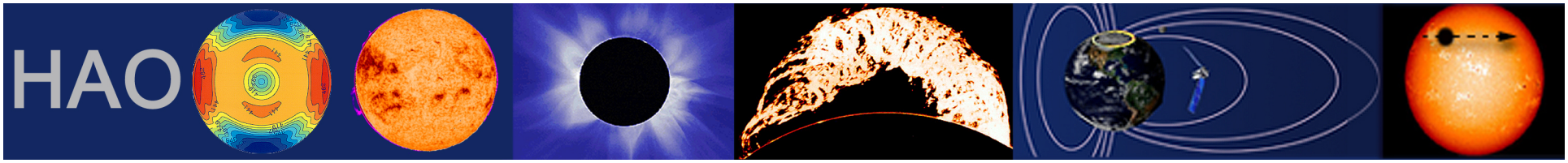

Coronal Seismology Requirements for Solar-C

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Coronal Seismology

Observe phase speed of waves in the solar corona

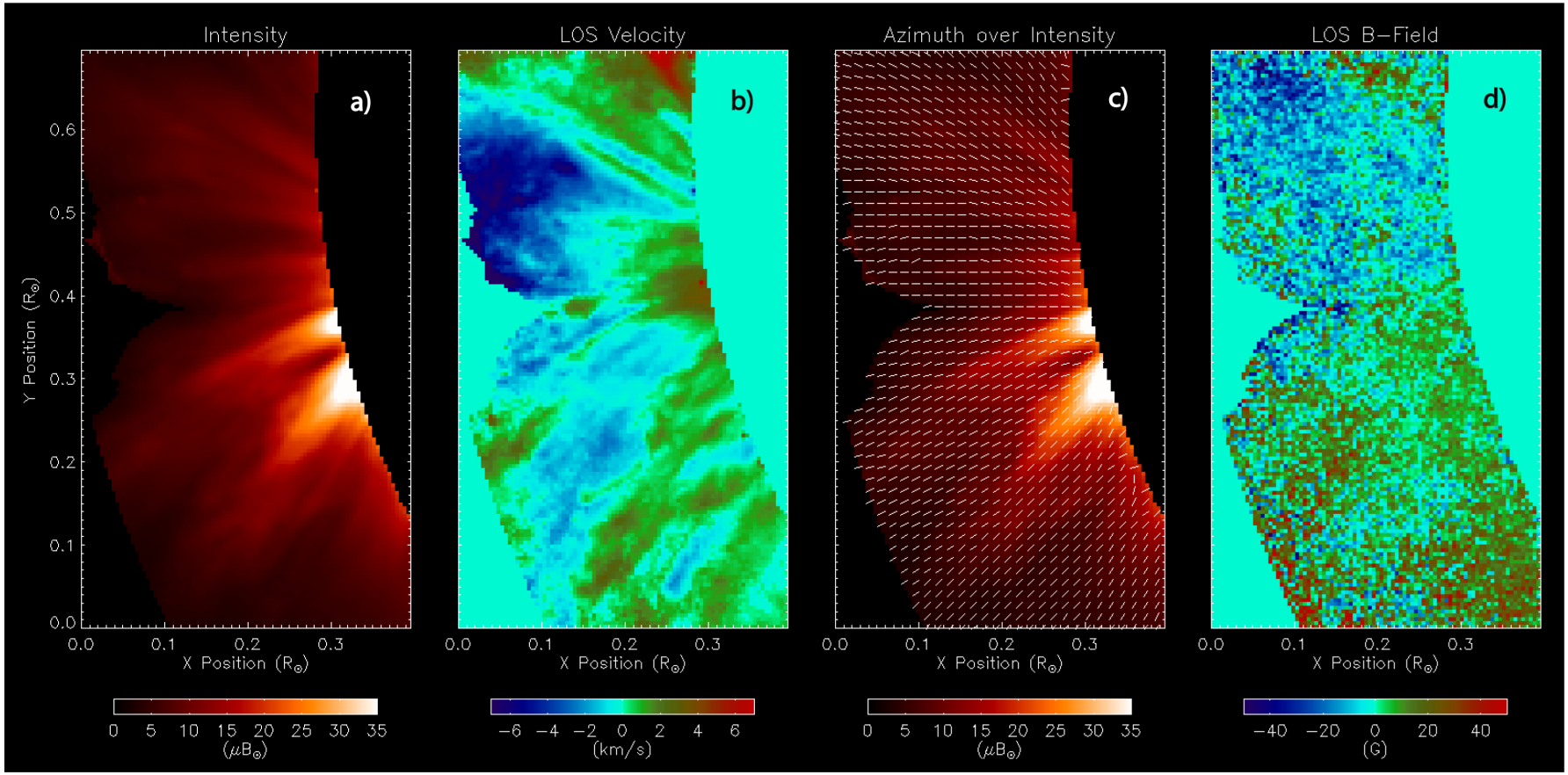
Speed of wave propagation is a function
of density and magnetic field

