Full-Sky Imaging at Low Radio Frequencies

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Over the past few years several concepts have been studied for missions to explore the frequency range from a few tens of MHz (where observations from the ground become very difficult due to the Earth's ionosphere) down to a few tens of kHz (approaching the local solar wind plasma frequency). A common feature of almost all such mission concepts is the use of multiple antennas operating as an aperture synthesis interferometer to obtain angular resolution limited only by physical processes in the interplanetary and interstellar medium.

Aperture synthesis imaging at very low radio frequencies must overcome several unique problems, such as the corrupting effects of interplanetary scintillation, strong interfering signals from terrestrial transmitters, and nearly isotropic antennas which "see" strong sources such as the Sun and Jupiter at all times. This last effect requires the use of extremely wide-field imaging techniques, which are computationally expensive.

The current imaging study is using realistic simulated data to determine the dynamic range which can be obtained in aperture synthesis images of the entire sky. The effects of baseline phase fluctuations caused by the solar wind, bandpass filtering (to reduce delay beam sidelobes), the size and number of 3-D Fourier transforms used, the number of separate dirty beams used during deconvolution, the number of deconvolution iterations, and the number of antennas in the array are being studied. Final results of the study are expected by mid-1996.

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