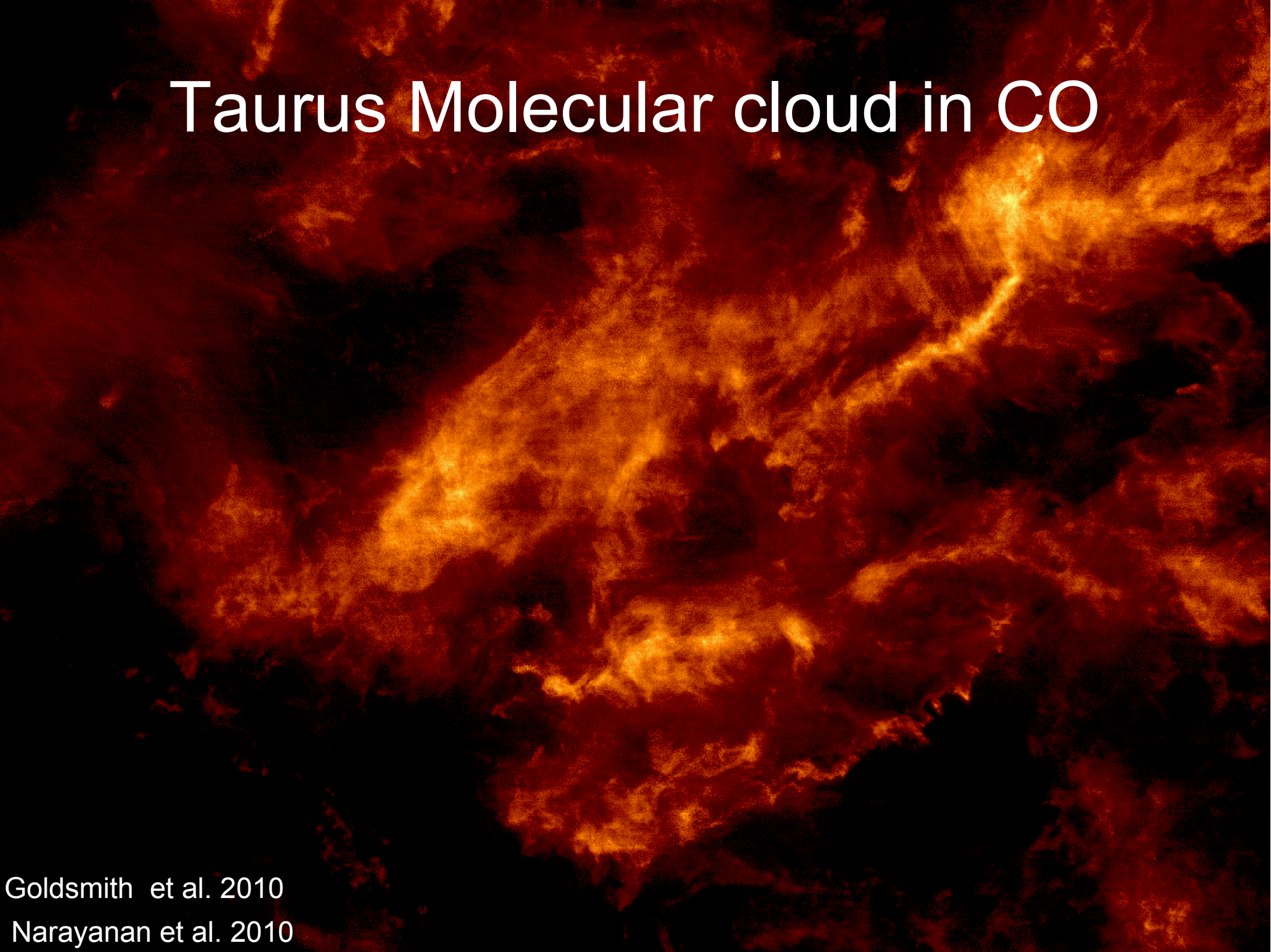
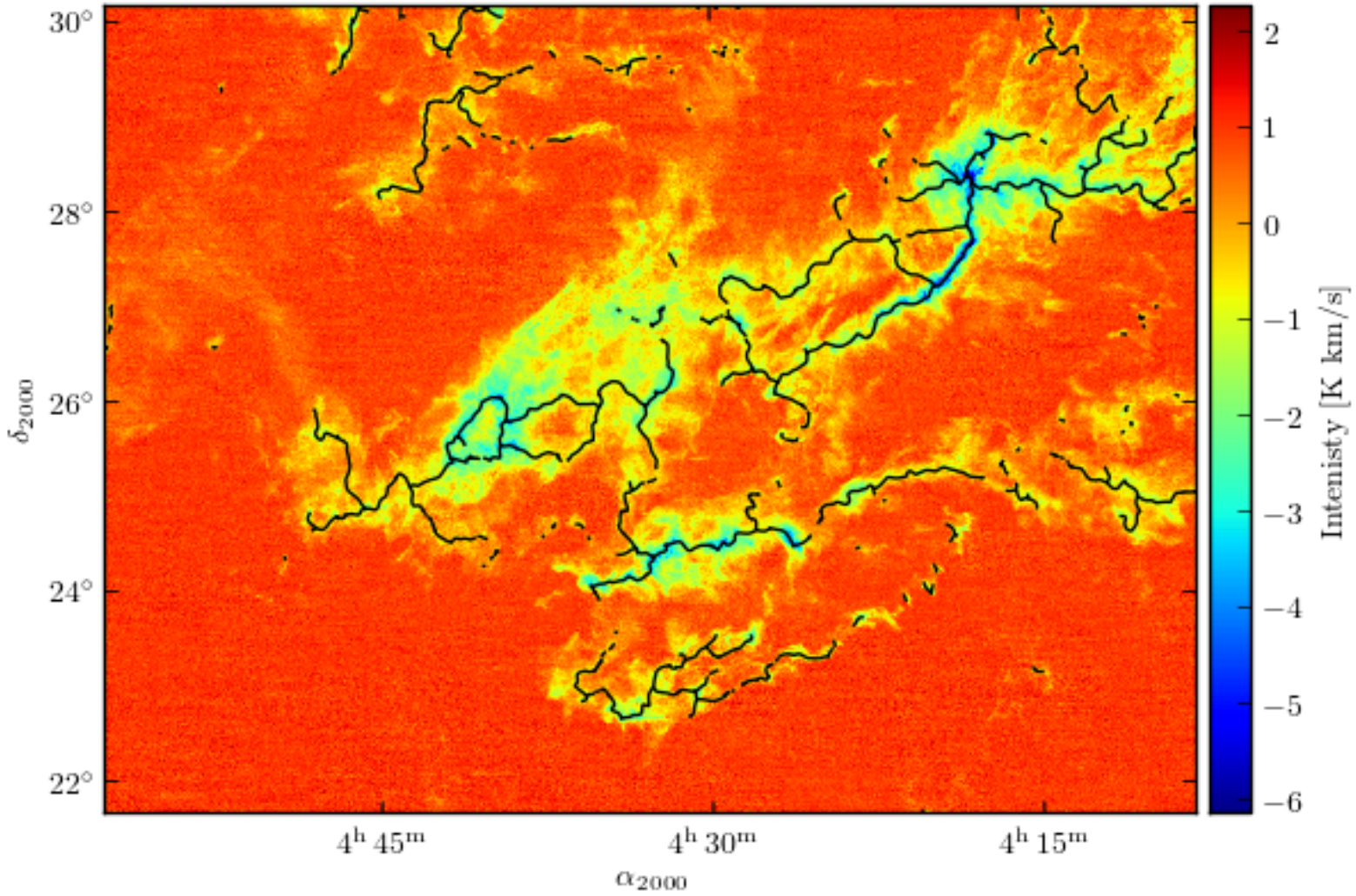
^{13}CO filaments in the Taurus Molecular Cloud

