Extraterrestial Physics Division
Fachverband Extraterrestrische Physik (EP)

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Overview of Invited Talks and Sessions

(Lecture rooms: DO24 1.103 and SPA Kapelle; Posters: DO24 Foyer)

Invited Talks

EP 1.1	Mon	14:00–14:30	DO24 1.103	**The gaseous outskirts of the Milky Way** — •Philipp Richter
EP 2.1	Mon	16:30–17:00	DO24 1.103	**Modeling of the solar impact on the climate system** — •Eugene Rozanov
EP 3.1	Tue	10:30–11:00	DO24 1.103	**Sources of ECMWF-resolved gravity waves revealed by ray-tracing** — •Peter Preusse, Manfred Ern, Silvio Kalisch, Stephen Eckermann, Hye-Yeong Chun, Martin Riese
EP 4.1	Tue	14:00–14:30	DO24 1.103	**Atmospheric Waves on Mars and Venus** — •Silvia Tellmann, Bernd Häusler, Martin Pätzold, Michael K. Bird, G. Leonard Tyler, Thomas P. Andert, Stefan Remus
EP 8.1	Fri	10:30–11:00	DO24 1.103	**Solar magnetic fields and their heliospheric response** — •Julia K. Thalmann
EP 8.2	Fri	11:00–11:15	DO24 1.103	**An Introduction to the International Space Weather Initiative** — •Michael Danielides

Invited talks of the joint symposium SYSE

See SYSE for the full program of the symposium.

SYSE 1.1	Wed	14:00–14:30	Audimax	**Addressing open questions of stellar evolution with laboratory experiments** — •Almudena Arcones
SYSE 1.2	Wed	14:30–15:00	Audimax	**Methods and problems of the modern theory of stellar evolution** — •Achim Weiss
SYSE 1.3	Wed	15:00–15:30	Audimax	**Photoabsorption and opacity in the X-ray region: The role of highly charged ions** — •José R. Crespo López-Urrutia
SYSE 1.4	Wed	15:30–16:00	Audimax	**Neutron-rich matter: From cold atoms to neutron stars** — •Achim Schwenk

Invited talks of the joint symposium SYRE

See SYRE for the full program of the symposium.

SYRE 1.1	Wed	16:30–17:00	Audimax	**Rare and large events: examples from the natural sciences and economics** — •Thomas Guhr
SYRE 1.2	Wed	17:00–17:30	Audimax	**The roles of energy-level and electronic-coupling fluctuations in the control of biomolecular and small-molecule charge transfer reactions** — •Spiros Skourtis
SYRE 1.3	Wed	17:30–18:00	Audimax	**What do we know about extreme solar events?** — •Ilya Usoskin
SYRE 1.4	Wed	18:00–18:30	Audimax	**The climate impact of very large volcanic eruptions: An Earth system model approach** — •Claudia Timmreck

Invited talks of the joint symposium SYPA

See SYPA for the full program of the symposium.

SYPA 1.1	Thu	14:00–14:30	SPA Kapelle	**Cosmic Particle Acceleration** — •Gaetano Zimbardo, Silvia Perri
SYPA 1.2	Thu	14:30–15:00	SPA Kapelle	**Simulation of shock waves** — •Felix Spanier
SYPA 1.3	Thu	15:00–15:30	SPA Kapelle	**Dynamo experiments: A guide through dynamo theory** — •Andreas Tilgner
SYPA 1.4	Thu	15:30–16:00	SPA Kapelle	**Turbulent dynamo effects in astrophysical plasmas** — •Wolfram Schmidt, Dominik Schleicher
SYPA 1.5	Thu	16:30–17:00	SPA Kapelle	**Physical Processes in the Turbulent Interstellar Medium** — •Dieter Breitschwerdt, Miguel de Avillez, Michael Schulreich, Jenny Feige, Christian Dettbarn

Sessions

EP 1.1–1.7	Mon	14:00–16:00	DO24 1.103	**Astrophysik**
EP 2.1–2.7	Mon	16:30–18:30	DO24 1.103	**Erdnaher Weltraum**
EP 3.1–3.7	Tue	10:30–12:30	DO24 1.103	**Erdnaher Weltraum / Planeten**
EP 4.1–4.7	Tue	14:00–16:00	DO24 1.103	**Planeten**
EP 5.1–5.25	Tue	16:30–18:30	DO24 Foyer	**Postersitzung**
EP 6.1–6.8	Thu	10:30–12:30	DO24 1.103	**Exoplaneten und Astrobiologie**
EP 7.1–7.2	Thu	18:00–18:30	SPA Kapelle	**Sonne und Heliosphäre (I)**
EP 8.1–8.9	Fri	10:30–13:00	DO24 1.103	**Sonne und Heliosphäre (II)**

Annual General Meeting of the Extraterrestial Physics Division

Donnerstag 12:30–13:30 DO24 1.103

- Bericht
- Wahl
- Verschiedenes

EP 1: Astrophysik

Time: Monday 14:00–16:00 Location: DO24 1.103

Invited Talk EP 1.1 Mon 14:00 DO24 1.103

The gaseous outskirts of the Milky Way — •Philipp Richter — University of Potsdam

Galaxies like the Milky Way are surrounded by large amounts of diffuse gas that connects the stellar body of a galaxy with the surrounding cosmological large-scale structure. This diffuse gas component, commonly referred to as circumgalactic medium (CGM), plays a key role in the on-going formation and evolution of galaxies in the local Universe. In this talk I will review our current understanding of the distribution and physical nature of the circumgalactic gas surrounding the Milky Way and discuss recent observational and theoretical studies of the local CGM that provide important new information on the past and future evolution of our Galaxy.

EP 1.2 Mon 14:30 DO24 1.103

Evidence for the Stochastic Acceleration in Supernova Remnants — •Alina Wilhelm[1,2] and Igor Telezhinsky[1] — [1]Desy, Zeuthen, Deutschland — [2]Universität Potsdam, Deutschland

Observationally deduced particle spectra in Supernova Remnants (SNR) often do not fit to expectations based on cosmic-ray modified Diffusive Shock Acceleration theory. Here we are concerned with the Second Order Fermi Acceleration process; we discuss its benefits and argue why introducing such a mechanism is the most natural solution. We solve the full transport equation for cosmic rays in the test-particle regime and investigate the consequences of Stochastic Acceleration. We infer that Second Order Fermi Acceleration strongly modifies the particle spectrum and that its contribution is sufficient to generate the observed radio emission flux. We therefore conclude that Stochastic Acceleration is an essential part of the particle dynamics in SNR.

EP 1.3 Mon 14:45 DO24 1.103

Cosmic-ray pitch-angle scattering and isotropization — •Robert C. Tautz — Technische Universität Berlin

Spacecraft observations have revealed the necessity to refine the modeling of the transport of charged energetic particles to allow for phase-space distributions that are strongly pitch-angle anisotropic, which cannot be properly accounted for by the diffusion approximation. Central to such a modeling refinement is the determination of the pitch-angle diffusion coefficient that occurs in the Fokker-Planck transport equation and is frequently used to determine the parallel mean-free path. In addition, the process of pitch-angle isotropization is important for many applications ranging from diffusive shock acceleration to large-scale cosmic-ray transport. In the talk, both a systematic comparison and new results are shown from analytical predictions of the Fokker-Planck coefficient of pitch-angle scattering and from numerical test-particle simulations.

EP 1.4 Mon 15:00 DO24 1.103

Understanding the anisotropy of cosmic rays — •Robert Rettig — Universität Potsdam, Institut für Physik und Astronomie, Karl-Liebknecht-Strasse 24/25, 14476 Potsdam-Golm

The anisotropy in the distribution of cosmic-ray arrival directions measured in the TeV-energy range by several experiments shows both large and small-scale structures. While the large-scale anisotropy can be explained within the framework of a diffusive propagation of cosmic rays, the origin of the small-scale structures remains unclear. We investigate the arrival directions of charged particles using numerical three-dimensional Monte-Carlo test-particle simulations, in which the test-particles propagate in a time-independent spatially fluctuating magnetic field derived from a three-dimensional isotropic turbulence power spectrum. Is has been recently argued that the turbulent magnetic field itself generates the small-scale structures of the anisotropy if a global cosmic-ray dipole moment is present. Using our test-particle approach, we can test the reliability of that hypothesis.

EP 1.5 Mon 15:15 DO24 1.103

Reconstruction of externally triggered radio events with AERA 124 — •Qader Dorosti Hasankiadeh — Institut für Experimentelle Kernphysik, Karlsruher Institut für Technologie, Hermann-von-Helmholtz-Platz 1, Geb. 425 76344 Eggenstein-Leopoldshafen

The Auger Engineering Radio Array (AERA) aims to detect air showers caused by the interactions of ultra-high energy cosmic rays with the Earth atmosphere, providing complementary information on the direction, energy and composition of the cosmic rays to the Auger surface and fluorescence detectors. The second stage of the AERA, currently consisting of 124 radio stations, has been completed at the Pierre Auger Observatory in early 2013, resulting in a larger detection area. Compared with the first stage of the AERA, i.e. AERA 24, AERA 124 exploits a larger detection area, which consequently results in a larger event rate. However, a larger detection area increases the probability of noise contaminations in radio signal. We have developed a robust reconstruction strategy to select radio signals with high purity by largely suppressing noise contaminations. The selection method relies on the causality relation between the arrival time of radio signals and the incoming direction of air showers independently measured by the Auger surface detector. To this end, we have applied the reconstruction strategy on the AERA experimental data externally triggered by the surface detector. The initial analysis of the externally triggered radio events measured by AERA 124 will be presented in this talk.

EP 1.6 Mon 15:30 DO24 1.103

Studies of Blazar emission regions and their morphology — •Stephan Richter[1] and Felix Spanier[2] — [1]Lehrstuhl für Astronomie, Universität Würzburg, Germany — [2]Centre for Space Research, North-West University, Potchefstroom, South Africa

The so called Synchrotron-Self-Compton (SSC) models have been quite successful in explaining the broad spectral energy distributions (SEDs) emitted by Blazars. They are, however, unable to explain the observed radio emission. Furthermore the assumption of a finite emission region imposes artificial boundary conditions for most of the high energy particle content.

In this talk we present studies aiming to resolve both of the above issues. We adopt the so called shock-in-jet model and track the accelerated particles downstream up to scales of VLBI observations. We find that most of the SED, except the highest energies, is strongly dependent on the imposed morphology and can be used to constrain the radial confinement and magnetic field structure behind the shock.

The full time dependence of our approach can be used to further constrain the model by comparison with radio and high energy light-curves and their time lags.

EP 1.7 Mon 15:45 DO24 1.103

Transport of magnetic turbulence in the vicinity of Supernova Remnant shock fronts — •Robert Brose[1,2] and Igor Telezhinsky[2,3] — [1]Humboldt-Universität zu Berlin, Institute of Physics, Unter den Linden 6, 10099 Berlin, Germany — [2]DESY, Platanenallee 6, 15738 Zeuthen, Germany — [3]University of Potsdam, Institue of Physics & Astronomy, Karl-Liebknecht-Straße 24/25, 14476 Potsdam, Germany

To model the acceleration of cosmic rays in Supernova Remnants, we solve a time-dependent transport equation for magnetic turbulence accounting for advection and cascading of waves traveling in upstream or downstream direction. This is combined with prior simulations by Telezhinsky, et al., which modeled CR acceleration by solving the CR transport equation in a test-particle approach combined with 1-D hydrodynamical simulations of the Remnant evolution. This way we account for the amplification of magnetic turbulence, which is thought to be needed to confine particles close enough to the shock to participate in the acceleration process. Both transport equations are coupled via the diffusion coefficient respectively the energy density of the magnetic turbulence and the growth rates. Here first self-consistent particle and turbulence spectra for type Ia Supernova Remnants are going to be presented.

