

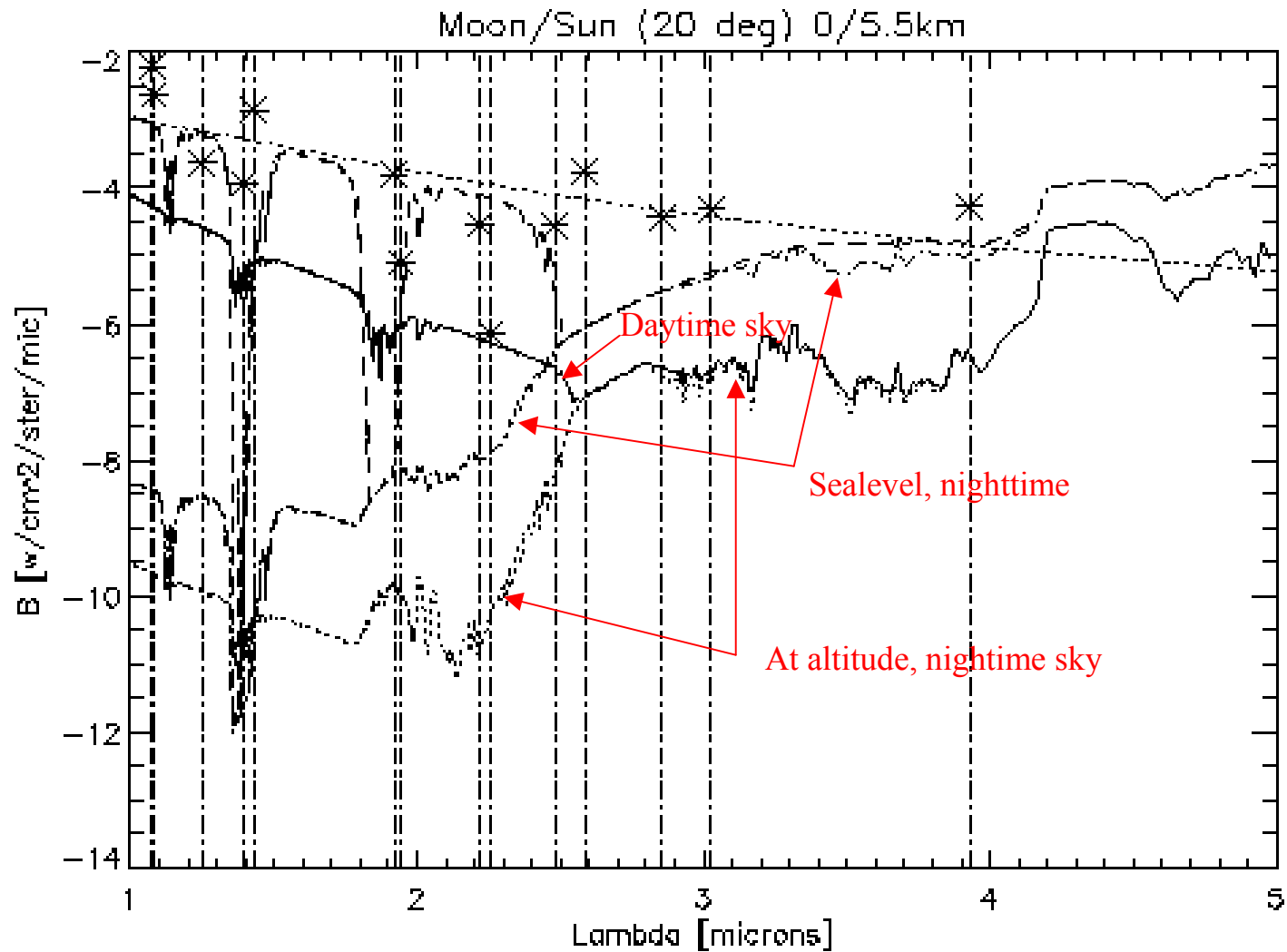
Measuring Coronal Magnetic Fields

- The infrared window
- Technology issues
- Extracting useful magnetic diagnostics

Why Infrared?