Georgia Virginia Panopoulou
University of Crete

Konstantinos Tassis (UCrete), Paul Goldsmith (JPL), Mark Heyer (UMASS)

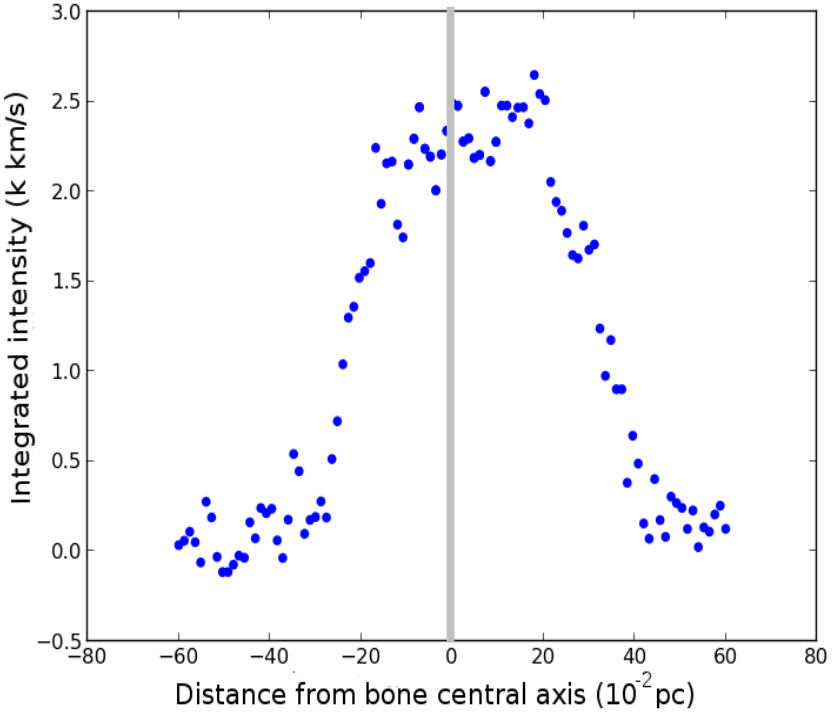

Taurus Molecular cloud in CO
Goldsmith et al. 2010
Narayanan et al. 2010

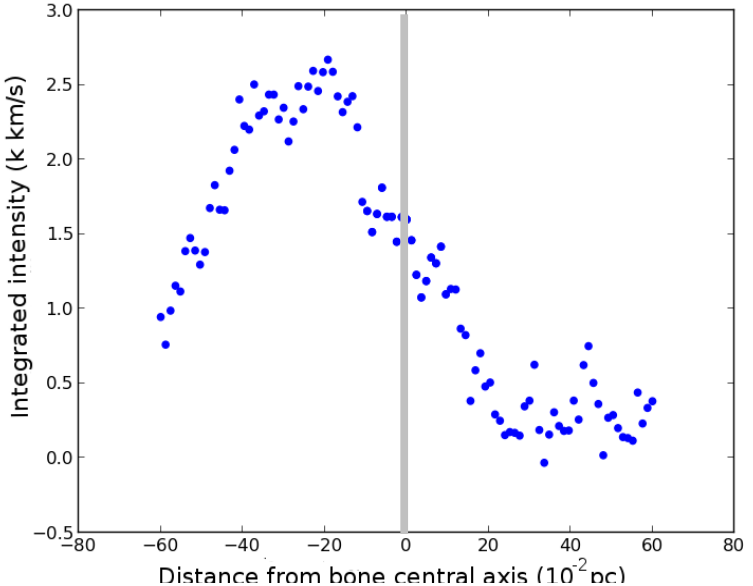
Methodology

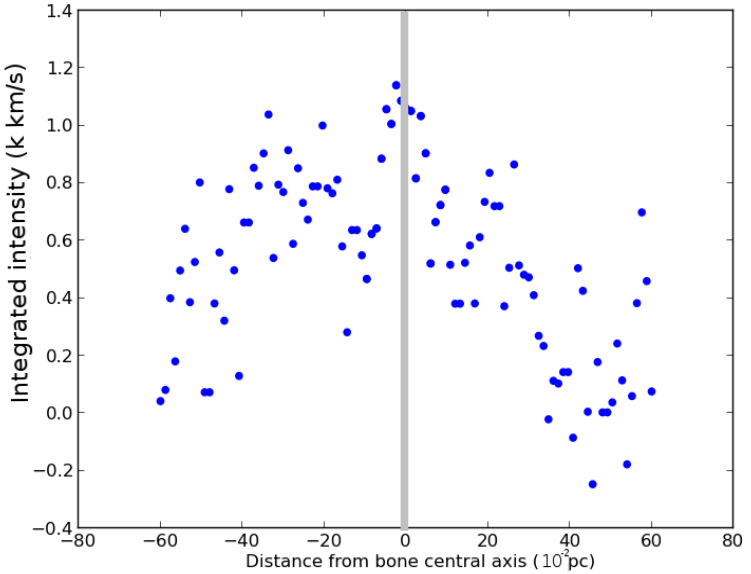


- Trace filamentary network (DisPerSe)