EP 2: Erdnaher Weltraum

Time: Monday 16:30–18:30 Location: DO24 1.103

Invited Talk EP 2.1 Mon 16:30 DO24 1.103

Modeling of the solar impact on the climate system — •Eugene Rozanov — PMOD/WRC and IAC ETHZ

The solar magnetic activity variations modulate both the solar spectral irradiance and energetic particle precipitation affecting the energy deposition followed by an alteration of the photolysis and heating rates in the Earth's atmosphere. Subsequent changes of the ozone and temperature distribution have an influence on the stratospheric circulation pattern. In turn, the reconfiguration of the stratospheric winds can affect the wave pattern and surface air temperature distribution. This chain of the physical processes is characterized by downward propagation and lead to the changes of the surface temperatures and the Brewer-Dobson circulation strength. The absorption of the solar visible and infrared radiation at the surface is also able to alternate the energy balance and temperature fields at the surface which can also penetrate upward influencing the atmosphere. Modeling of these processes requires application of sophisticated numerical models which include all relevant processes and their interaction. In this review talk I will discuss all involved mechanisms and their representation in the state-of-art models. Different features of the modeled atmospheric response to solar variability will be presented and compared with the observation data. The implications of the potential weakening of the solar activity in the future will be also discussed.

EP 2.2 Mon 17:00 DO24 1.103

Neutron monitor measurements on the German research vessel Polarstern * First results — •B. Heber[1], C. Schwerdt[2], M. Walter[2], G. Bernade[3], R. Fuchs[3], H. Krüger[3], and H. Moraal[3] — [1]Insititut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel — [2]Deutsches Elektronen-Synchrotron DESY, D-15738 Zeuthen — [3]Center for Space Research, North-West University, Potchefstroom 2520, South Africa

Cosmic-ray particles provide a unique opportunity to probe the dynamic conditions in the highly variable heliosphere. The longest continuous measurements of galactic cosmic rays come from cosmogenic isotopes and from neutron monitors located at different location on Earth. Understanding the effects of energetic particles in and on the atmosphere and the environment of Earth must address their transport to Earth and their interactions with the Earth's atmosphere, including their filtering by the terrestrial magnetosphere. Since neutron monitors are integral detectors of secondary cosmic rays produced in the atmosphere, a single neutron monitor can only derive the energy spectra of the particles impinging on the Earth during latitudinal surveys. A portable neutron monitor was built at the North-West University, South Africa, and was installed on the German research vessel Polarstern. Such latitude surveys have been done before, but this vessel is better suited for this purpose than previous platforms because it traverses all the locations with geomagnetic cutoff rigidities from $\ll 1$ GV to 15 GV at least twice per year. In this contribution we present first results from the measurement campaigns.

EP 2.3 Mon 17:15 DO24 1.103

The AFIS experiment: Detecting low energetic antiprotons in a low earth orbit, using an active target detector — •Thomas Pöschl[1], Martin Losekamm[1,2], Dominic Gaisbauer[1], Daniel Greenwald[1], Alexander Hahn[1], Philipp Hauptmann[1], Igor Konorov[1], Linxin Meng[1], Stephan Paul[1], and Dieter Renker[3] — [1]Physics Department E18, Technische Universität München — [2]Institute of Astronautics, Technische Universität München — [3]Physics Department E17, Technische Universität München

Since the first observation of geomagnetically trapped antiprotons by the PAMELA experiment and the new results on the positron excess by the AMS-02 experiment, the creation and transport of antimatter in the Earth's upper atmosphere attracts more and more attention both at theoretical and experimental side. For this reason the AFIS experiment was initiated to measure the flux of low energetic antiprotons in the South Atlantic Anomaly (SAA). We developed an active target detector made from scintillating fibers connected to silicon photomultipliers which allows to detect antiprotons in the energy interval of about 30 MeV - 100 MeV. The stopping curve of incoming antiprotons (Bragg peak) and the signal of outgoing pions created from the annihilation, are used for particle identification as well as triggering.

We plan to implement this detector on a 3 unit cubesat satellite in the framework the 'Move2Warp' mission, which is carried out as a student project by the Technische Universität München. This work is supported by the Excellence Cluster 'Origin and Structure of the Universe'.

EP 2.4 Mon 17:30 DO24 1.103

Measuring the Low-Energy Cosmic Ray Spectrum with the AFIS Detector — •Martin Losekamm[1,2], Dominic Gaisbauer[1], Daniel Greenwald[1], Alexander Hahn[1], Philipp Hauptmann[1], Igor Konorov[1], Lingxin Meng[1], Stephan Paul[1], Thomas Pöschl[1], and Dieter Renker[3] — [1]Physics Department E18, Technische Universität München — [2]Institute of Astronautics, Technische Universität München — [3]Physics Department E17, Technische Universität München

High-energy cosmic rays interact with Earth's upper atmosphere and produce antiprotons, which can be trapped in Earth's magnetic field. The Antiproton Flux in Space (AFIS) Mission will measure the flux of trapped antiprotons with energies less than 100 MeV aboard the nanosatellite MOVE 2. An active-target tracking detector comprised of scintillating plastic fibers and silicon photomultipliers is already under construction at the Technische Universität München. As a precursor to the space-bound mission, a prototype version of the detector will be launched aboard a balloon from Kiruna, Sweden as part of the REXUS/BEXUS student program by the German Aerospace Center (DLR). Named AFIS-P, it will be used to measure the low-energy part of the cosmic-ray spectrum for energies less than 100 MeV-per-nucleon. Spectrometers in previous balloon missions were not sensitive in this low-energy region. Thus AFIS-P will deliver unprecedented data, while simultaneously allowing us to field-test the AFIS detector.

This project is supported by DLR and the Cluster of Excellence "Origin and Structure of the Universe".

EP 2.5 Mon 17:45 DO24 1.103

Atmospheric Ionization Module OSnabrueck - Update — •Jan Maik Wissing and May-Britt Kallenrode — Universität Osnabrück

The Atmosperic Ionization Module OSnabrueck (AIMOS) calculates the 3D atmospheric ionization rate due to particle precipitation. Including particles of solar and magnetospheric origin AIMOS covers an altitude range from the troposphere (for protons) and mesosphere (for electrons) up to the thermosphere. The model itself is based on a Geant4 Monte-Carlo Simulation for the particle interactions and in-situ particle measurements from the POES and GOES satellites. A user-friendly website allows easy adoption of the AIMOS results on a user-specific model grid.

This presentation will deal with the recent AIMOS version update (v1.6), its motives and implications. Most important aspects to meantion here: (a) applying multiple correction algorithms for the satellite data, (b) adjusting model resolution in main precipitation regions, and (c) switching internal data handling from LT to MLT.

The main differences to the earlier versions are a significant reduction of electron induced ionization rate in the mesosphere and reduced smoothing of precipitation patterns ending up in higher ionization rate in a more defined auroral zone. Where possible these changings will be verified by measurements.

EP 2.6 Mon 18:00 DO24 1.103

Solar influence on the MLT region: NOx production due to energetic particles and solar radiation — •Holger Nieder[1], Nadine Wieters[2], and Miriam Sinnhuber[1] — [1]Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research — [2]University of Bremen, Institute of Environmental Physics

The chemistry in the mesosphere/lower thermosphere (MLT) region is always driven by forcing from solar radiation and energetic particles. The resulting ionisation, dissociation and excitation of the constituents lead to production of reactive species such as NOx (N, NO, NO2), directly from dissociation as well as indirectly from subsequent ionic reactions. NOx can be transported downwards and contribute to ozone depletion in polar winter.

The production rate of NOx is approximately proportional to the

ionisation rate, but the coefficient depends considerably on the atmospheric background state and on the types of primary ions produced, where the latter is different for photoionisation and ionisation due to energetic particles.

The production of NOx is investigated in detail. Its implications are studied using 1d chemistry and 3d chemistry and transport models.

EP 2.7 Mon 18:15 DO24 1.103

Langzeitmessungen von NO in der Mesosphäre und Thermosphäre mit SCIAMACHY — •Stefan Bender[1], Miriam Sinnhuber[1], John Burrows[2] und Martin Langowski[2] — [1]Karlsruhe Insitut für Technologie, Karlsruhe — [2]Institut für Umweltphysik, Universität Bremen, Bremen

Geladene Teilchen des Sonnenwindes erzeugen Stickstoffmonoxid (NO) in der oberen Atmosphäre. Nach Abwärtstransport bis in die Stratosphäre beeinflußt dieses Spurengas durch chemische Reaktionen die Ozonschicht und das Klima. Wir messen NO-Emissionen in der Mesosphäre und unteren Thermosphäre (MLT, 50–150 km) mit dem Satelliteninstrument SCIAMACHY auf dem Forschungssatelliten Envisat.

Aus den SCIAMACHY MLT UV Spektren berechnen wir die NO Teilchendichte von 60 km bis 160 km. Wir erreichen dabei eine vertikale Auflösung von 5–10 km und eine horizontale Auflösung von etwa neun Grad. Mit der Auswertung der nominellen SCIAMACHY Daten (limb scans von -3 km bis 90 km) erhalten wir tägliche Messungen der NO Dichte in Höhen von 60 bis 90 km für annähernd zehn Jahre, von August 2002 bin März 2012.

Anhand dieser Zeitreihe untersuchen wir den Einfluß der Sonnenaktivität auf die Erdatmosphäre. Zusammenhänge mit solaren Indizes (Lyman-α, f10.7, Kp, Ap etc.) erlauben es uns, Klimamodelle in dieser Hinsicht zu überprüfen und zu verbessern.

EP 3: Erdnaher Weltraum / Planeten

Time: Tuesday 10:30–12:30 Location: DO24 1.103

Invited Talk EP 3.1 Tue 10:30 DO24 1.103

Sources of ECMWF-resolved gravity waves revealed by raytracing — •Peter Preusse[1], Manfred Ern[1], Silvio Kalisch[1], Stephen Eckermann[2], Hye-Yeong Chun[3], and Martin Riese[1] — [1]IEK-7, Forschungszentrum Jülich — [2]Naval Reasearch Laboratory, Washington DC, USA — [3]Yonsei University, Seoul, Korea

Can we employ global ECMWF high-resolution data to infer quantities of resolved GWs? Does this give us insight for the characteristics and relative importance of real GW sources? And can we use such data safely for, e.g., campaign planing?

We here determine amplitudes and 3D wave vectors of GWs at different levels (25km, 35km and 45km altitude) in the stratosphere from their 3D wave structure. Based on the 3D wavevectors backward raytracing is employed to characterize specific sources. For instance, in northern winter strong GWMF stems from mountain waves from Norway and Greenland as well as from waves emitted in the lower troposphere by a storm approaching Norway. Together these three events form a burst in the total hemispheric GWMF of a factor of 3.

In the tropical region, GWs have significantly larger horizontal wavelengths but shorter vertical wavelengths than in observations. Likely, the reason is that the convective parametrization of ECMWF treats convection inside a single model cell and couples only the net effects to the global dynamical fields.

EP 3.2 Tue 11:00 DO24 1.103

Vertical shifts between OH Meinel bands due to quenching by atomic oxygen — •Christian von Savigny[1], Olexandr Lednytskyy[1], and Kai-Uwe Eichmann[2] — [1]Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald, Greifswald — [2]Institut für Umweltphysik, Universität Bremen, Bremen

OH Meinel emissions from different vibrational levels are known to occur at slightly different altitudes in the terrestrial airglow. Model studies suggest quenching by atomic oxygen to be the principal cause of these vertical shifts. Here we employ the tropical mesopause region - characterized by pronounced semiannual variations - as a natural laboratory to test the hypothesis that vertical shifts between different OH Meinel bands are a consequence of quenching by atomic oxygen. Nighttime satellite measurements of OH(3-1) and OH(6-2) volume emission rate profiles and atomic oxygen with Scanning Imaging Absorption Spectrometer for Atmospheric Chartography on Envisat are used for this purpose. Upper mesospheric atomic oxygen profiles are retrieved from measurements of the O(1S-1D) green line emission. The results demonstrate that vertical shifts between the OH bands investigated are indeed correlated with the amount of atomic oxygen in the upper mesosphere, corroborating the hypothesis.

