

Report on PRE 8 Workshop

The 8th International Workshop on Planetary, Solar, and Heliospheric Radio Emissions (PRE 8) was organized by the Space Research Institute of the Austrian Academy of Sciences. The workshop took place at the conference hotel Schloss Seggau in Seggauberg, near Leibnitz/Graz, Austria, from October 25-27, 2016. October 24 was the arrival day, and October 28 was the departure day. A total of 50 participants attended the workshop, with 20% female scientists (Figure 1). There were 13 other scientists who could not come to Austria in person, but sent posters that were presented by other scientists at the workshop. 68 abstracts were submitted in total, which were presented as 42 talks and 26 posters in nine oral sessions and one poster session. Key topics of the workshop were the recent developments in the study of non-thermal radio emissions from the sun, the five radio planets, the heliosphere, and potential radio emissions from exoplanets.

On the first conference day, one oral session dealt with the new findings of Juno at Jupiter, two oral sessions were about Jovian radio emissions, and one oral session was about Saturn radio emissions. One highlight of the workshop was the first presentation of scientific results from the Juno/Waves radio instrument. The NASA mission to Juno had entered an orbit around Jupiter in early July 2016, and the first periastron pass with scientific data took

place on August 27. First dynamic spectra revealed the multitude of the Jovian radio spectrum, with the first view of Jovian radio emissions from high latitudes with frequencies close to the cyclotron frequency suggesting that Juno passed very close to the emission's source region. Juno/Waves also observed electron and proton whistlers, dust impacts, lightning whistlers, quasi-periodic (QP) bursts, and upstream Langmuir waves and ion-acoustic waves during the approach. Juno is also a good example where space-based observations are supported by ground-based observations, which was a topic at PRE 8. Radio telescopes, such as the French NDA (Nançay Decameter Array), have observed Jupiter for almost 40 years. From this abundance of radio data, it was shown in presentations at PRE 8 that there are radio emissions induced by the Jovian moons of Ganymede and Europa. The changing periodicity of Saturn kilometric radiation was an important topic concerning Saturn radio emissions. The first day was concluded with a wine-tasting event at the wine cellar of Schloss Seggau.

The topics of the second day were terrestrial radio emissions, developments of radio instruments, and theory. For terrestrial radio emissions, the observations of higher-harmonic electron-cyclotron emissions from the aurora with ground-based radio stations in Antarctica were an interesting finding. The technical development of antennas



Figure 1. A group picture of the PRE 8 workshop in Schloss Seggau, October 25-27, 2016.

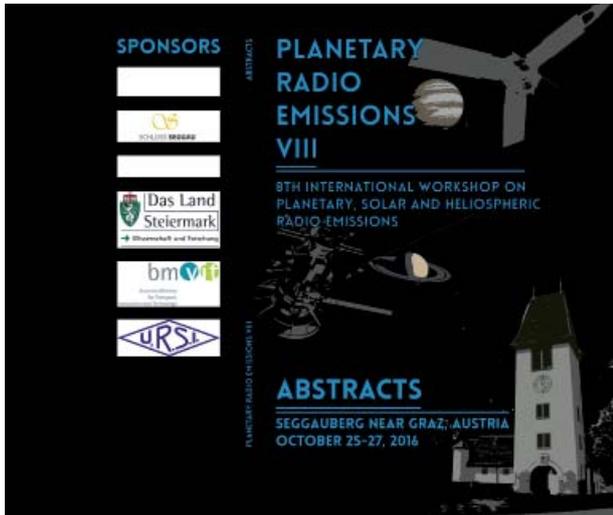


Figure 2. The cover of the PRE 8 abstract book with the logos of the sponsors.

and receivers for ground-based radio stations was also discussed, such as the novel usage of small cubesats for the investigation of solar radio emissions, or the usage of small portable radio arrays as interferometric detectors.

In the afternoon, we took a bus tour with an excursion to the chocolate factory “Zotter” in Bergl, close to Riegersburg. Everybody enjoyed the walk through the transparent chocolate factory to see the transformation from the cocoa bean into chocolate – mostly because there were numerous places where chocolate could be tasted, according to the motto “all you can eat.”

On the third day, there were two oral sessions about solar radio emissions, one oral session about potential exoplanetary radio emissions, and the poster session. A new technique, called tied-array imaging – which uses multiple beams pointing at the radio source – has been used with LOFAR to obtain new results on solar S (short) bursts. This interesting invited talk was presented by Diana Morosan, a young scientist from Trinity College Dublin, who was supported by funds from URSI. The solar S bursts were also observed with the UTR-2 radio telescope during the solar maximum in 2013/14. Another interesting talk about a multi-wavelength analysis of solar EUV jets was presented by Sargam Mulay, a student from Cambridge University who was the second person supported by URSI funds. Exoplanetary radio emissions have not yet been detected. However, the radio emissions of brown dwarfs are thought to be created by the same mechanism as auroral kilometric radiation, and the search for exoplanetary radio emissions will continue. The last session of the day and the workshop was the poster session.

Planetary and solar radio emissions can be measured either by antennas on spacecraft or by ground-based radio telescopes. At PRE 8, special emphasis was put on current space missions such as Juno (at Jupiter), Cassini (at Saturn), Stereo (observing the sun), and the Earth-orbiting missions Themis, the Van Allen Probes, and Hisaki. New findings from data of older missions such as the Voyagers, Fast, or Wind were also discussed. Key questions for radio-wave measurements with future missions such as ESA’s large mission JUICE (Jupiter Icy Moons Explorer) or the small cubesat mission HeRO (Heliophysics Radio Observer) were addressed. New developments and scientific data from the following ground-based radio telescopes were discussed. Here, the main telescopes were the European network LOFAR (LOW Frequency ARray); UTR-2 and URAN in the Ukraine; the NDA (Nançay Decameter Array) in France, with its new LOFAR station called NenuFAR; the LWA (Long Wavelength Array) and VLA (Very Large Array) in the USA; the MWA (Murchison Widefield Array) in Australia; and the Japanese IPRT (Iitate Planetary Radio Telescope).

In summary, PRE 8 showed the most recent developments in the study of planetary, solar, heliospheric, and possible exoplanetary radio emissions. It should lead to new collaborations among the participants. This was the main objective of the PRE workshop series. PRE 8 was the continuation of the series of international workshops that took place in 1984, 1987, 1991, 1996, 2001, 2005, and 2010. The abstracts of PRE 8 were compiled in a printed abstract book (Figure 2), which can also be downloaded from the Web site at <http://pre8.oeaw.ac.at/>. A proceedings book was published after all previous PRE workshops, and we will keep up this tradition. All participants were asked to submit a written version of their contribution, and the manuscripts will be collected and reviewed. It is planned to publish the proceedings book with the Austrian Academy of Sciences Press in late 2017. PRE 8 was sponsored by the International Union of Radio Science (URSI); Europlanet; the Province of Styria; the Austrian Ministry for Transport, Innovation and Technology; and the Space Research Institute of the Austrian Academy of Sciences. The sponsors were mentioned in a press release, and their logos were displayed on the conference Web page, in and on the abstract book (Figure 2), and will also be displayed in the proceedings. There might be a PRE 9 workshop in future, maybe in the year 2020.

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