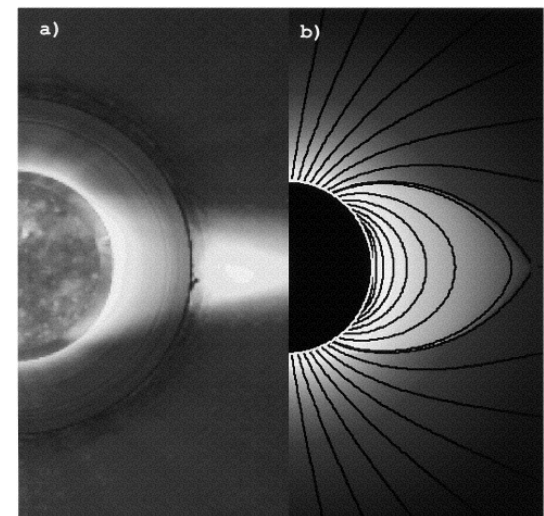
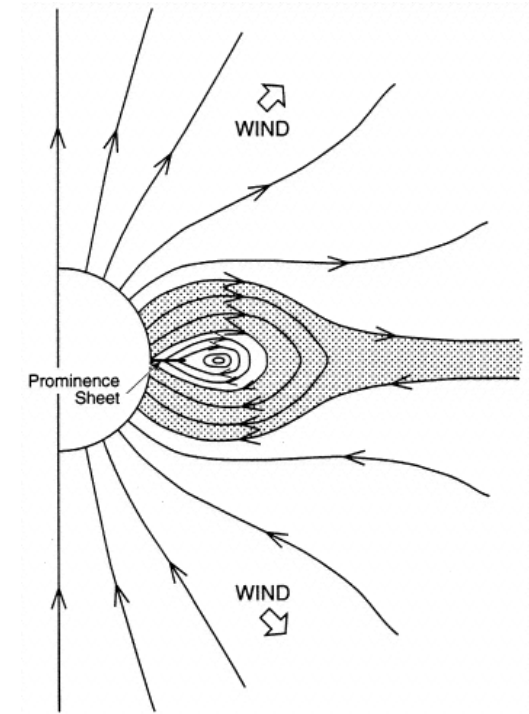
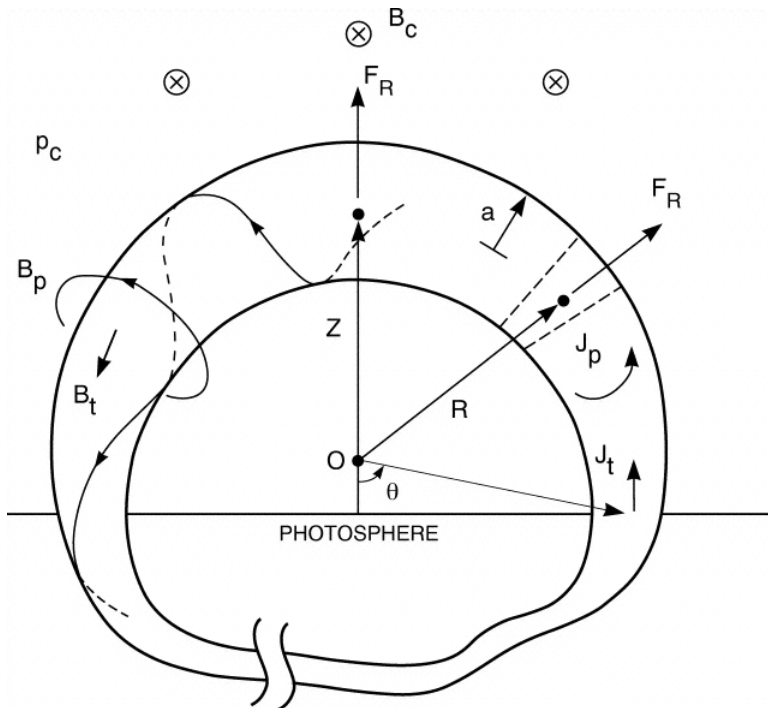
- IR detector technology offers new possibilities
- Atmosphere “technology” issues
 - angular resolution
 - transparency
 - scattered brightness
- Physics
 - deepest possible photospheric probe
 - highest possible magnetic sensitivity