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

This is complementary to Zeeman measurements

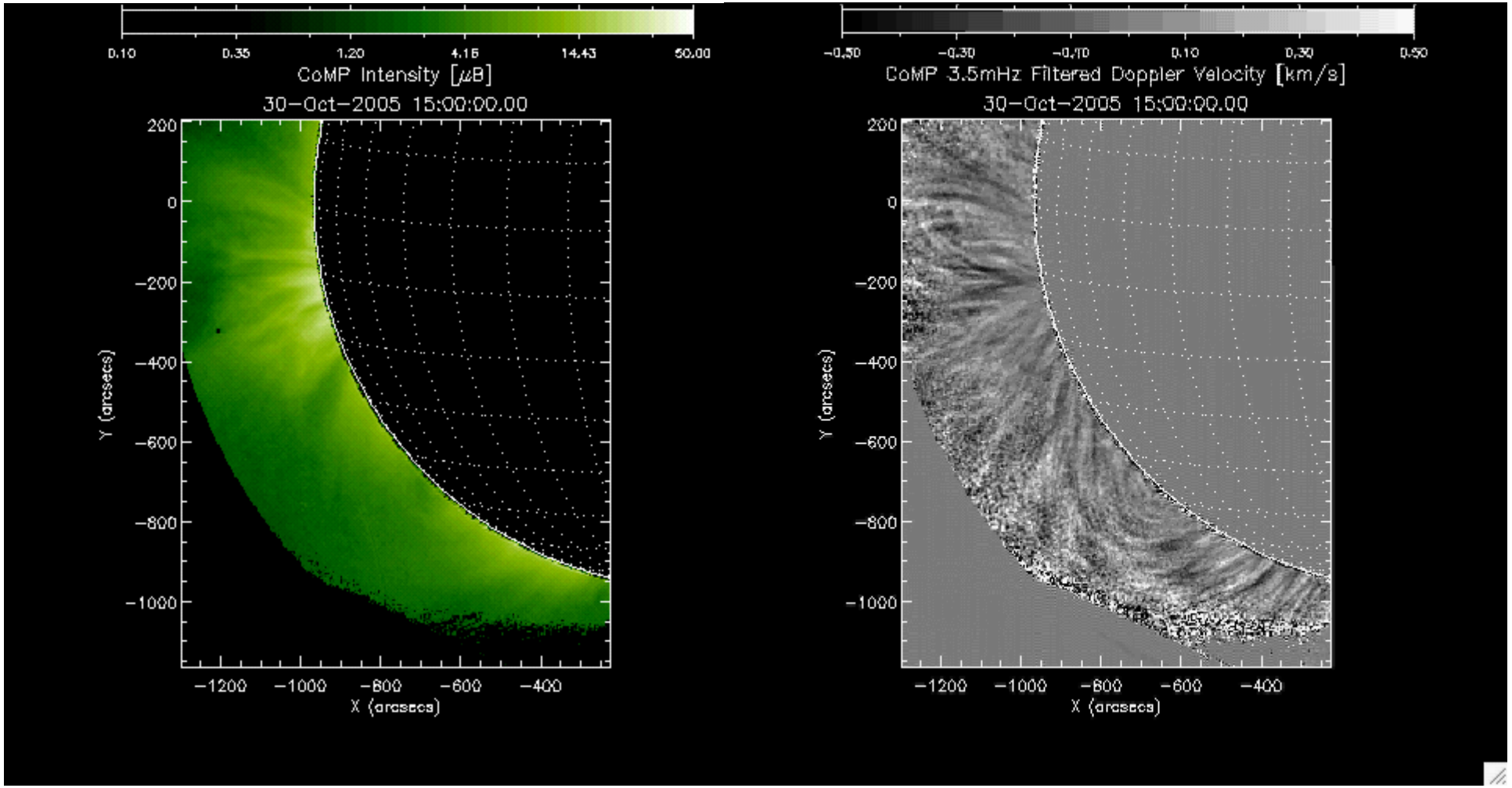
Combination provides coronal vector field measurement

