EP 10: Poster Session

Time: Thursday 11:00–12:30 Location: ZHG Foyer 1. OG

EP 10.1 Thu 11:00 ZHG Foyer 1. OG

The NASA Landolt mission — •Peter Plavchan — Mason Space Center MS 6D5, 4400 University Drive, George Mason University, Fairfax, Virginia, 22030 USA

The NASA Landolt mission is a timely PIONEERS program that will provide significant improvement in the accuracy of photometric measurements of absolute stellar fluxes. This will be accomplished with a high accuracy National Institute of Standards and Technology (NIST) calibrated suite of single-mode fiber-fed laser beacons which will be observable from selected ground-based observatory stations. Landolt will improve the photometric accuracy to <0.5% at visible (VIS) and near-infrared (NIR) wavelengths for >60 target stars. Such measurements can only be achieved by a space-based orbiting artificial star, where the physical photon flux is accurately known. Accuracy of absolute flux zero points is now the leading error budget term in the characterization of stars, be they standard stars or exoplanet hosts. Similarly, the accuracy of the ratio of the VIS/NIR absolute flux calibration zero point is the limiting error budget term in the Supernovae (SNe) Ia cosmological constraints on dark energy, a key science goal of the Nancy Grace Roman Space Telescope (Roman) and Vera C. Rubin Observatory (Rubin). Consequently, Landolt will enable the refinement of dark energy parameters, improve our ability to assess the habitability of terrestrial worlds, and advance fundamental constraints on stellar evolution.

EP 10.2 Thu 11:00 ZHG Foyer 1. OG

The Astropy Project: a community effort for a common software developent platform in Python — •Derek Homeier — Aperio Software Ltd. — The Astropy Team

Astropy is a project developing a common core platform for astronomical software in Python. Since the early 2010s Python has been recognised as a powerful alternative to data analysis platforms like IDL or Matlab, or compiled languages like Fortran and C++, for scientific data processing in the astrophysics research community. Numerical computation and visualisation needs led to significant contributions to evolving modules like Numpy and Matplotlib; yet individual needs also started to set off a proliferation of independent solutions. Astropy was created to foster an ecosystem of interoperable astronomy packages, sharing common coding standards and data APIs, to allow and actively encourage contributors from the community to invest their development work into a widely usable professional package.

A decade later this has made Python+Astropy now the dominant data-processing platform in astrophysical research. It is the basis for many observatories' data analysis tools, including STScI and JWST, and has a partner project in heliophysics, Sunpy. These efforts have been recognised by awards such as the IOP Publishing Top Cited Paper and most recently the Lancelot M. Berkeley-New York Community Trust Prize for Meritorious Work in Astronomy, and they are for the first time funded on a mid-long term basis under the NASA ROSES programme. With this growth the project has also evolved into a more formally organised and structured system.

EP 10.3 Thu 11:00 ZHG Foyer 1. OG

Water Megamasers: Rare Cosmic Beacons for Accurate SMBH Masses and Hubble Parameter Constraints — •Ahlam Farhan — Boğaziçi University, physics department, Istanbul, Turkiye

Extragalactic water vapour maser emission at 22 GHz (H2OMM) has been traced with remarkable accuracy to within a few parsecs of accretion discs around supermassive black holes (SMBHs). High-resolution VLBI observations demonstrate their ability to measure SMBH masses beyond the Milky Way and constrain the Hubble parameter to within 4% accuracy, as the Megamaser Cosmology Project (MCP) shows.

Despite these capabilities, H2OMMs are rare, with only 200 detections among over 6,000 surveyed galaxies. The complex and poorly understood physical conditions required for their formation, make it challenging to pinpoint the ideal galaxies to hunt new maser galaxies. Statistical studies are therefore crucial to identify trends that can guide future surveys toward higher detection rates.

Our study focuses on Active Galactic Nuclei (AGN) properties and highlights that galaxies with luminous dense gas tracers (e.g., HCO+, HCN) and weak 6.4 keV Fe Kα emission are more likely to host H2OMMs. These findings offer a pathway to optimise future searches, enhancing both cosmological measurements and our understanding of AGN environments.

