

Microwave observations of the giant planets - Cassini/Radar and Juno/MWR

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The thermal emission of a giant planet's atmosphere in the microwave region reveals the thermal structure and composition of the atmosphere below the clouds. During the last decade, the Cassini/Radar instrument mapped Saturn's global thermal radiation at 2.2 cm wavelength. Particularly, in the year 2010, the planet-encircling giant storm on Saturn appeared 16 K brighter than average, revealing desiccation of ammonia gas due to convection and atmospheric dynamics. More recently at Jupiter, the Juno spacecraft has completed a dozen orbits around the planet, making detailed observations of Jupiter's troposphere from north to south and down to pressures of about 200 bars. The results are both astonishing and stimulating. Jupiter's equatorial zone appears cold in all six channels of Juno/MWR, which range from 1.2 – 50 cm, whereas the other latitudes are significantly warmer than what was predicted by an adiabatic model. The internal structure of the GRS has also been mapped during orbit 7th close approach. Yet, the interpretation is partly confounded by the inhomogeneous distribution of ammonia gas. We will give an overview of the previous findings, current challenges, and future opportunities of microwave sounding of the giant planets.

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