Transparency/Scattering

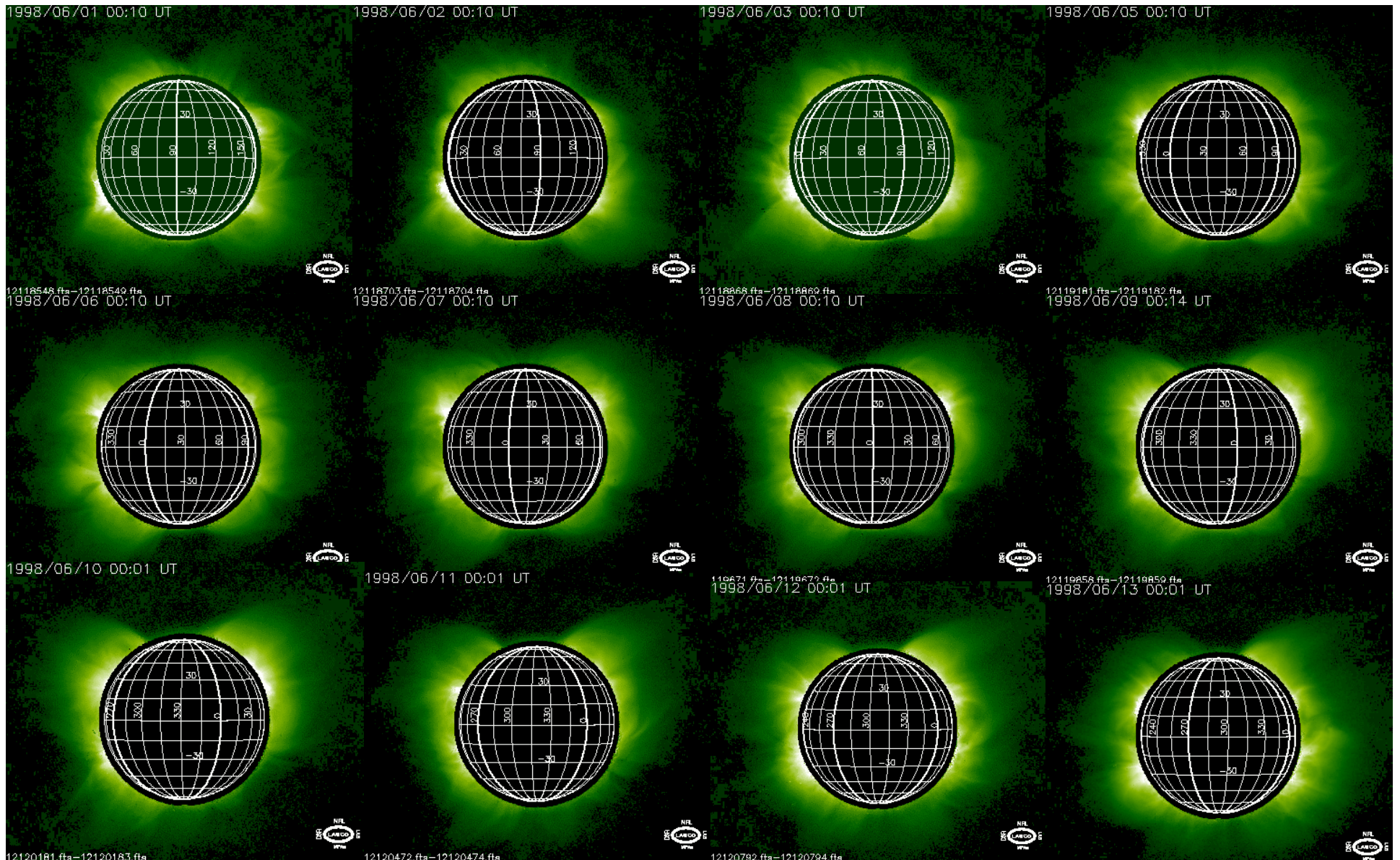


Only the magnetic field will tell...

