Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre (SYAK)

gemeinsam veranstaltet
vom Fachverband Umweltphysik (UP) und
vom Fachverband Extraterrestrische Physik (EP)

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Übersicht der Hauptvorträge und Fachsitzungen

(Hörsaal GW2 B2880)

Hauptvorträge

SYAK 1.1	Fr	8:30– 9:00	GW2 B2880	**Solar Irradiance Variation** — •Natalie Krivova
SYAK 1.2	Fr	9:00– 9:30	GW2 B2880	**Cosmic rays and ground level enhancements** — •Bernd Heber
SYAK 1.3	Fr	9:30–10:00	GW2 B2880	**Impact of precursor gases and ions on new particle formation and climate** — •Urs Baltensperger
SYAK 1.4	Fr	10:00–10:30	GW2 B2880	**Regional Influence of Solar Variability on European Climate** — •Katja Matthes

Fachsitzungen

SYAK 1.1–1.4	Fr	8:30–10:30	GW2 B2880	**Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre**

SYAK 1: Symposium Einfluss solarer Variabilität auf Atmosphäre und Klima der Erde: Von der Heliophysik bis zur Erdatmosphäre

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

Hauptvortrag SYAK 1.1 Fr 8:30 GW2 B2880

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

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

Hauptvortrag SYAK 1.2 Fr 9:00 GW2 B2880

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

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

Hauptvortrag SYAK 1.3 Fr 9:30 GW2 B2880

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

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

Hauptvortrag SYAK 1.4 Fr 10:00 GW2 B2880

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

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

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