

# Simultaneous Imaging and Spectroscopy by Inversion of MOSES Sounding Rocket Data

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# Abstract



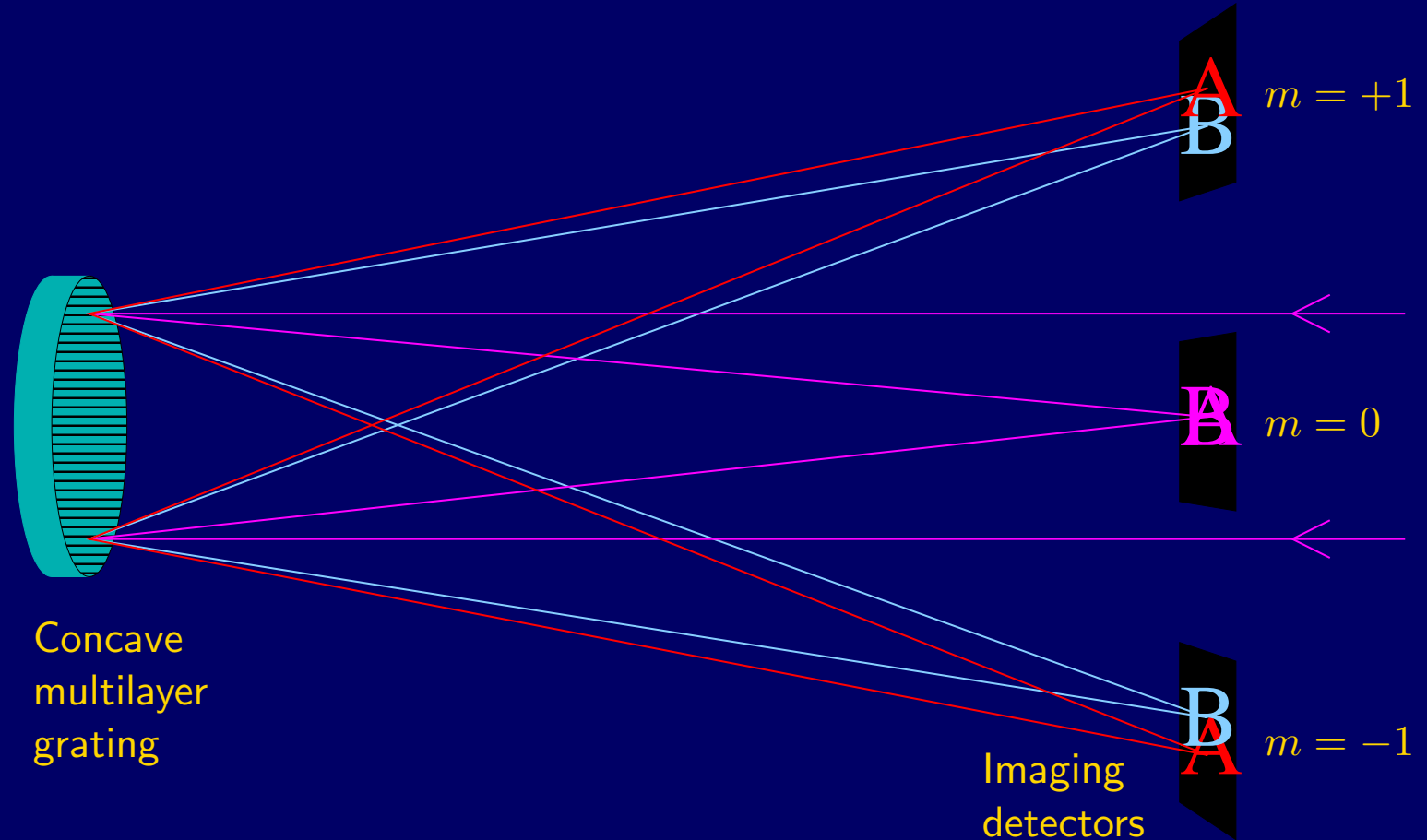
The Multi-Order Solar EUV Spectrograph (MOSES) forms 304 Å EUV images at three spectral orders from an objective multilayer grating. The images encode spatial and spectral data over a  $20 \times 10$  arc minute field of view. We describe an inversion algorithm and present spectra derived thereby from data obtained during the 2006 flight.