EP 3.3 Tue 11:15 DO24 1.103

Metal atom and ion number densities retrieval from SCIAMACHY/Envisat Limb mesophere and lower thermosphere states — •Martin Langowski[1], Christian von Savigny[2], Miriam Sinnhuber[3], Art C. Aikin[4], and John P. Burrows[1] — [1]University of Bremen, Bremen, Germany — [2]University of Greifswald, Greifswald, Germany — [3]Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany — [4]Catholic University of Maryland, Maryland, US

A very uncertain amount of meteoric material ranging between 2 to 300 tons per day enters the earth's atmosphere every day. The meteoric material partly ablates in the upper atmosphere between 80 and 120 km altitude, which leads to the formation of metal atom layers. Furthermore metal ion layers are formed at the top of the metal layers through charge exchange with the mayor species. The metal atoms and ions show very strong resonance fluorescence signals. This emission is used to retrieve the densities of theses species.

EP 3.4 Tue 11:30 DO24 1.103

20 Rotationsperioden von äußeren Saturnmonden — •Tilmann Denk[1] und Stefano Mottola[2] — [1]FU Berlin — [2]DLR Berlin

Mit der ISS-Kamera an Bord der internationalen Raumsondenmission Cassini-Huygens beobachten wir die irregulären (äußeren) Monde des Saturn. Die Bestimmung der Rotationsperioden dieser Objekte ist dabei ein Forschungsziel. Bislang wurden die Eigenumdrehungen von 8 prograden und 12 retrograden Objekten wie folgt gemessen.

Prograde Monde: Siarnaq (S29) 10,2 h; Tarvos (S21) 10,7 h; Ijiraq (S22) 13,0 h; Albiorix (S26) 13,3 h; Bebhionn (S37) ˜15,8 h; Paaliaq (S20) 18,7 h; Kiviuq (S24) 21,8 h; Erriapus (S28) ˜28 h.

Retrograde Monde (bei mehreren Angaben für einen Mond ist die Anzahl der Extrema in der Lichtkurve noch unsicher): Hati (S43) 5,4 h; Mundilfari (S25) 6,7 h; Suttungr (S23) ˜7,4 h; Kari (S45) 7,7 h; Phoebe (S9) 9,3 h; Skoll (S47): 10,9 h (oder 7,4 h?); Ymir (S19) 11,9 h; Skathi (S27): ˜11,9 h (oder ˜18 h?); Hyrrokkin (S44) 12,8 h; Bestla (S39) 14,6 h; Narvi (S31): ˜15,6 h (oder ˜11,3 h?); Thrymr (S30): ˜27 h (oder ˜40 h?).

Merkwürdigerweise scheinen leichte Zusammenhänge zwischen den Rotationsdauern und Bahnparametern der Monde zu bestehen. Von allen Monden im Sonnensystem, von denen eine Rotationsperiode bekannt ist, sind Hati und Mundilfari die schnellsten Rotatoren.

T.D. dankt dem Deutschen Zentrum für Luft- und Raumfahrt (DLR) in Bonn für die Unterstützung dieser Forschungsarbeiten (Förderkennzeichen: 50 OH 0305 und 50 OH 1102).

EP 3.5 Tue 11:45 DO24 1.103

Titan's Magnetotail from Hybrid Modelling and Observations — •Moritz Feyerabend[1], Sven Simon[1], Joachim Saur[1], and Uwe Motschmann[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln — [2]Institut für Theoretische Physik, TU Braunschweig

We study Titan's plasma interaction by applying a 3D hybrid model which treats the ions as particles and the electrons as a fluid. As a consequence of the impinging Kronian magnetospheric plasma interacting with Titan's ionosphere, a magnetotail is formed downstream of Titan. The shape of the magnetotail can be very asymmetric with respect to the direction of the convective field and is highly influenced by the directions of the background magnetic field and the velocity vector of the impinging plasma. It is also influenced by the position of the ionospheric density peak which is determined by the direction of the incident solar radiation. We model Titan's plasma interaction during the Cassini flybys T9, T63 and T75, which all crossed through the

distant wake of Titan. The ionosphere is generated by a realistic and statistically consistent implemented photoionization model. Finally the model results are compared with Cassini plasma and magnetic field observations from these encounters.

EP 3.6 Tue 12:00 DO24 1.103

Transient Water Vapor at Europa's South Pole — •Lorenz Roth[1,2], Joachim Saur[2], Kurt Retherford[1], Darrell Strobel[3], Paul Feldman[3], Melissa McGrath[4], and Francis Nimmo[5] — [1]Southwest Research Institute — [2]Universität zu Köln — [3]Johns Hopkins University — [4]Marshall Space Flight Center, NASA — [5]University of California Santa Cruz

In November and December 2012 the Hubble Space Telescope (HST) imaged Europa's ultraviolet emissions in the search for vapor plume activity. We report statistically significant coincident surpluses of hydrogen Lyman-α and oxygen OI130.4 nm emissions above the southern hemisphere in December 2012. These emissions are persistently found in the same area over ∼7 hours, suggesting atmospheric inhomogeneity; they are consistent with two 200 km high plumes of water vapor with line-of-sight column densities of about 10^{20} m^{-2}. Non- detection in November and in previous HST images from 1999 suggests varying plume activity that might depend on changing surface stresses based on Europa's orbital phases. The plume is present when Europa was near apocenter, and not detected close to its pericenter in agreement with tidal modeling predictions.

EP 3.7 Tue 12:15 DO24 1.103

MHD-model of Io's interaction with Jupiter's magnetosphere: Influence of asymmetries in Io's atmosphere, induction in a magma ocean, and the ionospheric Hall currents — •Aljona Blöcker and Joachim Saur — Institut für Geophysik und Meteorologie, Universität zu Köln, Köln, Deutschland

We developed a three-dimensional MHD model to study the influence of various effects on the interaction of Jupiter's magnetosphere with Io's atmosphere. Io's atmosphere is supported by sublimation of SO2 surface frost and by direct volcanic injection of SO2, which both lead to partly unknown density variations with latitude and longitude. In our MHD model we have included different types of asymmetries in the model atmosphere to study their influence on the local plasma interaction and the Alfvén wings. Additionally, our model takes into account the ionospheric Hall effect, which is responsible for the rotation of the plasma flow and the magnetic field in the interaction. Khurana et al. (Science 2011) claimed that the perturbations in the magnetic field measured by the Galileo spacecraft are due to induction signals from a global and partially molten magma ocean. By comparing our simulation results with observations from the Galileo spacecraft we demonstrate that the measured perturbations can likewise be explained without induction signals from an electrically conductive layer, but by considering the asymmetries of the atmosphere.

EP 4: Planeten

Time: Tuesday 14:00–16:00 Location: DO24 1.103

Invited Talk EP 4.1 Tue 14:00 DO24 1.103

Atmospheric Waves on Mars and Venus — •Silvia Tellmann[1], Bernd Häusler[2], Martin Pätzold[1], Michael K. Bird[1,3], G. Leonard Tyler[4], Thomas P. Andert[2], and Stefan Remus[5] — [1]RIU Köln, Abteilung Planetenforschung, Universität zu Köln, Köln, Deutschland — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, 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, Spain

The atmospheres of Venus and Mars show a wide range of atmospheric wave phenomena on all spatial scales. Next to quasi-horizontal waves and eddies on near planetary scales, diurnally forced eddies and thermal tides, small-scale gravity waves and turbulence play an important role in the energy and momentum budget of the planets. They are also assumed to contribute significantly to the maintenance of the atmospheric superrotation on Venus.

The Radio Science Experiments on Mars Express (MaRS) and Venus Express (VeRa) retrieved an extensive atmospheric data set in the mesosphere and troposphere of Venus as well as in the lower atmosphere of Mars, respectively. The atmospheric profiles cover a wide range of latitudes and local times, enabling us to study wave phenomena at different spatial scales. These studies contribute significantly to the understanding of the forcing mechanisms and the coupling of the waves to the background atmosphere. Wave drag and heat fluxes deliver insight into the atmospheric dynamics on these planets.

EP 4.2 Tue 14:30 DO24 1.103

Die Tagionosphäre des Mars: Vergleich von Beobachtungen und Modellen — •Kerstin Peter[1], Martin Pätzold[1], Francisco González-Galindo[2], Gregorio Molina-Cuberos[3], Olivier Witasse[4], Bernd Häusler[5], Silvia Tellmann[1], G.L. Tyler[6], Paul Withers[7] und Dave Hinson[6] — [1]Rheinisches Institut für Umweltforschung, Köln, Deutschland — [2]Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain — [3]Universidad de Murcia, Murcia, Spain — [4]Research and Scientific Support Department of ESA, ESTEC, Noordwijk, The Netherlands — [5]Universität der Bundeswehr München, Neubiberg, Germany — [6]Stanford University, Stanford, CA, USA — [7]Boston University, Boston, MA, USA

Beobachtungen der Marsionosphäre mit dem Radio Science Experiment MaRS auf Mars Express zeigen eine hohe Variabilität der Elektronendichte im Bereich der unteren und oberen Ionosphäre. Die bisher mehr als 600 beobachteten vertikalen Elektronendichteprofile der Tag- und Nachtseite des Mars bilden das Verhalten der Marsionosphäre sowohl für hohen, als auch für niedrigen solaren Fluss ab.

Diese Beobachtungen bilden eine gute Datenbasis für den Vergleich mit der modellierten Marsionosphäre und erlauben so Rückschlüsse auf die zugrunde liegende Neutralatmosphäre. Basis für den Vergleich bilden ein photochemisches 1D Modell der Marsionosphäre (IonA) und die Mars Climate Database, ein komplexes 3D Modell der Neutralatmosphäre und Ionosphäre.

EP 4.3 Tue 14:45 DO24 1.103

Transportmodellierung in der Venusatmosphäre basierend auf der globalen Verteilung von H2SO4 beobachtet vom Venus Express Radio Science Experiment VeRa — •Janusz Oschlisniok[1], Martin Pätzold[1], Bernd Häusler[2], Silvia Tellmann[1] und Arbeitsgruppe Radio Science[2,3,4] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München — [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 an und bildet eine ca. 15 km dicke Dunstschicht, welche für eine starke Absorption von Radiosignalen verantwortlich ist. Aus der Absorption der Radiosignale lässt sich die Konzentration von H2SO4 bestimmen. Seit 2006 sondiert das Experiment VeRa auf Venus Express die Atmosphäre des Planeten mit Radiosignalen im X- und S-Band (8,4 und 2,3 GHz). Die gesammelten Daten liefern ein Bild über die globale Verteilung von H2SO4, welche die Transportprozesse in der Venusatmosphäre wiederspiegelt. Präsentiert wird die Verteilung von H2SO4, sowie ein Vergleich mit Ergebnissen früherer Missionen und anderer Experimente an Bord von Venus Express. Weiterhin wird ein Transportmodell vorgestellt, welches die beobachteten Daten verwendet um Erkenntnisse über Transportprozesse in der unteren und mittleren Venusatmosphäre zu gewinnen.