CoMP Measurements

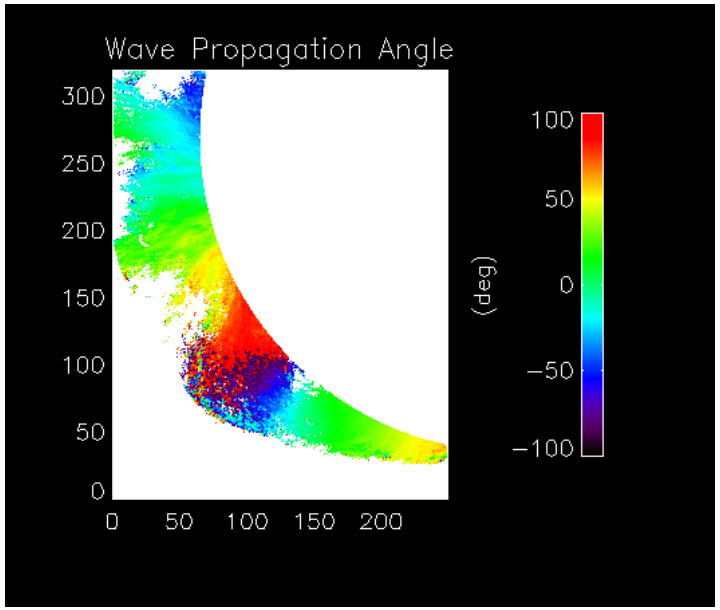


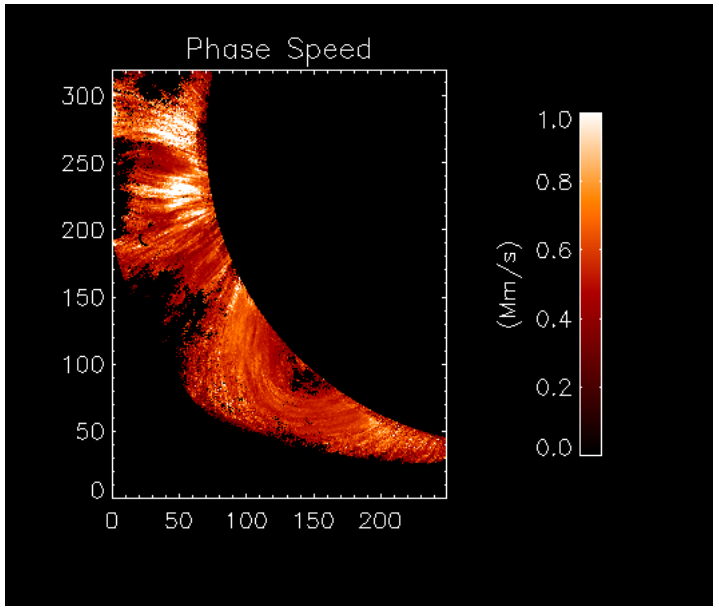
a) Intensity, b) LOS velocity, c) Magnetic Field Direction,
d) LOS Magnetic Field Strength obtained on Oct 31, 2005.

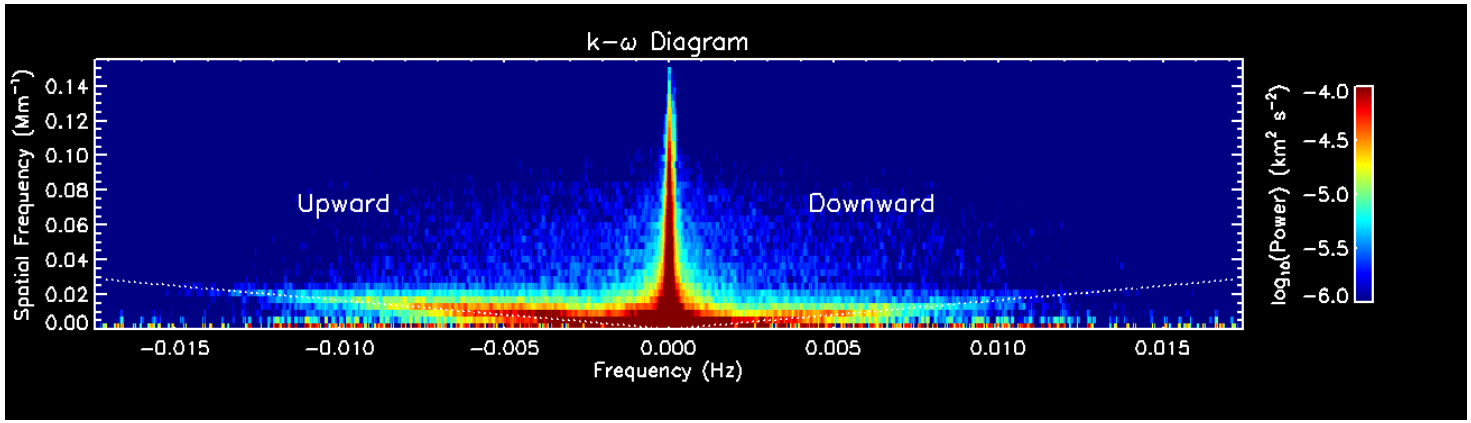
Waves


0.10
0.35
1.20
4.16
14.43
50.00
CoMP Intensity [μB]
30-Oct-2005 15:00:00.00
200
0
-200
-400
-600
-800
-1000
Y (arcsecs)
-1200
-1000
-800
-600
-400
X (arcsecs)
-0.50
-0.30
-0.10
0.10
0.30
0.50
CoMP 3.5mHz Filtered Doppler Velocity [km/s]
30-Oct-2005 15:00:00.00
200
0
-200
-400
-600
-800
-1000
Y (arcsecs)
-1200
-1000
-800
-600
-400
X (arcsecs)

Observed Wave Properties







Noise Estimate

$$v_A = 1210\left(\frac{B}{20\,G}\right)\left(\frac{n_e}{10^9\,cm^{-3}}\right)^{-1/2}\ (km/s) \qquad \text{(Aschwanden, 2004)}$$

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

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

Need $n_e/\sigma_{ne} > \sim 3$; CoMP measurements: $\sigma_{vphase} < 50$ 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