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# Multi-Order Solar EUV Spectrograph



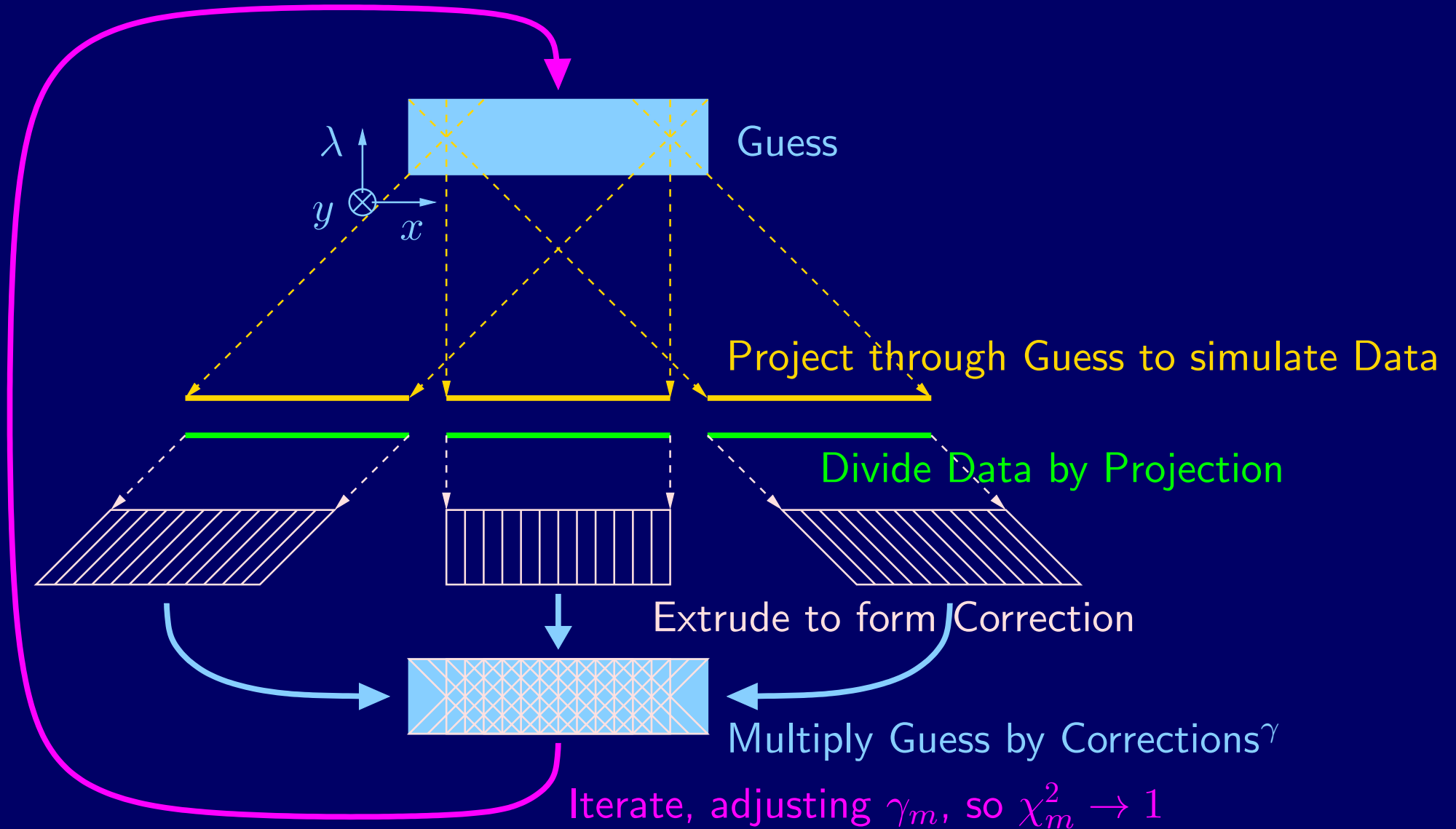
MOSES-I — Launched 2006-Feb-08



Slitless spectrograph, He II 304 Å. Line profiles are sensitive to differences between images.

