

Low-frequency VLA observations of Jupiter

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This paper presents observations of Jupiter performed with the Very Large Array (VLA) at frequencies of 330 MHz and 74 MHz. Radio emission at frequencies between 50 MHz and 5 GHz is predominantly due to synchrotron emission from relativistic electrons interacting with Jupiter's magnetic field. Consequently, the shape of Jupiter's radio spectrum is a function of three properties: the range in energies of the emitting electrons, the spatial distribution of the emitting electrons, and Jupiter's magnetic field. Additionally, Jupiter's radio spectrum has been shown to vary temporally, hence observations must be made simultaneously to reveal an accurate spectrum. Because of strong background radio emission, very few observations have previously been made at frequencies between 50 and 330 MHz. Recent innovations in data reduction techniques in this regime have lessened this problem and opened this window to radio astronomers. The observations were made with the VLA in its B-configuration. The 330 MHz observations were made on September 15, 16, 19, and 20, 1998 while the 74 MHz observations were made on September 19 and 20, 1998. These observations are combined with simultaneous observations at higher frequencies and Jupiter's full radio energy spectrum (74 MHz – 8 GHz) is presented [Icarus 163 (2003) 434-448]. This spectrum is compared to previous spectra and discrepancies are discussed. Furthermore, theoretical models are fit to the spectrum to constrain the aforementioned physical parameters.