(from Chen et al., Low, Gibson)



Time evolution doesn't always dominate rotation LASCO C1 Coronal timeseries



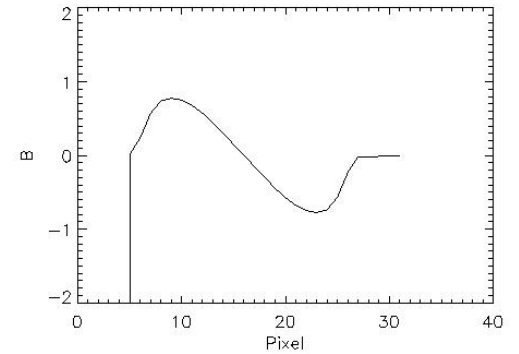
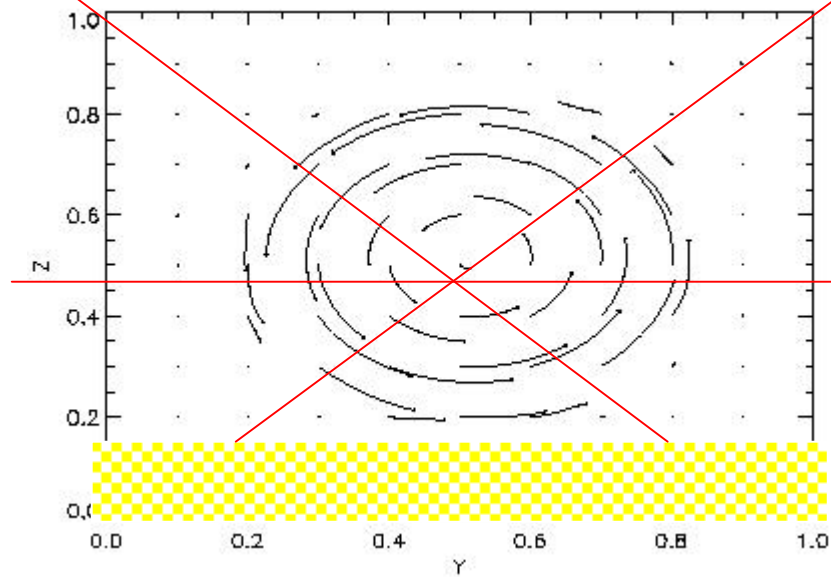
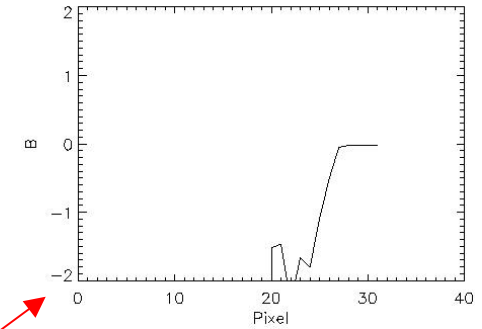
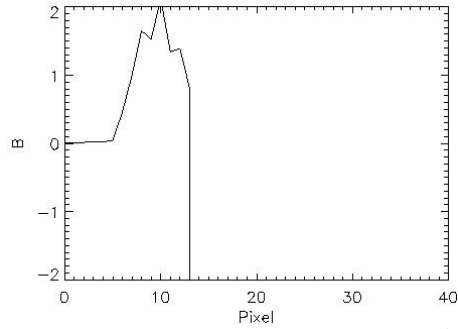
Vector Inversions

- FF and potential model from Low (1993)
 - External potential field+FF at $r < R$ + dipole
- Radon transform using Algebraic Reconstruction Technique