1. Subtract Darks
2. Flat Field
3. Coregistration
4. PSF Equalization (Atwood et al., 203.03)
5. Inversion (sSMART)

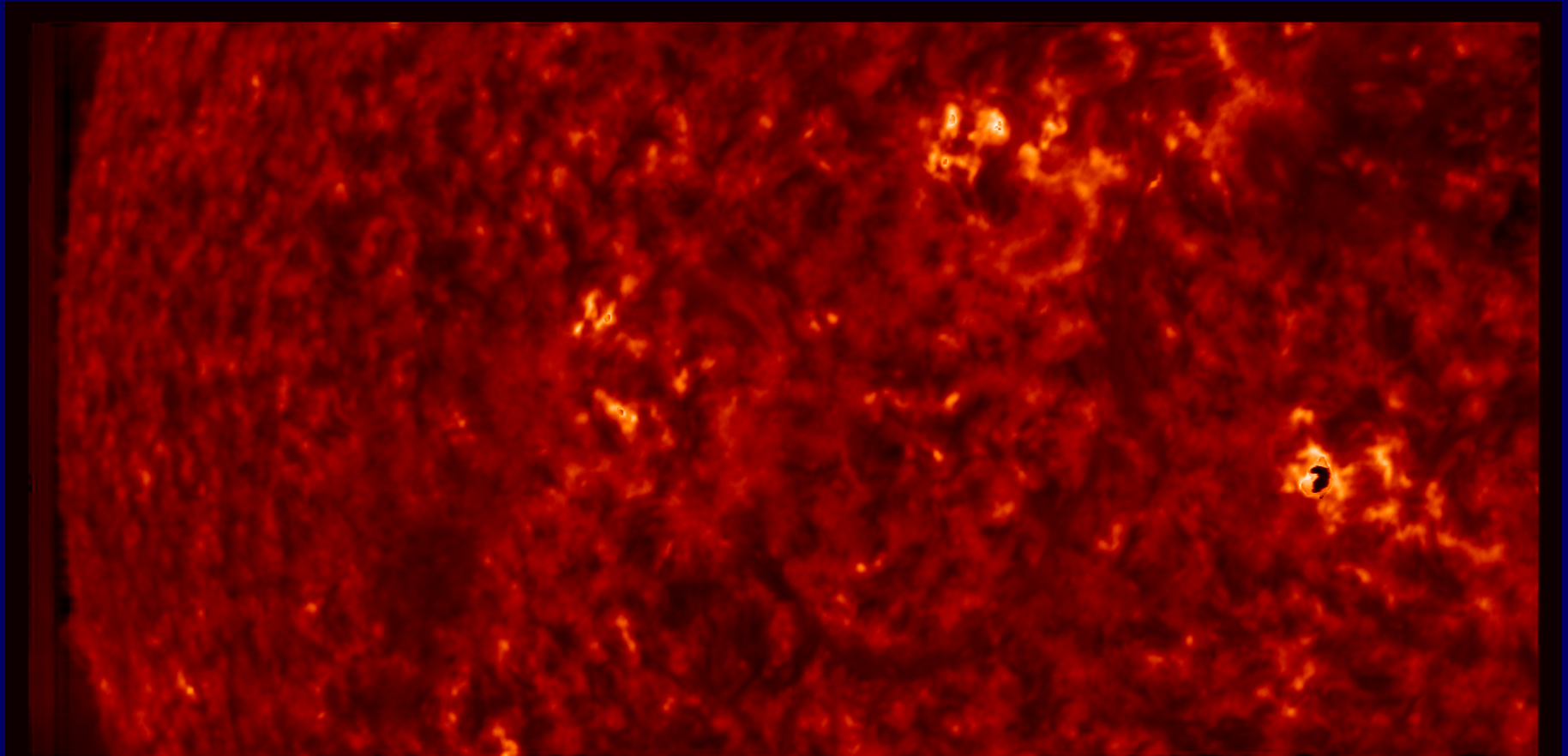
*Our latest inversion code is robust, handles saturated pixels or other missing data gracefully, and runs successfully on all the data.*



## Results: Line Intensities



Intensities of He II 303.8 Å (orange) and Si XI 303.3 Å (green).