EP 10.4 Thu 11:00 ZHG Foyer 1. OG

Stochastic High Frequencies in massive stars — •Julieta Paz Sanchez Arias[1], Suryani Guha[1,2], and Alejandra Christen[3] — [1]Astronomical Institute, Czech Academy of Science, Fričova 298, 251 65 Ondřejov, Czech Republic. — [2]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic. — [3]Instituto de Estadistica, Universidad de Valparaiso, Valparaiso, Chile.

The light curves of massive OB stars are known to be affected by red noise, which translates into a power excess in the low-frequency range. The origin of these stochastic low frequencies has been proposed to be convection and/or granulation at the stellar surface, internal gravity waves stochastically excited, and inhomogeneities in the winds of massive stars. However, the underlying physics of their origin is still poorly understood. Thanks to a new mathematical method for frequency analysis (the Empirical Mode Decomposition method), we have found frequencies excited at high frequency ranges in massive stars, which seem to be connected also with a stochastic process. In this work, we present numerical experiments with ARFIMA processes to model stochastic high frequencies (SHF) signals and detailed frequency analysis of a group of massive stars observed with TESS mission that exhibit SHF. The presence of these newly detected SHF provides additional tools to understand the origin of the red noise in massive stars.

EP 10.5 Thu 11:00 ZHG Foyer 1. OG

Near-infrared characterization of evolved massive stars in M31 and M33 — •Michaela Kraus[1], María Laura Arias[2], Michalis Kourniotis[1], Andrea Torres[2], Lydia Cidale[2], and Marcelo Borges Fernandes[3] — [1]Astronomical Institute AV CR, Ondrejov, Czech Republic — [2]Universidad Nacional de La Plata, Argentina — [3]Observatório Nacional, Rio de Janeiro, Brazil

The upper region of the Hertzsprung-Russell diagram is populated by massive stars in a diversity of evolutionary states, and the classification of these stars is often based on observed characteristics exclusively in the optical spectral range. The near-infrared regime provides useful complementary information that can help resolving ambiguities in stellar classification and add valuable information about circumstellar envelopes or late-type companions. We present new, near-infrared medium-resolution K-band spectra for a sample of seven evolved massive stars, four in M31 and three in M33. Based on the spectral appearance of the objects, we classify three objects as B[e] supergiants, of which two are found to be surrounded by dense and warm molecular gas rings. One B[e] supergiant and one Luminous Blue Variable display dense ionized winds, and one object is possibly a Luminous Blue Variable in outburst. The spectra of the remaining two objects indicate the presence of the red supergiant. Whether these are physical companions to the hot objects or they are just close in projection needs to be investigated.

EP 10.6 Thu 11:00 ZHG Foyer 1. OG

OCEANS - Overcoming challenges in the evolution and nature of massive stars — •Michaela Kraus and The OCEANS Consortium — Astronomical Institute AV CR, Ondrejov, Czech Republic

Massive stars are the cornerstone of the dynamic and chemical evolution of the cosmos, enriching it as they evolve with chemically processed material that is blown away from their surface by energetic winds and eruption processes. Despite their importance, their evolution from cradle to death as spectacular supernova explosions still poses many mysteries due to crucial knowledge gaps in the physical processes taking place in their interior and atmosphere and the mutual influence by close-by siblings. This poster presents the project OCEANS funded by the European Union. Our goal is to elucidate the physical properties and evolution of massive stars impacted by companions, as well as their contribution to the generation of gravitational waves. For this, we established a multidisciplinary, international network of researchers from Europe and America with expertise in various disciplines, and with background in both theory and observations. We exploit the avalanche of public data archives and develop machine learning algorithms to detect massive stars in binary and multiple systems, classify them, and create statistically meaningful samples for diverse evolutionary states. We also develop progressive methods of signal processing for the analysis of the stellar properties, and cutting-edge numerical codes to unveil the impact of stellar interaction and mass ejection on the evolution of the stars and stellar systems.