EP 4.4 Tue 15:00 DO24 1.103

Die Wolkenschicht der Venus - eine Zusammenfassung der Ergebnisse des Radio Science Experimentes (VeRa) an Bord von Venus Express — •Maren Herrmann[1], Bernd Häusler[2], Martin Pätzold[1], Silvia Tellmann[1] und Janusz Oschlisniok[1] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung an der Universität zu Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr, München

Die dichte Atmosphäre der Venus hat in den letzten Jahren und Jahrzehnten mit der Entdeckung einer Vielzahl von Phänomenen, wie zum

Beispiel diversen atmosphärischen Wellenstrukturen und unerwarteten Windsystemen überrascht. Hierzu hat im Wesentlichen die ESA Raumsonde Venus Express (VEX) beigetragen, die sich seit 2006 im Orbit um die Venus befindet. Ihre wissenschaftlichen Instrumente ermöglichen es, die sehr heiße und hoch dynamische Atmosphäre genauer zu untersuchen. In der Atmosphäre, die hauptsächlich aus Kohlenstoffdioxid besteht, befindet sich in einer Höhe von ca. 45 km bis 70km eine ausgedehnte Wolkenschicht, die vorwiegend aus Schwefelsäure besteht. Mit dem Radio Science Experiment (VeRa) ist es im Okkultationsmodus möglich, atmosphärische Temperatur- und Absorptionsprofile für die obere Troposphäre und die Mesosphäre (40 - 90km) mit sehr hoher vertikaler Auflösung zu gewinnen. Über Refraktivität und Absorptivität lassen sich so auch Einblicke in die optisch dichte Wolkenschicht, ihre Dynamik und Variabilität, erreichen. Die bisherigen Ergebnisse werden im Kontext mit weiteren unabhängigen Messungen der Venus Wolkenschicht zusammengefasst und interpretiert.

EP 4.5 Tue 15:15 DO24 1.103

The multi-tailed asteroid P/2013 P5 — •Jessica Agarwal[1], David Jewitt[2], Harold Weaver[3], Max Mutchler[4], and Stephen Larson[5] — [1]Max-Planck-Institut für Sonnensystemforschung, Göttingen, Deutschland — [2]University of California, Los Angeles, USA — [3]The Johns Hopkins University Applied Physics Laboratory, Laurel, USA — [4]Space Telescope Science Institute, Baltimore, USA — [5]University of Arizona, Tucson, USA

We present Hubble Space Telescope observations of the active asteroid P/2013 P5, (P5) and discuss possible mechanisms for its activation. P5 is an inner Main Belt asteroid <240m in diameter, and was discovered in August 2013 by the Pan-STARRS sky survey, following a brightening episode that produced a comet-like appearance. We obtained high-resolution images of P5 with the Hubble Space Telescope and found six tails emerging from the nucleus. Each tail contained dust ejected at a specific date over the spring and summer of 2013. Since the activity of this asteroid is episodic, we exclude an impact as the cause. Also sublimation of subsurface ices is an unlikely cause of activity, because temperatures in the inner Main Belt are too high for asteroids to harbour ices over the age of the solar system. We therefore think that the most likely cause of the activity is rotation-driven breakup, where YORP or other torques have increased the spin rate of the asteroid to the point where surface material breaks loose and escapes the gravity field of the nucleus. P5 is the second asteroid (P/2010 A2 being the first) with indications that we might witness such a process.

EP 4.6 Tue 15:30 DO24 1.103

The Dynamics of Comet ISON C/2012 S1 near Perihelion — •Adalbert Ding[1,5], Shadia Rifai Habbal[2], Miloslav Druckmüller[3], and Peter Aniol[4] — [1]Institut für Optik und Atomare Physik, Technische Universität Berlin, Berlin, Germany — [2]Institute for Astronomy, University of Hawaii, Honolulu, Hawaii, USA — [3]Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic — [4]ASTELCO, Martinsried, Germany — [5]Institut für Technische Physik, Berlin, Germany

Comet ISON C/2012 S1, discovered in 2012, was predicted to have a sun grazing orbit approaching the sun as near as 0.7 solar radii above its surface on Nov 28 2013 at 18:45 UT.

Direct white light images of the comet's tail trace moving through the inner corona were obtained with a wide angle Lyot-type coronograph. The perfect match between the observed inner corona orbit and the trail captured by the LASCO/C2 coronograph was proven using a special correlation procedure.

A high resolution imaging slit spectrometer designed to investigate emission lines simultaneously in 2 different bands An external linear occulter was used to discriminate between the sun's and the comet's emission location. Line spectra were observed which display distinct features of diatomic molecular emission differing from the atomic and molecular absorption features in the sun's spectrum. In a preliminary analysis these were assigned to the C2 molecular emission features (Swan bands) and possibly CO+ emission.

EP 4.7 Tue 15:45 DO24 1.103

Bestimmung der Eigenschaften der Ausgasung des Kometen 67P/Churyumov-Gerasimenko mit dem Rosetta Radio-Sondierungs-Experiment RSI — •Matthias Hahn[1], Martin Pätzold[1], Silvia Tellmann[1], Bernd Häusler[2] und Tom Andert[2] — [1]Rheinisches Institut für Umweltforschung an der Universität zu Köln, Abteilung Planetenforschung, Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr, München

An Bord von Rosetta befindet sich das Radiosondierungsexperiment RSI. Das Experiment soll fundamentale Eigenschaften wie die Masse des Kometen, dessen Dichte und sein Schwerefeld bestimmen. Heizt sich der Komet durch Sonneneinstrahlung auf, sublimiert an der Oberfläche Material und strömt gasförmig vom Kometenkern weg. Dieser Gasfluss übt eine Beschleunigung auf die Raumsonde aus. Zwischen der Raumsonde und einer Bodenstation auf der Erde wird ein Radiosignal gesendet. Wirken auf die Raumsonde Kräfte ein, kommt es zu einer Störung der Relativgeschwindigkeit zwischen Sender und Empfänger und damit zu Frequenzverschiebungen des Trägersignals. Der oben genannte Gasfluss führt zu einer extra Frequenzverschiebung. Mittels einer Vorhersage aller anderen Kräfte auf die Raumsonde, lassen sich diese Frequenzresiduen extrahieren. Damit lässt sich die lokale Beschleunigung durch den Gasfluss bestimmen. Daraus lassen sich die Gasdichte und Flussgeschwindigkeit bestimmen. Über aktiveren Bereichen auf dem Kern kann es zu Gas-Jets mit hoher Dichte und Geschwindigkeit kommen. In diesem Beitrag soll die Sensitivität des RSI Experiments gegenüber Ausgasungskräften gezeigt werden.

EP 5: Postersitzung

Time: Tuesday 16:30–18:30 Location: DO24 Foyer

EP 5.1 Tue 16:30 DO24 Foyer

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

In recent 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 effects of the hot plasma in the neutron star atmosphere. The largest broadening effect for atoms in neutron star magnetic fields is the motion of the atoms perpendicular to the magnetic field (motional Stark effect). For hydrogen we calculate the energy shift due to this motional Stark effect. We work in center of mass and relative coordinates and expand the wavefunction in a 2D B-Spline basis. Additionally the cylindrical symmetry is lost and we also have to expand in basis functions with different magnetic quantum numbers.

EP 5.2 Tue 16:30 DO24 Foyer

Helicity of cosmic gamma rays – a new observable for astrophysics — •Stanislav Tashenov[1] and Vladimir A. Yerokhin[2] — [1]Physikalisches Institut der Universität Heidelberg, Germany — [2]Center for Advanced Studies, St. Petersburg State Polytechnical University, Russia

Linear polarization has recently added a new dimension to the gamma-ray astrophysics. Its measurements provide information about geometries, magnetic fields and emission mechanisms of the most energetic sites in the Universe. Circular polarization, or helicity, of cosmic gamma rays, however, still remains a terra incognita. Here we show that the latest developments in the laboratory electron-beam polarimetry pave the way for the helicity detection techniques compatible with the existing orbital telescopes. Armed with these techniques, we should be able to get hold of the helicity of cosmic gamma rays in a not-too-distant future.

EP 5.3 Tue 16:30 DO24 Foyer

Environmental Impact on the Interstellar Medium of Disk Galaxies — •Jan Bolte[1], Elke Roediger[2], Marcus Brüggen[2], and Dieter Breitschwerdt[1] — [1]Zentrum für Astronomie und Astrophysik, TU Berlin, Hardenbergstr. 36, 10623 Berlin, Germany — [2]Hamburger Sternwarte, Universität Hamburg, Gojenbergsweg 112, 21029 Hamburg, Germany

Hydrodynamical simulations of the intercluster medium provide us

with the orbit of a disk galaxy through a galaxy cluster. In a zoom-in simulation we study the impact of the time-dependently changing boundary conditions on the interstellar medium of the disk galaxy. In particular, we discuss the resulting star formation rate and the turbulent structure of the interstellar medium and compare the results with simulations with constant boundary conditions.

EP 5.4 Tue 16:30 DO24 Foyer

Solar induced interannual variability of ozone — •Tilo Fytterer, Miriam Sinnhuber, and Gabriele Stiller — Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany

Measurements by the Michelson Interferometer for Passive Atmospheric Sounding instrument on board the ENVIromental SATellite from 2005 - 2011 are used to investigate the impact of solar and geomagnetic activity on O3 in the stratosphere and mesosphere inside the Antarctic polar vortex. Observations of NOy in the Antarctic upper stratosphere/mesosphere and the Ap index have shown a positive correlation. Therefore, a link between high energetic particles, mainly originating from the sun, and the destruction of O3 in the presence of solar radiation due to catalytic chemical reactions with odd nitrogen (N+NO+NO2) and odd hydrogen (H+OH+HO2) is suggested. Thus in this study, correlation analysis between a 26 days average centred at 1 Apr, 1 May and 1 Jun of several solar/geomagnetic indices (Ap, F10.7 cm solar radio flux, Lyman-a, 2 MeV electrons flux) and 26 day running means from 1 Apr - 1 Nov of O3 in the altitude range from 20-70 km were performed. The results reveal negative correlation coefficients propagating downward throughout the polar winter, at least for the Ap index and the 2 MeV electrons flux. Comparisons with Saber and Odin/SMR O3 data are in moderate agreement, also showing a descending negative signal in either indices, but only for the correlation with 1 Apr.

EP 5.5 Tue 16:30 DO24 Foyer

Messung von sekundären Neutronen mit einem Phoswich-Detektor auf der Umweltforschungsstation Schneefernerhaus — •Enno Scharrenberg[1], Stephan Böttcher[1], Sönke Burmeister[1], Esther Miriam Dönsdorf[1], Bernd Heber[1], Vladimir Mares[2] und Werner Rühm[2] — [1]Christian-Albrechts-Universität zu Kiel, Institut für Experimentelle und Angewandte Physik, Extraterrestrische Physik — [2]Helmholtz Zentrum München, German Research Center for Environmental Health (GmbH), Institute of Radiation Protection

Sekundäre Neutronen in der Erdatmosphäre entstehen durch Wechselwirkung der primären Teilchen der galaktischen kosmischen Strahlung mit den Atomkernen der Luft wie zum Beispiel durch Spallation und Kernverdampfungsprozesse. Mit Neutronenmonitoren und Bonner Kugeln werden diese sekundären Neutronen üblicherweise am Erdbogen kontinuierlich gemessen. Mit dem Phoswich Detektor PING (Phoswich Instrument for Neutrons and Gammas) soll eine alternative Möglichkeit zu den vorhandenen Messmethoden vorgestellt werden. Seit Ende November 2013 misst PING dauerhaft an der Umweltforschungsstation Schneefernerhaus auf der Zugspitze (2660 m über Meeresspiegel). Die Funktionsweise des Detektors PING und erste Messergebnisse werden vorgestellt.

EP 5.6 Tue 16:30 DO24 Foyer

The On-Board Data Handling System of the AFIS-P Mission — •Dominic Gaisbauer[1], Daniel Greenwald[1], Alexander Hahn[1], Philipp Hauptmann[1], Igor Konorov[1], Martin Losekamm[1,2], Lingxin Meng[1], Stephan Paul[1], Thomas Pöschl[1], and Dieter Renker[3] — [1]Physics Department E18, Technische Universität München — [2]Institute of Astronautics, Technische Universität München — [3]Physics Department E17, Technische Universität München

The Antiproton Flux in Space experiment (AFIS) is a novel particle detector comprised of silicon photomultipliers and scintillating plastic fibers. Its purpose is to measure the trapped antiproton flux in low Earth orbit. To test the detector and the data acquisition system, a prototype detector will be flown aboard a high altitude research ballon as part of the REXUS/BEXUS program by the German Aerospace Center (DLR). This talk will present the on-board data handling system and the ground support equipment of AFIS-P. It will also highlight the data handling algorithms developed and used for the mission.

