low-mass companions. We show that from spectra of the objects, using light concentration by an AO, temperature, extinction, metallicity and surface gravity can be derived and that this procedure allows a mass determination in combination with luminosities by the direct observations, as done by us for e.g. GQ Lup, CT Cha or UScoCTIO 108 and PZ Tel.

EP 4: Poster Session

Zeit: Dienstag 11:15–12:45 Raum: Poster OG

EP 4.1 Di 11:15 Poster OG

Hydrodynamical Simulations of the Young Supernova Remnant CTB 109 — •Jan Bolte[1], Manami Sasaki[2], and Dieter Breitschwerdt[1] — [1]Zentrum für Astronomie und Astrophysik, TU Berlin — [2]Institut für Astronomie & Astrophysik, Universität Tübingen

Based on the assumption that the background medium has not changed significantly during the evolution of the SNR, we use the present ambient medium, given by the CO emission, as the initial condition of a 3D hydrodynamical simulation. By adding an additional small dense cloud to this realistic inhomogeneous medium, not only the observed morphology of the remnant can be reproduced very well, but also the prominent X-ray lobe of CTB 109 can be explained as the result of a shocked dense cloud. With further constraints from X-ray observations we can derive various important physical parameters from the parameter studies and get a picture of the preshock medium.

EP 4.2 Di 11:15 Poster OG

Arecibo message: Fatigue due to diffraction effects ? — •Erhard K. Schweizer — D-97980 Bad Mergentheim, Neunkircher Str. 46

In 1974 the Arecibo message was sent toward M13, 25'000 light years away with a radiated power of 1 MW. Taking diffraction effects into account, the signal from the 305m-Arecibo-antenna is shaped to a conical, modified Bessel lobe showing a cone angle of 0,017°. This minute divergence results in a circular spread of 18.3AU after 1 year of travel. The 1MW starting power is diluted to a power strength of less than 5E-20 W/m*, 1 light year away. Further propagation weakens the signal quadratically with distance, so ET needs sophisticated devices to detect the MW-Arecibo message at all. Acchievable signal strength for our extraterrestrial neighbours are discussed as a function of antenna size, radiated power, frequency and sender-recipient distance.

EP 4.3 Di 11:15 Poster OG

Monte Carlo studies for ground state configurations of atoms and ions in strong magnetic fields — •Sebastian Boblest, Christoph Schimeczek, Dirk Meyer, and Günter Wunner — 1. Institut für Theoretische Physik, Universität Stuttgart, 70550 Stuttgart

Accurate data of atoms and ions in magnetic fields as they occur on magnetic white dwarfs (MWD) and neutron stars (NS) are an essential requirement for better understanding these extreme objects. We present precise computations of the electronic ground state configurations and energies of atoms and ions in a wide range of magnetic field strengths using the Fixed Phase Diffusion Quantum Monte Carlo Method. We utilize trial functions obtained from Hartree Fock calculations performed using an expansion in a basis of Landau levels. The results from such computations may ultimately be used to uncover the origin of absorption features in the thermal emission spectra of MWD and NS.

EP 4.4 Di 11:15 Poster OG

HD 42659: the first spectroscopic binary around a rapidly oscillating Ap star — •Michael Hartmann and Artie Hatzes — Thüringer Landessternwarte Tautenburg, Sternwarte 5, 07778 Tautenburg, Germany

Chemically peculiar Ap stars are main-sequence stars of spectral type B8 – F0 which show large overabundances of some chemical elements (e.g., Si, Sr, Cr, and Eu), especially of rare earth elements, compared to normal A-type stars. Furthermore, they have strong, global magnetic fields and low rotational velocities. Spectra of these stars contain plenty of narrow absorption lines, thus making precise radial velocity (RV) measurements possible. Some Ap stars exhibit high-overtone, low-degree, non-radial p-mode pulsations with periods of 6 – 21 min and are called rapidly oscillating Ap (roAp) stars. Interestingly, no roAp star is known to be a spectroscopic binary (SB), while many non-oscillating Ap (noAp) stars are found in SB systems. One hypothesis to explain this difference is that the pulsations in Ap stars might be inhibited due to tidal interaction in binaries. To find a SB around a roAp star would thus disprove this hypothesis. We observed a sample of noAp and roAp stars with the HARPS spectrograph at the 3.6-m telescope at the European Southern Observatory (La Silla, Chile). We find significant variability with a period of 93 days in the RVs of the roAp star HD 42659 which is caused by a stellar companion with a minimum mass of 0.5 solar masses in a slightly eccentric ($e = 0.15$) orbit. This detection makes HD 42659 the first confirmed SB around a roAp star in a relatively close orbit ($a = 0.55$ AU).

EP 4.5 Di 11:15 Poster OG

Supernova remnants in a dense gas environment and the problem of the cosmic ray origin — •Tatyana Liseykina[1], Mikhail Malkov[2], and Galina Dudnikova[3] — [1]Institut für Physik, Universität Rostock, Germany — [2]University of California at San Diego, USA — [3]University of Maryland, USA

Although cosmic rays (CR) have been discovered a century ago, their origin is still not precisely known. The latest direct observations [1] of galactic supernova remnants (SNR) strongly support a hypothesis that those are the objects where most of the galactic CR originate from. Turning to the possible mechanisms of CR generation, observations favour the diffusive shock acceleration (DSA) scenario [2]. The limited understanding of the phenomena critical to the DSA, i.e., the confinement of energetic particles in partially ionized molecular clouds (MC) in front of SNR shocks, the modification of MC by cosmic rays, the escape of CRs and their propagation into the interstellar medium, precludes the interpretation of recent, significantly improved SNR observations. We review some important shortcomings of the theory, propose ways to overcome them, and present preliminary results on the identification of the most significant CR driven instabilities.

[1] A. A. Abdo et al., Science 327(2010); Astrophys. J. 734(2011); F. Aharonian et al., A& A 449(2006); R. Enomoto et al., Nature 416(2002); V.A. Acciari et al., Astrophys. J. 714(2010).
[2] L.O. Drury, Rep. Prog. Phys. **46** (1983); R. Blandford, D. Eichler, Phys. Rep. **154** (1987); M.A. Malkov, L.O. Drury, Rep. Prog. Phys. **64** (2001).

EP 4.6 Di 11:15 Poster OG

A high precision experimental benchmark of Fe M-shell unresolved-transition-array (UTA) inter-shell absorption lines — C. Beilmann[1], M. Leutenegger[2], R. Steinbrügge[1], J. Rudolph[1,3], S. Eberle[1], M.C. Simon[1], S.W. Epp[1], A. Graf[4], G.V. Brown[4], P. Beiersdorfer[4], T.M. Baumann[1], F.R. Brunner[1], S. Bernitt[1], Z. Harman[1,5], N.S. Oreshkina[1], C.H. Keitel[1], R. Follath[6], G. Reichardt[6], J. Ullrich[1], and •J.R. Crespo López-Urrutia[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]NASA/GSFC, Greenbelt MD, USA — [3]Universität Gießen, Germany — [4]LLNL, Livermore CA, USA — [5]EMMI, Darmnstadt, Germany — [6]HZB/BESSY, Berlin, Germany

Measurements of inner-shell absorption lines in highly charged ions have been performed with the portable electron beam ion trap FLASH-EBIT. It was coupled to a high-resolution monochromator at the synchrotron X-ray source BESSY II [1] to measure the resonant excitation energies of states decaying by autoionization or photon emission, which are measured by counting photoions and fluorescence photons in dependence of the X-ray energy. We compared the results with those of our own state-of-the-art relativistic configuration-interaction and multiconfiguration Dirac-Fock calculations, as well as with other recent calculations. The experimentally determined resonance energies typically have absolute precisions of about 70 meV, stringently benchmarking theory.

[1] M.C. Simon et al., Phys. Rev. Lett. **105**, 183001 (2010)

EP 4.7 Di 11:15 Poster OG

High resolution X-ray spectroscopy of young Neutron Stars — •Markus Hohle — AIU Jena, Germany

High resolution X-ray spectroscopy of young Neutron Stars using XMM RGS and Chandra HRC data unveiled previously unknown narrow absorption features. In some cases these features are likely not caused by the ISM, but may have their origins in the Neutron Star atmosphere (NSA). With these spectra we can probe current, highly magnetized NSA models. Although still challenging, a properly fitting model can yield the compactness of the Neutron Star, hence delivers precious constrains on the Equation of State.

EP 4.8 Di 11:15 Poster OG

Moving neutral helium in neutron star magnetic fields — •Thorsten Kersting and Günter Wunner — Institut für Theoretische Physik 1, Universität Stuttgart

In the past years, significant improvements in numerical calculations of atoms in neutron star magnetic fields have led to the possibility of producing a huge amount of atomic data, which can serve as a basis for modeling neutron star atmospheres. To calculate the quantity of interest, i.e. the opacity, from cross sections and dipole strengths, it is necessary to consider broadening effects due to influences of the hot plasma in the neutron star atmosphere. The largest broadening effect for atoms in neutron star magnetic fields is likely to be the influence of the motional Stark effect induced by the magnetic field. We will primarily focus on helium and work in center of mass and relative coordinates. The wave function is described by configuration interaction and the single-particle orbitals are expanded in B-Splines. This approach requires sophisticated numerical algorithms.

EP 4.9 Di 11:15 Poster OG

Bounds on the compactness of the isolated neutron stars via X-ray phase-resolved spectroscopy. — •Valeri Hambaryan — AIU Jena

We try to constrain compactness, thereby the nuclear Equation-of-State, of the isolated neutron stars in our galactic neighborhood. There are seven thermally emitting isolated neutron stars known from X-ray and optical observations, radio-quiet with blackbody-like X-ray spectra. Among them two (RBS1223 and RXJ0720) are very well suited to perform rotational phase-resolved X-ray spectroscopy, thanks to the observed large pulsed fractions and multi-epoch pointed observations, conducted by XMM and/or Chandra X-ray observatories. With number of models of magnetized atmosphere we fitted simultaneously the observed general spectral shape and the broad absorption feature in different spin-phases of the isolated neutron star, allowing to derive bounds of the gravitational redshift.

EP 4.10 Di 11:15 Poster OG

Giant radio pulses from the Crab pulsar — •Natalia Lewandowska and MAGIC Collaboration — Lehrstuhl für Astronomie, Universität Würzburg, Deutschland

Since its discovery in 1969 the Crab pulsar has been regarded as a special source of pulsar radio emission. Apart from its regular pulsed emission discovered to be emitted over the entire electromagnetic spectrum, it is one of the few pulsars in which giant radio pulses have been observed.

Giant radio pulses are characterized by much higher flux densities, an apparently non-periodical occurrence, short durations ranging from the microseconds to the nanoseconds range and their power-law energy statistics. These properties distinguish them clearly from regular pulses.

Neither the region of origin in the magnetosphere nor the emission mechanisms of giant pulses are understood. Within the framework of this talk we present an overview of our study of Crab radio giant pulses resulting from a multi-frequency campaign between radio and gamma-ray telescopes.

EP 4.11 Di 11:15 Poster OG

Beobachtung und Modellierung des Staubes in gut aufgelösten "Trümmerscheiben" um nahe Sterne — •Torsten Löhne und Alexander Krivov — Astrophysikalisches Institut und Universitätssternwarte Jena

Um zahlreiche Sterne findet man, meist am Rande der Systeme, größere Ansammlungen von Staub, den man in der Regel über seine thermische Emission im fernen Infraroten nachweist. Diese sogenannten Trümmerscheiben gelten als Überreste der Planetenentstehung, in denen Kleinkörper von höchstens Plutogröße in Kollisionskaskaden ebendiesen beobachteten Staub nachproduzieren.

Für ein besseres Verständnis dieser Systeme und ihrer Geschichte wurden im Rahmen der Mission des Herschel-Weltraumteleskops zahlreiche Trümmerscheiben bei Wellenlängen von 70 bis 500 Mikrometern beobachtet. Dabei sind es besonders die nahen und gut aufgelösten Scheiben, die detailiertere Untersuchungen zulassen.

Wir präsentieren hier einen Abriss der Beobachtungs- und Modellierungsergebnisse für zwei Objekte mit hervorragender Datenlage. Dabei wird gezeigt, welche Rückschlüsse die räumliche Verteilung und die spektrale Energieverteilung des Staubs auf die Dynamik der nicht sichtbaren größeren Objekte im Speziellen und die Entwicklung von Planetensystemen im Allgemeinen zulassen.

EP 4.12 Di 11:15 Poster OG

A high precision experimental benchmark of Fe M-shell unresolved-transition-array (UTA) inter-shell absorption lines — C. Beilmann[1], M. Leutenegger[2], R. Steinbrügge[1], J. Rudolph[1,3], S. Eberle[1], M.C. Simon[1], S.W. Epp[1], A. Graf[4], G.V. Brown[4], P. Beiersdorfer[4], T.M. Baumann[1], F.R. Brunner[1], S. Bernitt[1], Z. Harman[1,5], N.S. Oreshkina[1], C.H. Keitel[1], R. Follath[6], G. Reichardt[6], J. Ullrich[1], and •J.R. Crespo López-Urrutia[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]NASA/GSFC, Greenbelt MD, USA — [3]Universität Gießen, Germany — [4]LLNL, Livermore CA, USA — [5]EMMI, Darmnstadt, Germany — [6]HZB/BESSY, Berlin, Germany

Measurements of inner-shell absorption lines in highly charged ions have been performed with the portable electron beam ion trap FLASH-EBIT. It was coupled to a high-resolution monochromator at the synchrotron X-ray source BESSY II [1] to measure the resonant excitation energies of states decaying by autoionization or photon emission, which are measured by counting photoions and fluorescence photons in dependence of the X-ray energy. We compared the results with those of our own state-of-the-art relativistic configuration-interaction and multiconfiguration Dirac-Fock calculations, as well as with other recent calculations. The experimentally determined resonance energies typically have absolute precisions of about 70 meV, stringently benchmarking theory.