EP 10.7 Thu 11:00 ZHG Foyer 1. OG

Revealing the pulsation-induced mass loss of blue supergiants and its interplay with the interstellar medium — Michaela Kraus, Julieta Sánchez Arias, Peter Németh, Michalis Kourniotis, •Olga Maryeva, Dieter Nickeler, Suryani Guha, and Kuljeet Saddal — Astronomical Institute of the Czech Academy of Sciences, Ondrejov, Czech Republic

Massive stars play an important role in many astrophysical processes: from the formation of heavy elements in the Universe to a significant influence on the evolution of their host galaxies and star formation. One of the key parameters required to accurately model these processes, alongside luminosity, is the mass-loss rate. In the talk we will present a new ambitious project devoted to the determination of the mass loss rate for blue supergiants (BSGs) – evolutionary phase through which all massive stars pass. The goal of the project is to quantify the total amount of mass loss of BSGs from their winds and pulsations as improved input to stellar evolution calculations, and to gain insight into the mutual interaction between stellar pulsations, winds and their impact on shaping the local interstellar medium. In order to achieve our goal, we will combine calculation of the evolution and internal structure of massive stars (MESA code); computation of pulsations (GYRE code); stellar atmosphere and wind modeling (CMFGEN) – with collected time-series of spectroscopic and photometric observations. Also, we will use the obtained wind parameters in 2D and 3D magneto-hydrodynamics calculations to study its interaction with the interstellar medium.

EP 10.8 Thu 11:00 ZHG Foyer 1. OG

New Insights into Stellar Activity through Simultaneous High-Resolution Spectroscopy and Photometry — •Jakob Adamczewski[1,2] and Eike Günther[2] — [1]Göttingen University, Göttingen, Germany — [2]Thüringer Landessternwarte, Tautenburg, Germany

To address unresolved questions about activity processes, one of the most active systems, UY Pic A, in the PLATO southern field was observed using simultaneous TESS photometry and ground-based high-resolution spectroscopy with the PLATOSpec spectrograph. Our study aims to determine the sizes of coronal loops, establish the relationship between radial velocity variations and starspot dynamics, and investigate the effects of magnetic coupling between two active stars and potentially their planets.

EP 10.9 Thu 11:00 ZHG Foyer 1. OG

Stellar activity in the solar system and beyond: Earth as an exoplanet — •Alexander Siebelts — Karlsruher Institut für Technologie(KIT)

With their increasing number of discoveries, research in the habitability of exoplanets becomes an increasing topic of interest. In several cases, atmospheres on exoplanets have already been detected. Even if we assume that an Earth-like atmosphere is present on an exoplanet in the habitable zone around its host star, the orbital and stellar conditions it lives in have a profound effect on the climatological conditions of its atmospheres, the weather, and ultimately the habitability. In the scope of a Master's thesis, several experiments have been conducted to research the effect that changes on orbital parameters have on the climatological conditions on such an exoplanet. With the climate model ICON, simulations of Earth have been done as an Earth-like exoplanet. In a first step, the research included the adaptation of the solar spectrum, the topography and composition of its surface and the magnetic field, but was later limited to the obliquity and eccentricity of the planet's orbit, the distance and solar intensity simulated by the solar constant, and the angular velocity of the planet. The model simulations provide insight into the changes in the atmospheric dynamic and climatology under extreme conditions. While the changes made to the obliquity show a more realistic transformation of the extent of Earth's seasons, the changes made to the angular velocity provide unrealistic results. The effect of all parameters is heavily outweighed by the changes made to the solar constant.

EP 10.10 Thu 11:00 ZHG Foyer 1. OG

EPP-climate link by reactive nitrogen polar winter descent:science studies for the EE11 candidate mission CAIRT — •Stefan Bender[1], Bernd Funke[1], Manuel López Puertas[1], Maya Garcia-Comas[1], Gabriele Stiller[2], Thomas von Clarmann[2], Michael Höpfner[2], Björn-Martin Sinnhuber[2], Miriam Sinnhuber[2], Quentin Errera[3], Gabriele Poli[4], and Jörn Ungermann[5] — [1]IAA-CSIC, Spain — [2]KIT, Germany — [3]BIRA, Belgium — [4]IAP "Nello Carrara", Italy — [5]FZJ, Germany

Polar winter descent of NOy produced by energetic particle precipitation (EPP) in the mesosphere and lower thermosphere affects polar stratospheric ozone by catalytic reactions. This, in turn, may affect regional climate via radiative and dynamical feedbacks. NOy observations by MIPAS/Envisat during 2002–2012 have provided observational constraints on the solar-activity modulated variability of stratospheric EPP-NOy. These constraints have been used to formulate a chemical upper boundary condition (UBC) for climate models in the context of solar forcing recommendations. ESA's Earth Explorer 11 candidate Changing Atmosphere Infra-Red Tomography (CAIRT) will observe the atmosphere from about 5 to 115 km with an across-track resolution of 30 to 50 km within a 500 km wide field of view. CAIRT will provide NOy and tracer observations from the upper troposphere to the lower thermosphere with unprecedented spatial resolution. We present the science studies to assess its potential to advance our understanding of the EPP-climate link and to improve upon the aforementioned constraints in the future.