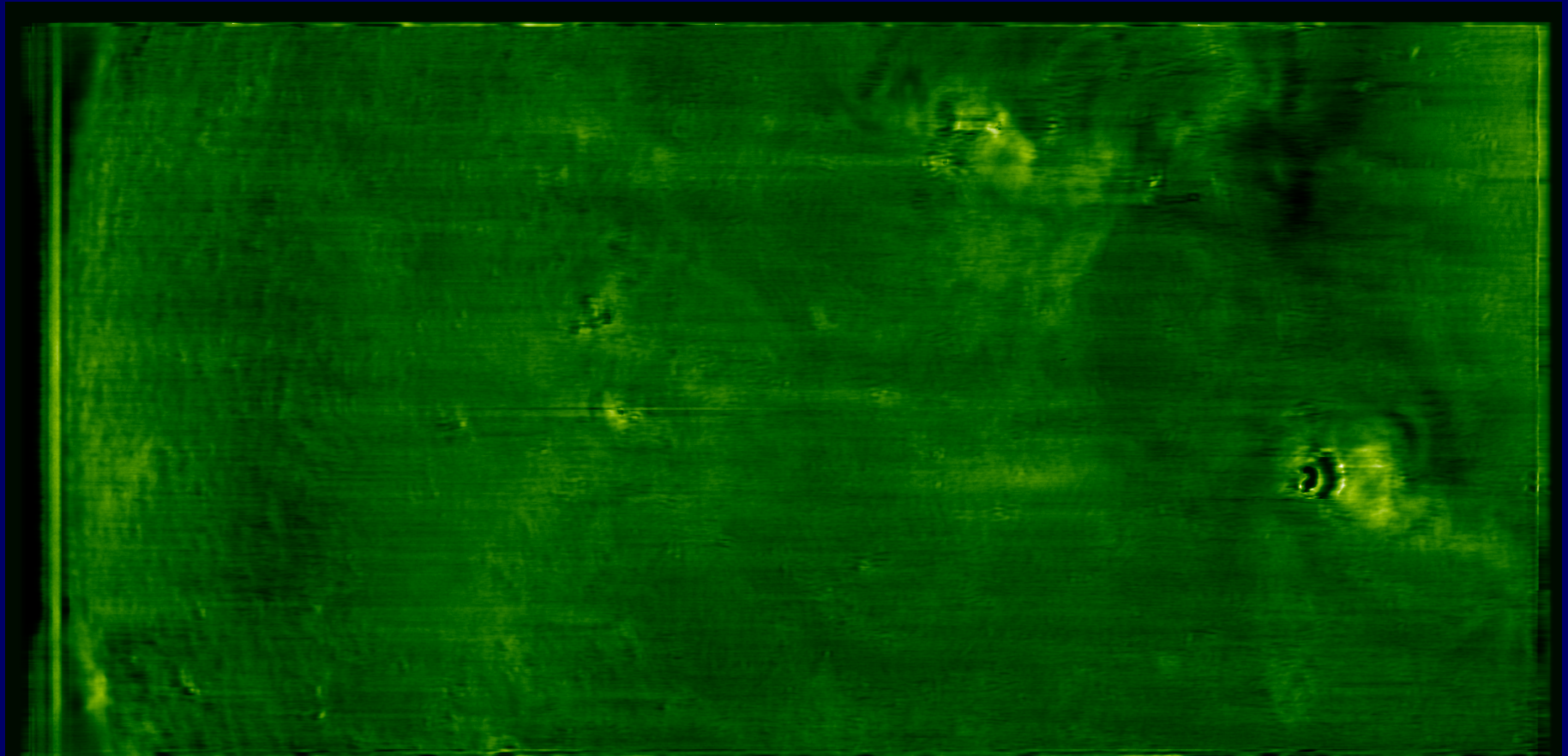


He ii images purer than those obtained by multilayers may help to constrain models of the line's formation (Plovnic 203.08).

## Results: Line Intensities



Intensities of He II 303.8 Å (orange) and Si XI 303.3 Å (green).



Detection of Si XI in quiet sun is difficult (cf. Brosius, Davila & Thomas 1998), but we see coronal features with little cross-talk from He II.