[1] M.C. Simon et al., Phys. Rev. Lett. **105**, 183001 (2010)

EP 4.13 Di 11:15 Poster OG

YETI - search for young transiting planets — •Ronny Errmann[1], Ralph Neuhäuser[1], Stefanie Rätz[1], Gracjan Maciejewski[2], Manfred Kitze[1], and YETI Team[3] — [1]Astrophysikal Institute und University Observatory, University Jena — [2]Centre for Astronomy of the Nicolaus Copernicus University, Torun — [3]all over the world

The transit method is the only method to determine the radius of a planet and inclination of the orbit directly. Radial velocity follow up results the true mass. So far, only transiting exoplanets older than several hundred Myr are known. To close the gap at young ages, the YETI network (Young Exoplanet Transit Initiative) was established. The network consists of ground based telescopes with mirror sizes of 0.4 to 2 m, located at different longitudes all over the world. With the telescopes it is possible to observe continuously for 24h a day without gaps in the light curves and therefor not missing a transit.

The targets are young clusters, which provide a large number of young stars with similar properties. The cluster is observed with YETI in three runs per year with length of one to two weeks each and over three years. The first target was Trumpler 37 with an age of 4 Myr. The monitoring started 2009. We reach a precision better than 30 milli-mag for 5500 out of the 17,000 field stars. Data processing of 50,000 images from 12 telescopes is still in progress, but we found already 2 transiting candidates, for which follow up is partly done.

EP 4.14 Di 11:15 Poster OG

TTV@YETI: Analysing Transit-Timing-Variations using ground-based observations — •Martin Seeliger[1], Gracjan Maciejewski[2], and Ralph Neuhäuser[1] — [1]Astrophysical Institute and University Observatory Jena — [2]Torun Centre for Astronomy, Poland

The transit timing variation (TTV) method, that was already successfully applied to space-based (i.e. Kepler) data, is sensitive to small perturbing masses in orbits near the low-order mean-motion resonances. However, deriving the orbital elements and mass of the perturber from TTV is a difficult inverse problem that requires many observations to at least partially remove degeneracies and point out the most probable configuration.

So far, we have observed transits of selected known transiting planets with known or suspected non-zero eccentricities and/or scatter in the radil-velocity orbit solution (which may indicate additional planets in the system). We could show that the achievable precision using ground-based data allows us to find planets as described above. Since single-site ground-based observations are not sufficient, we use the YETI-network, a consortium of small- to medium-size telescopes around the world to be able to cover all longitudes, allowing us to observe transits at certain phases and to probe certain frequencies in the periodogram, even though they would not be observable from single-site monitoring. Hence we are now able to compensate the disadvantages of ground-based observations.

EP 4.15 Di 11:15 Poster OG

The Next Generation Transit Search — •Philipp Eigmüller — Institut für Planetenforschung, Deutsches Zentrum für Luft- und Raumfahrt, Rutherfordstrasse 2, 12489 Berlin

The 'Next Generation Transit Search' project (ngts) is a new ground-based transit survey aimed at detecting sub-Neptune sized exoplanets around bright stars. It will consist of twelve robotic telescopes with an aperture of 200mm, each equipped with a 2kx2k NIR sensitive detector. NGTS builds upon the experience of past and current surveys. The instrument will be installed at the ESO Paranal observatory in order to benefit from the excellent observing conditions and follow-up synergy with the VLT and E-ELT.

EP 4.16 Di 11:15 Poster OG

Orbital motion of the binary brown dwarf companions HD130948BC around their host star — •Christian Ginski, Ralph Neuhäuser, Markus Mugrauer, Tobias O. B. Schmidt, and Christian Adam — Astrophysikalisches Institut und Universitäts-Sternwarte Jena, Jena 07745, Germany

Evolutionary models and mass estimates for brown dwarfs remain uncertain, hence determining the masses of brown dwarfs by model-independent methods is important to test and constrain such theories. Following the orbital motion of brown dwarf companions around their primaries gives us the opportunity to dynamically calculate the masses of these systems. In addition, detecting curvature (acceleration or deceleration) in the orbit would confirm that the companion is physically associated with its primary, thus eliminating the possibility of a by-chance alignment of the primary's and the companion's proper motions and positions. Furthermore, the orbit parameters can be important indicators for the formation process of such wide, massive sub-stellar companions.

The binary brown dwarf companions to HD 130948 were discovered by Potter et al. 2002. We present various observations of this triple system over the course of seven years. With these data points we can infer that HD 130948 BC show orbital motion around A.

EP 4.17 Di 11:15 Poster OG

High contrast imaging search for (sub)stellar companions to young stars in the Lupus star forming region — •Markus Mugrauer — AIU Jena, Jena, Germany

We give an introduction to our high contrast imaging search for (sub)stellar companions of pre-main sequence stars in the Lupus star forming region, carried out with NACO at ESO-VLT. The survey started 2010 with the 1st epoch AO observations of 63 targets taken at the Paranal Observatory. Recently in June 2012, the follow-up imaging of all our targets could be completed successfully. Here, we will present some first results of our multiplicity study.

EP 4.18 Di 11:15 Poster OG

High contrast AO imaging observations of PZ Tel and its sub-stellar companion — •Markus Mugrauer — AIU Jena, Jena, Germany

We will present new high contrast AO imaging observations of the PZ Tel system, taken with NACO at the Paranal Observatory. Our new NACO astrometry confirms the companionship of PZ Tel B on a very high significance level. The orbital motion of the companion relative to its primary is clearly detected between all observing epochs with evidence for deceleration. Our new NACO astrometry, together with the previously taken one, allows a characterization of the orbit elements of the PZ Tel system.

EP 4.19 Di 11:15 Poster OG

Messungen mit einem Phoswich-Detektor auf einem Stratosphärenballon — •Johannes Marquardt, Enno Scharrenberg, Esther M. Dönsdorf, Patrick Kühl, Henning Lohf und Henning Winterfeld — Christian-Albrechts-Universität zu Kiel

Die Galaktische Kosmische Strahlung (GCR) wird durch die Heliosphäre, die Magnetosphäre und die Atmosphäre moduliert. Durch die Ablenkung durch das Erdmagnetfeld erreichen nur Teilchen mit einem gewissen Impuls pro Ladung, genannt Steifigkeit, die Erdatmosphäre. Bei Wechselwirkungen wie Spallation von primären Teilchen der GCR mit Atomen der Atmosphäre entsteht ein höhenabhängiges, komplexes Strahlungsfeld sekundärer Teilchen, von denen Neutronen einen erheblichen Anteil an der Umgebungsäquivalentdosis liefern. Zudem wird der Teilchenfluss der GCR durch den solaren Zyklus beeinflusst; er ist antikorreliert zur Sonnenaktivität. Der höhenabhängige Neutronenfluss sollte während eines solaren Maximums an einem Ort mit geringer geomagnetischer Abschneidesteifigkeit bestimmt werden. Dazu wurde ein Teilchendetektor auf einem BEXUS-Ballon in der Stratosphäre geflogen. BEXUS ist ein Studentenprojekt des Deutschen Zentrums für Luft- und Raumfahrt und bietet die Möglichkeit, im Rahmen des Programms Experimente auf einem Ballon durchzuführen. Das Instrument für das Experiment ist ein Phoswich-Detektor, welcher aus zwei verschiedenen optisch miteinander gekoppelten Szintillatoren, angeschlossen an einen gemeinsamen Photomultiplier, besteht. Der Ballonflug fand Ende Septmeber 2012 in Kiruna (Schweden) erfolgreich statt und es wurden bereits grundlegende Datenanalysen durchgeführt.

EP 4.20 Di 11:15 Poster OG

The First Ground Level Event of Solar Cycle 24 and its longitudinal distribution in the inner heliosphere — •Bernd Heber[1], Nina Dresing[1], Wolfgang Dröge[2], Raúl Goméz-Herrero[3], Klaudia Herbst[1], Yulia Kartavikh[2], Andreas Klassen[1], Johannes Labrenz[1], and Olga Malandraki[4] — [1]Christian-Albrechts-Universität zu Kiel — [2]University of Würzburg, Würzburg, Germany — [3]SRG, University of Alcalá, Alcalá de Henares, Spain. — [4]Institute of Astronomy, Astrophysics, Space Applications and Remote Sensing, National Observatory of Athens, Athens, Greece

Ground level events (GLEs) are solar energetic particle (SEP) events that are recorded by ground-based instrumentation. The energy of the particles is so high that they produce secondary particles, i.e. protons and neutrons, which are detected as sudden increases in cosmic ray intensities measured by e.g. neutron monitors. On May 17 at 1:25 UT a M5.1 X-ray flare from the active region 11476 (N11W76) was detected accompanied by type II and III radio bursts and a coronal mass ejection heading towards STEREO A. The corresponding shock wave passed STEREO A on May 18 at 12:43 UT but missed the Earth and STEREO B. The event onset of near relativistic electrons was at SOHO (250 -700 keV),at STEREO A and B (125-335 keV)at 1:51 UT,6:05 UT and 3:38 UT, respectively. In contrast to observations close to the Earth no strong anisotropies have been observed at both STEREO A and B. The neutron monitor network recorded the first GLE for solar cycle 24.The Electron Proton Helium INstrument on board SOHO measured protons with energies of more than 600 MeV (rigidities of more than 1.2 GV). The interplanetary field direction was such that neutron monitor stations with asymptotic direction in the 1 to 2 GV range over Australia were connected best and recorded the biggest increase of 17

EP 4.21 Di 11:15 Poster OG

The Current Status of Development of the Electron and Proton Telescope for Solar Orbiter — •Jan Steinhagen, Shri Kulkarni, Sebastian Boden, Cesar Martin-Garcia, Stephan Böttcher, Björn Schuster, Lars Seimetz, and Robert Wimmer-Schweingruber — IEAP, Christian-Albrechts-Universität zu Kiel

ESA's Solar Orbiter mission, scheduled for launch in January 2017, will study how the sun creates the inner heliosphere. Therefore, the spacecraft will perform in situ and remote sensing measurements of the sun on a high inclination orbit with a perihelion of about 60 solar radii, making it possible to observe the poles of the sun from nearby. The Energetic Particle Detector suite on-board of Solar Orbiter will measure particles of a wide energy range and from multiple directions. One of the important sensors of the EPD suite is the Electron and Proton Telescope. It consists of two antiparallel telescopes with two silicon detectors respectively and is designed to detect electrons between 20 - 400 keV and protons from 20 keV to 7 MeV. EPT relies on a magnet/foil technique to discriminate between electrons and protons. Its design is driven by mass allocation, the thermal environment, power consumption and electronic noise; especially the magnet system must guarantee stray fields low enough to be compliant with the Solar Orbiter EMC requirements. Here, we present the current status of the Structural/Thermal Model and Engineering Model assembly as well as the integration and testing of the prototype.

EP 4.22 Di 11:15 Poster OG

Characterisation of a LSO scintillation crystal for space applications — •Robert Elftmann, Jan Grunau, Shrinivasrao Kulkarni, César Martin, and Robert Wimmer-Schweingruber — IEAP Christian-Albrechts-Universität, Kiel, Deutschland

Inorganic scintillation crystals coupled with semiconductor detectors are often used in space applications as gamma ray detectors or high energy particle calorimeters. Currently BGO ($Bi_4Ge_3O_{12}$) is widely used for this purpose because of its high stopping power, the non hygroscopy

and its ruggedness, which is favorable in space applications. Cerium doped LSO (Lu_2SiO_5) offers the same benefits with higher light output capabilites and a shorter decay time. In this work a cerium doped LSO scintillation crystal coupled with a photo diode is investigated. The light yield and resolution studies for two different radioactive sources, ^{207}Bi and ^{60}Co, are presented. To increase the light collection and consequently the energy resolution, scintillation crystals are wrapped in highly reflective material. The increase in light collection depending on the amount of layers for the LSO crystal along with investigations of quenching effects with alpha particles and the background spectrum, which arises from radioactive cerium isotopes, are also included in this work.

EP 4.23 Di 11:15 Poster OG

MHD simulations: Corotating Interaction Regions — •Tobias Wiengarten, Horst Fichtner, and Jens Kleimann — Theoretische Physik IV, Ruhr-Universität Bochum, Germany

Corotating Interaction Regions (CIRs) form in the solar wind when, due to the rotation of the Sun, parcels of fast-speed wind interact with slow-speed wind. The resulting build-up of pressure generates waves that with increasing time (or distance from the Sun) may evolve into a so-called forward-reverse shock-pair. During solar-quiet times CIRs can be the dominant drivers for shaping large-scale structures in the heliosphere. Studying CIRs is also important because the associated shocks are capable of (re-)accelerating energetic particles or deflect cosmic rays. The global, three-dimensional structure of CIRs is modeled with an MHD approach that gives the plasma quantities needed to model the transport and acceleration of particles in the heliosphere (with, e.g., stochastic differential equations (SDEs), see the talk by *Effenberger*).
Here, we show results from 3D-MHD simulations made with our code CRONOS for a) analytic boundary conditions where results can be compared with those obtained with a different code and b) boundary conditions derived from observational data that are compared to spacecraft observations.