EP 10.11 Thu 11:00 ZHG Foyer 1. OG

Amplitudes of Magnetopause Surface Waves: Comparison of THEMIS Observations with MHD Theory — •Adrian Pöppelwerth[1], Niklas Grimmich[1], Rumi Nakamura[2], and Ferdinand Plaschke[1] — [1]Institut für Geophysik und Extraterrestrische Physik, TU Braunschweig, Braunschweig, Deutschland — [2]Institut für Weltraumforschung, Österreichische Akademie der Wissenschaften, Graz, Österreich

The Earth's magnetopause is the boundary between the terrestrial and the interplanetary magnetic fields. Variations in solar wind pressure and structures originating from the solar wind or foreshock regions induce constant dynamic motion of this boundary. In addition, a high velocity shear between the magnetosheath and magnetospheric plasmas can trigger the Kelvin-Helmholtz instability. All these interactions can generate waves on the magnetopause, which can either propagate along the magnetopause towards the nightside or form standing surface waves. These surface waves excite fluctuations within the ambient plasma on either side of the magnetopause and allow them to propagate away from the source region. According to magnetohydrodynamic (MHD) theory, the amplitude of these waves should decrease exponentially with distance from the boundary.

With the multi-spacecraft mission Time History of Events and Macroscale Interactions during Substorms (THEMIS), we are able to observe surface waves at different distances from the magnetopause. Here we present preliminary findings that compare these spacecraft observations with predictions from MHD theory.

EP 10.12 Thu 11:00 ZHG Foyer 1. OG

An exact analytical solution for the weakly magnetized flow around an axially symmetric paraboloid, with application to magnetosphere models — •Jens Kleimann[1] and Christian Röken[2] — [1]Theoretische Physik IV, Ruhr-Universität Bochum, Germany — [2]Institut für Philosophie, Universität Bonn, Germany

Rotationally symmetric bodies with longitudinal cross sections of parabolic shape are frequently used to model astrophysical objects, such as magnetospheres and other blunt objects, immersed in interplanetary or interstellar gas or plasma flows. We discuss a simple formula for the potential flow of an incompressible fluid around an elliptic paraboloid whose axis of symmetry coincides with the direction of incoming flow. Prescribing this flow, we derive an exact analytical solution to the induction equation of ideal magnetohydrodynamics for the case of an initially homogeneous magnetic field of arbitrary orientation being passively advected in this flow. Our solution procedure employs Euler potentials and Cauchy's integral formalism based on the flow's stream function and isochrones. Furthermore, we use a particular renormalization procedure that allows us to generate more general analytical expressions modeling the deformations experienced by arbitrary scalar or vector-valued fields embedded in the flow as they are advected first toward and then past the parabolic obstacle. Finally, both the velocity field and the magnetic field embedded therein are generalized from incompressible to mildly compressible flow, where the associated density distribution is found from Bernoulli's principle.

EP 10.13 Thu 11:00 ZHG Foyer 1. OG

Permittivity sensor for radar measurements and complex permittivity analysis of the ice crust on Jupiter's moon Europa — •Fabian Becker, Enrico Ellinger, and Klaus Helbing — Bergische Universität Wuppertal, Wuppertal, Deutschland

The icy moons in our solar system are gaining significant attention as targets for upcoming space missions. This interest stems from the substantial reservoirs of liquid water hidden beneath their icy surfaces, which could potentially harbour conditions suitable for extraterrestrial life. Following the era of orbital missions that have studied moons like Europa, Ganymede, Callisto, and Enceladus, the next step is to design and deploy lander missions.