Methodology





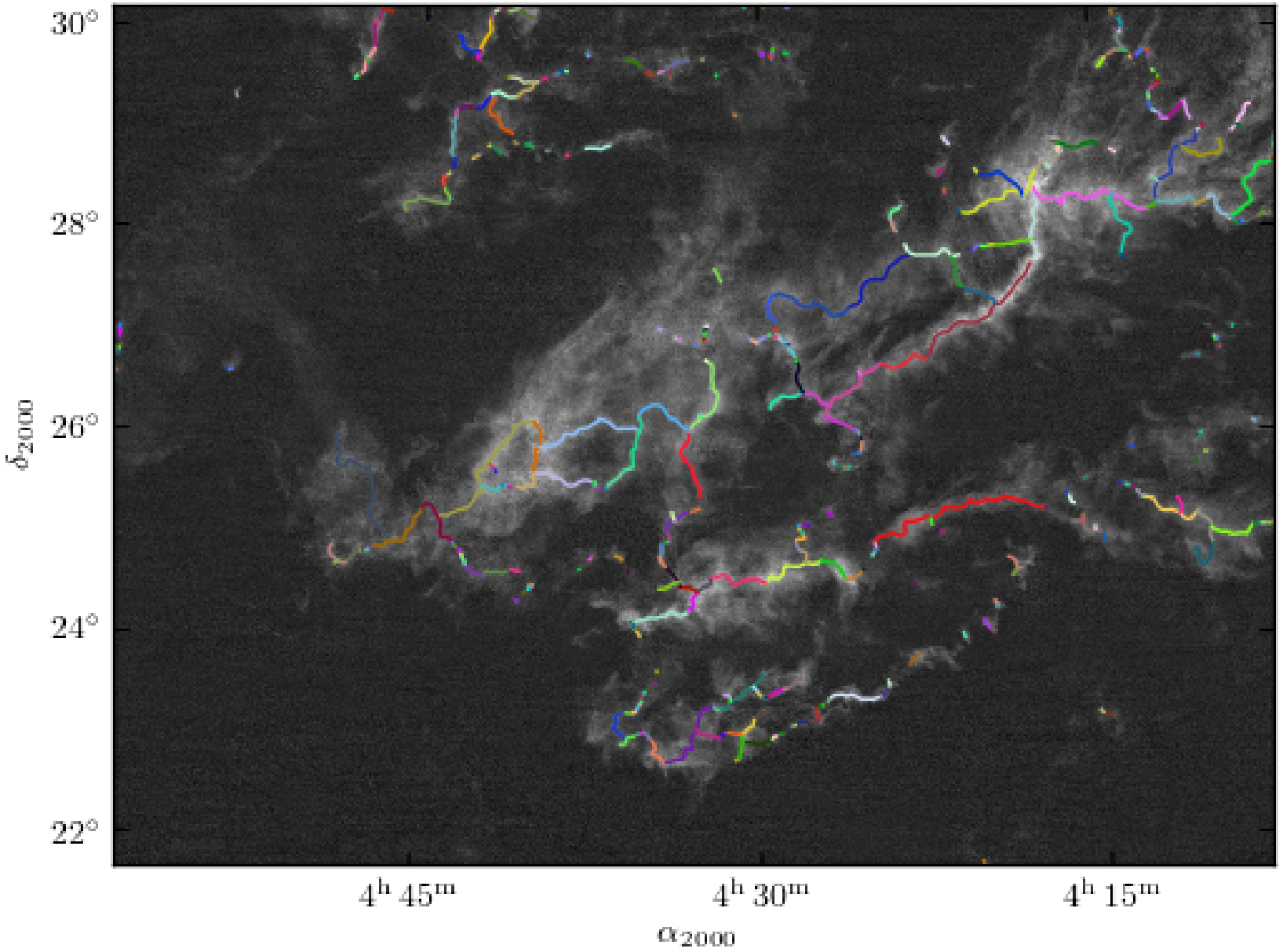


Methodology

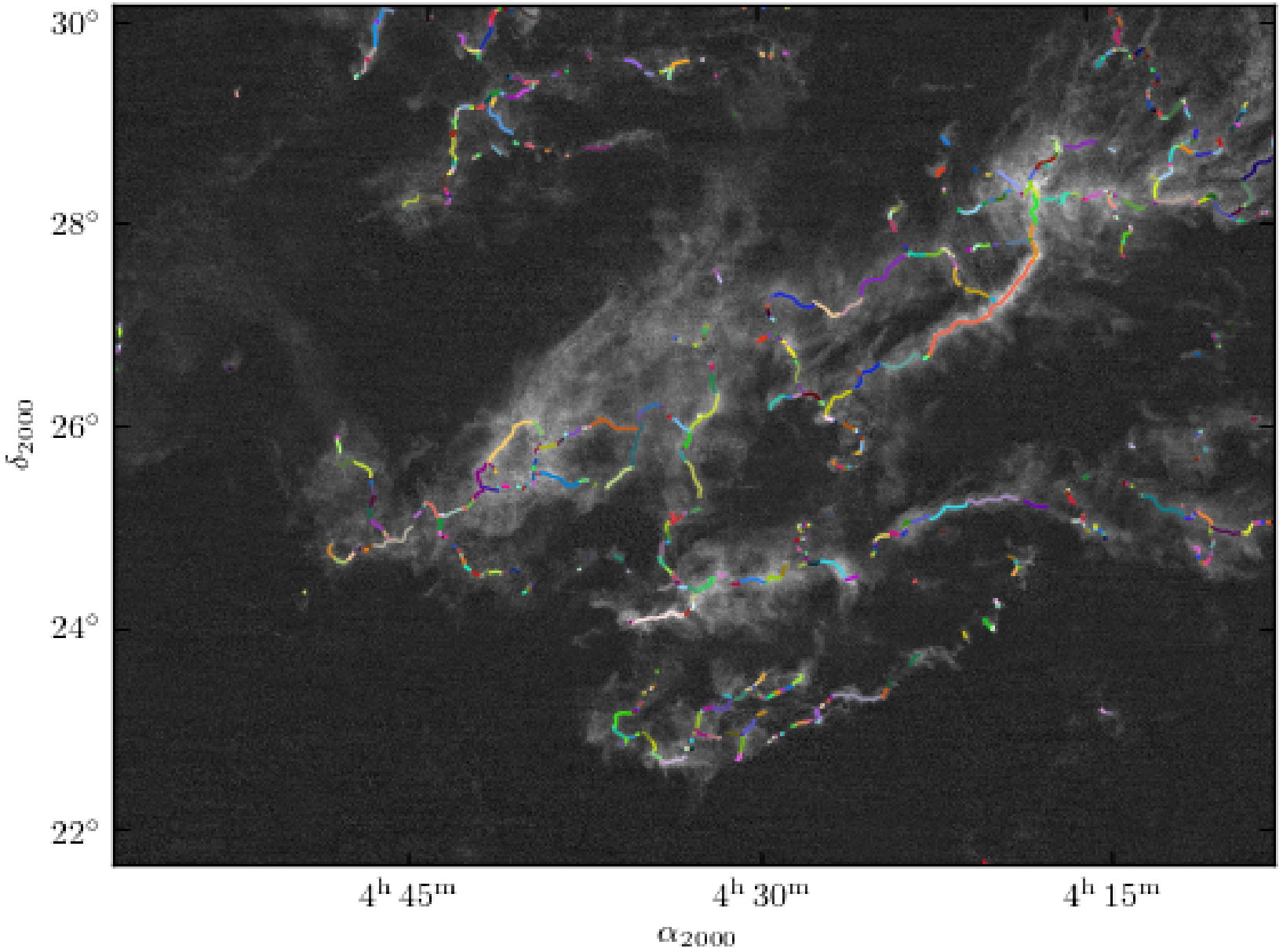
- Automatically assess the shape of a profile
- Perform quality checks
  - existence of peak
  - peak at center
  - Peak intenisty above noise level

- Filter network of DisPerSe to only include continuous structures with desirable properties

Network of integrated emission map (DisPerSe)