EP 4.24 Di 11:15 Poster OG

Laboratory Experiments on the Expansion of Magnetically Confined Plasma Loops — •Jan Tenfelde[1], Felix Mackel[1], Sascha Ridder[1], Henning Soltwisch[1], Jürgen Dreher[2], Thomas Tacke[2], and Philipp Kempkes[3,4] — [1]Institut für Experimentalphysik V, Ruhr-Universität Bochum — [2]Institut für theoretische Physik I, Ruhr-Universität Bochum — [3]Ernst-Moritz-Arndt-Universität, Greifswald — [4]MPI für Plasmaphysik, EURATOM Association, Greifswald

Plasma loops reminiscent of Solar flares are generated in a pulsed-power laboratory experiment. A constant apex expansion velocity as well as constant current channel diameter are observed over a wide range of experimental parameters. Commonly, the evolution of current-carrying plasma loops is interpreted as being driven by the hoop force. We compare modifications of this hoop expansion that include the effect of mass loading with the expansion velocites obtained from the experiment. In addition, the effect of boundary conditions of the electric field is investigated in 3D time-dependent MHD simulations and compared with experimental results. Both mechanisms are discussed with respect to measurements of the plasma magnetic field and plasma currents.

MHD pumping driven by the axial plasma current has been proposed as possible cause of the uniform diameter along the plasma loop. However, it is found that this mechanism does not play a significant role in our device.

EP 4.25 Di 11:15 Poster OG

The Local Interstellar Spectrum Beyond the Heliopause: What can we Learn from Voyager in the Inner Heliosheath? — •Klaudia Herbst[1], Bernd Heber[1], Andreas Kopp[1], Oliver Sternal[2], and Friedhelm Steinhilber[3] — [1]Christian-Albrechts-Universität zu Kiel, Germany — [2]MINT-Kolleg, University of Stuttgart, Germany — [3]Swiss Federal Institute of Aquatic Science and Technology, EAWAG, Dübendorf, Switzerland

The local interstellar spectrum (LIS) is one of the most important but unknown parameters in all model efforts to describe the modulation of Galactic Cosmic Rays on their way from the galaxy through a possible bow shock, heliosheath and heliosphere towards the Earth. Because it could not be measured so far, several LIS models derived from numerical simulations or data at Earth were developed. A new perspective to determine the LIS was opened when the Voyager spacecraft crossed the termination shock and entered the heliosheath. Webber & Higbie (2009) derived a new LIS, which is lower than all previous LIS models over the entire energy range, on the base of these measurements. Numerical simulations by Scherer et al. (2011) showed that already particles in the outer heliosheath are modulated, suggesting that the LIS by Webber & Higbie (2009) is a heliopause spectrum rather than the "true" LIS. By using the same simplified simulation model we estimate the diffusion coefficient in the OHS by mapping the LIS models to this HPS and conclude that the Voyager measurements will not be able to determine the LIS in the next future.

EP 4.26 Di 11:15 Poster OG

Investigation of Pickup Ions with SOHO/CELIAS/CTOF — •Andreas Taut[1], Nils Janitzek[1], Lars Berger[1], Peter Bochsler[2], Christian Drews[1], Berndt Klecker[3], and Robert F. Wimmer-Schweingruber[1] — [1]Institute for Experimental and Applied Physics, Christian-Albrechts-University Kiel, Germany — [2]Physikalisches Institut, University of Bern, Switzerland — [3]Max Planck Institute for Extraterrestrial Physics, Garching, Germany

The Charge Time Of Flight (CTOF) sensor of the Charge, ELement, and Isotope Analysis System (CELIAS) experiment on SOHO is a time-of-flight mass spectrometer designed to measure the ionic composition of the solar wind. CTOF determines an ion's mass, mass-per-charge and velocity by the combined measurement of energy-per-charge (0.3 keV/e to 35 keV/e), time-of-flight and residual energy. Due to failure of detector components in August 1996, CTOF ceased to operate nominally after 150 days, but partially compensates the relatively small operation time by a signifcantly higher collection power with respect to other time-of-flight mass spectrometers. Thus, CTOF is able to study rare solar wind heavy ions with exceptional statistics. CTOF is especially well suited for the investigation of interstellar and inner-source pickup ions, because of its excellent time-of-flight resolution. Pickup ions are ionized neutral atoms coming from the interstellar medium or a source close to the sun, respectively. We report on first results of our investigation of the abundance and velocity spectra of inner-source and interstellar C+ and O+ pickup ions. Furthermore the in-flight calibration of the instrument is shown.

EP 4.27 Di 11:15 Poster OG

Particle simulation of an Alfvénic turbulence cascade in the solar chromosphere — •LiHui Chai[1,2], Jörg Büchner[2], and KuangWu Lee[2] — [1]University of Science and Technology of China, Hefei, China — [2]Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany

Inertial Alfvén waves has been proposed to accelerate electrons in the chromosphere where they might cause hard X ray radiation during solar flare [Fletcher & Hudson 2008, ApJ, 675, 1645]. Due to their short transverse wave length inertial Alfvén waves carry a longitudinal electric field parallel to the background magnetic field. This longitudinal field can accelerate particles and dissipate wave energy to the plasma particles that move at the wave speed, i.e. via Landau damping effect [Landau 1946, J. Phys. USSR, 10, 25].

For this study an electromagnetic two-dimensional particle-in-cell simulation (2D EM PIC) is used to study the proposed acceleration mechanism in chromospheric plasmas. To generate an incoming Alfvén wave, an antenna that generates sinusoidal oscillating perpendicular electric fields is placed at one boundary. While the waves propagates into chromospheric plasmas a parallel electric field is obtained. The response of the particle distribution to this parallel electric field as well as the acceleration due to Landau damping are discussed in this work.

EP 4.28 Di 11:15 Poster OG

High Time Resolution Measurements of Solar Wind Heavy Ions with SOHO/CELIAS/CTOF — •Nils Janitzek[1], Andreas Taut[1], Lars Berger[1], Peter Bochsler[2], Christian Drews[1], Berndt Klecker[3], and Robert F. Wimmer-Schweingruber[1] — [1]Christian-Albrechts-Universität Kiel — [2]Universität Bern — [3]MPE Garching

The Charge Time-Of-Flight (CTOF) mass spectrometer as one of the three main sensors of the Charge, ELement and Isotope Analysis System (CELIAS) onboard the SOlar and Heliospheric Observatory (SOHO) is designed to measure the kinetic properties and elemental/ionic composition of solar wind ions heavier than H^+, which we refer to as heavy ions. This is achieved by measuring the E/q-ratio, the time-of-flight and the energy deposit of incident ions. While CTOF was able to measure data only for a short time period from DOY 80 1996 until DOY 230 1996 due to an instrument failure, the measured

data shows a remarkable time-of-flight resolution compared to similar instruments such as SWICS on ACE. In addition the CTOF measurement cycle of about 5 minutes allows the investigation of short-time variations of the solar wind composition. We performed an in-flight calibration of the CTOF sensor which includes the determination of both time-of-flight range and energy deposit range of the measured ion species at fixed E/q-ratios. The results of our calibration will allow us to infer the composition and spectra of solar wind heavy ions with high time resolution.

EP 4.29 Di 11:15 Poster OG

Simulation results of the Electron-Proton Telescope for Solar Orbiter — •Sebastian Boden, Jan Steinhagen, Shrinivasrao Kulkarni, Jan Grunau, Rolf Paspirgilis, César Martin, Stephan Böttcher, Lars Seimetz, Björn Schuster, Alexander Kulemzin, and Robert Wimmer-Schweingruber — Christian-Albrechts-Universität Kiel

The Electron Proton Telescope (EPT) is one of five instruments in the Energetic Particle Detector suite for Solar Orbiter. It investigates low energy electrons and protons of solar events. EPT covers an energy range from 20 - 400 keV for electrons and 20 keV - 7 MeV for protons and distinguishes electrons from protons using a magnet/foil technique with silicon detectors.

There will be two EPT units, each with double-barreled telescopes, one looking sunwards/antisunwards and the other north/south.

EPT is designed using the GEometry ANd Tracking (GEANT) simulation toolkit developed by CERN for Monte Carlo calculations. Here we present the details of our simulations and the simulation results with respect to energy coverage and the geometrical factor of the EPT instrument. We will also look at the far-field of the EPT magnets, which is important for electo-magnetic cleanliness considerations.

EP 4.30 Di 11:15 Poster OG

Particle acceleration in the solar corona above active regions — •Xiaowei Zhou[1,2], Jan Skala[2], Joerg Buechner[2], Siming Liu[1], and Weiqun Gan[1] — [1]PMO, Nanjing, China — [2]MPS, Lindau, Germany

Recent solar observations gave important clues about the particle acceleration in solar flares. Many models have been investigated, but the many questions still remain. In our contribution we present relativistic test particle approach to study the acceleration mechanisms by magnetic reconnection.

We choose a relativistic guiding center approach, because particles are adiabatic along the magnetic field and the details of the particle trajectories is not important for our study.

The magnetic and electric fields are obtained from resistive MHD numerical simulations. The particles can be effectively accelerated by the parallel component of electric field Ejj. Our MHD simulations are based on the observations. The initial magnetic field is extrapolated from magnetogram of active region.

We investigate various models of anomalous resistivity dependent on the current carrier velocity. We compared the particle acceleration in different models. We studied the dependence of acceleration times and energy gains for ions and as well as their energy distribution needed to calculate the Hard X-ray spectrum to be compared with the observations of RHESSI.

EP 4.31 Di 11:15 Poster OG

Radiation Measurement on a Stratospheric Balloon — •Thomas Möller[1], Thomas Berger[2], Sönke Burmeister[1], Bent Ehresmann[1], Bernd Heber[1], Johannes Labrenz[1], Lauri Panitzsch[1], and Robert F. Wimmer-schweingruber[1] — [1]IEAP, Christian-Albrechts-University Kiel, Kiel, Germany — [2]German Aerospace Center (DLR), Cologne, Germany

The Earth is permanently exposed to energetic particle radiation from cosmic rays. This energetic particle radiation yields, together with its secondary particles produced in the Earth's atmosphere, a natural radiation field inside the atmosphere. The radiation exposure is dependent on altitude and geomagnetic latitude. In the future, it is planned to use supersonic aircraft, with operation altitudes between 20 and 25 km which is significantly higher than common aircraft altitudes. At these altitudes the radiation level is higher and reaches a maximum due to production of secondary particles. Therefore it is important to know which kind of radiation level will be expected in these altitudes. For this investigation a particle telescope consisting of four segmented silicon semiconductor detectors was developed. Due to the arrangement of the detectors, it is possible to separate neutral and charged particles. Therefore the dose rates induced by charged and neutral particles can be determined seperately. The Flight Radiation Environment Detector (FRED) conducted measurements onboard a stratospheric balloon in altitudes up to 25 km as part of the BEXUS programme. The results of the measurements will be presented.

EP 4.32 Di 11:15 Poster OG

Space Weather monitoring with Neutron Monitor measurements — •Christian Steigies — Christian-Albrechts-Universität zu Kiel

Space Weather affects many areas of the modern society, advance knowledge about space weather events is important to protect personnel and infrastructure. Cosmic Rays (CR) measurements by ground-based Neutron Monitors are influenced by Coronal Mass Ejections (CME), the intensity of the ever present Cosmic Rays is reduced in a Forbush decrease (Fd). In the case of very energetic CMEs, the measured intensity can be significantly increased in a Ground Level Enhancement (GLE). By detecting the anisotropy of the CR environment, a CME can be detected hours before it arrives at Earth. During a GLE the high-energy particles from the Sun can be detected before the more abundant lower energy particles arrive at Earth, thus allowing to take protective measures. Since the beginning of the Neutron Monitor Database (NMDB) project, which has been started in 2008 with funding from the European Commission, real-time data from Neutron Monitors around the world has been made available through one web-portal. We have more than doubled the number of stations providing data since the start of the project to now over 30 stations. The effectiveness of the ALERT applications which are based on NMDB data has been shown by the recent GLE71. We will present different applications through which the measurements and different data products are accessible.

EP 4.33 Di 11:15 Poster OG

Modernes Solares Röntgen Flare Monitoring im VLF Bereich — •Michael Danielides[1] und Thomas Bayer[2] — [1]E.-M. Arndt-Strasse 11, 17129 Bentzin — [2]Hungerstorf 40, 17139 Faulenrost

Das Indirekte Solare Röntgen Flare Monitor- Netzwerk (InFlaMo- Net) besteht aus neu entwickelten Detektoren für das VLF- Band, deren Daten auf einem sich noch im Aufbau befindlichen Internet-Portal gesammelt werden. Da die Detektoren fast autark arbeiten können, ist ein weit gestreutes und globales Netzwerk möglich.

Die so gewonnen und archivierten Daten geben indirekt Aufschluss über Weltraumwetterereignisse und eignen sich für eine Verbesserung der HF- Ausbreitungsvorhersage oder z.B. der Funkfernsteuerungsverfahren.

EP 4.34 Di 11:15 Poster OG

Ionization rates in the heliosheath and in astrosheaths — •Klaus Scherer[1], Horst Fichtner[1], Hans-Joerg Fahr[2], Maciej Bzowski[3], and Stefan Ferreira[4] — [1]Institut für Theoretische Physik IV, Ruhr-Universität Bochum, 44780 Bochum — [2]Argelander Institut, Universität Bonn, 53121 Bonn — [3]Polish Space Science Center, Warsaw — [4]Centre for Space Research, North-West University, 2520 Potchefstroom, South Africa

In the heliosphere, especially in the inner heliosheath, mass-, momentum-, and energy loading induced by the ionization of neutral interstellar species plays an important and underestimated role. We discuss the importance of the charge exchange and electron impact processes for interstellar neutral hydrogen and helium and its implications for further modeling. We will show, that electron impact can in some regions of the heliosphere, particularly in the heliotail, more effective than charge exchange, and the ionization of neutral interstellar helium contributes about 20% to the mass- and momentum loading in the inner heliosheath.