Our approach to exploring the ice crust and potentially traversing the thick ice layer to reach the liquid water beneath involves using melting probes. For these probes, a specialized sensor system has been developed to measure the surrounding ice's complex permittivity ε_r^*. This sensor system will provide valuable preliminary information about the structure and composition of the moon's ice crust, offering key insights into its physical and chemical properties.

This poster will demonstrate how such a sensor is integrated into a melting probe, the precision with which it measures both the real and imaginary components of permittivity and the underlying principles of its operation. Furthermore, it will highlight how advanced calibration techniques and simulations have enabled more accurate measurements, enhancing the sensor's performance and reliability.

EP 10.14 Thu 11:00 ZHG Foyer 1. OG

Integration of Scientific Payloads into the TRIPLE-IceCraft Melting Probe for the Exploration of Subglacial Lakes — •Max Schmit[1], Jan Audehm[1], Clemens Espe[2], Marco Feldmann[2], Gero Francke[2], Mia Giang Do[1], Christoph Günther[1], Dirk Heinen[1], Lukas Michels[1], Fabian Schöttler[2], Christopher Wiebusch[1], and Simon Zierke[1] — [1]RWTH Aachen University - Physics Institute III B, Aachen, Germany — [2]GSI - Gesellschaft für Systementwicklung und Instrumentierung mbH, Aachen, Germany

Europa, one of Jupiter's moons, is a top contender in the search for extraterrestrial life, with evidence suggesting a global ocean beneath its icy crust. Upcoming missions aiming to explore this hidden water reservoir will require drilling through Europa's thick ice shell. The TRIPLE projectline (Technologies for Rapid Ice Penetration and Subglacial Lake Exploration) is initiated by the German Space Agency at DLR to develop the key technologies for such missions. The TRIPLE-IceCraft is a modular melting probe designed to carry a range of scientific payloads through ice. These payloads include the nanoAUV, a small autonomous submarine, instruments for in-situ water analysis and a forefield reconnaissance system. Integrating these payloads into the TRIPLE-IceCraft structure is crucial for exploring subglacial lakes and will pave the way for future missions to explore Europa's subglacial ocean. This poster highlights the integration of these scientific payloads into the TRIPLE-IceCraft and presents initial test results.

EP 10.15 Thu 11:00 ZHG Foyer 1. OG

Characterizing cometary dust: Insights from advanced modeling of scattered light — •Johannes Markkanen — Institut für Geophysik und Extraterrestrische Physik, TU Braunschweig, Germany

Analyzing the scattered light produced by cometary dust particles can provide valuable insights into their physical properties, including size, morphology, and composition. However, interpreting this scattered light presents significant challenges for standard computational methodologies. Moreover, the solutions to inverse problems are often non-unique, suggesting that reliance on a single observable may lead to potentially erroneous conclusions.

In this presentation, I will offer a comprehensive analysis of the observed polarization and color in cometary comae, utilizing cutting-edge numerical light-scattering solvers. I will demonstrate that integrating multi-instrument observations with self-consistent numerical light scattering and dust dynamical modeling can substantially enhance the reliability of the derived physical properties of cometary dust. Additionally, this approach allows us to investigate potential ongoing non-stationary processes, such as fragmentation and sublimation, within the coma.

EP 10.16 Thu 11:00 ZHG Foyer 1. OG

Non-thermal motions in the solar corona — •Arjun Kannan, Hardi Peter, Yajie Chen, and Damien Przybylski — Max Planck Institute for Solar System Research, 37077 Göttingen, Germany

Almost all spectra from the Solar atmosphere show a line width in excess of the pure thermal broadening. Extreme UV (EUV) emission lines are formed in the transition region and the corona under optically thin conditions. Hence, the non-thermal broadening of these lines is expected to be mainly due to non-resolved motions, e.g., waves or turbulence. However, observations show that non-thermal motions in the upper solar atmosphere do not depend on spatial resolution, hinting at a mechanism operating well below currently resolvable scales. So far, general 3D models have failed to reproduce the observed non-thermal motions. Our study aims to investigate the latest high-resolution 3D models of the quiescent Solar regions to see if, at sufficient resolution, these models match observations. We synthesize emission in the respective EUV line and calculate the spectra to derive a synthetic map of the non-thermal line width, which can then be compared to real observations. This will provide insights into the extent to which the current 3D MHD models represent the solar upper atmosphere. This proof is essential for the future inclusion of these models in interpreting the data from new complex coronal spectroscopic observations, particularly with the upcoming MUltislit Solar Explorer (MUSE).

