# Symposium Remote Sensing of Planetary Atmospheres (SYSA)

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

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# Übersicht der Hauptvorträge und Fachsitzungen

(Plenarsaal)

## Hauptvorträge

| | | | | |
|---|---|---|---|---|
| SYSA 1.1 | Di | 14:00–14:30 | Plenarsaal | **Remote sensing of planetary atmospheres: questions and (some) answers.** — •Martine De Maziere, Sieglinde Callewaert, Bart Dils, Bavo Langerock, Charles Robert, Mahesh K. Sha, Sophie Vandenbussche, Corinne Vigouroux, Minqiang Zhou |
| SYSA 1.2 | Di | 14:30–15:00 | Plenarsaal | **24 years of atmospheric trace gas observations from spectrally resolving UV/vis satellite observations: optimisation of the spatio-temporal resolution and coverage** — •Thomas Wagner |
| SYSA 1.3 | Di | 15:00–15:30 | Plenarsaal | **Infrared Remote Sensing of the Atmosphere of Mars** — •Armin Kleinböhl |
| SYSA 1.4 | Di | 15:30–16:00 | Plenarsaal | **Investigating planetary atmospheres in our own Solar System and beyond: Advances and Perspectives** — •Miriam Rengel |

## Fachsitzungen

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|---|---|---|---|---|
| SYSA 1.1–1.4 | Di | 14:00–16:00 | Plenarsaal | **Remote Sensing of Planetary Atmospheres** |

## Weiterführende Fachsitzung mit Kurzvorträgen zu Planetary Atmospheres (joint session EP/UP)

Dienstag 16:30–18:45 HS 22

# SYSA 1: Remote Sensing of Planetary Atmospheres

Zeit: Dienstag 14:00–16:00 Raum: Plenarsaal

**Hauptvortrag** SYSA 1.1 Di 14:00 Plenarsaal

**Remote sensing of planetary atmospheres: questions and (some) answers.** — •Martine De Maziere, Sieglinde Callewaert, Bart Dils, Bavo Langerock, Charles Robert, Mahesh K. Sha, Sophie Vandenbussche, Corinne Vigouroux, and Minqiang Zhou — Royal Belgian Institute for Space Aeronomy, Brussels, Belgium

The principles of remote sensing techniques must be well understood to make correct use of the data. Even the comparison between data coming from two similar remote sensing instruments may show differences, that are surprising at first sight but can be explained if one has a good understanding of the techniques.

This presentation will show some applications of remote sensing from ground and space, and highlight the challenge of correctly interpreting the data. It will also show the complementarity between in-situ and remote sensing data, and some comparisons between ground-based and satellite remote sensing data.

Questions that require further developments and research will be addressed.

**Hauptvortrag** SYSA 1.2 Di 14:30 Plenarsaal

**24 years of atmospheric trace gas observations from spectrally resolving UV/vis satellite observations: optimisation of the spatio-temporal resolution and coverage** — •Thomas Wagner — MPI for Chemistry, Hahn-Meitner-Weg 1, D-55128 Mainz, Germany

In 1995 the first instrument of a new generation of UV/vis satellite instruments (GOME) was launched. GOME measured the backscattered sun light in continuous spectral windows with a spectral resolution between 0.2 and 0.4 nm. In the measured spectra the absorptions of many atmospheric trace gases could be detected. One important novelty of GOME was its sensitivity to tropospheric trace gases (e.g. NO2, SO2, HCHO, BrO, IO). However, GOME measurements had a rather coarse spatial resolution (320 x 40 km*) and low sampling rate (global coverage after 3 days). These properties were mainly determined by technical constraints, e.g. the downlink data rate. In the following years several similar missions, but with largely improved spatial resolution, were put in orbit, e.g. SCIAMACHY, OMI, and GOME-2. Finally, in October 2017 the TROPOMI was launched. It has a spatial resolution of 3.5x7 km* and daily global coverage and provides unprecedented information on the global distribution of tropospheric trace gases and their emission sources. The spatial resolution of TROPOMI comes close to the maximum achievable value, which is eventually constraint by the intensity of the solar radiation. In this presentation novel trace gas maps from TROPOMI are presented. Also future satellite missions, in particular geostationary satellites, and methods for the optimum exploitation of the measured spectra are discussed.

**Hauptvortrag** SYSA 1.3 Di 15:00 Plenarsaal

**Infrared Remote Sensing of the Atmosphere of Mars** — •Armin Kleinböhl — Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

Infrared remote sensing has provided the most comprehensive information on the martian atmosphere to date. Atmospheric structure and aerosol loading are typically measured by thermal infrared spectrometry or radiometry in nadir or limb geometries, while measurements of atmospheric constituents often rely on the sun as a light source, either in nadir or solar occultation geometry. Thermal infrared sounding of temperature relies on the 15 micron absorption band of the CO2 molecule as CO2 is the main constituent of the martian atmosphere and its abundance is well known. Thermal infrared temperature sounding at Mars goes back to Mariner 9, which arrived in 1971 and was the first spacecraft orbiting Mars. Since then several thermal infrared sounders have been surveying the martian atmosphere from orbiting spacecraft. The most comprehensive dataset originates from the Mars Climate Sounder (MCS) on Mars Reconnaissance Orbiter, which arrived in 2006 and has been operating since then. MCS is a passive, 9-channel infrared radiometer that views the martian atmosphere in limb and on-planet geometries. It has established a global climatology of temperature, dust, and water ice profiles that spans 6 Mars years and is still being continued. The most recent addition to the fleet of Mars orbiters is the ExoMars Trace Gas Orbiter, which carries instrumentation for thermal infrared sounding as well as solar occultation spectrometry.

**Hauptvortrag** SYSA 1.4 Di 15:30 Plenarsaal

**Investigating planetary atmospheres in our own Solar System and beyond: Advances and Perspectives** — •Miriam Rengel — Max-Planck-Institut für Sonnensystemforschung

The exploration of planets inside and outside our own Solar System is a very active research area in astronomy and planetology, and exoplanets are known to exhibit an extreme diversity in their physical properties. Investigating the chemical composition of planets helps to constrain atmospheric processes, abundances, and formation and evolution conditions. Crossing the next frontier in detailed characterization of exoplanetary atmospheres via remote-sensing, which is dependent on observations and interpretation toolkits, it is instructive to start with an assessment of the atmospheric characterization of planets and satellites in our own Solar System. In this contribution, I will concentrate on the investigation of key atmospheric gases and thermal profiles on Venus and Titan. Although these atmospheres have been studied with a variety of remote-sensing techniques, across a wide spectral range, they are still not fully understood. With the help of spectroscopic observations and appropriate radiative transfer calculations and atmospheric retrieval methods, I constrain the chemical concentration profiles, temperature and winds in these fascinating atmospheres.

Furthermore, expanding our knowledge gained from studies of solar system planets, I will review the latest key achievements accomplished in the study of exoplanet atmospheres, developments in our understanding of physical and chemical conditions of planetary atmospheres, and prospects for the future.