EP 4.35 Di 11:15 Poster OG

Energetic Neutral Atoms (ENAs) produced along the Voyager trajectories and implications for modeling of the inner heliosheath — •Mark Siewert and Hans-Jörg Fahr — Argelander-Institut f. Astronomie, Univ. Bonn, Auf dem Hügel 71, 53121 Bonn

Over the past years, we have developed our model for the production of Energetic Neutral Atoms (ENAs) produced in the inner heliosheath, and how they relate to the skymaps obtained by the IBEX mission. We now present first results of a study aiming to improve our initial model for the outer heliosphere with independent observational data.

The main contribution to this is derived from the two Voyager spacecrafts, which offer the only directly observed data on plasma properties of the heliospheric boundary layer. As it turns out, no existing model is able to describe, globally and self-consistently, all observations by the Voyagers, so a new and improved description is clearly required. We present first results on how strong a more realistic description would impact observed ENA fluxes.

EP 4.36 Di 11:15 Poster OG

Teilchenidentifikation von Neutronen und Gammas — •Dennis Sie, Sönke Burmeister, Stephan Böttcher und Bernd Heber — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel

Die Messung energiereicher neutraler Teilchen mittels Silizium Halbleiterdetektoren beruht auf der spezifischen Wechselwirkung der Teilchen mit dem Absorber-Material. Während Neutronen mit Kerne des Materials wechselwirken, reagieren Photonen im Wesentlichen mit der Atomhülle. Letztere erzeugen durch Compton- oder Paarerzeugung Elektronen bzw. Positronen. Bei einem elastischen Stoß von Neutronen mit dem Absorber-Material werden die Stoßkerne beschleunigt. Zusätzlich können Neutronen durch in-elastische Wechselwirkungen mit dem Absorber energiereiche Teilchen erzeugen. Bei gleichem Energieverlust in dem Material besitzen Ionen gegenüber Elektronen ein wesentlich höheres Ionisationsvermögen. Aus diesem Grunde werden beim Messprozess unterschiedliche Pulsformen erwartet. Deshalb sollten die Impulse, die auf einer Wechselwirkung von Neutronen mit dem Material basieren. Die sehr kleinen Ladungsimpulse der Silizium PIN-Fotodiode werden mittels einem ladungsempfindlichen Verstärkers verstärkt und in Spannungsimpulse leicht messbarer Amplitude umgewandelt. Mittels einer zusätzlichen Digitalelektronik werden die Signale für die Auswertung digitalisiert und gespeichert. Mit der entwickelten Elektronik und der Pulse-Shape-Analysis können über die verschiedenen Pulsformen, Neutronen und Gammas getrennt werden. Der Aufbau und das Verfahren sollen hier vorgestellt werden.

EP 4.37 Di 11:15 Poster OG

On the gravitational redshift — •Klaus Wilhelm[1] and Bhola N. Dwivedi[2] — [1]Max-Planck-Institut für Sonnensystemforschung (MPS), 37191 Katlenburg-Lindau, Germany — [2]Dept. of Applied Physics, Indian Institute of Technology (Banaras Hindu University), Varanasi-221005, India

The study of the gravitational redshift — a relative wavelength increase of $\approx 2 \times 10^{-6}$ was predicted for solar radiation by Einstein in 1908 — is still an important subject in modern physics. Two research teams have recently disagreed on the physical cause of the shift. We argue that both teams miss the important point that the ratio of the gravitational force acting on an electron in a hydrogen atom situated in the Sun's photosphere to the electrostatic force between the proton and the electron is very small, namely, 3×10^{-21} and, of course, it is much smaller on Earth. A comparison of this ratio with the predicted and observed solar redshift indicates a discrepancy of many orders of magnitude. With Einstein's early assumption that the frequency of a spectral line depends only on the generating ion itself, a solution is found based on a two-step process in analogy with Fermi's treatment of the Doppler effect. A sequence of physical processes in line with the conservation of energy and momentum results in the observed shift. We suggest that the gravitational field affects the release of the photon and not the atomic transition. The atomic emission is then compared with the gravitational redshift of matter-antimatter annihilation events.

EP 4.38 Di 11:15 Poster OG

Modellierung des Einflusses von CIRs auf niedrig energetische Elektronen — •Adrian Vogt[1], Bernd Heber[1], Horst Fichtner[2], Jens Kleimann[2], Frederic Effenberger[2] und Oliver Sternal[3,1] — [1]Institut für Experimentelle und Angewandte Physik, Christian Albrechts Universität zu Kiel, 24118 Kiel, Germany — [2]Lehrstuhl für Theoretische Physik IV, Ruhr Universität Bochum, 44780 Bochum, Germany — [3]MINT-Kolleg Baden-Württemberg, Universität Stuttgart, Germany

In diesem Beitrag unterersuchen wir den Einfluss korotierender Wechselwirkungsregionen auf die Modulation niederenergetischer Elektronen mithilfe von Computersimulationen durch den VLUGR3-Code. Dazu werden zwei verschiedene analytische Modelle der Sonnenwindgeschwindigkeit und des Diffusionskoeffizienten bzw. der Magnetfeldstärke weiterentwickelt und ihre Parameterkonfiguration anhand der Zählratenmessungen von IMP-8 überprüft.

EP 4.39 Di 11:15 Poster OG

Calculating particle spectra from the Solar Electron and Proton Telescope onboard STEREO — •Jan Gieseler, Stephan Böttcher, Bernd Heber, and Jan Köhler — IEAP, CAU Kiel, Kiel, Germany

STEREO (Solar TErrestrial RElations Observatory) was launched on October 26, 2006. It consists of two spacecraft on heliocentric orbits, one preceding the Earth, the other following it. The Solar Electron and Proton Telescope (SEPT) onboard each of the two spacecraft is made up of two dual double-ended magnetic/foil particle telescopes which separate and measure electrons (from 30 to 400 keV) and ions, mainly protons and α-particles (from 70 keV to 2.2 MeV). Low energy ions are stopped by the thin foil which electrons can pass with an essentially unaltered spectrum. The magnet on the other side deflects electrons while ions still reach the detector. Up to now, SEPT energy spectra were obtained using defined energy channels from accelerator calibration measurements and geometric factors derived from Monte Carlo simulations. We try a different approach, applying inversion methods to calculate the energy spectra from the measurements, expecting higher accuracy and better separation of the different particle populations.

EP 4.40 Di 11:15 Poster OG

Particle scattering at amplified wavemodes within the heliosphere — •Sebastian Lange[1], Felix Spanier[1], and Rami Vainio[2] — [1]Lehrstuhl für Astronomie, Universität Würzburg, Emil-Fischer-Straße 31, D-97074 Würzburg — [2]Department of Physics, P.O.Box 64, 00014 University of Helsinki, Finland

Coronal mass ejections and flares are most likely the accelerators of high-energy particles. Streaming particles up to GeV energy causing plasma instabilities within the heliosphere. This leads to amplified wavemodes which influence the turbulent evolution and hence the particle scattering significantly. To investigate these effects, we use a hybrid simulation code called Gismo, which treats the heliospheric turbulence by an incompressible magnetohydrodynamic appoach separately from a kinetic particle description. In this talk, we present results of particle scattering within turbulence by using conditions observed at three solar radii. Furthermore, simulations of particle scattering at amplified wavemodes will be shown. These numerical results are compared to a semi-analytical approach using quasilinear theory. Differences and problems in these models will be discussed to achieve a fundamental understanding of wave-particle interactions.

EP 4.41 Di 11:15 Poster OG

Reconstruction of the Solar Modulation Parameter during the Holocene — •Klaudia Herbst[1], Bernd Herber[1], and Jürg Beer[2] — [1]Christian-Albrechts-Universität zu Kiel, D-24118 Kiel, Kiel — [2]Swiss Federal Institute of Aquatic Science and Technology, EAWAG, Dübendorf, Switzerland

On their way through the interplanetary space the intensity of galactic cosmic rays is modulated by the solar activity. In the Earth's atmosphere, however, the intensities of these primary cosmic rays but also of secondary particles produced in the atmosphere are anti-correlated to the solar activity. Cosmogenic radionuclides produced by spallation reactions of primary and secondary hadrons with atmospheric nuclei are mixed and transported into natural archives like ice sheets, tree rings or sediments. We compute the local and global production rates of ^{10}Be, ^{7}Be, ^{3}H, ^{36}Cl, ^{26}Al and ^{14}C on shorter time-scales, showing a clear anti-correlation to the solar activity. For ^{14}C we present, moreover, production rates for the entire Holocene and investigate their correlation to the solar modulation parameter.

EP 4.42 Di 11:15 Poster OG

Scintillation quenching in BGO crystal of the Solar Orbiter HET — •J. Grunau, S.R. Kulkarni, C. Martin, S. Boettcher, L. Seimetz, B. Schuster, A. Kulemzin, and R.F. Wimmer-Schweingruber — IEAP, Christian-Albrechts-Universität zu Kiel, Germany

The High-Energy Telescope (HET) on ESA's Solar Orbiter mission will measure electrons from 300 keV up to about 30 MeV, protons from 10 to 100 MeV and heavy ions from approximately 20 to 200 MeV/nuc. These measurement capabilities are reached by a combination of solid-state tracking detectors and a scintillator calorimeter. This setup can perform particle identification via the dE/dx vs total E technique. The scintillator approach provides a good resolution over the complete energy range but the total energy deposition has to be corrected for the

scintillation quenching. The quenching lowers light output depending on the type and energy of the incident particle. We measured the crystal response for different heavy ions and energies and compared them to simulated values. Simulations were carried out using the GEANT4 toolkit provided by CERN. From comparison of simulated and measured data we were able to calculate quenching factors for the BGO crystals for ions up to iron. The results are of great interest for later data analysis with the HET telescope.

EP 4.43 Di 11:15 Poster OG

Magnetic Field Fluctuations in Saturn's Magnetosphere — •Michael von Papen[1], Joachim Saur[1], and Olga Alexandrova[2] — [1]Institut für Geophysik & Meteorologie, Universität zu Köln — [2]Observatoire de Paris, LESIA, Meudon, France

In the framework of turbulence, we analyze the statistical properties of magnetic field fluctuations measured by the Cassini spacecraft inside Saturn's plasma sheet. In the power spectra of the fluctuations we identify two power-law spectral ranges seperated by a spectral break around ion gyro-frequencies of O^+ and H^+. The spectral indices of the low frequency power-law are found to be between 5/3 (for fully developed cascades) and 1 (during energy input on the corresponding scales). Above the spectral break there is a constant power-law with mean spectral index ∼2.5 indicating a permament turbulent cascade in the kinetic range. An increasing non-gaussian probability density with frequency indicates the build-up of intermittency. Correlations of plasma parameters with the spectral indices are examined and it is found that the power-law slope depends strongly on background magnetic field strength and plasma beta.

EP 5: Erdnaher Weltraum und Planeten

Zeit: Mittwoch 16:30–18:30 Raum: HS 9

Hauptvortrag EP 5.1 Mi 16:30 HS 9

Die Rolle der Stratosphäre im Klimasystem — •Martin Dameris — DLR-Institut für Physik der Atmosphäre, Oberpfaffenhofen, Wessling

Unter anderem bedingt durch die Entdeckung des Ozonlochs über der Antarktis hat sich die Erforschung der Stratosphäre in den beiden letzten Jahrzehnten deutlich intensiviert. Beobachtungen und Studien mit numerischen Modellen haben das Verständnis über die Rolle der Stratosphäre auf Wetter und Klima deutlich verändert.

Aktuelle Studien und Ergebnisse werden vorgestellt und diskutiert. Besonderes Augenmerk wird auf die Arbeiten gelegt, die Rahmen der DFG-Forschergruppe SHARP durchgeführt werden. In SHARP (Stratospheric Change and its Role for Climate Prediction) stehen Untersuchungen der Dynamik und Chemie in der Stratosphäre und deren Bedeutung für die Troposphäre im Vordergrund. Ziel der Forschergruppe ist die Identifizierung und Quantifizierung von dynamischen und chemischen Prozessen und wie diese durch den Klimawandel beeinflusst werden. Insgesamt soll das Prozessverständnis und somit die Vorhersagefähigkeit globaler Klimaänderungen unter Einschluss der Stratosphäre verbessert werden. SHARP folgt dabei den Empfehlungen von SPARC (Stratospheric Processes and their Role in Climate), einem Projekt des World Climate Research Programme (WCRP).

EP 5.2 Mi 17:00 HS 9

Messungen von NO in der Mesosphäre und Thermosphäre mit SCIAMACHY — •Stefan Bender[1], Miriam Sinnhuber[1], John Burrows[2], Martin Langowski[2], Bernd Funke[3] und Manuel López-Puertas[3] — [1]Karlsruhe Insitut für Technologie, Karlsruhe — [2]Institut für Umweltphysik, Universität Bremen, Bremen — [3]Instituto de Astrofísica de Andalucía, Granada, Spanien

Wir messen Stickstoffmonoxid (NO) in der Mesosphäre und unteren Thermosphäre (MLT) mit dem Satelliteninstrument SCIAMACHY auf ENVISAT. NO wird durch energetische Teilchen der Sonne in der oberen Atmosphäre erzeugt und beeinflußt nach Abwärtstransport bis in die Stratosphäre durch chemische Reaktionen die Ozonschicht und das Klima.