EP 10.17 Thu 11:00 ZHG Foyer 1. OG

Chromospheric Fe I lines in the NUV solar spectrum — •Edvarda Harnes[1,2], Smitha Narayanamurthy[1], Andreas Korpi-Lagg[1,3], Damien Przybylski[1], and Sami Solanki[1] — [1]Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany — [2]Georg-August-Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany — [3]Aalto University, Department of Computer Science, Konemiehentie 2, 02150 Espoo, Finland

In the near-ultraviolet (NUV) solar spectrum there are several Fe I lines that show very broad profiles typical of chromospheric lines. The diagnostic potential of these spectral lines is largely unexplored due to a lack of high-resolution observations. With the successful flight of the SUNRISE III balloon-borne observatory we have for the first time full spectro-polarimetric data at high spatial resolution of this region, and ground-based observatories can also observe the broad Fe I lines around 400 nm. The goal of this work is to investigate and discuss the formation properties of these spectral lines and their suitability for interpreting observations. An initial investigation was done by synthesizing a selection of lines in the FAL one-dimensional semi-empirical solar atmosphere models using the non-LTE radiative transfer code RH. We found that the lines are significantly affected by overionization in the wings and scattering in the chromospheric line cores. The next step is to investigate the lines in a dynamic atmosphere of a 3D radiation-MHD model, made with the chromospheric extension of MURaM, and results from this will be presented.

EP 10.18 Thu 11:00 ZHG Foyer 1. OG

Diagnostics of comprehensive simulations of the chromosphere — •Patrick Alexander Ondratschek[1], Damien Przybylski[1], H.N. Smitha[1], Robert Cameron[1], Sami K. Solanki[1], and Jorrit Leenaarts[2] — [1]Max-Planck-Institut für Sonnensystemforschung, Göttingen, Germany — [2]Institute for Solar Physics, Stockholm, Sweden

The chromosphere is a region of the solar atmosphere above the photosphere and below the millions of Kelvin hot corona. It is a place of extremes where multiple physical transitions take place. In the photosphere, the dynamics are dominated by the plasma pressure. As the density decreases with height, the magnetic field becomes dynamically important. The detailed processes that heat the chromosphere and provide the mass for the corona are only poorly understood. Many studies of the chromosphere are based on a few strong spectral lines that carry the necessary diagnostic potential to infer physical quantities such as e.g. temperature, velocity, and magnetic field. These spectral lines form under nonlocal thermodynamic equilibrium conditions and are difficult to interpret. We aim to understand line formation in the solar chromosphere by synthesizing spectral lines from numerical models. Previous models of the solar chromosphere resulted in too-faint intensities and too-narrow line widths when compared with observations. We use a new model of the chromosphere simulated with the MURaM-ChE code to study the formation of the Mg II h&k and Ca II 8542 lines. We find an improved match with the observations, signifying a step forward in our understanding of the chromosphere.

EP 10.19 Thu 11:00 ZHG Foyer 1. OG

Helium at the terrestrial planets - recent spacecraft observations — •Markus Fränz and Harald Krüger — Max-Planck-

Institut fuer Sonnensystemforschung, 37077 Goettingen, Germany

The Sun is a primary source of Helium in the inner solar system. At the terrestrial planets radio active decay can also contribute to the Helium budget in the exospheres. The third source of Helium is the interstellar neutral gas. Recent missions to planet Mercury are giving new interesting insights on the role of the different sources. The MESSENGER spacecraft was launched in 2004, and between March 2011 and April 2015 it was the first spacecraft in orbit around Mercury. The FIPS instrument on board MES- SENGER measured the ion composition in the vicinity of Mercury and in the inner solar system. We aim to determine the origin of He+ ions in the inner solar system and in the environment of Mercury, continuing earlier work by Gershman et al. (2013). We have analyzed measurements of He+ and He2+ ions made by the FIPS instrument during the interplanetary cruise phase of MESSENGER and its entire orbital mission at Mercury. We de- termined the spatial distributions of He+ ions in the regions sampled by MESSENGER during that period and compare the spectra to a similar observation by the MPPE-MSA instrument onboard BepiColombo. We here consider two possible sources of He+: (1) interstellar neutral helium ionized close to Mercury and (2) solar He2+ ions converted close to or at the surface of Mercury. We also compare the observed densities with a simple model of the ionization of the interstellar helium flow.

