Geophysical Research Abstracts
Vol. 12, EGU2010-7661-1, 2010
EGU General Assembly 2010

VLA Observations of the Jupiter Impact

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The Jupiter impact event of 2009 was observed with the VLA to study the changes to the thermal emission from Jupiter at 3.5 cm and 1.3 cm wavelengths. The total emission from Jupiter at radio wavelengths is due to the thermal component from the planet as well as the synchrotron component from electrons in the magnetosphere. At long wavelengths, synchrotron emission dominates and at short wavelengths thermal emission dominates. The cross-over is approximately at 6 cm. At the observation wavelengths, the contribution to the total emission from Jupiter is mostly from the thermal component. Different wavelengths not only have different thermal and synchrotron contribution, but they also probe to different depths in the atmosphere, with the longer wavelengths probing deeper into the atmosphere of the planet. The 3.5 cm wavelength probes the atmospheric layers between 0.8 bars and 3 bars and the 1.3 cm wavelength probes the atmospheric layers between 0.3 bars and 0.8 bars.

When an object bombards Jupiter, a plume of material from the object as well as from Jupiter's atmosphere is brought up from Jupiter's troposphere into the stratosphere. Hence, there will be a change in the composition of the stratosphere as well as the troposphere at the impact site. Enhanced emission associated with ammonia gas and an increase of temperatures in the upper troposphere at the site of the impact, were observed with the IRTF (Orton et al., B.A.A.S., 41, 2009).

The observation wavelengths (1.3 cm and 3.5 cm) probe the upper and middle troposphere of Jupiter. The VLA is capable of measuring changes due to the impact because of its sensitivity and resolution. The resolution at 3.5 cm was about 2.3" (6800 km linear at the planet) and at 1.3 cm was about 0.8" (2300 km). Jupiter was observed at the VLA for a total of 18.5 hours between July 22, 2009 and August 10, 2009. The observations were split into 1-3 hour time slots such that the impact site was visible as viewed from Earth at the time of the observation.

Initial data reduction and analysis shows no significant changes to the thermal component because of the impact at both the wavelengths (Butler et al., B.A.A.S., 41, 2009). Rotational de-projection of the images into a planetary cartographic system will be made (Sault et al., Icarus, 168, 2004). The final reduced images at the observation wavelengths and any changes to the thermal emission from Jupiter because of the impact will be presented.