Mit den SCIAMACHY MLT UV Spektren berechnen wir die NO Teilchendichte von 60 km bis 160 km und erreichen eine vertikale Auflösung von 5–10 km und eine horizontale Auflösung von etwa neun Grad. Vergleiche mit MIPAS Daten zeigen eine gute Übereinstimmung der Dichten im Bereich von 90 km und höher. Unsere Ergebnisse von 2008 bis 2011 sind unabhängige Messungen, die bereits etablierte Mechanismen bestätigen und neue Möglichkeiten darstellen, einen Bereich der Atmosphäre zu untersuchen, dem bisher wenig Beachtung geschenkt wurde. So können wir mit SCIAMACHY den Abwärtstransport von NO während des polaren Winters im Allgemeinen und bei sogenannten Stratosphärischen Erwärmungen im Speziellen erkennen, sowie den Einfluß von solaren Elektronen auf die Erdatmosphäre untersuchen.

EP 5.3 Mi 17:15 HS 9

Mesosphärische NO2 Produktion durch Elektronenniederschlag von 2007 bis 2011 — •Felix Friederich[1], Miriam Sinnhuber[1], Bernd Funke[2], Thomas von Clarmann[1], Gabriele Stiller[1] und Johannes Orphal[1] — [1]Karlsruher Institut für Technologie, Institut für Meteorologie und Klimaforschung - Atmosphärische Spurengase und Fernerkundung, Eggenstein-Leopoldshafen, Deutschland — [2]Instituto de Astrofisica de Andalucia, Granada, Spanien

Elektronen aus den Strahlungsgürteln und der Aurora können abhängig ihrer Energie verschieden tief in die Erdatmosphäre präzipitieren. Dabei können sie N2 anregen, ionisieren oder spalten. Darauf folgende (ionen-)chemische Reaktionen führen zu einer effektiven NOx-Produktion (NOx=NO+NO2). Am meisten NOx wird in der Thermosphäre bei ca. 110km Höhe produziert. Relativistische Elektronen können auch die Stratosphäre erreichen. In der Stratosphäre und unteren Mesosphäre wurde aber bisher noch keine direkt durch Elektronenschauer verursachte NOx-Produktion nachgewiesen.

Mittels einer Superposed Epoch Analysis der NO2 Daten des Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) auf Envisat zeigen wir, dass der AP Index mit der nächtlichen NO2 Häufigkeit zwischen 44km und 54km bei 65+-5°N geomagnetischer Breite korreliert. In diesen Höhen ist der NO2-Anteil an NOx bei Nacht zwischen 80% und 100%. Aus der Korrelation NO2(Nacht) zu Ap-Index schließen wir auf eine direkte NOx Produktion durch relativistische Elektronen.

Hauptvortrag EP 5.4 Mi 17:30 HS 9

Progress and challenges in understanding magnetosphere-atmosphere coupling on Giant Planets — •Ingo Müller-Wodarg[1,2], Luke Moore[2], Marina Galand[1,2], Steve Miller[3], and Michael Mendillo[2] — [1]Imperial College London, UK — [2]Boston University, USA — [3]University College London, UK

The giant planets in our solar system such as Saturn and Jupiter represent fascinating worlds which exhibit a range of electro-magnetic, collisional and chemical processes coupling the upper atmospheres with the magnetospheres and some of their moons. Over the past decades, missions such as Voyager, Galileo and most recently Cassini/Huygens, as well as Earth based observations have explored the giant planets, measuring atmospheric properties, magnetic and electric fields as well as plasma characteristics. In tandem, increasingly sophisticated numerical tools have been developed, characterizing the upper atmospheres (thermospheres/ionospheres) on one hand and the magnetospheres on the other. The art of calculating the coupling between these regimes - is still under-developed. Yet, key currently unresolved science questions, including the giant planet 'energy crisis', the origin of highly variable and structured ionospheres of Jupiter and Saturn as well as the variation of Saturn's apparent rotation rate all rely on understanding magnetosphere-atmosphere coupling. Using our Saturn Thermosphere-Ionosphere model, we calculate the magnetosphere influence on Saturn's upper atmosphere in unprecedented detail. We will highlight key results from recent studies which form important puzzle pieces to help resolve the above science questions.

EP 5.5 Mi 18:00 HS 9

Mapping Ganymede's Time Variable Aurora in the Search for a Subsurface Ocean — •Joachim Saur[1], Stefan Duling[1], Lorenz Roth[1], Paul Feldman[2], Darrell Strobel[2], Kurt Retherford[3], Melissa McGrath[4], Fabrizio Musacchio[1], and Alexandre Wennmacher[1] — [1]University of Cologne — [2]Johns Hopkins University — [3]Southwest Research Institute — [4]NASA, Marshall Space Flight Center

We present results of Hubble Space Telescope (HST) observations of

Ganymede's auroral ovals when Ganymede was located at eastern elongation. The observations were obtained on November 19, 2010 and October 1, 2011 and cover five consecutive orbits of HST each. They were designed such that the Jovian magnetic latitudes of Ganymede span the entire possible range, i.e. Ganymede is exposed to the maximum variability of Jupiter's magnetospheric field during each visit. Our analysis shows that the auroral ovals only weakly rock in concert with the time-variable Jovian magnetic field. This weak rocking of the ovals is consistent with shielding of the time-variable field due to electromagnetic induction in a saline subsurface ocean on Ganymede.

EP 5.6 Mi 18:15 HS 9

Magnetfeld-Randbedingung an der Oberfläche von Ganymed in einer Plasma Simulation — •Stefan Duling[1], Joachim Saur[1], Mario Seufert[1] und Johannes Wicht[2] — [1]Universität zu Köln, Institut für Geophysik und Meteorologie — [2]Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau

Für das Verständnis der Plasmawechselwirkungen in der Umgebung von Ganymed sind numerische Simulationen auf Grundlage der magnetohydrodynamischen (MHD) Gleichungen erforderlich. Bei diesen Simulationen müssen für die Simulationsvariablen der Plasma-Massendichte und -Geschwindigkeit sowie des Magnetfeldes Randbedingungen physikalisch korrekt festgelegt werden. Wir leiten neue Randbedingungen für das Magnetfeld an der nicht leitenden Oberfläche eines beliebigen Himmelskörpers ab, wie z.B. der Eisoberfläche von Ganymed.

Da eine über die Rotation des Magnetfeldes formulierte Randbedingung numerisch nicht implementiert werden kann, zerlegen wir das Magnetfeld in poloidale und toroidale Anteile. Die für die spektralen Koeffizienten formulierte Randbedingung wird in sphärischen Koordinaten im Simulationscode ZEUS MP realisiert.

Wir erhalten das Ergebnis, dass die toroidalen Anteile des Magnetfeldes an der Oberfläche eines Nichtleiters verschwinden. Für die poloidalen Anteile erhalten wir eine Cauchy-Randbedingung, welche die Gaußkoeffizienten eines intrinsischen Feldes enthält. Diese kann sowohl Ganymeds intrinsisches Dynamofeld als auch die Konvektion des Plasmafeldes in den Eismantel beschreiben.

EP 6: Astrobiologie/Erdnaher Weltraum

Zeit: Mittwoch 14:00–16:00 Raum: HS 9

Hauptvortrag EP 6.1 Mi 14:00 HS 9

Schritte zum Leben: präbiotisch-chemische Evolution auf erdähnlichen Planeten — •Henry Strasdeit — Universität Hohenheim, Institut für Chemie, 70599 Stuttgart, Deutschland

Chemische Evolutionsforschung ist ein Teilgebiet der Astrobiologie. Sie befasst sich mit den chemischen Prozessen, aus denen Leben abiotisch hervorgeht (Abiogenese, Urzeugung). Man kennt verschiedene abiotische Synthesewege, auf denen unter präbiotisch plausiblen Bedingungen kleine organische Moleküle, darunter Biomoleküle wie Aminosäuren, entstehen. Viele dieser Moleküle werden in interstellaren Wolken und Asteroiden gebildet und gelangen von dort auf Planeten und Monde. Es ist allerdings noch unklar, wie sie sich zu funktionellen Polymeren und stoffwechselähnlichen Reaktionsnetzwerken organisieren können. Im Vortrag werden Hypothesen dazu vorgestellt. Anschließend wird erläutert, warum urzeitliche Vulkaninseln als Orte der chemischen Evolution und möglicherweise der Lebensentstehung attraktiv erscheinen. Geophysikalische und geochemische Bedingungen auf Vulkaninseln lasssen sich im Labor simulieren, z. B. die Interaktion zwischen Meerwasser und geschmolzener Lava, Blitze in Eruptionswolken, Rockpools und katalytische Mineral- und Gesteinsoberflächen. Feldstudien tragen dazu bei, solche Simulationsexperimente "realistisch" zu gestalten. Dadurch wurden in jüngster Zeit neue Erkenntnisse über das mögliche organisch-chemische Inventar der Erde vor vier Milliarden Jahren gewonnen. Man kann vermuten, dass Prozesse, die zumindest teilweise der irdischen chemischen Evolution gleichen, vielfach auf erdähnlichen Planeten ablaufen.

EP 6.2 Mi 14:30 HS 9

3D climate modeling of Earth-like extrasolar planets orbiting different types of central stars — •Mareike Godolt[1,2], John Lee Grenfell[1], Markus Kunze[3], Ulrike Langematz[3], A. Beate C. Patzer[1], and Heike Rauer[1,2] — [1]Zentrum für Astronomie und Astrophysik, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin — [2]Institut für Planetenforschung, Deutsches Zentrum für Luft- und Raumfahrt, Rutherfordstr. 2,12489 Berlin — [3]Institut für Meteorologie, Freie Universität Berlin, Carl-Heinrich-Becker-Weg 6-10 12165 Berlin

The habitability of a terrestrial planet is usually defined by the existence of liquid water on the surface. The potential presence of liquid water on a planetary surface depends e.g. on surface temperatures. These are determined by various climate processes and their interaction with the radiative energy provided by the planet's host star. To evaluate the influence of three-dimensional (3D) and dynamical atmospheric processes a state-of-the-art Earth climate model has been adapted and applied to Earth-like extrasolar planets orbiting different types of central stars which receive the same amount of total energy. All planetary scenarios studied result in habitable surface conditions. For the planet around the F-type star lower surface temperatures lead to an increase in surface albedo increases due to the build-up of sea ice. For the planet around the K-type star temperatures increase yielding a massive build-up of water vapor and clouds in the atmosphere. The 3D model results are compared to those of a cloud-free one-dimensional radiative-convective climate model.

EP 6.3 Mi 14:45 HS 9

Bestimmung der Transit Time Variation in extrasolaren Planetensystemen der Weltraummission Kepler — •Judith Korth, Sascha Grziwa und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abt. Planetenforschung an der Universität zu Köln

Weltraumteleskope wie CoRoT und Kepler benutzen die Transitmethode, um nach extrasolaren Transitplaneten zu suchen. Eine grundlegende Annahme dieser Methode ist, dass der Transitplanet seinen Stern auf einem stabilen Keplerorbit umkreist, so dass das Zeitintervall zwischen aufeinanderfolgenden Transits konstant periodisch ist. Abweichungen der Perioden eines Transitplaneten von der konstanten Periode werden als Transit Time Variationen bezeichnet. Diese Abweichungen können u.a. von der gravitativen Wechselwirkung eines weiteren (noch unbekannten) Planeten verursacht und damit auf die Anwesenheit dieses zusätzlichen Planeten in einem extrasolaren Planetensystem hinweisen. Ebenfalls können die Parameter von hypothetischen zusätzlichen Planeten in einem Multiplanetensystem mit dieser Methode eingeschränkt werden. Die Transitzeiten der von uns detektierten Kandidaten des Weltraumteleskops Kepler wurden untersucht und die Ergebnisse werden vorgestellt.

EP 6.4 Mi 15:00 HS 9

A search for transit timing variation — •Stefanie Raetz[1], Gracjan Maciejewski[2], Martin Seeliger[1], and Manfred Kitze[1] — [1]Astrophysikalisches Institut und Universitäts-Sternwarte, Schillergäßchen 2-3, 07745 Jena, Germany — [2]Torun Centre for Astronomy, N. Copernicus University, Gararina 11, PL-87100 Torun, Poland

Photometric follow-ups of transiting exoplanets may lead to discoveries of additional, less massive bodies in extrasolar systems. This is possible by detecting and then analyzing variations in transit timing of transiting exoplanets. In 2009 we launched an international observing campaign to detect and characterize transit timing variation signal in selected transiting exoplanets. The programme is realised by collecting data from 0.6 - 2.2-m telescopes spread worldwide at different longitudes. We present our observing strategy and summarize first results for selected transiting exoplanets.

EP 6.5 Mi 15:15 HS 9

Multiplicity studies of exoplanet host stars — •Markus Mugrauer — AIU Jena, Jena, Germany

Since several years we conduct surveys in the visible and near infrared spectral range to search for (sub)stellar companions of exoplanet host stars. We carry out seeing limited imaging to detect wide companions of exoplanet host stars with projected separations between about hundred up to thousands of AU. In addition, with diffraction limited AO observations at 8m-class telescopes we are able to identify very close

stellar systems with exoplanets with projected separations of only a few tens of AU, which are considered to be the most challenging environments for planet formation, according to theory. Many companions (among them also brown a white dwarfs) could be detected already in our imaging campaigns during the last years. In this talk we will present the most recent results of our ongoing surveys. Furthermore, we will describe our new lucky-imaging multiplicity study of exoplanet host stars carried out at the Calar Alto observatory and present some first results.

