Coronal Seismology
Requirements for Solar-C

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Coronal Seismology

Observe phase speed of waves in the solar corona

Speed of wave propagation is a function of density and magnetic field

Transverse waves – LOS velocity perturbation constrain transverse component of magnetic field

This is complementary to Zeeman measurements

Combination provides coronal vector field measurement
CoMP Measurements

a) Intensity, b) LOS velocity, c) Magnetic Field Direction, d) LOS Magnetic Field Strength obtained on Oct 31, 2005.
Waves
Observed Wave Properties
Noise Estimate

\[ v_A = 1210 \left( \frac{B}{20 \text{ G}} \right) \left( \frac{n_e}{10^9 \text{ cm}^{-3}} \right)^{-1/2} \text{ (km/s)} \]  

(Aschwanden, 2004)

Then,

\[ \sigma_B = \left( \frac{\sigma_{v_A}}{60 \text{ km/s}} \right) \left( \frac{n_e}{10^9 \text{ cm}^{-3}} \right)^{1/2} \text{ (G)} \]

An uncertainty in the phase speed of 60 km/s, and an electron density of \(10^9 \text{ cm}^{-3}\) results in a 1 G magnetic field uncertainty

Need \(n_e/\sigma_{ne} > \sim 3\); CoMP measurements: \(\sigma_{v\text{phase}} < 50 \text{ km/s (3 hours)}\)
Wave Properties → Requirements

Velocity Amplitude: ~300 m/s rms
Period: ~300 s
Phase Speed: up to several Mm/s
1 Mm/s * 300 s = wavelength of 300 Mm
Velocity Noise < 100 m/s
FOV ≥ 0.5 solar radii
Cadence ≤ 15 secs