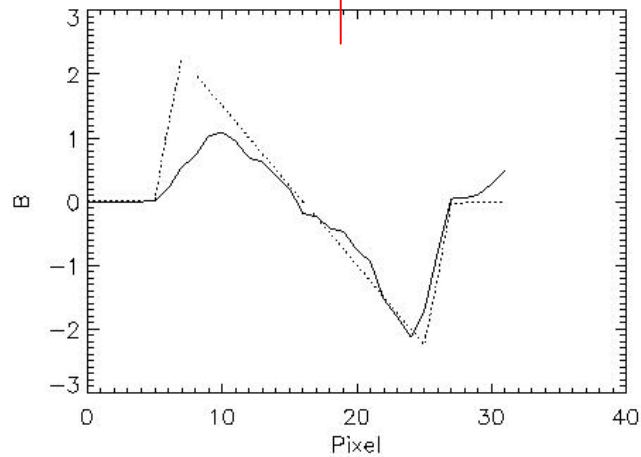
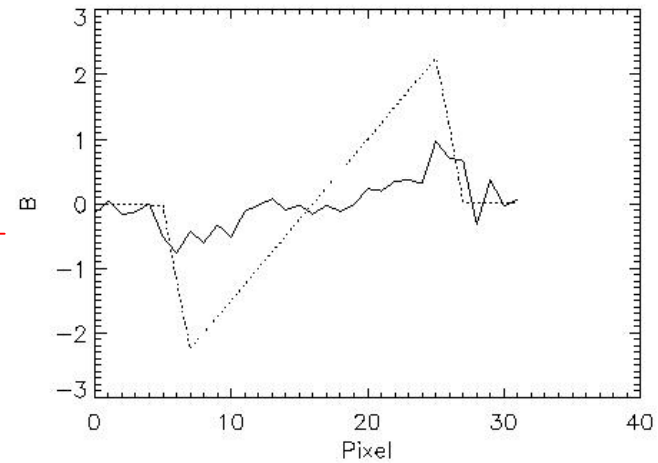
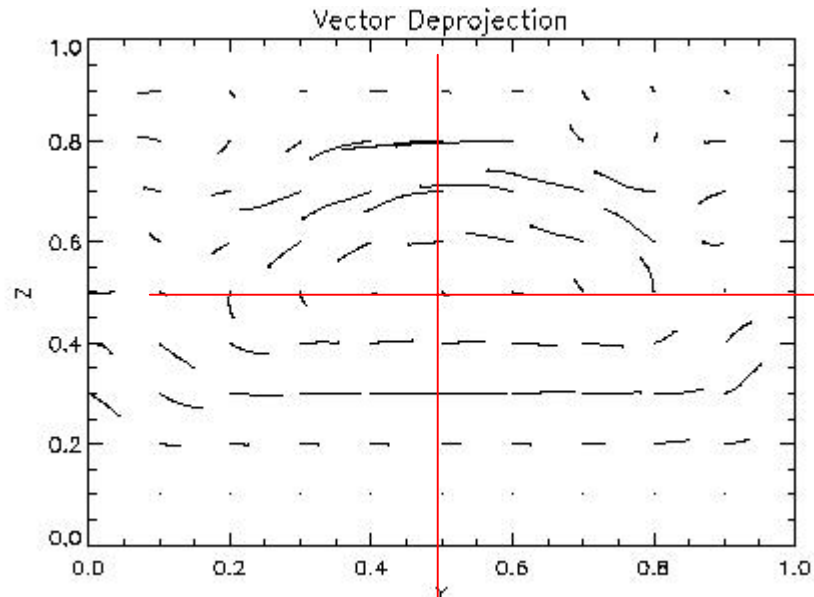
$$B(y, z) = \mathfrak{R}^{-1}(B_y(s, \theta) \cos \theta + B_z(s, \theta) \sin \theta)$$

$$\mathfrak{R}^{-1}(\cos \theta \sin \theta) = 0 \quad B_y \approx \mathfrak{R}^{-1}(B_{los} \cos \theta) \quad B_z \approx \mathfrak{R}^{-1}(B_{los} \sin \theta)$$