EP 10.20 Thu 11:00 ZHG Foyer 1. OG

Simulation of sunspots in the chromosphere and further comparison of the results with observations — •Aswathi Krishnan Kutty, Robert Cameron, Damien Przybylski, and Sami Solanki — Max Planck Institute for Solar System Research, Goettingen

At the photospheric level, sunspots consist of a dark central umbra, scattered with umbral dots, surrounded by a filamentary penumbra that is on average considerably brighter than the umbra but darker than the surrounding quiet Sun. In the photosphere, the nearly horizontal Evershed flow is directed outward from the outer edge of the umbra along penumbral filaments. On the other hand, the flow is reversed in the chromosphere, the layer just above the photosphere where the plasma flows inwards and towards the umbra. Radiative MHD codes by, e.g., Heinemann et al. (2007) and Rempel et al. (2009) have been used to simulate sunspots at the photosphere and below. The chromospheric component of the atmosphere near and above a sunspot is not well understood from a theoretical perspective. In this poster, we will present preliminary simulations extending the previous simulations higher into the solar atmosphere.

EP 10.21 Thu 11:00 ZHG Foyer 1. OG

Investigating high-speed outflows from a coronal hole with UV spectroscopy — •Mario Roco-Moraleda[1], Luca Teriaca[1], Pradeep Chitta[1], Ziwen Huang[1], Hardi Peter[1,2], and Sami Solanki[1] — [1]Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany — [2]Institut für Sonnenphysik (KIS), Georges-Köhler-Allee 401a, 79110 Freiburg, Germany

Coronal holes have been known since decades to be the main source regions of the solar wind. Recent very high resolution observations from the HRIEUV telescope of the EUI instrument on Solar Orbiter show evidence that the fast solar wind and the Alfvénic slow wind originate from largely unipolar, open field region characterized by low emission in coronal lines (T = 1 MK). Those observations draw a connection between speeds on the plane of sky of about 100-150 km/s at a few tens of megameter above the solar surface and picoflare jets, with kinetic energy content in the range of 10^21 to 10^24 erg, at the base of the corona in these dark areas.

However, classical spectroscopic observations (line of sight velocities) in lines formed at the base of the corona (T=0.6 MK) do not show evidence of upflow velocities above about 10 km/s, difficult to reconcile with the HRIEUV observations.

We revisit high quality SUMER observations of an on-disk equatorial coronal hole. We perform a very accurate wavelength calibration and analysis of the spectral profiles to detect signature of high-speed flows occurring at spatial scales below 1" resolution of the instrument.

EP 10.22 Thu 11:00 ZHG Foyer 1. OG

A new categorization of coronal dimmings — •Bernhard Kliem and the ISSI Team Coronal Dimmings — University of Potsdam, Institute of Physics and Astronomy, 14476 Potsdam

A new, physics-based categorization of coronal dimmings has recently been proposed by an ISSI International Team "Coronal dimmings and their relevance to the physics of solar and stellar coronal mass ejections" (Veronig, Dissauer, Kliem, Downs et al. 2025, LRSP, subm.) The new categories were defined by considering the magnetic flux systems involved in solar coronal mass ejections (CMEs) and the principal magnetic reconnection processes between them. These are proposed to replace the morphology-based traditional categories of Core and Secondary Dimmings. They are expected to aid the physical interpretation of the often complex dimming morphologies. The flux systems are: the erupting core flux (a magnetic flux rope, MFR), the strapping flux (external poloidal field) yielding force-free MFR equilibrium, closed exterior flux, and open flux (an ambient coronal hole). The principal reconnection processes are: strapping-strapping ("flare") reconnection, rope-strapping reconnection, rope-exterior reconnection, rope-open-flux reconnection, and leg-leg reconnection of the erupting flux rope. These lead to Stationary, Shrinking, and Moving Flux-rope Dimmings, Strapping-flux Dimmings, Exterior Dimmings, and Openflux Dimmings. Schematics and illustrative examples will be shown.