This project is supported by DLR and the Cluster of Excellence "Origin and Structure of the Universe".

EP 5.7 Tue 16:30 DO24 Foyer

Dynamical response of middle atmosphere to changed ozone climatology: results from coupled chemistry-climate model (EMAC) — •Khalil Karami, Stefan Versick, and Miriam Sinnhuber — Karlsruhe Institute of Technology- Institute for Meteorology and Climate Research

Knowledge about natural variability of the climate is crucially important to understand the observed climate change. On the other hand, in order to accurately determine the role of anthropogenic activities on climate change, we need to distinguish between contributions of Man-made and natural sources on climate variability. The sun, as a variable star, not only is the source of energy to climate system, but also is one of the most important sources of natural variability of Earth's climate system. In general, climate response to solar variation is divided into two broad categories, directly affecting tropospheric processes (bottom up), or indirectly due to coupling with stratospheric ozone and radiative heating (top-down).The impact of changed ozone values on middle atmospheric dynamics and temperature is the primary goal of the current study. The Chemistry-Climate Model ECHAM/MESSy Atmospheric Chemistry (EMAC), version 2.42, with FUBRad shortwave radiation scheme is used to investigate the impact of changed ozone values on stratospheric temperatures and wind fields. Several model runs were carried out over a period of 50 years with a free-running version of the model driven by a prescribed ozone climatology differing slightly in the different model runs to investigate the impact of ozone changes in different altitudes and latitude regions.

EP 5.8 Tue 16:30 DO24 Foyer

Solare Variation in NO und NO2 der mittleren Atmosphäre — •Felix Friederich[1], Miriam Sinnhuber[1], Stefan Bender[1], Thomas von Clarmann[1], Bernd Funke[2] und John Burrows[3] — [1]Institut für Meteorologie und Klimaforschung, KIT, Karlsruhe, Deutschland — [2]Instituto de Astrofisica de Analucia, CSIC, Granada, Spanien — [3]Institut für Umweltphysik, Universität Bremen, Bremen, Deutschland

Elektronen aus der Aurora und aus den Strahlungsgürteln präzipitieren abhängig ihrer Energie verschieden tief in die Erdatmosphäre. (Ionen-)chemische Reaktionen, die dadurch ausgelöst werden, können in der Mesosphäre und der oberen Stratosphäre HOx(OH+OH2) und NOx(NO+NO2) erzeugen. Jüngste Studien zeigen eine HOx-Produktion überhalb 52km und eine NO-Produktion überhalb 70km, die auf Elektronenniederschlag zurückzuführen sind.

Die Instrumente SCIAMACHY und MIPAS auf dem Satelliten Envisat haben von 2002-2012 die Erdatmosphäre während eines fast kompletten Sonnenzyklus beobachtet. Der NO-Datensatz von SCIAMACHY (nomineller Modus, 60-90km Höhe) und der NO2-Datensatz von MIPAS (nomineller Modus, 40-60km Höhe) werden auf den Einfluss von solaren und geomagnetischen Veränderungen untersucht und miteinander verglichen. Mit Hilfe der Methode der Superposed Epoch Analysis finden wir in beiden Datensätzen den 27-Tage-Zyklus der Sonnenrotation und eine Abhängigkeit zu geomagnetischen Indizes. Der Einfluss von diesen wird höhen- und längenabhängig präsentiert, wobei auch die Lebenszeit der Gase bestimmt und berücksichtigt wird.

EP 5.9 Tue 16:30 DO24 Foyer

Messung der Winkelverteilung geladener Teilchen in der Atmosphäre — •Dennis Trautwein, Marlon Köberle, Stefan Wraase, Finn Christiansen, Maximilian Brüdern, Sebastian Martensen, Bernd Heber, Robert Wimmer-Schweingruber, Sönke Burmeister und Stephan Böttcher — IEAP, Christian-Albrechts-Universität zu Kiel, Deutschland

Durch die Wechselwirkung der kosmischen Strahlung mit der Atmosphäre entstehen Teilchenschauer aus einer hohen Anzahl von Sekundärteilchen. Ziel unseres Experiments ist die Winkelverteilung von geladenen Teilchen in der Atmosphere zu bestimmen. Wir planen die geladenen Teilchen mit einem Sensorkopf, bestehend aus mehreren Halbleiter-Detektoren, zu messen. Dieser Sensorkopf benötigt einen wohldefinierten geometrischen Aufbau, der eine hinreichende Winkelauflösung zulässt. Trifft ein geladenes Teilchen auf einen der Halbleiter-Detektoren, wird die im Material abgegebene Energie registriert, verstärkt, digitalisiert und zusammen mit dem Zeitpunkt des Aufpralls gespeichert. Über Koinzidenzmessung können wir dann durch den geometrischen Aufbau Rückschlüsse auf den Einfallswinkel ziehen. Das Experiment wird im Rahmen des BEXUS-Programms des DLR mit einem Atmosphärenballon im kommenden Herbst fliegen und Messungen in bis zu 30km Höhe vornehmen. In diesem Poster soll

der wissenschaftliche Hintergrund, das Experiment sowie das BEXUS-Programm vorgestellt werden.

EP 5.10 Tue 16:30 DO24 Foyer

SUMER observations of sungrazing comet 2012/S1 during perihelion — •Werner Curdt, Hermann Böhnhardt, Sami Solanki, Luca Teriaca, and Udo Schühle — Max Planck Institute for Solar System Research; Katlenburg-Lindau, Germany

During its recent perihelion passage comet ISON came so close to the Sun that it appeared in the field-of-view of the SUMER spectrometer on SOHO and allowed observations with high spatial and temporal resolution. We report results of spectroscopic observations of the comet during its encounter with the Sun. Our data show the dust tail behind the predicted position of the nucleus in Lyman-alpha emission, seen as light from the solar disk scattered at fine dust particles. The tail is offset from the trajectory and not aligned with it. We model the dust emission and dynamic to reproduce the appearance of the tail. We could not find any signature of activity around the expected position of the nucleus and conclude that the outgassing processes must have stopped before the comet entered our FOV. After observing 18 years mostly solar targets, this was the first time that SUMER completed spectroscopic observations of a comet.

EP 5.11 Tue 16:30 DO24 Foyer

Separation der Helium Isotope mit dem Electron Proton Helium Instrument (EPHIN) an Bord der Raumsonde SOHO — •Cedric Berndt[1], Patrick Kühl[1], Bernd Heber[1], Raúl Goméz-Herrero[2], Nina Dresing[1] und Andreas Klassen[1] — [1]Institut für Experimentelle und Angewandte Physik, CAU Kiel — [2]Universidad de Alcalá

An Bord der Raumsonde SOHO (Solar and Heliospheric Observatory) misst das Electron Proton Helium Instrument (EPHIN) Elektronen im Energiebereich von 0.3 MeV bis oberhalb von 10 MeV und Wasserstoff sowie Helium im Energiebereich von 4 MeV/Nukleon bis oberhalb von 50 MeV/Nukleon. Das Instrument besteht aus 5 Silizium Halbleiterdetektoren in Teleskop Geometrie und erlaubt die Isotopentrennung der gemessenen Ionen. Solare energiereiche Teilchenereignisse werden anhand der Heliumisotope in impulsive oder graduale Ereignisse eingeteilt. Dabei werden Häufigkeiten der Verhältnisse zwischen ^{3}He und ^{4}He von 10^{-4} (gradual) bis nahezu 1 (impulsiv) beobachtet. In diesem Beitrag stellen wir ein Verfahren vor, dass basierend auf der dE/dx-E-Methode eine möglichst genaue Bestimmung des Isotopenverhältnisses ermöglicht und zeigen exemplarisch das 3He zu 4He Verhältnis für die galaktische kosmische Hintergrundstrahlung und einige ausgewählte Ereignisse.

EP 5.12 Tue 16:30 DO24 Foyer

The Current Status of Model Development of the Electron and Proton Telescope for Solar Orbiter — •Jan Steinhagen, S.R. Kulkarni, Jan Tammen, Sebastian Boden, Robert Elftmann, César Martin, Ali Ravanbakhsh, Stephan I. Böttcher, Lars Seimetz, Björn Schuster, and Robert Wimmer-Schweingruber — Institute for Experimental and Applied Physics, University of 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 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. Here, we present the testing of the Structural and Thermal Model, which has already been delivered to ASTRIUM for spacecraft level tests as well as the integration and testing of the Engineering Model, which already provides full electrical functionality.

EP 5.13 Tue 16:30 DO24 Foyer

SEPServer SEP Event Catalogue in and out of the Ecliptic; a Ulysses and L1 Particle Data Driven Study — •B. Heber[1], N. Agueda[2], D. Heyndrickx[3], K. Klein[4], O. Malandraki[5], A. Papaioannou[5], B. Sanahuia[2], and R. Vainio[6] — [1]Insititut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel — [2]Departament d'Astronomia i Meteorologia, Universitat de Barcelona — [3]DH Consultancy BVBA, Leuven — [4]LESIA*Observatoire de Paris, CNRS, UPMC Univ Paris — [5]National Observatory of Athens — [6]University of Helsinki

SEPServer is a three year collaborative project funded by the seventh framework programme of the European Union. The objective of the project is to provide, among other things, access to state-of-the-art observations and analysis tools for the scientific community on solar energetic particle (SEP) events. The Ulysses mission, launched in 1990, explored the three dimensional heliosphere during different solar activity conditions until the spacecraft was finally switched off on June 30, 2009. The mission has been the only one that allowed us to study the characteristics of SEPs at low and high latitudes. In this work, the Cosmic Ray and Solar Particle Investigation (COSPIN) Kiel Electron Telescope (KET) data of 38 to 125 MeV has been used to identify a number of 40 events SEPs observed in and out of the ecliptic plane over solar cycle 23. The event catalogue presented in this paper will be available to the community for further analysis through http://server.sepserver.eu.

EP 5.14 Tue 16:30 DO24 Foyer

Modeling the Electron-Proton Telescope on Solar Orbiter — •Sebastian Boden, Jan Steinhagen, S.R. Kulkarni, Jan Tammen, Robert Elftmann, César Martin, Ali Ravanbaksh, Stephan Böttcher, Lars Seimetz, and Robert F. Wimmer-Schweingruber — Christian-Albrechts-Universität, Kiel

The Electron Proton Telescope (EPT) is one of four sensors in the Energetic Particle Detector suite for Solar Orbiter. It investigates low energy electrons and protons of solar events in an energy range from 20 - 400 keV for electrons and 20 keV - 7 MeV for protons. It 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.

We set up a Monte Carlo model of EPT using the GEANT4 framework, which we can use to simulate interactions of energetic particles in the sensor. Here we will present simulation results of the energy coverage for different ion species and we will study how it will be possible to distinguish between them.

EP 5.15 Tue 16:30 DO24 Foyer

Near-realtime Cosmic Ray measurements for space weather applications — •Christian Steigies — Christian-Albrechts-Universität zu Kiel, Germany

In its FP7 program the European Commission has funded the creation of scientific databases. One successful project is the Neutron Monitor database NMDB which provides near-realtime access to ground-based Neutron Monitor measurements. In its beginning NMDB hosted only data from European and Asian participants, but it has recently grown to also include data from North American stations. We are currently working on providing also data from stations in Australia, South Africa, and Tibet. With the increased coverage of stations the accuracy of the NMDB applications to issue an alert of a ground level enhancement (GLE) or to predict the arrival of a coronal mass ejection (CME) is constantly improving. Besides the Cosmic Ray community and Airlines, that want to calculate radiation doses on flight routes, NMDB has also attracted users from outside the core field, for example hydrologists who compare local Neutron measurements with data from NMDB to determine soil humidity. By providing access to data from 50 stations, NMDB includes already data from the majority of the currently operating stations. However, in the future we want to include data from the few remaining stations, as well as historical data from stations that have been shut down.