The projection problem

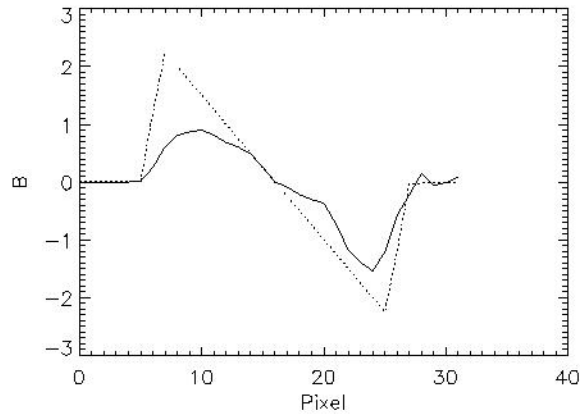
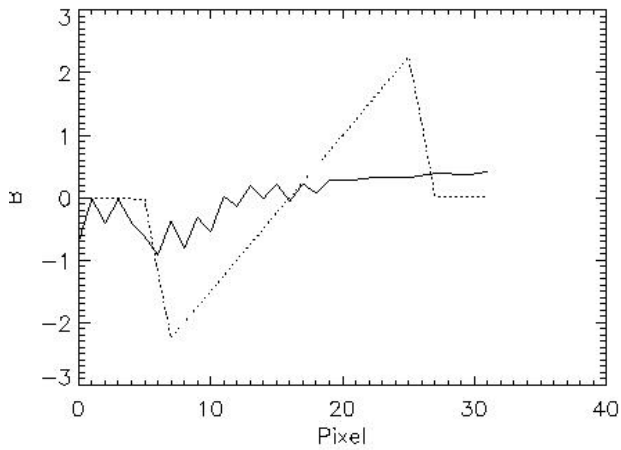
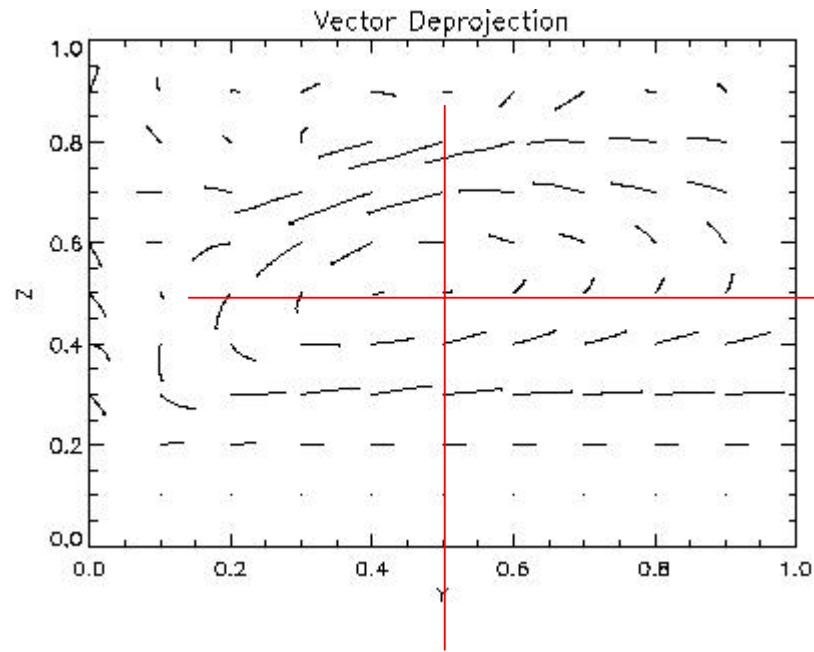