## Other Coronal Emission?

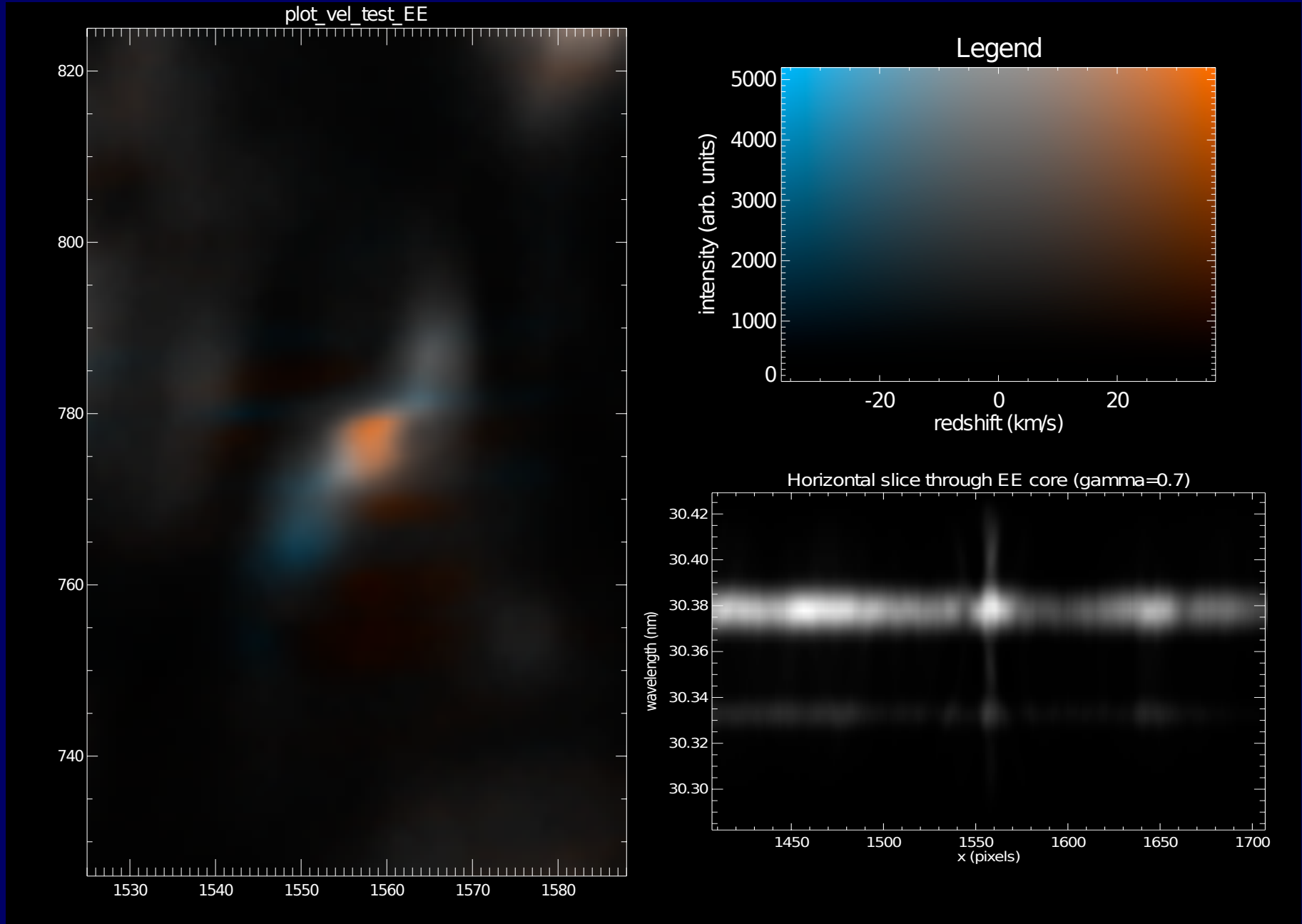
Following is a difference of  $m = 0$  intensity minus  $m = -1$  intensity.