EP 5.16 Tue 16:30 DO24 Foyer

Usage of the force field approach and its limitation - a statistical survey — •Jan Gieseler, Bernd Heber, and Konstantin Herbst — IEAP, CAU Kiel, Deutschland

Galactic cosmic rays (GCRs) are modulated by various effects as they propagate through the heliosphere before they can be detected at Earth. The Parker equation describes this transport. It calculates the phase space distribution of GCRs depending on the main modulation processes: convection, drifts, diffusion and adiabatic energy changes. The force field approximation is a simplification of this equation, reducing it to a one-parameter dependency, the force field potential. This approach is commonly used in many fields. Here, we investigate carefully its constraints by comparing spacecraft GCR measurements

at different energies for the last four solar cycles with corresponding force field approximations.

EP 5.17 Tue 16:30 DO24 Foyer

The First Ground Level Event of Solar Cycle 24 and its longitudinal distribution in the inner heliosphere** — •B. Heber[1], N. Dresing[1], W. Dröge[2], R. Goméz-Herrero[3], K. Herbst[1], Y. Kartavykh[2], A. Klassen[1], J. Labrenz[1], O. Malandraki[4], and R. Müller-Mellin[1] — [1]Christian-Albrechts-Universität, Kiel, Germany — [2]2Universität Würzburg, Germany — [3]SRG, University of Alcalá, 28871, Alcalá de Henares, Spain — [4]3National Observatory of Athens, Greece

Ground level events (GLEs) are the most energetic solar particle events (SEPs) that are detected not only by space born instrumentation but also by ground*based instruments like e.g. neutron monitors. On May 17 2012 at 01:25 UT a M5.1 X-ray flare from the active region 1476 (N07, W88) was detected. The event was accompanied by a type III radio burst starting at 1.30 UT 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. The event onsets of near relativistic electrons have been detected at 06:05 UT, 03:38 UT, and 01:51 UT aboard STEREO A and B (125-335 keV) and at SOHO (250-700 keV), 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. Data observed close to and at Earth will be presented and the longitudinal structure of the event in the inner heliosphere will be discussed.

EP 5.18 Tue 16:30 DO24 Foyer

Modellierung des MeV-Elektronentransportes unter dem Einfluss Korotierender Wechselwirkungsregionen — •Adrian Vogt[1], Frederick Effenberger[2], Horst Fichtner[2], Bernd Heber[1], Jens Kleimann[2], Andreas Kopp[1,2], Marius Potgieter[3] und Oliver Sternal[4] — [1]IEAP Universität Kiel, Germany — [2]Ruhr Universität Bochum — [3]North West Universtiy Potchefstroom, South Africa — [4]Mint Kolleg Baden Württemberg

Seit den 1970er Jahren ist bekannnt, dass Jupiter eine quasikontinuierliche Quelle von MeV-Elektronen ist,die den Elektronenfluss in der inneren Heliossphäre dominieren. Dies ermöglicht, den Transport von Elektronen im heliosphärischen Magnetfeld zu untersuchen, indem man den Einfluss von Korotierenden Wechselwirkungsregionen (CIRs) betrachtet. CIRs sind periodische Strukturen im Sonnenwind, die durch einen sprunghaften Anstieg der Geschwindigkeit und eine Verdichtung der Magnetfeldes charakterisiert werden. Um diese veränderten Bedingungen und ihren Einfluss auf den Fluss der Jupiterelektronen zu untersuchen, wurde der VLUGR3-Code verwendet, um die Parker-Transportgleichung zu lösen. Dafür wurden zwei verschiedene Ansätze genutzt, das Modell von Kissmann [2002] und ein weiteres von Giacalone [2002], das zu diesem Zweck weiterentwickelt und den Messdaten von STEREO sowie ACE angepasst wurde. Die Simulationsergebnisse wurden mit den Elektronenzählraten der IMP-8-Mission verglichen, um die Unterschiede zwischen den beiden Modellen zu untersuchen. Dabei zeigt sich eine realistischere Beschreibung des Zeitprofiles durch das neue Giacalone-Modell.

EP 5.19 Tue 16:30 DO24 Foyer

Studying the near-Sun dust environment with Solar Probe Plus — •Jens Rodmann[1], Volker Bothmer[1], Russ A. Howard[2], Arnaud Thernisien[2], Malte Venzmer[1], and Angelos Vourlidas[2] — [1]Institut für Astrophysik, Universität Göttingen, Deutschland — [2]Naval Research Laboratory, Washington, D.C., USA

Solar Probe Plus will be a ground-breaking mission to explore the innermost regions of the solar system. By flying down to ∼10 solar radii (∼0.05 AU), the mission will revolutionize our knowledge of the Near-Sun dust environment. This region is governed by a poorly understood interplay of dust delivery by sungrazing comets and radiation forces, the destruction of dust by sublimation, and interactions of dust particles with the ambient coronal plasma.

We will present the Solar Probe Plus mission and its scientific payload. Emphasis will be on two instruments that are directly relevant for dust-related science: (1) the Wide-field Imager for SolarPRobe (WISPR), a white-light heliospheric imager dedicated to study the solar wind, coronal mass ejections, and dust-plasma interactions; (2) the FIELDS Experiment for electric and magnetic field measurements in the solar wind, that can also detect telltale voltage signatures of dust-particle impacts on the spacecraft.

We will highlight simulations of the scattered-light emission from dust particles (F-corona) in order to assess the capabilities of the WISPR instrument to image the dust-free zone around the Sun. We will test whether dust density enhancements as predicted by dynamical simulations (e.g. Kobayashi et al. 2009) can be identified and resolved.

EP 5.20 Tue 16:30 DO24 Foyer

Comet ISON - from cradle to grave: The approach phase — •Jessica Agarwal[1], Hermann Boehnhardt[1], Dietmar Germerott[1], Ulrich Hopp[2], Bernd Inhester[1], Luisa Lara[3], Nilda Oklay[1], Borut Podlipnik[1], Christoph Ries[2], Michael Schmidt[2], Udo Schühle[1], Colin Snodgrass[1], Sami Solanki[1], Bringfried Stecklum[4], Luca Teriaca[1], Cecilia Tubiana[1], and Jean-Baptiste Vincent[1] — [1]Max-Planck Institut für Sonnensystemforschung — [2]Universitätssternwarte München — [3]Instituto de Astrofísica de Andalucía — [4]Thüringer Landessternwarte Tautenburg

Comet ISON came from the Oort Cloud (10000 - 100000 AU), the outermost region of the Solar System, where the debris from the formation of giant planets and possible extra-solar comets are stored since the early days of the Sun's existence. The overall chemistry of the comet appears to be normal suggesting a solar origin. During approach to the Sun it was active at least since it passed 9.4AU displaying enhanced activity most likely driven by CO2 and CO ice sublimation. From about 2.5 AU inwards water ice sublimation dominated the activity of the km size nucleus producing a gas and dust coma of 100000 km extension and a several Million km long plasma and dust tails most of which were seen overlapping from Earth.

EP 5.21 Tue 16:30 DO24 Foyer

Comet ISON - from cradle to grave: The perihelion passage — •Jessica Agarwal[1], Hermann Boehnhardt[1], Dietmar Germerott[1], Ulrich Hopp[2], Bernd Inhester[1], Luisa Lara[3], Nilda Oklay[1], Borut Podlipnik[1], Christoph Ries[2], Michael Schmidt[2], Udo Schühle[1], Colin Snodgrass[1], Sami Solanki[1], Bringfried Stecklum[4], Luca Teriaca[1], Cecilia Tubiana[1], and Jean-Baptiste Vincent[1] — [1]Max-Planck Institut für Sonnensystemforschung — [2]Universitätssternwarte München — [3]Instituto de Astrofísica de Andalucía — [4]Thüringer Landessternwarte Tautenburg

Comet ISON came from the Oort Cloud (10000 - 100000 AU), the outermost region of the Solar System, where the debris from the formation of giant planets and possible extra-solar comets is stored since the early days of the Sun existence. The comet approached the Sun within 0.012AU on 28 Nov. 2013. The fatal disintegration of the nucleus occurred close to the Sun in two steps: About 1.5 days before perihelion, an explosion of the nucleus produced an armada of fragments that continued on the track of the comet with fading activity. The subnuclei exhausted their icy fuel shortly before reaching perihelion and dissolved in a cloud of dust. This cloud and some solid material from the nucleus explosion escaped the Sun and witness the death of the nucleus of comet ISON.

EP 5.22 Tue 16:30 DO24 Foyer

Rosetta/OSIRIS observations of the dust coma of comet 67P/Churyumov-Gerasimenko — •Jessica Agarwal, Jean-Baptiste Vincent, and Holger Sierks — Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany

We present our planned observations and analyses of the dust coma of comet 67P/Churyumov-Gerasimenko with the OSIRIS camera system on board the Rosetta spacecraft. Comet 67P/Churyumov-Gerasimenko is the main target of the European Space Agency's Rosetta mission, which will reach the comet in the course of 2014, deploy a lander on its surface and follow the comet on its path towards perihelion. The Optical, Spectrocopic and Infrared Remote Imaging System (OSIRIS) on the Rosetta orbiter will take high-resolution images in multiple wavelength bands from the UV to the near-IR, which will show the nucleus surface and the near-nucleus coma in unprecedented detail. The coma images will allow us to study the activity distribution on the surface, and give us constraints for quantitative models of the comet's dust production. We present our expected data, the scientific questions we want to address, and the envisaged strategies for data analysis.

EP 5.23 Tue 16:30 DO24 Foyer

New Horizons Vorbeiflug: Massenbestimmung von Pluto und Charon — •Martin Pätzold[1], Tom Andert[2], Len Tyler[3], Michael K. Bird[1], David P. Hinson[3] und Ivan Linscott[3] — [1]RIU-

Planetenforschung an der Universität zu Köln, Köln — [2]Universität der Bundeswehr München, Neubiberg — [3]Stanford University, Stanford, California, USA

Die Raumsonde New Horizons wird am 14.Juli 2015 als erste Raumsonde durch das Pluto-System fliegen und dabei Pluto und Charon in einem Abstand von 10.000 km bzw. 20.000 passieren. Eine der Aufgaben des REX Radio Science Experimentes an Bord von New Horizons ist die direkte und präzise Bestimmung der (Einzel-)Massen von Pluto und seines großen Mondes Charon über die Dopplerverschiebung des Radiosignals der Raumsonde. Unüblicherweise für Radio Science Experimente werden zwei unterschiedliche Radioverbindungen während des Vorbeifluges eingesetzt. Die Radiomessungen beginnen bereits eine Woche vor dem Vorbeiflug und werden für weitere vier Tage nach dem Vorbeiflug weitergeführt. Vorgestellt werden die Planungen für den Vorbeiflug, die Datentypen, sowie Abschätzungen über die Genauigkeit der Massenbestimmung. Der größte Beitrag zum Fehler der Massenbestimmung wird dabei die Ungenauigkeit der Kenntnis der Vorbeiflugsentfernung (oder allgemein die Pluto Ephemeride) sein.

EP 5.24 Tue 16:30 DO24 Foyer

The Dust Impact Monitor (DIM) on-board the Rosetta lander Philae — •Thomas Albin[1], Harald Krueger[1], Alexander Loose[1], and Alberto Flandes[2] — [1]Max-Planck-Institut für Sonnensystemforschung, 37077 Göttingen, Germany — [2]Ciencias Espaciales, Instituto de Geofisica, UNAM, 04510 Mexico, D.F.

The Dust Impact Monitor (DIM) is a dust and ice measuring instrument mounted on top of the Rosetta lander Philae. Rosetta is an ESA mission to comet 67P/Churyumov-Gerasimenko that shall encounter the comet in summer 2014. Philae shall land on the comet nucleus in November 2014.

DIM is a cube-shaped instrument with 9 piezoelectric sensor plates mounted on 3 orthogonal sides of the cube. Impacts of ice and dust particles onto the sensor plates lead to deformation of these plates that cause a voltage signal which can be measured. On the comet, active regions emit dust particles of different sizes, shapes, velocities and directions. With DIM one can determine the properties of these particles by comparing the amplitude and contact time of the impact events with Hertzian theory of elastic impact. This will reveal the physical characteristics of the cometary ice and dust in the size range of a few 100 Micrometers to a few Millimeters.