The inversion



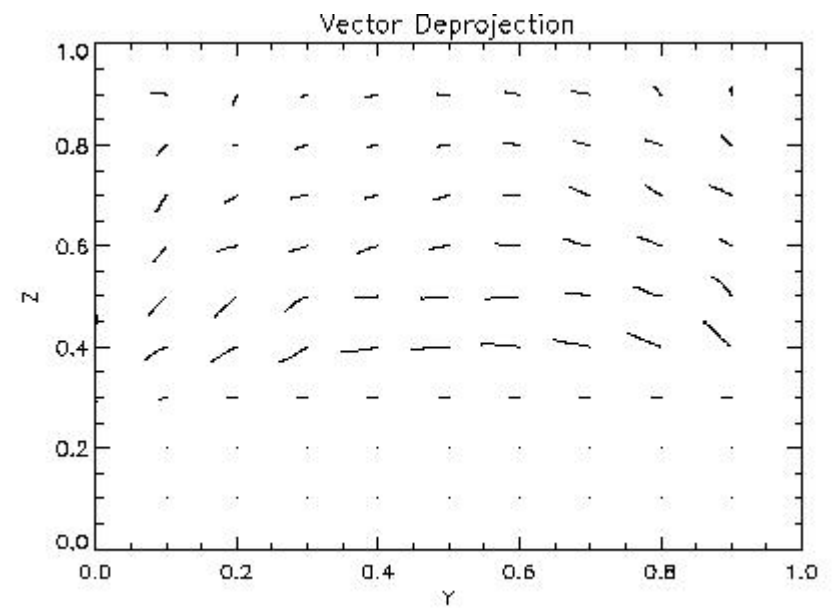
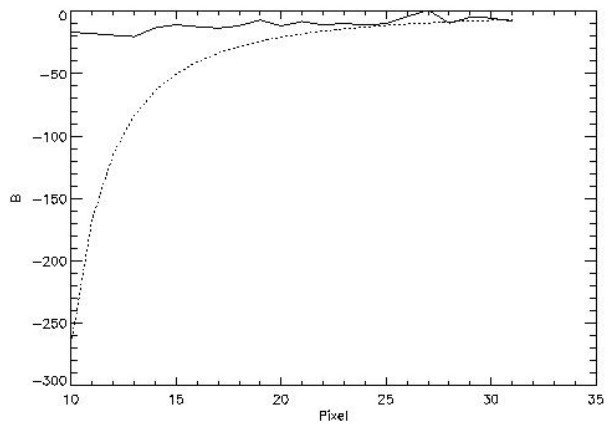
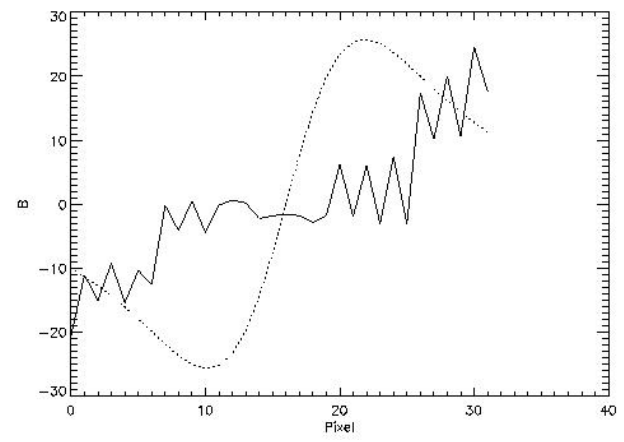
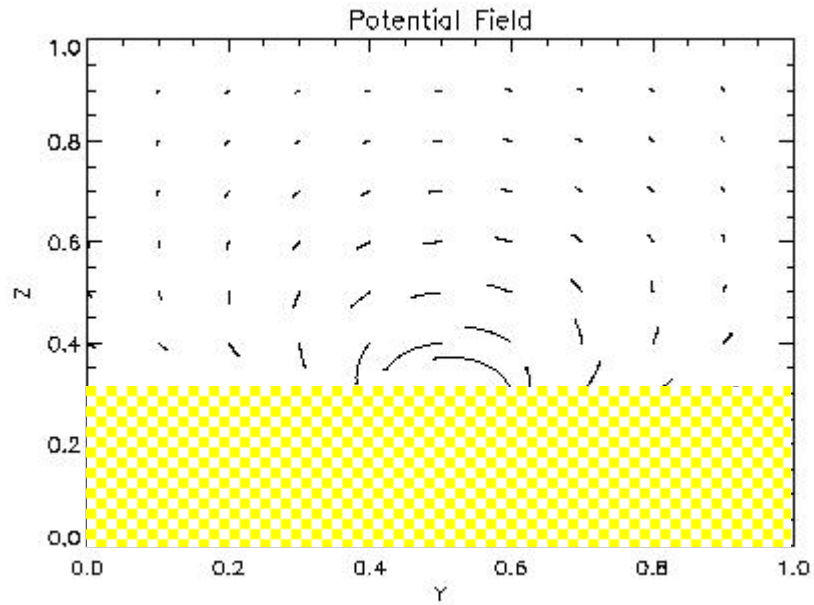
10 iterations over 12 projections
spaced 15 degrees...

Another inversion



6 projections, 0-90 degrees...

Potential field...



Summary

- Technology for IR solar physics is “ready”
- Until we can routinely measure coronal fields, we’re in the dark: IR Coronal magnetometry and photometry is possible now
- New instruments and technologies are ready for IR