Hauptvortrag EP 6.6 Mi 15:30 HS 9

Atmospheric coupling processes by internal gravity waves — •Andreas Dörnbrack — Institut für Physik der Atmosphäre, DLR Oberpfaffenhofen, Germany

Internal gravity waves exist by virtue of the stable density stratification of the atmosphere. Disturbances to a balanced state, e.g. by the flow past a mountain, excite internal gravity waves with a variety of spatial and temporal scales. Horizontal wavelengths range from kilometers to thousands of kilometers, and periods range from the Brunt-Väisälä period (approximately ten minutes in the troposphere) to the inertial period, which is infinite at the Equator and 12 hours at the poles.

Gravity waves occur at all altitudes and are important for several reasons: They transport energy and momentum from one region of the atmosphere to another; they initiate and modulate convection and subsequent hydrological processes; they disturb the smooth, balanced state through injection of energy and momentum into the flow; and, when the waves break, turbulence hazardous to aviation is generated and chemical species are mixed. These wave breaking processes occur globally and significantly affect climate of the mesosphere and stratosphere. Gravity waves may also affect space weather by seeding ionospheric irregularities.

The presentation will overview recent attempts to answer the outstanding questions in the gravity wave excitation mechanism, source distribution and variability, especially, the wave impact in the lower, middle and upper atmosphere.

EP 7: Planeten-II

Zeit: Donnerstag 11:15–12:45 Raum: HS 9

EP 7.1 Do 11:15 HS 9

Tthe cooling History of Saturn Considering H-He demixing — •Robert Püstow[1], Nadine Nettelmann[2], Winfried Lorenzen[3], and Ronald Redmer[4] — [1]University of Rostock — [2]University of Rostock — [3]University of Rostock — [4]University of Rostock

The intrinsic excess luminosity in Saturn has been proposed to be helium rain for a long time. If we assume that Saturn evolved completely homogeneously its resulting cooling time is 2.2 billion years only. Compared to the age of the solar system of 4.56 billion years this is much too short because all planets are believed to have formed at the same time out of a protoplanetary disk. Therefore we present an inhomogeneous evolution model by considering the demixing of hydrogen and helium inside Saturn during its cooling history. This demixing effect leads to formation of helium droplets that fall into the planet*s deeper interior and release gravitational energy. As a result we obtain a different energy budget and therefore a delayed cooling. Consequently we are able to prolong the cooling time of Saturn by considering this additional energy source inside the planet.

EP 7.2 Do 11:30 HS 9

Saturns äußerer Mond Ymir — •Tilmann Denk[1] und Stefano Mottola[2] — [1]FU Berlin — [2]DLR Berlin

Ymir gehört zur Gruppe der irregulären Saturnmonde und umkreist den Planeten in großem Abstand auf einer exzentrischen retrograden Umlaufbahn (a = 23,1 Mio. km; e = 0,33; i = 172°; P = 3,6 a). Mit der Telekamera (ISS-NAC) an Bord der internationalen Raumsondenmission Cassini-Huygens haben wir aus Abständen zwischen 15 und 19 Mio. km und bei Phasenwinkeln zwischen 2° und 102° sieben Lichtkurven von Ymir aufgenommen. Mit drei Maxima und drei Minima schon bei moderaten Phasenwinkeln ist Ymirs Lichtkurve sehr ungewöhnlich. Aus den Daten konnten wir die siderische Rotationsperiode und die Polachsenorientierung bestimmen sowie ein dreidimensionales Modell ("convex hull shape model") des Objekts berechnen. Die siderische Periode von Ymir beträgt P = 11,92220 h +/- 0,00002 h, der Ymir-Nordpol weist in die Richtung RA = 100°+/-20°, Dec = -70°+/-10°. Somit rotiert Ymir retrograd im Vergleich zum im Sonnensystem vorherrschenden Drehsinn. Die Form von Ymir kann ganz grob als dreieckiges Prisma mit Kantenlängen von ˜20, ˜24 und ˜25 km beschrieben werden. Das Verhältnis zwischen der längsten Achse (a ˜ 25 km) und der Rotationsachse (c ˜ 15 km) beträgt a/c ˜ 1,7.

EP 7.3 Do 11:45 HS 9

The influx of water ice particles to Titan's atmosphere determined by Cassini-CDA — •Ralf Srama[1,2] and CDA Team[1,2,3,4,5] — [1]IRS, University Stuttgart, GER — [2]MPI Kernphysik, Heidelberg, GER — [3]Univ. Heidelberg, GER — [4]Univ. Potsdam, GER — [5]Univ. Oulu, FIN

The Cosmic Dust Analyser (CDA) onboard Cassini determines the speed, mass, charge and composition of individual dust particles in the environment of Saturn. Cassini is in orbit around Saturn since 2004 and the dust instrument was continuously measuring the particle properties in Saturn's largest ring, the E-ring. Due to the high reliability and sensitivity of CDA, it was discovered, that the E ring extents out to Titan's orbit. Therefore Titan acts as a sink for E-ring dust particles. This process deliveries water ice grains to Titan's atmosphere. In this paper we do estimate the overall influx of icy grains and the amount of water molecules provided by the E-ring. A comparison with Cassini-CIRS and new Herschel measurements is given.

EP 7.4 Do 12:00 HS 9

Auf der Spur von organischen und anorganischen Komponenten in Enceladus' Eisteilchen — •René Reviol[1], Ferdinand Stolz[2], Frank Postberg[1] und Bernd Abel[2] — [1]Institut für Geowissenschaften, Uni Heidelberg — [2]Institut für Physikalische Chemie, Uni Leipzig

Seit 2004 ermöglicht der Staubanalysator "CDA" an Bord der Raumsonde Cassini teils bahnbrechende Entdeckungen im Saturnsystem, wie beispielsweise die Eisfontänen am Südpol des Enceladus, die Saturns E-Ring mit Eisteilchen speisen. Das CDA-Flugzeit-Massenspektrometer lieferte zahlreiche Spektren von Eispartikeln, die in drei unterschiedliche Typen (Typ I,II und III) eingeordnet werden konnten. Eine gute Möglichkeit zur Kalibration der Eispartikelspektren im Labor bietet die Flüssigstrahldesorptions-Massenspektrometrie, bei der ein IR-Laser hoher Energiedichte auf wenige Mikrometer feine Wassertröpfchen gelenkt wird, um den Aufprall eines Eisteilchens auf den CDA-Detektor sowie die Ionisation seiner Bestandteile zu simulieren. Die resultierenden Analogspektren deuteten auf einen hohen Natriumsalz-Gehalt der Typ III-Partikel hin, der auf die Existenz eines flüssigen Ozeans unter der Eisoberfläche des Enceladus schließen lässt (vgl. Postberg, 2009). Durch die Wechselwirkung von Wasser mit Gesteinsmaterial unter der Oberfläche von Enceladus werden weitere Komponenten in den Eisteilchen vermutet. Deren Nachweis bzw. die Eingrenzung ihrer Konzentration (etwa von, P, S, Fe, Mg) stehen im Fokus unserer derzeitigen Untersuchungen. Auch ob sich astrobiologisch relevante Komponenten wie Aminosäuren finden ist von besonderem Interesse.

EP 7.5 Do 12:15 HS 9

Wellen in der Venusatmosphäre untersucht vom VeRa Radio Science Experiment auf Venus Express — •Silvia Tellmann[1], Bernd Häusler[2], Martin Pätzold[1], Michael K. Bird[1,3], David P. Hinson[4], G. Leonard Tyler[4], Thomas P. Andert[2] und Stefan Remus[5] — [1]Rheinisches Institut für Umweltforschung (RIU), Abteilung Planetenforschung, Köln, Deutschland — [2]Universität der Bundeswehr München, Institut für Raumfahrttechnik, Neubiberg, Deutschland — [3]Argelander Institut für Astronomie, Universität Bonn, Deutschland — [4]Department of Electrical Engineering, Stanford University, Stanford, California, USA — [5]ESA ESAC, Villa Franca, Spanien

Atmosphärische Wellen auf Venus existieren in vielerlei Dimensionen. Neben lokalen, kleinskaligen Wellenphänomenen wie Schwerewellen existieren auch globale Wellen wie Gezeitenwellen. Diese Wellen sind entscheidend an Impuls- und Energietransporten beteiligt. So wird unter anderem vermutet, dass sie auf der Venus zur Aufrechterhaltung

der Superrotation beitragen.

Das Radio Science Experiment VeRa untersucht die Atmosphäre der Venus in Erdokkultationsexperimenten. Hieraus können atmosphärische Profile in der Troposphäre und der Mesosphäre der Venus gewonnen werden, die es erlauben, Schwerewellen, die vor allem oberhalb der Wolkenschicht existieren ($>$ 65 km), zu detektieren und Rückschlüsse auf mögliche Quellen zu ziehen. Darüberhinaus werden auch Gezeitenwellen untersucht, die vor allem in der oberen Mesosphäre in niedrigen Breiten von Bedeutung sind.

EP 7.6 Do 12:30 HS 9

Absorption von Radiowellen in der Venusatmosphäre beobachtet vom Venus Express Radio Science Experiment VeRa — •Janusz Oschlisniok[1], Martin Pätzold[1], Bernd Häusler[2], Silvia Tellmann[1], Michael Bird[1,3], Thomas Andert[2] und Stefan Remus[4] — [1]Rheinisches Institut für Umweltforschung, Abteilung für Planetenforschung, Köln, Deutschland — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, Neubiberg — [3]Argelander Institut für Astronomie, Bonn — [4]European Space Astronomy Centre (ESAC), Villanueva, Spanien

Der Planet Venus ist von einer Wolkenschicht aus flüssiger und gasförmiger Schwefelsäure umgeben, welche sich zwischen ca. 50 und 70 km Höhe befindet. Der gasförmige Anteil steigt unterhalb der Wolken dramatisch an und bildet eine ca. 15 km dicke Dunstschicht. Die globale Verteilung von H2SO4 wird beeinflusst durch starke Winde in der Venusatmosphäre. Gasförmige Schwefelsäure ist für eine starke Absorption von Radiosignalen verantwortlich, woraus die Konzentration von H2SO4 in der Venusatmosphäre bestimmt wird. Das Radioscience Experiment (VeRa) auf Venus Express sondiert die Atmosphäre des Planeten mit Radiosignalen im X- und S-Band. Absorptionsprofile des VeRa X-Band Radiosignals aus atmosphärischen Okkultationen und resultierende H2SO4-Profile werden präsentiert. Vergleichend werden Ergebnisse früherer Missionen sowie anderer Experimente an Bord von Venus Express herangezogen. Anhand der erhaltenen Absorptions- und Schwefelsäuredaten lässt sich die globale Schwefelsäureverteilung und somit die Dynamik der Venusatmosphäre untersuchen.

EP 8: Sonne und Heliosphäre I

Zeit: Donnerstag 11:15–12:45 Raum: SR 113

EP 8.1 Do 11:15 SR 113

Dissipation des Sonnenwindes durch kinetische Alfvén-Wellen — •Anne Schreiner und Joachim Saur — Universität zu Köln, Institut für Geophysik und Meteorologie

Wir beabsichtigen mit unserer Studie, den Einfluss kinetischer Alfvén-Wellen auf die Dissipation und auf die spektrale Struktur turbulenter Fluktuationen im Sonnenwind zu untersuchen. Magnetische Energiespektren im Sonnenwind zeichnen sich durch folgende spektrale Bereiche aus: Nach dem Inertialbereich mit spektralem Index -5/3 folgt ein erster spektraler Bruch zu einem steilerem Spektrum mit variablem Index, welcher im Mittel -8/3 beträgt. Aktuelle Cluster-Beobachtungen zeigen erstmals einen zweiten spektralen Bruch auf Elektronenskalen mit anschließendem Dissipationsbereich. Analysen von Sahraoui et al. (2009) finden im Dissipationsbereich ein weiteres Potenzgesetz mit einem spektralen Index von -4. Alexandrova et al. (2009) beobachten hingegen einen exponentiellen Verlauf nach dem zweiten Bruch.

Ziel unserer Arbeit ist es, diese Beobachtungen mit einem einfachen Modell zu beschreiben und den physikalischen Mechanismus der Dissipation im Sonnenwind zu untersuchen. Unser Modell enthält den Energietransport zu kleineren Skalen und berücksichtigt als Dämpfungsmechanismus die kinetischen Alfvén-Wellen. Wir beabsichtigen, den Imaginärteil der Wellenfrequenz aus der Dispersionsrelation für kinetische Alfvén-Wellen als Dämpfungsrate einzusetzen.

EP 8.2 Do 11:30 SR 113

Welle-Teilchen-Resonanz in kinetischen Plasmen — •Cedric Schreiner[1], Andreas Kempf[1], Patrick Kilian[1], Urs Ganse[2] und Felix Spanier[1] — [1]Lehrstuhl für Astronomie, Universität Würzburg — [2]Fysiikaan Laitos, Helsingin Yliopisto

Solare energetische Teilchen werden unter anderem an Schockwellen in der Heliosphäre beschleunigt. Einer der Beschleunigungsprozesse ist der Fermi-I Prozess, der auf mehrfacher Querung des Schocks basiert. Zum Verständnis ist es notwendig, die Streuung von Teilchen in Up- und Downstream zu kennen.

In einem magnetisierten, thermischen Hintergrundplasma werden gezielt Alfvén-Wellen angeregt. Anhand von eingestrahlten Testteilchen wird die Welle-Teilchen-Wechselwirkung untersucht.

Nach der quasilinearen Theorie des Teilchentransports kann die Streuung des Pitchwinkels eines Teichens durch die resonante Wechselwirkung des Teilchens mit einer Wellenmode beschrieben werden. Dieses Verhalten kann in kinetischen Plasmasimulationen reproduziert werden, um Rückschlüsse auf die Beschleunigung von Protonen zu ziehen.