We present laboratory measurements performed with a flight-spare unit of the DIM sensor. We performed impact experiments with spherical ice particles and with balls of other materials to simulate impacts of cometary grains onto the sensor. Our results are mostly consistent with Hertz' theory of elastic impact.

EP 5.25 Tue 16:30 DO24 Foyer

The prediction of stellar atmospheric oscillations as a result of propagating magnetic tube waves — •Diaa Fawzy[1] and Zdzislaw Musielak[2] — [1]Izmir University of Economics, Izmir, Turkey — [2]Physics dept., University of Texas at Arlington, USA

In the current study we theoretically predict atmospheric oscillations in a thin and non-isothermal magnetic flux tube embedded in magnetic-free atmospheres of late-type stars. Our models are based on self-consistent, nonlinear and time-dependent numerical computations. Longitudinal tube waves are considered and the wave energy spectra and fluxes generated in convective zones of these stars are calculated. The process of filtering the energy carried by longitudinal tube waves is investigated and both the local heating by shock waves as well as the excitation of atmospheric oscillations are studied. Frequencies of the resulting atmospheric oscillations are computed numerically at different atmospheric heights in stars of different effective temperatures and gravities, and compared to three analytically obtained cutoff frequencies. The obtained results show that the oscillation frequency ranges from 4 mHz for F5V stars to 20 mHz for M0V stars. It is pointed out that this frequency range may be relevant to the recent stellar p-mode observations made by the NASA space mission Kepler.

EP 6: Exoplaneten und Astrobiologie

Time: Thursday 10:30–12:30 Location: DO24 1.103

EP 6.1 Thu 10:30 DO24 1.103

The Planetary System to KIC 11442793: A Compact Analogue to the Solar System — •J. Cabrera[1], Sz. Csizmadia[1], H. Lehmann[2], R. Dvorak[3], D. Gandolfi[4,5], H. Rauer[1,6], A. Erikson[1], C. Dreyer[1,6], Ph. Eigmueller[1], and A. Hatzes[2] — [1]Institute fuer Planetenforschung, DLR, Rutherfordstrasse 2, D-12489 Berlin — [2]Thueringer Landessternwarte, D-07778 Tautenburg — [3]Universitaetssternwarte Wien, Tuerkenschanzstr. 17, A-1180 Wien — [4]INAF - Catania Astrophysical Observatory, Via S.Sofia 78, I-95123 Catania — [5]ESTEC/ESA, PO Box 299 NL-2200 AG Noordwijk — [6]ZAA, TU Berlin, Hardenbergstr. 36, D-10623 Berlin

We announce the discovery of a planetary system with 7 transiting planets around a Kepler target, a current record for transiting systems. Planets h and g are gas giants and show strong dynamical interactions. The orbit of planet g is perturbed in such way that its orbital period changes by 25.7h between two consecutive transits during the length of the observations, which is the largest such perturbation found so far. The rest of the planets also show mutual interactions: planets d, e and f are super-Earths close to a mean motion resonance chain (2:3:4), and planets b and c, with sizes below 2 Earth radii, are within 0.5% of the 4:5 mean motion resonance. This complex system presents some similarities to our Solar System, with small planets in inner orbits and gas giants in outer orbits. It is, however, more compact. The outer planet has an orbital distance around 1 AU, and the relative position of the gas giants is opposite to that of Jupiter and Saturn. The dynamical interactions between planets are also much richer.

EP 6.2 Thu 10:45 DO24 1.103

Living with stars - the interaction between exoplanets and their host stars — •Malcolm Fridlund — DLR - Institut für Planetenforschung, Berlin

As we are rapidy approaching a total of 1000 known planets orbiting stars other than our Sun, it is becoming abundantly clear that the properties of the host star is of ultimate importance with respect to the formation and evolution of the planet(s) orbiting it. In this talk we will outline the processes that are of importance for the formation of the planet, the evolution of their atmospheres and the ultimate fates of the systems as the stars and planets evolve together.

EP 6.3 Thu 11:00 DO24 1.103

Separation stellarer Variabilität durch die Filtermethode VARLET und PHALET zur Detektion von Exoplaneten in Lichtkurven der Weltraummissionen CoRoT und Kepler. — •Sascha Grziwa, Judith Korth und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abt. Planetenforschung an der Universität zu Köln (RIU-PF)

Der Einsatz dedizierter Weltraumteleskope wie CoRoT und Kepler haben die Anzahl der bestätigten Exoplaneten stark gesteigert. Obwohl beide Teleskope den Betrieb eingestellt haben, verbergen sich in den weit über 300.000 Lichtkurven noch viele bisher unentdeckte Exoplaneten. Variationen in der beobachteten Sternintensität erschweren die Detektion von kleinen Exoplaneten in hochaufgelösten Lichtkurven erheblich. Dieses Problem gewinnt in zukünftigen Missionen wie PLATO und TESS an Bedeutung. Das RIU-PF hat für seine seit 2006 für CoRoT eingesetzte Detektionspipeline EXOTRANS die wavelet-basierte modellunabhängige Filtermethode VARLET entwickelt, welche die Variationen des Zielsterns vollständig separiert. Auch schwache Transitsignale werden dadurch detektiert. Komplexe Störungen bekannter Periode und detektierte Transits von Planetenkandidaten und Binärsternen lassen sich mit PHALET entfernen. Die Suche nach zusätzlichen Planeten in Multiplanetensysteme und Binärsternsystemen ist dadurch möglich. Wir präsentieren neue Ergebnisse der Anwendung von VARLET und PHALET auf die Lichtkurven der Weltraumteleskope CoRoT und Kepler und eine Auswahl unserer 120 bisher unbekannter Kandidaten der Weltraummission Kepler.

EP 6.4 Thu 11:15 DO24 1.103

Bestimmung von orbitalen Parametern in extrasolaren Multiplanetensystemen mit Hilfe der Transit Time Variation — •Judith Korth, Sascha Grziwa und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung an

der Universität zu Köln (RIU-PF)

Abweichungen von der mittleren Orbitperiode eines Transitplaneten werden als Transit Time Variationen (TTV) bezeichnet. Diese Abweichungen können u.a. von einem weiteren (bisher unbekannten) Planeten verursacht werden, der die Bahn des Transitplaneten durch Gravitationswechselwirkung stört, und damit auf die Anwesenheit dieses zusätzlichen Planeten hinweisen. Die Orbitelemente des hypothetischen zusätzlichen Planeten, der den Orbit des Transitplaneten stört, können dann abgeschätzt werden. Die Masse des störenden Planeten sowie die Exzentrizität der Planetenorbits sind entscheidend für die Amplitude der TTV. Simulationen der Planetensysteme, die eine TTV aufweisen, wurden mit einer Vielzahl von Parameterkombinationen durchgeführt und die Ergebnisse der Untersuchung werden vorgestellt.

EP 6.5 Thu 11:30 DO24 1.103

Effects of stellar cosmic ray flux on Earth-like exoplanets around M dwarfs — •Fachreddin Tabataba-Vakili[1,2], John Lee Grenfell[2,3], Jean-Mathias Griessmeier[4,5], and Heike Rauer[2,3] — [1]University of Oxford, UK — [2]TU Berlin, Germany — [3]DLR, Berlin, Germany — [4]LPC2E, Université d'Orléans, France — [5]Station de Radioastronomie de Nancay, France

M-dwarfs are generally considered favorable for rocky planet detection. However, such planets may be subject to extreme conditions due to possible high stellar activity and tidal effects.

The goal of this work is to determine the potential effect of stellar cosmic rays (CR) on key atmospheric species of Earth-like planets orbiting in the HZ of M-dwarf stars and show corresponding changes in the planetary spectra. We improve the CR model scheme of Grenfell et al. (2012), who considered CR-induced NOx production, thereby adding further CR-induced production mechanisms (e.g. HOx) and introducing primary protons of a wider energy range (16 MeV - 0.5 TeV).

Previous studies suggested HZ planets with high atmospheric methane and that the ozone biosignature is destroyed for strong flaring conditions. Our current study shows, however, that adding a new, CR-induced HOx production can cause a decrease in atmospheric methane of up to 80%. Another important result is that spectral signals of ozone remain visible in the theoretical spectrum when incorporating the new CR-induced NOx and HOx schemes, even for a constantly flaring M-star case.

EP 6.6 Thu 11:45 DO24 1.103

Models of planet interiors and semiconvection in rotating spherical shells. — •Patrick Blies and Friedrich Kupka — University of Vienna, Austria

While the traditional school of thought on the inner structure of giant gas planets assumes their interior to consist of two separated, homogeneous layers around a solid rocky/icy core and an adiabatic temperature profile, Stevenson (1985) has called this assumption into question, when he suggested that a metallic gradient in the inner regions of a planet could lead to semiconvection. Leconte and Chabrier (2012) have shown that taking a mixed, inhomogeneous solid-gas composition as a model for giant gas planets leads to a much higher interior temperature and a non-adiabatic temperature profile, amongst other things. This could also help to explain Saturn's increased luminosity as they have shown in 2013. The question remains, however, if semiconvection is really taking place in giant gas planets and what its precise effects on thermal and solute transport properties are. That's why numerical experiments are needed. While there exist simulations of semiconvection, rotation has always been neglected so far. We present a first study of the effects of rotation on the temporal evolution of a semiconvective layer in a spherical shell.

EP 6.7 Thu 12:00 DO24 1.103

NGTS: Next Generation Transit Survey — •Philipp Eigmüller — Institut für Planetenforschung, Deutsches Zentrum für Luft- und Raumfahrt, Rutherfordstr. 2, 12489 Berlin, Germany

The Next Generation Transit Survey (NGTS) is a new ground-based transit survey designed to detect small transiting exoplanets around bright stars. NGTS consist of twelve individual telescopes, each with an aperture of 20cm and a field of view of eight square degrees. It operates in a wavelength range between 550-900nm to maximize its sensitivity to stars of K and early M spectral type. The high photometric precision of the NGTS telescopes will allow to detect down to sub-Neptune sized planets around these stars. The brightness of the host stars (<13 Vmag) will allow for follow up observations of the detected planets, not only to confirm their planetary nature, but also for further characterization. The system will be located at the ESO Paranal site in order to benefit from the excellent photometric conditions as well as follow-up synergy with the VLT and E-ELT. The installation on site has already started. First light and science operations are due to begin this year.

EP 6.8 Thu 12:15 DO24 1.103

Gezeitenwechselwirkungen der Corot Planeten — •Martin Pätzold — RIU-Planetenforschung an der Universität zu Köln, Köln

Das Corot Planetenensemble wurde bezüglich des Austausches von Gezeitenkräften zwischen einem nahen massiven Planeten und seinem Zentralstern untersucht. Mit vier einfachen Grundsätzen kann die Effizienz von Gezeitenkräften in einem Sternsystem abgeschätzt werden: i) der Planetenorbit muss sich innerhalb der Synchronbahn befinden, ii) mit der Doodson-Konstante, die die Gezeitenkräfte zwischen zwei Partner bezüglich des Abstandes abschätzt, iii) mit dem Property-Factor, der Stern- und Planeteneigenschaften einbringt und iv) mit dem kritischen Orbitradius, der von der Restlebenszeit des Sterns und von der stellaren Dissipation Q/k2 abhängt. Von den 22 untersuchten Corot-Planeten (davon 15 heisse Jupiter und 2 Brown Dwarfs) werden 6 heisse Jupiter innerhalb der Restlebensdauer ihrer Sterne in die stellare Roche-Zone laufen und zerstört werden, wenn Q/k2 <= 1E7 ist. Gezeitenkräfte können Planetensysteme in die doppelt-synchrone Rotation treiben. Vier Corot-Systeme scheinen in oder nahe der doppelt-synchronen Rotation zu sein. Es wird gezeigt, dass dieser Zustand aber nicht als stabil angesehen werden kann.

