

527. Wilhelm and Else Heraeus-Seminar: Plasma and Radiation Environment in Astrospheres and Implications for the Habitability of Extrasolar Planets

10 - 15 March 2013

Physikzentrum Bad Honnef, Germany,

The seminar is generously funded and organised by the Wilhelm und Else Heraeus Stiftung and will be held in the Physikzentrum in Bad Honnef near Bonn/Germany. Since the number of participants is limited, registrants will pass through a selection procedure. Registration is free, accomodation and full board (except beverages) are kindly covered by the Wilhelm und Else Heraeus Stiftung for accepted participants.

Since the discovery of the first exo-planet around a main sequence star in 1995 the exploration of these objects has evolved far beyond their mere detection. Observations of several hundred exo-planets have led not only to a tremendous increase in knowledge of dynamical systems in celestial mechanics: due to an immense, still ongoing progress in observational techniques it has become increasingly feasible to infer individual characteristics and properties of hot exo-planets and Earth-like exo-planets. Among these properties are planetary radii, signatures of their atmospheres and, recently, even a spatially resolved spectrum of an exo-planetary atmosphere and the detection of atmospheric winds, the determination of the exo-planet's orbital velocity, which allows to measure its mass as well as to provide an estimate for the abundances of atmospheric molecules. These observations are so promising that even the detection of molecules in exo-planetary atmospheres that can be regarded as tracers of life can be expected in the near future. The observational progress has also improved our detailed knowledge about planet-hosting stars, which allows to infer even more exo-planetary properties: the discoveries of stellar activity triggered by an exo-planet and of neutral hydrogen around an exo-planet show that a close-in exo-planet does interact with its host star magnetically rather than tidally and that these observations can be interpreted as indications of a stellar wind interacting with a magnetosphere. In view of this recent progress it will be timely to have a synoptic overview of all components influencing the observation of an exo-planet.

For this Heraeus seminar the emphasis is put on five key questions for the following topics:

Astrospheres: What is the spectrum of the cosmic ray flux outside an astrosphere and how is it transported through it?

Stellarspheres: How does the host star influence the exo-planetary environment by its electromagnetic radiation and energetic particle production?

Magnetospheres: What are the possible magnetosphere configurations of an exo-planet and what is its influence on the transport of energetic particles?

Atmospheres: How does the chemistry, the atmospheric dynamics and interaction with energetic particles influence the observability of an exo-planet?

Biospheres: Can possible signatures of life such as atmospheric ozone, methane be observed, and what is their possible contamination by energetic particle and radiation processes in the exo-planetary atmosphere?

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