Nachdem die Wellenanregung durch nicht-thermische Teilchenpopulationen in kinetischen Plasmasimulationen beobachtbar ist, kann so zunächst eine Wellenmode erzeugt werden, und dann die Streuung der Teilchen an dieser Mode untersucht werden.

EP 8.3 Do 11:45 SR 113

Numerische Analyse der Pitchwinkel-Streukoeffizienten — •Alex Ivascenko, Sebastian Lange und Felix Spanier — Lehrstuhl für Astronomie, Universität Würzburg, Emil-Fischer-Straße 31, D-97074 Würzburg

Die Lösung der Fokker-Planck-Gleichung ist unabdingbar für die Beschreibung des Teilchentransports i n der Heliosphäre. Insbesondere die Bestimmung der Fokker-Planck-Koeffizienten, die dem diffusiven Charakter des Transports Rechnung tragen, kann nur in wenigen Spezialfällen unter besonderen Annahmen analytisch durchgeführt werden. Daher wird hier auf einen numerischen Ansatz zurückgegriffen. Dazu wird zuerst die Entwicklung der Turbulenz mit dem spektralen MHD-Code Gismo [siehe EP75] simuliert, um dann das voll entwickelte turbulente Magnetfeld mit einem Testteilchen-Ansatz zu kombinieren. Die statistische Auswertung der Teilchensimulationen erlaubt nun Aussagen über Transportparameter.

Wir präsentieren mehrere Methoden zur Bestimmung des Pitchwinkel-Diffusionskoeffizienten $D_{\mu\mu}$, die auf unterschiedlichen Annahmen der zugrundeliegenden Physik basieren. Einige der vorgestellten Methoden sind auch auf winkelaufgelöste Satellitenmessdaten anwendbar. Auf der Basis der ersten Ergebnisse werden wir im Vortrag die Frage behandeln, ob die Diffusion ein Markow-Prozess ist.

EP 8.4 Do 12:00 SR 113

Transporteigenschaften geladener Teilchen am Termination-Schock — •Robin Stern, Horst Fichtner und Frederic Effenberger — Ruhr-Universität Bochum, Germany

Die Annahme von anomalen Transporteigenschaften energiereicher Teilchen in der Heliosphäre gerät durch Ergebnisse von Testteilchensimulationen und in-situ Messungen von Sonden wie Voyager 2, ACE und anderen immer mehr in den Fokus. Die Modellierung von superdiffusivem Transport mit einer räumlich-fraktionalen Diffusions-Advektionsgleichung wird anhand des Beispiels entsprechender Messdaten aus der Termination-Schock-Region vorgestellt. Dabei werden die Lösungen einer gitterbasierten Numerik, einer Monte Carlo Methode (SDE) und eine semi-analytische Lösung an die Daten angepasst. Nach einer analogen Anwendung eines einfachen Modells für Gauß'sche Diffusion werden die Fit-Ergebnisse untereinander verglichen.

EP 8.5 Do 12:15 SR 113

Modification of Cosmic-Ray Energy Spectra by Stochastic Acceleration — •Robert C. Tautz — Technische Universität Berlin

Typical space plasmas contain spatially and temporally variable turbulent electromagnetic fields. Understanding the acceleration scenarios of high-energetic charged particles is an important goal of today's astroparticle physics. However, to assess the acceleration mechanisms at the particle source, subsequent effects have to be known; accordingly, the modification of a particle energy distribution due to stochastic acceleration needs to be taken into account. Recently, the diffusion in momentum space was investigated by using both a Monte-Carlo simulation code and by analytically solving the momentum-diffusion equation. In the talk, it will be shown that, on average, all particles with velocities comparable to the Alfvén speed are accelerated. Such gives rise to the conclusion that, due to electromagnetic turbulence,

a particle energy spectrum measured at Earth can drastically deviate from its initial spectrum.

EP 8.6 Do 12:30 SR 113

In-situ measurements of solar energetic particles with the SupraThermal Electrons, Ions and Neutrals sensor onboard Solar Orbiter. — •Christoph Terasa[1], Lauri Panitzsch[1], Cesar Martin[1], Lars Seimetz[1], Stefan Kolbe[1], Stephan Böttcher[1], Alexander Kulemzin[1], Björn Schuster[1], Ho Jin[2], Dong-Hun Lee[2], Jung-Kyu Lee[2], John Sample[3], and Robert F. Wimmer-Schweingruber[1] — [1]Christian-Albrechts-Universität, Kiel, Germany — [2]Kyung-Hee University, Yongin, Republic of Korea — [3]Space Sciences Laboratory, Berkeley, CA, USA

The SupraThermal Electrons, Ions and Neutrals (STEIN) sensor is part of the Energetic Particle Detector (EPD) instrument suite onboard the upcoming Solar Orbiter mission. With a planned launch in early 2017, it will orbit the Sun with an perihelion as close as 0.28 AU. In the later phase of the mission Solar Orbiter will go to higher inclinations enabling observations of the polar regions of the Sun.

STEIN provides low-energy measurements of electrons, ions and neutral particles from a few keV up to 100 keV. Its two anti-parallel telescope heads are aligned along the orbit averaged Parker spiral direction, and enable the detection of particle streams travelling sunwards and anti-sunwards along the heliospheric magnetic field. Each head includes several solid state detector (SSD) pixels and an electrostatic deflection system, which, in conjunction with the onboard magnetometer, allows to resolve pitch-angle distributions.

We will present the current development status as well as the expected performance of the sensor as part of EPD.

EP 9: Sonne und Heliosphäre II

Zeit: Freitag 9:30–11:00 Raum: HS 9

EP 9.1 Fr 9:30 HS 9

Can magnetic reconnection in the quiet Sun heat the chromospheric and coronal plasma? — •Thomas Wiegelmann[1], Sami Solanki[1], Juan Borrero[2], Hardi Peter[1], and and the Sunrise Team[1] — [1]MPI fuer Sonnensystemforschung — [2]Kiepenheuer-Institut fuer Sonnenphysik

We extrapolate a 22-minute long time series of photospheric magnetic field measurements from the balloon-borne Sunrise/IMaX instrument into the upper solar atmosphere. Using the extrapolated 3D magnetic-field lines as tracer, we investigate the temporal evolution of the magnetic connectivity in the quiet Sun's atmosphere. The majority of magnetic loops are asymmetric in the sense that the photospheric field strength at the loop footpoints is very different. We find that the magnetic connectivity of the loops changes rapidly with a typical connection recycling time of about 3 minutes in the upper solar atmosphere and 12 minutes in the photosphere. This is considerably shorter than previously found. Nonetheless, our estimate of the energy released by the associated magnetic-reconnection processes is not likely to be the sole source for heating the chromosphere and corona in the quiet Sun.

EP 9.2 Fr 9:45 HS 9

Coronal active region modeling based on SDO data — •Stephan Barra[1,2], Thomas Wiegelmann[1], and Horst Fichtner[2] — [1]MPI für Sonnensystemforschung, Katlenburg-Lindau — [2]Ruhr-Universität Bochum, Lehrstuhl f. Theor. Weltraum- u. Astrophysik

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.

Several models to describe the physical parameters, e.g. temperature or density, along coronal loops with different assumptions for the relevant physical processes (like wave damping) were suggested in the past, for example the RTV78 model by Rosner, Tucker and Vaiana. With these models and the knowledge of the 3D configuration of the magnetic field above an active region it is possible to calculate the radiation emitted by the coronal loops above this region. This 3D field configuration is provided for an active region with the help of a non-linear force free field optimization code from photospheric SDO/HMI vector magnetograms as boundary conditions.

We use this field to model the plasma along these loops with the RTV78 model and create artificial coronal images in different wavelength, which we compare with images obtained with the multispectral imager SDO/AIA. Such comparisons allow us to evaluate the quality of our model approach.

EP 9.3 Fr 10:00 HS 9

Kinetic Simulations of Nonlinear Wave Interactions in Type II Bursts — •Urs Ganse[1], Felix Spanier[2], Patrick Kilian[2], and Rami Vainio[1] — [1]Department of Physics, University of Helsinki, Finland — [2]Lehrstuhl für Astronomie, Universität Würzburg

Type II radiobursts are commonly accepted to originate from CME- and flare driven shocks, with observational evidence of electron beam populations in the purported emission regions. Using the kinetic particle-in-cell code ACRONYM, we have investigated nonlinear wave interaction processes in CME foreshock regions in presence of electron beams. Focus lay on the quantitative analysis of wave kinematics: excitation of electrostatic waves by the electron beams and and nonlinear coupling to tranverse magnetic modes can be observed in the simulation data. By varying parameters of the background plasma, the emission process at low and high heliocentric distances have been compared, and found to be very similar despite a significant difference in density and magnetization.

EP 9.4 Fr 10:15 HS 9

Shock accelerated electrons in the solar corona — •Mann Gottfried, Braune Stephan, and Aurass Henry — Leibniz-Institut für Astrophysik Potsdam, Potsdam, Germany

In the solar corona, shocks are generated either by flares or by coronal mass ejections. They appear as type II bursts in dynamic spectra of the solar radio radiation. The energetic electrons are regarded to be generated by shock drift acceleration resulting in the production of beams of energetic electrons in the upstream region. These electrons excite Landmuir waves, which convert into escaping radio waves as observed as type II radio bursts. The aim of this talk is to discuss, what can we learn from both observations and theory for a better understanding of shock acceleration of electrons in the solar corona. In result, a consistent picture of type II radio bursts and the associated shocks are obtained by this study.

EP 9.5 Fr 10:30 HS 9

On the heating and acceleration of the solar wind due to modified plasma wave spectra — Bidzina Shergelashvili and •Horst Fichtner — Ruhr-Universität Bochum, Institut für Theoretische Physik IV, Universitätsstrasse 150, 44780 Bochum

A new aspect of the turbulent heating and acceleration of the solar wind is investigated. A physical meaning of the lower boundary of the Alfven wave turbulent spectra in the solar atmosphere and the solar wind is studied and its significance is demonstrated. Via an analytical and quantitative treatment of the problem we show that a truncation of the wave spectra from the lower frequency side, which is a consequence of the solar magnetic field structure and its cyclic changes, results in a significant reduction of the heat production and acceleration rates, particularly at low heliographic latitudes being consistent with slow solar wind emanating from these regions.

EP 9.6 Fr 10:45 HS 9

Helicity transport in a simulated coronal mass ejection — •Norbert Seehafer[1] and Bernhard Kliem[1,2] — [1]Institut für Physik und Astronomie, Universität Potsdam, Karl-Liebknecht-Str. 24/25, 14476 Potsdam, GERMANY — [2]Mullard Space Science Laboratory, University College London, Holmbury St. Mary, Dorking, Surrey, RH5 6NT, UK

It has been suggested that coronal mass ejections (CMEs) remove the magnetic helicity of active regions from the Sun. Such removal is often regarded to be necessary due to the hemispheric sign preference of the helicity, which inhibits a simple annihilation by reconnection between volumes of opposite chirality. We have monitored the relative magnetic helicity contained in the coronal volume of a simulated flux rope CME,

as well as the upward flux of helicity through a horizontal plane in the simulation box, both based on exact new expressions for the computation of the relative helicity from the magnetic field in the box. The unstable and erupting flux rope carries away only part of the initial helicity through the open upper boundary; the larger part remains in the volume. We suggest a simple physical explanation for this result and perform a parametric study of the helicity shedding in our CME model.

EP 10: Planeten-III

Zeit: Freitag 9:30–10:45 Raum: SR 113

EP 10.1 Fr 9:30 SR 113

Mars: ein globaler Vergleich zwischen dem IonA-Modell und Beobachtungen der Tagionosphäre — •Kerstin Peter, Martin Pätzold und Silvia Tellmann — Rheinisches Institut für Umweltforschung, Abt. Planetenforschung, Köln, Deutschland

Das Radio Science Experiment MaRS auf Mars Express sondiert die Atmosphäre und Ionosphäre des Mars seit 2004. Die seitdem gemessenen mehr als 600 vollständigen und vertikalen Elektronendichteprofile bieten eine große Bandbreite an externen Beobachtungsparametern, z.B. Beobachtungen für hohe / niedrige solare Aktivität oder Unterschiede in der planetaren Lokalzeit. IonA (Ionization in Atmospheres) ist ein schnelles und flexibles photochemisches Modell der unteren Marsionosphäre. Es basiert auf der Neutralatmosphäre der Mars Climate Database [www-mars.lmd.jussieu.fr/] (MCD), welche Temperatur/Dichte-Profile der wichtigsten atmosphärischen Spezies für verschiedene Parameter (z.B. planetare Länge/Breite, Lokalzeit, solare Aktivität) zur Verfügung stellt. Dies ermöglicht die direkte Modellierung der Marsionosphäre auf der Basis von MaRS-Beobachtungsparametern und damit einen direkten Vergleich zwischen Modell und Beobachtung. So kann die Anwendbarkeit der verschiedenen MCD Szenarien überprüft und Informationen über die Entstehungsmechanismen der Marsionosphäre gewonnen werden.