EP 7: Sonne und Heliosphäre (I)

Time: Thursday 18:00–18:30 Location: SPA Kapelle

EP 7.1 Thu 18:00 SPA Kapelle

Simulation of weak collisionless shockfronts in the solar wind — •Patrick Kilian[1], Cedric Schreiner[2], Andreas Kempf[3], Urs Ganse[4], Felix Spanier[5], and Jörg Büchner[1] — [1]MPI für Sonnensystemforschung, Göttingen, Deutschland — [2]Julius-Maximilians-Universität, Würzburg, Deutschland — [3]Ruhr-Universtität, Bochum, Deutschland — [4]University of Helsinki, Finnland — [5]Northwest University, Potchefstroom, Südafrika

Several type of collisionless shockfronts exist in the solar wind. Those shocks tend to exhibit shock speed not much greater than the critical speed, leading to weak shocks with relatively low Mach numbers. Nevertheless those shocks are the site of particle acceleration yielding particles much more energetic than the typical thermal energies in the solar wind. Kinetic simulation codes offer the opportunity to study the shock front and the acceleration mechanisms in detail. This talk addresses the challenges posed by the low shock speed and techniques necessary to simulate weak, non-relativistic shock fronts with an explicit Particle-in-Cell code.

EP 7.2 Thu 18:15 SPA Kapelle

Resonante Welle-Teilchen-Wechselwirkung in kinetischen Plasmen — •Cedric Schreiner[1] und Felix Spanier[2] — [1]Lehrstuhl für Astronomie, Universität Würzburg, Deutschland — [2]Center for Space Research, North-West University Potchefstroom, Südafrika

Der Transport hochenergetischer, geladener Teilchen im Sonnenwind wird von der Streuung dieser Teilchen an magnetischen Störungen dominiert. Ein wichtiger Prozess, der sowohl für Diffusion als auch für die Beschleunigung von Protonen und schwereren Kernen sorgt, ist die resonante Streuung an niederfrequenten Alfvén-Wellen.

Aufgrund der nichtlinearen Wechselwirkung zwischen Plasma und geladenen Teilchen wird zur Untersuchung des Gesamtsystems häufig der Testteilchenansatz herangezogen. Auf diese Weise ist es möglich, im Rahmen der quasilinearen Theorie (QLT) analytische Ausdrücke zur Beschreibung der Pitchwinkelstreuung zu finden, oder MHD Si-

mulationen durchzuführen, in denen die Teilchenstreuung anhand der Trajektorien einzelner Testteilchen nachvollzogen werden kann.

Ein anderer Ansatz ist mit Particle-in-Cell (PiC) Simulationen möglich, in denen Hintergrundplasma und Testteilchen selbstkonsistent beschrieben werden. Zur Validierung werden zunächst die Vorhersagen der QLT, sowie Ergebnisse von MHD Simulationen reproduziert. Anschließend können PiC Simulationen genutzt werden, um Streuung an Wellen im dispersiven Bereich der L-Mode nahe der Zyklotronresonanz zu untersuchen, was im MHD Ansatz nicht möglich ist.

EP 8: Sonne und Heliosphäre (II)

Time: Friday 10:30–13:00 Location: DO24 1.103

Invited Talk EP 8.1 Fri 10:30 DO24 1.103

Solar magnetic fields and their heliospheric response — •Julia K. Thalmann — Institute of Physics/IGAM, University of Graz, 8010 Graz, Austria

Permanently (re-)generated by a dynamo action deep inside the Sun, a large-scale magnetic field is extending far out into interplanetary space and in the form of the solar wind causing the so-called space weather. Global as well as local features of the Sun's magnetic field reappear more or less regularly with alternating periods of low and high activity. The temporal evolution of the global magnetic field and superposed, smaller-scale centers of activity (active regions) determine the dynamics in the inner heliosphere. Most impressive, localized solar phenomena like flares and coronal mass ejection originate from the magnetically closed solar active regions and expel considerable amounts of charged particles and radiation. In addition large-scale, magnetically open regions like coronal holes that interact with neighboring magnetically closed regions contribute to the ongoing acceleration of solar wind particles and cause a corresponding heliospheric response. A concise summary of our current understanding of the physical contributors dominating the dynamics in the inner heliosphere is necessary and important in order to possibly realize real-time space weather prediction and formulate remaining open questions for future missions.

Invited Talk EP 8.2 Fri 11:00 DO24 1.103

An Introduction to the International Space Weather Initiative — •Michael Danielides — Danielides Space Science Consulting, Bentzin, Germany

Presented will be an introdution to the International Space Weather Initiative (ISWI), its projects, organization and opportunities. A summary on the international activities related to ISWI follows.

ISWI supports small global instrument networks, science data bases and provides space science training through out Centres for Space Science and Technology Education.

A report and outview on German ISWI (http://www.iswi-germany.de) activities and projects will be given.

EP 8.3 Fri 11:15 DO24 1.103

Coronal active region modeling based on SDO data — •Stephan Barra[1,2], Wiegelmann Thomas[1], and Fichtner Horst[2] — [1]MPI für Sonnensystemforschung — [2]Ruhr-Universität Bochum

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 nonlinear force free field optimization code from photospheric SDO/HMI vector magnetogramms 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. The same has been done with a potential field reconstructed from the same data set. Such comparisons allow us to evaluate the quality of our model approach.

EP 8.4 Fri 11:30 DO24 1.103

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

STEREO, in combination with near-Earth observatories as ACE or Wind provides three well separated viewpoints, which are perfectly suited to investigate SEP events and their longitudinal dependences. We collected a list of 21 near-relativistic wide-spread electron events in the period from 2009 to mid 2013, where we request a minimum longitudinal separation angle of 80 degrees between the source active region at the Sun and the magnetic footpoint of one spacecraft observing the event. Anisotropies are investigated to disentangle source and transport mechanisms leading to the wide particle spreads. One favorable mechanism is efficient perpendicular transport in the IP medium leading to vanishing anisotropies at well-separated positionis. Another scenario is a large particle spread close to the Sun either due to a coronal shock or due to coronal transport. Here, we expect significant anisotropy at 1 AU due to the wide injection range at the Sun and the afterwards focusing during the outwards propagation. For both of the above scenarios we find events in our sample, which suit the expected observations and even further events, which do not agree with these.

EP 8.5 Fri 11:45 DO24 1.103

Influence of Ground Level Enhancements on the Terrestrial Production of ^{10}Be, ^{14}C and ^{36}Cl — •Konstantin Herbst[1], Jürg Beer[2], Bernd Heber[1], Allan J. Tylka[3], and William F. Dietrich[4] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, Kiel, Germany — [2]Swiss Federal Institute of Aquatic Science and Technology, EAWAG, Switzerland — [3]Space Science Division, Naval Research Laboratory, Washington, DC, USA — [4]Praxis, Inc., Alexandria, VA, USA

Cosmogenic radionuclides are a product of the interaction of primary cosmic rays, in particular galactic cosmic rays (GCRs), with the Earth's atmosphere. But only primary particles with energies above several 100 MeV can trigger the necessary reaction chains. Because GCRs are modulated by the solar activity on their way through the interplanetary medium the GCR-induced cosmogenic radionuclide production is anti-correlated to the solar cycle. During phases of strong solar activity also solar energetic particle (SEP) events occur frequently. In particular SEP events which can be detected by ground-based instruments, so-called ground level enhancements (GLEs), may strongly contribute to the cosmogenic radionuclide production. Beside the variation due to the modulation of GCRs we will investigate the influence of 58 GLEs, which occurred within the past five solar cycles and discuss the possibility to detect such events in present ice-core and tree-ring records. In addition, an estimate for the probability to find such events over the past 10'000 years, also known as Holocene, during different modulation conditions will be given.

EP 8.6 Fri 12:00 DO24 1.103

Anisotropy measurement capability of SOHO-EPHIN — •Saša Banjac[1], Nina Dresing[1], Raul Gómez-Herrero[2], Bernd Heber[1], Andreas Klassen[1], Patrick Kühl[1], and Cristoph Terasa[1] — [1]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel — [2]SRG, University of Alcalá, 28871, Alcalá de Henares, Spain

The Electron Proton Helium INstrument (EPHIN) is a multi-element array of solid-state detectors with anticoincidence to measure energy spectra of electrons in the range 250 keV to 8.7 MeV, and of hydrogen and helium isotopes in the range 4 MeV/n to 53 MeV/n. The instrument has a 83° full width conical field of view. It is mounted on the SOHO spacecraft pointing along the nominal Parker-Spiral, i.e. 45° west. Using a Monte Carlo based method we explore the anisotropy measurement capability of EPHIN, making use of the information pro-

vided by the segmentation of the two upper detectors of the stack (A and B). Finally, the developed methods are applied to a sample of solar events and the results are analyzed and compared in order to discuss the potential of the sensor to determine particle anisotropies.

EP 8.7 Fri 12:15 DO24 1.103

Transit-time aspects of ENAs generated by charge exchange in the outer heliosphere — •Mark Siewert and Hans-Jörg Fahr — AIFA, Universität Bonn

Energetic Neutral Atoms (ENAs) have recently emerged as a new tool for remote sampling of astrophyiscal plasmas in the border region of the heliosphere. Pushed forward by the highly successful IBEX mission, time-dependent ENA data of the entire heliospheric boundary layer is now available for a time range of nearly five years. However, the source region and interpretation of the ENAs observed by IBEX is still unclear, and criteria that may allow to differentiate between different models are sparse. In this talk, we present recent results on transit-time aspects of our own model for ENA production, and demonstrate that a reaction in the ENA flows due to the end of the solar minimum in late 2010 should emerge in the data being taken right now.

EP 8.8 Fri 12:30 DO24 1.103

The entropy production at the multi-fluid MHD solar wind termination shock — •Hans Jörg Fahr and Mark Siewert — Argelander Institut für Astronomie, Universität Bonn, Auf dem Huegel 71, 53121 Bonn

It has become evident meanwhile that the MHD solar wind termination shock needs a multifluid theoretical approach to adequately describe the intertwisted physical complexity in the interaction between fields and particles. In this approach here we treat the passage of three separate fluids over the MHD shock, namely solar wind protons, pickup protons and electrons. Connected with the different downstream pressures of three fluids we also calculate the different fluid entropies that are produced at the shock passage. As we can show the most relevant contribution to the total particle entropy is connected with the electron pressure which actually by far dominates the downstream plasma pressure.

EP 8.9 Fri 12:45 DO24 1.103

The Dynamics of Comet ISON C/2012 S1 near Perihelion — •Adalbert Ding[1,5], Shadia Rifai Habbal[2], Miloslav Druckmüller[3], and Peter Aniol[4] — [1]Institut für Optik und Atomare Physik, Technische Universität Berlin, Berlin, Germany — [2]Institute for Astronomy, University of Hawaii, Honolulu, Hawaii, USA — [3]Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic — [4]ASTELCO, Martinsried, Germany — [5]Institut für Technische Physik, Berlin, Germany

Comet ISON C/2012 S1, discovered in 2012, was predicted to have a sun grazing orbit approaching the sun as near as 0.7 solar radii above its surface on Nov 28 2013 at 18:45 UT. Direct white light images of the comet moving through the inner corona were obtained with a wide angle Lyot-type coronograph. The perfect match between the observed inner corona orbit and the trail captured by the LASCO/C2 coronograph was proven using a special correlation procedure. Furthermore emission spectra were obtained during perihelion using a high resolution ($\lambda/\Delta\lambda$=15000) imaging slit spectrometer operating simultaneously in 2 different bands. An external linear occulter was used to discriminate between the sun's and the comet's emission location. The observed line spectra display distinct features of diatomic molecular emission differing from the atomic and molecular absorption structures in the sun's spectrum. In a preliminary analysis these were assigned to the C_2 molecular emission features (Swan bands) and possibly CO^+ emission. The molecular emission processes and the dynamic behavior of the comet in a hostile environment will be discussed.