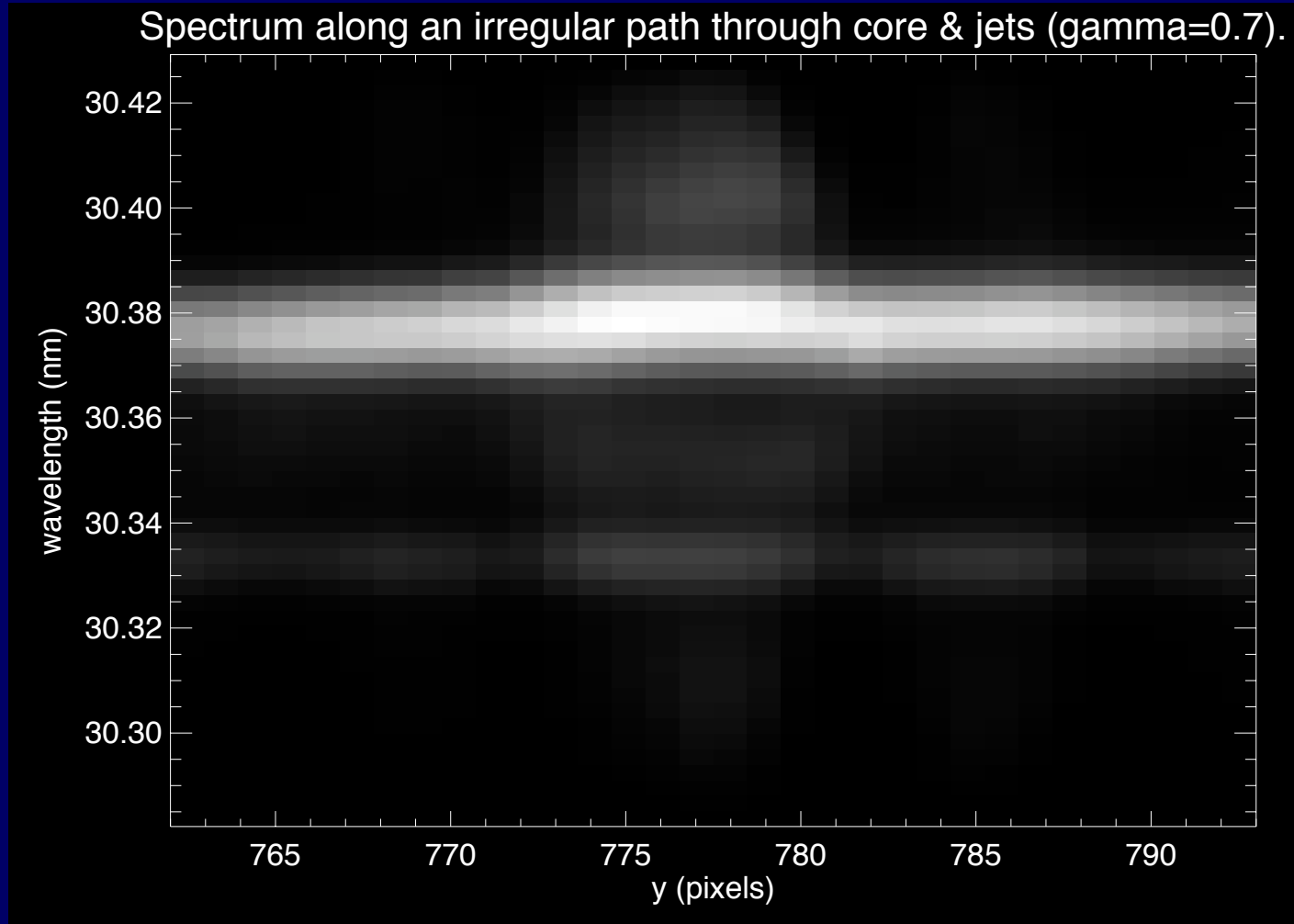
The “wishbone” at top center is neither Si XI 303 Å, nor Fe XV 284 Å, nor Fe XVI 335 Å. We are working to discover what it is.