EP 10.2 Fr 9:45 SR 113

Untersuchungen der Mars Winteratmosphäre mit dem Radio Science Experiment MaRS auf Mars Express — •Silvia Tellmann[1], Martin Pätzold[1], Bernd Häusler[2], David P. Hinson[3] und G. Leonard Tyler[3] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Köln, Deutschland — [2]Universität der Bundeswehr München, Institut für Raumfahrttechnik, Neubiberg, Deutschland — [3]Department of Electrical Engineering, Stanford University, Stanford, California, USA

Das Radio Science Experiment MaRS sondiert die Atmosphäre und Ionosphäre des Planeten in Erdokkultationsexperimenten. Vertikalprofile des Drucks, der Temperatur und der Neutralteilchendichte können somit von wenigen hundert Metern oberhalb der Planetenoberfläche bis ca. 40 km Höhe mit hoher Vertikalauflösung gewonnen werden. Der umfassende MaRS Datensatz deckt mittlerweile 4 Marsjahre und eine Vielzahl von Jahreszeiten, Lokalzeiten und Lokationen ab. Die Atmosphäre des Mars weist eine extreme jahreszeitliche Variabilität auf. Ca. 30% der atmosphärischen Gase kondensieren aufgrund der sehr niedrigen Temperaturen an den Polkappen der Winterpole als CO2-Eis.

Die MaRS Temperaturprofile zeigen eine Winteratmosphäre, deren Temperaturen häufig sehr nahe an der CO2-Kondensationstemperatur liegen. Teilweise werden sogar Temperaturen unterhalb dieser Kondensationstemperatur erreicht, was auf eine Übersättigung der Atmosphäre hindeutet. Aufgrund der ausgeprägten Dichotomie des Mars und seiner Inklination bestehen signifikante Unterschiede zwischen den Winteratmosphären beider Pole, die aufgezeigt und diskutiert werden.

EP 10.3 Fr 10:00 SR 113

Gravity field estimation of the nucleus of 67P/Churyumov-Gerasimenko by the Rosetta Radio Science experiment — •Matthias Hahn[1], Martin Pätzold[1], Silvia Tellmann[1], Bernd Häusler[2], and Tom Andert[2] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Cologne, Germany — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr, Munich, Germany

The perturbed Doppler frequency shift of the radio signal transmitted by the spacecraft will be used to reconstruct the flown orbit. The gravitational potential of the nucleus shall be estimated from this reconstruction. These parameters are the mass and 2nd degree and order gravity field coefficients. The accuracy of these parameter estimations depends on various error sources. The measurement is superimposed by thermal and plasma frequency noise. Another uncertainty will be the poorly known outgassing rates of the nucleus. The gravitational parameters, however, cannot be estimated independently. The uncertainties of the mass, for example, will be reflected in the errors of the 2nd degree and order coefficients, and vice versa. Various orbit trajectories are analyzed to estimate the accuracy with which the parameters GM, C20 and C22 can be measured. Therefore, simulated measurements are generated by using a complex force model, including all gravitational and non-gravitational forces. An artificial noise will be added to these simulations. A least squares adjustment to the simulated data including considered parameters will give the errors to be expected for the true measurements.

EP 10.4 Fr 10:15 SR 113

Mass, size and optical properties of interstellar dust particle candidates retreived from Stardust — •Veerle Sterken[1,2], Andrew Westphal[3], Anna Butterworth[3], Nicolas Altobelli[4], Jon Hillier[5], Frank Postberg[1,5], Ralf Srama[1,2], Eberhard Grün[2], and ISPE Team[6] — [1]IRS, Universität Stuttgart, Germany — [2]MPIK, Heidelberg, Germany — [3]SSL, UCL, Berkeley, CA, USA — [4]ESA, Madrid, Spain — [5]Institut für Geowissenschaften, Universität Heidelberg, Germany — [6]the entire World

In this talk we discuss the process of inferring the mass, size and optical properties of the interstellar dust candidates in the Stardust aerogel collector. In 2006, the Stardust mission brought back cometary particles from Comet Wild 2 on one side of a collector tray, and interstellar dust candidates on the other side. Up to now, three interstellar dust candidates were found in the aerogel collector and four extra ISD candidates were identified in the Aluminum foils surrounding the aerogel. The 3 aerogel ISD candidates were studied in depth by the Interstellar Preliminary Examination Team (ISPE) using non-destructive methods ranging from X-ray microscopy and calibration tests with a linear dust accelerator, to interstellar dust trajectory simulations. These provided information about the composition of the ISD candidates, their mass, size, impact velocity and indirectly to its optical properties. It was found that two of the three particles were more sensitive to solar radiation pressure force than woud be expected from compact (astro)silicates whereas one of the particles had a ratio of solar radiation pressure force to graviy lower than one.

EP 10.5 Fr 10:30 SR 113

Testexperimente zur akustischen Navigation der Eisschmelzsonde IceMole — Dmitry Eliseev, Dirk Heinen, Loic Huder, Karim Laihem, Richard Lensing, •Sebastian Verfers, Christopher Wiebusch und Marvin Willam — III. physikalisches Institut B RWTH Aachen

Eine der größten Herausforderungen der Raumfahrt ist die Suche nach extraterrestrischem Leben, zum Beispiel auf dem mit einer Eisschicht bedeckten Saturnmond Enceladus. Zur Vorbereitung einer solchen Mission soll im Rahmen des DLR-geförderten Enceladus-Explorer-Projektes eine navigierbare Eisschmelzsonde entwickelt werden. Der IceMole ist der Prototyp einer solchen Sonde. Er soll im Winter 2013/14 am Taylorgletscher in der Antarktis getestet werden, indem eine wasserführende Spalte angebohrt und kontaminationsfrei eine Wasserprobe genommen wird. Die autonome Navigation durch das Eis der Oberfläche erfordert die genaue Kenntnis der Position der Sonde und der Beschaffenheit des Vorfeldes. Dies soll mit Hilfe eines akustischen Positionssystems und eines Phasenarrays zur Vorfelderkundung durch Ultraschallsignale realisiert werden. Die hierfür in den Kopf der Sonde integrierten Ultraschallsensoren müssen unter möglichst realistischen Testbedingungen optimiert werden. Dieser Vortrag stellt die physikalischen Herausforderungen und erste Tests dieses akustischen Navigationssystems vor.

EP 11: Sonne und Heliosphäre III

Zeit: Freitag 11:15–13:15 Raum: HS 9

Hauptvortrag EP 11.1 Fr 11:15 HS 9

State and future of coronal seismology — •Erwin Verwichte — University of Warwick, UK

Coronal seismology is a technique that uses measurements of waves in the corona of the Sun to probe the structures they travel through and to provide information that would otherwise be difficult to measure directly. The past decade of solar observation has revealed the ubiquitous nature of waves of all types present in the corona. As a result, great strides have been made in wave modelling using theories that have relevance for coronal heating and solar wind acceleration. I will review the current state of coronal wave studies and highlights results using observations from the Solar Dynamics Observatory and discuss the limits and opportunities for coronal wave physics. I will show that seismology should not be seen in isolation but together with magnetic extrapolation and spectroscopy efforts.

EP 11.2 Fr 11:45 HS 9

Transport modeling of an energetic electron event observed on WIND, STEREO-A/B and MESSENGER on 18 August 2010 — •Wolfgang Dröge[1], Julia Kartavykh[1], Nina Dresing[2], Bernd Heber[2], Andreas Klassen[2], Raul Gómez-Herrero[3], and David Lario[4] — [1]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, D-97074 Würzburg, Germany — [2]Institut für Experimentelle und Angewandte Physik, Universität Kiel, D-24118 Kiel, Germany — [3]Universidad de Alcalá, Dpto. de Física, E-28871 Alcalá de Henares, Spain — [4]The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD 20723 USA

We present an analysis of near-relativistic electrons which were observed simultaneously by instruments onboard WIND, StEREO-A/B, and MESSENGER following a solar flare on 18 August 2010. At the time of the event the magnetic footpoints of STEREO-A and WIND were approximately equidistant (+/- 40 degrees) from the flare site, whereas the footpoint of STEREO-B was about 110 degrees east of the flare site. MESSENGER (at R = 0.31 AU) and STEREO-A (at R = 1.0 AU) were approximately on the same nominal field line. We have applied our numerical three-dimensional transport model which incorporates pitch angle diffusion, focusing and pitch-angle dependent diffusion perpendicular to the magnetic field to model intensity profiles and angular distributions observed on the above spacecraft. An attempt is made to disentangle the effects of electron injection close to the Sun from transport parallel and perpendicular to the magnetic field in interplanetary space.

EP 11.3 Fr 12:00 HS 9

Wide-spread SEP events observed with STEREO, SOHO and ACE — •Nina Dresing[1], Raúl Gómez-Herrero[2], Andreas Klassen[1], Bernd Heber[1], Wolfgang Dröge[3], Yulia Kartavykh[3,4], and Olga Malandraki[5] — [1]IEAP Universität Kiel, Kiel, Deutschland — [2]Space Research Group, University of Alcalá, Alcalá, Spain — [3]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, Würzburg, Germany — [4]Ioffe Physical-Technical Institute, St. Petersburg, Russian Federation — [5]National Observatory of Athens, Athens, Greece

The two STEREO spacecraft, in combination with near-Earth observatories like SOHO and ACE, provide three well separated viewpoints, which are best suited to investigate SEP events and their longitudinal dependences.
Requesting a minimum longitudinal separation angle of 80 degrees between the source active region at the Sun an the magnetic footpoint of one spacecraft observing the event we find an ensemble of 21 wide-spread events which were observed at least by two spacecraft. We investigate the events in a statistical manner in terms of maximum intensities, onset delays, rise times, anisotropies and correlation to other phenomena like CMEs or type II radio bursts to shed some light on the physical processes yielding such extremely large angular particle distributions. For events with sufficient anisotropies and pitch angle coverage we apply a 1D propagation model to determine the mean free path and injection function fitting these observations.

EP 11.4 Fr 12:15 HS 9

The AD 774/5 cosmic-ray event - from the Sun or a short Gamma-Ray Burst ? — •Ralph Neuhaeuser and Valeri Hambaryan — AIU, Univ. Jena, Schillergaeeschen 2, Jena

In the year AD 774/5, there was a strong short peak in 14C seen in tree rings and ices cores (Miyake et al. 2012). The energy input was 7e24 erg within up to one year. The cause remained unknown (Miyake et al. 2012), neither historic supernovae nor young nearby supernova remnants or pulsars are known for this age or year. We have shown that a short Gamma-Ray Burst in our Galaxy is consistent with all observables, including the production rate of both 14C and 10Be (Hambaryan & Neuhaeuser in press). More recently, it was also suggested by others that this event could have been due to either an impact of a comet onto the Sun or the very large solar flare of proton event. We will compare those possibilities in particular regarding the event rates and the differential production rate of 14C and 10Be. We can also speculate on possible effects of such an event on the Earth biosphere.

EP 11.5 Fr 12:30 HS 9

Spectrum of galactic and jovian electrons — •Patrick Kühl[1], Nina Dresing[1], Phillip Dunzlaff[1], Horst Fichtner[2], Jan Gieseler[1], Raul Gomez-Herrero[3,1], Bernd Heber[1], Andreas Klassen[1], Jens Kleimann[2], Andreas Kopp[1], Marius Potgieter[4], Klaus Scherer[2], and Du Toit Strauss[4] — [1]IEAP, Christian-Albrechts-Universität Kiel — [2]Theoretische Physik IV, Ruhr-Universität Bochum — [3]Universidad de Alcala, Alcala de Henares, Spain — [4]Unit for Space Physics, North-West University, Potchefstroom, South Africa

The electron intensities in the energy range from a few hundred keV to a few tenth of MeV in the inner heliosphere is determined by the intensitiy of Jovian and galactic cosmic ray electrons, with sporadic intensity increases of solar origin. In contrast to galactic cosmic rays Jovian electrons are emitted from a point source. Thus the magnetic connection of the Planet to the observer close to Earth as well as parallel and perpendicular diffusion on the propagation of these electrons is of major importance to understand the measured intensity variations. Here we discuss these variation by analysing the electron intensity near Earth as a function of the Earth's position with respect to Jupiter. I.e. Electron spectra for time series, in which jovian electrons can reach the Earth by perpendicular diffusion only and mainly by parallel diffusion are presented. By comparing these different spectra we can estimate an upper limit for the galactic cosmic ray electron spectrum in the energy range from a few hundred keV to about 10 MeV.

EP 11.6 Fr 12:45 HS 9

The role of electrons at the solar wind termination shock — Hans Joerg Fahr and •Mark Siewert — Argelander Institut für Astronomie, Universität Bonn, Auf dem Hügel 71, 53121 Bonn

Describing the solar wind termination shock as a multi-fluid MHD Rankine-Hugoniot shock structure, it is usually assumed that electrons and protons experience identical jumps in density and pressure at the plasma passage over the shock. When analysing the specific kinetic conditions for electrons and ions at this MHD shock crossing, we find that electrons react very much different from protons at their shock passage undergoing an over-adiabatic heating due to conversion of electrically induced overshoot energies into downstream thermal energies. In case of an electron-proton two-fluid plasma , electrons constitute the dominant contribution to the downstream thermal plasma pressure and thereby determine the resulting compression ratio at the shock. We show that taking this over-adiabatic electron heating into account will then deliver a correct representation of all shock data taken with VOYAGER-2.

EP 11.7 Fr 13:00 HS 9

Energetic neutral atoms from the outer heliosphere and the thickness of the heliosheath — •Martin Hilchenbach — Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany

The particle instrument CELIAS/HSTOF onboard SOHO is observing the energetic neutral atom (ENA) flux in the ecliptic plane since 1996. During quiet time periods, the ENA flux is well separated from the energetic ion flux, originating in the solar corona and/ or heliosphere. The instrument is capable to measure the energetic neutral hydrogen (ENH) and helium (ENHe) fluxes along the line-of-sight of the instrument field-of-view. We will discuss the neutral energetic flux measurements of hydrogen and helium in the 28 to 88 keV/n energy/mass range of CELIAS/HSTOF and the resulting thickness of the heliosheath.