Data products: what do we want?
The Radio Sun
The Radio Sun

1999 April 11: VLA 4.535 GHz mosaic

$I$ map

Max = 1095547, sky/disk rms = 0$''$ 9350 K

$V$ map

Max = 599261, min = -103252, sky/disk rms = 0$''$ 1323 K
Radio Emission Mechanisms

- **Plasma emission** is produced by energetic electrons at low harmonics of the plasma frequency: produces bright highly polarized bursts at low frequencies.

- **Bremsstrahlung** due to thermal plasma occurs throughout the solar atmosphere and is the dominant mechanism in most of the corona. It is optically thin above a few GHz and usually weakly polarized.

- **Gyroresonance emission** (emission from nonrelativistic thermal plasma at low harmonics of the electron gyrofrequency 2.8 B MHz) is strong wherever B > 300 G in the corona and produces optically thick emission in active regions which may be highly polarized.

- **Gyrosynchrotron emission** (emission by mildly relativistic electrons at harmonics 10-100 of the gyrofrequency) is produced by nonthermal electrons in flares.
The Radio Sun in Frequency

[Image showing radio images of the Sun at different frequencies (0.33 GHz, 1.4 GHz, 4.8 GHz, 17 GHz)]
What do we see in a radio image?
Radio Emission from the Solar Corona

Radio brightness temperature: 1999 May 13

Radio circular polarization: 1999 May 13

Red = positive radio polarity  Blue = negative radio polarity
Radio Emission from Magnetic Fields

Radio emission from a simple round sunspot
Radio Emission from Magnetic Fields

Region showing strong shear: radio images show high B and very high temperatures in this region.
Isogauss Surfaces in the Solar corona

Gyroresonance emission arises on surfaces of constant magnetic field in the corona.
Coronal Magnetogram

Magnetic field at the base of the corona: contours at 600, 1000, 1800 G
Polarization at low frequencies: origin?
Data products

- Radio images at multiple frequencies at reasonable cadence
- Coronal magnetograms
- Coronal temperature maps
- Variability maps
- Synoptic maps: what?