# Results: Explosive Event

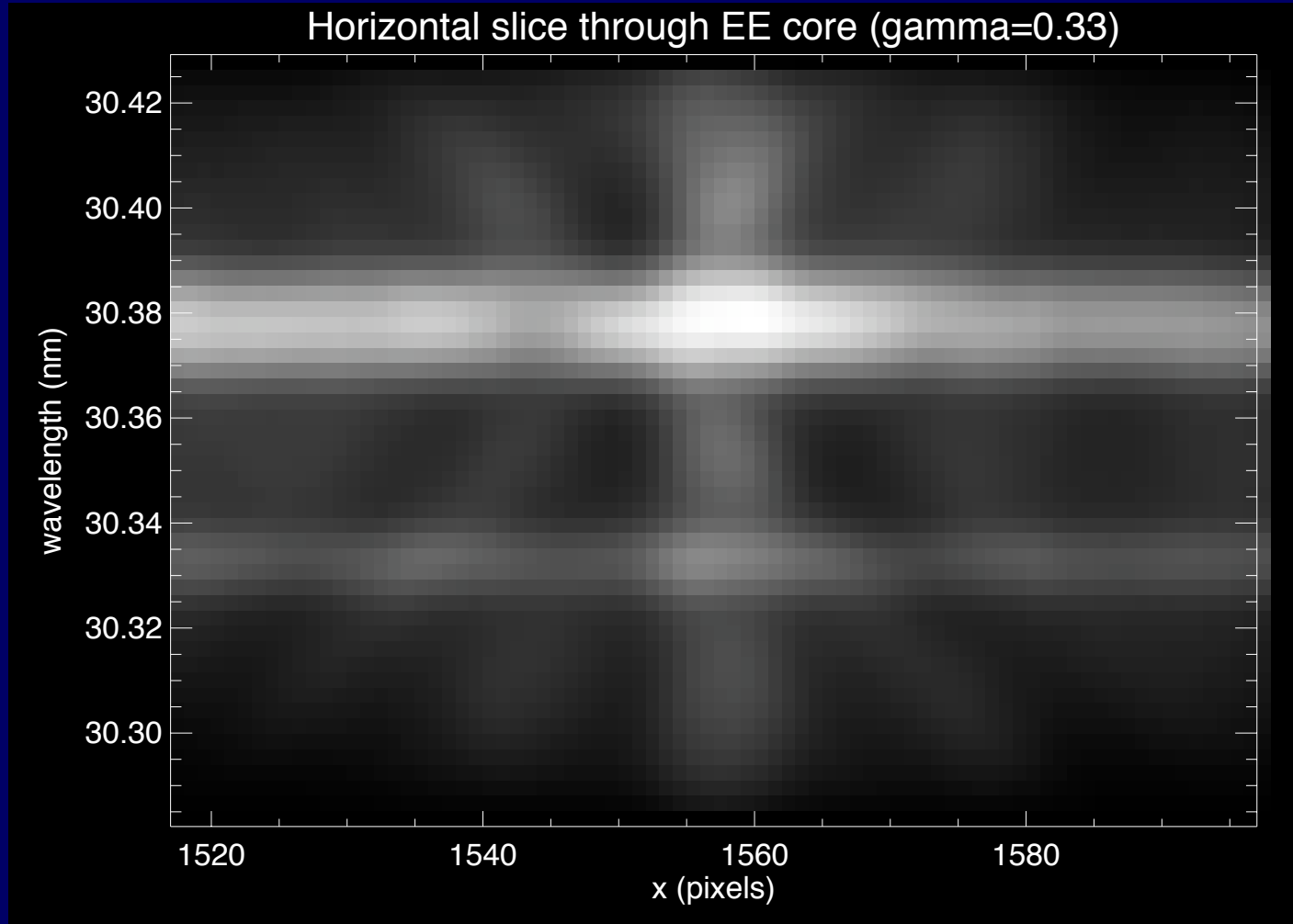


# Results: Explosive Event



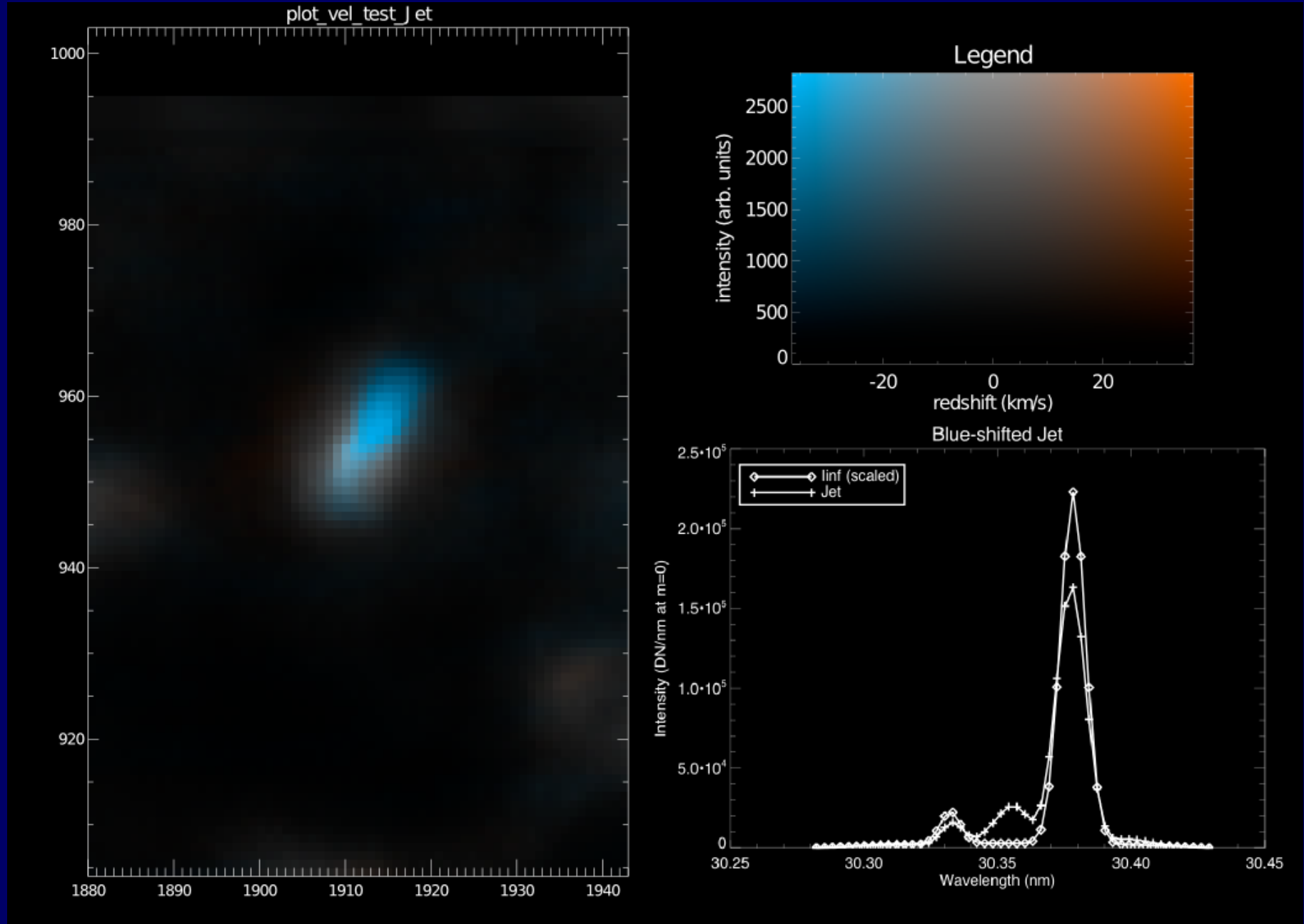
Here we use a “virtual slit” along an arbitrary path to display spectra of the blue shifted southern jet, red shifted and broadened core, and the northern jet.

# Results: Explosive Event



The artifacts shown in this cube-root-scaled image indicate the limitations of tomographic inversion using only 3 projections ( $m = 0, \pm 1$ ). (see Courier, 203.13)

# Results: Jet



# Conclusions



- We can now invert all the MOSES data (and have).
- PSF equalization is in place (Atwood et al., 203.03).
- Many interesting phenomena to be described.
- Lessons learned:
  - Controlling PSF is important.
  - More spectral orders would help constrain line profiles.
- $\Rightarrow$  New proposal: SIFS (Courrier, 203.13).