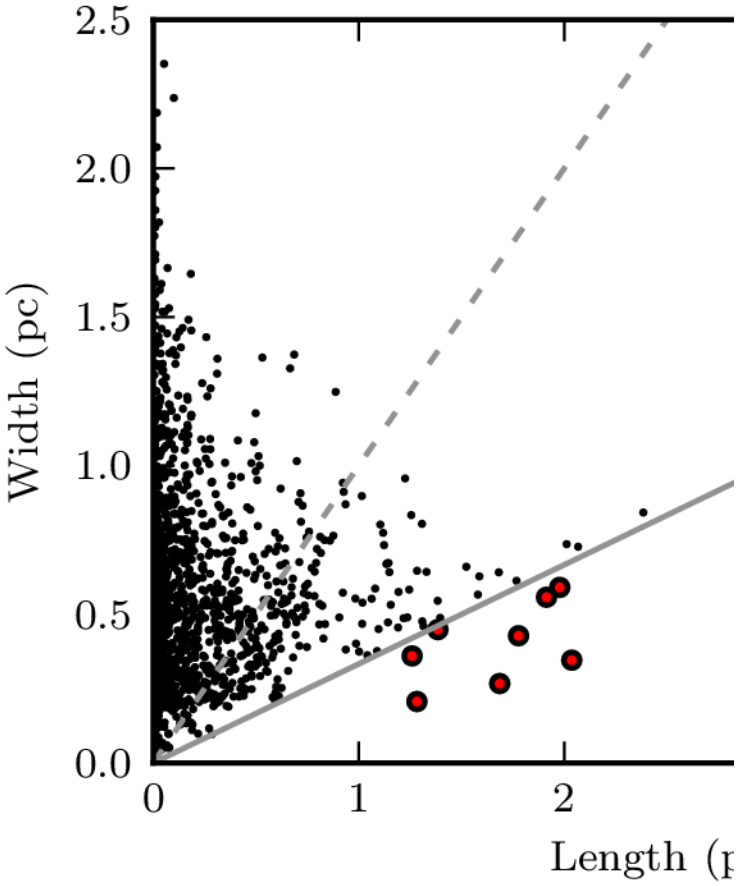


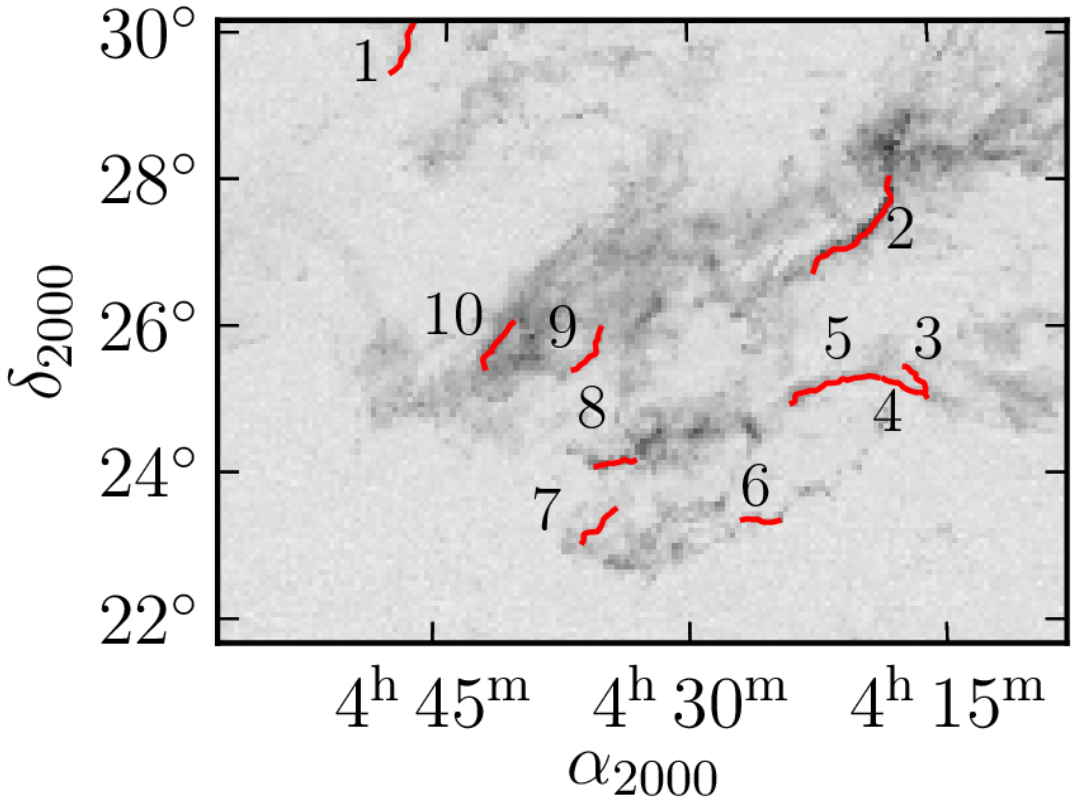
Network of integrated emission map (filtered)



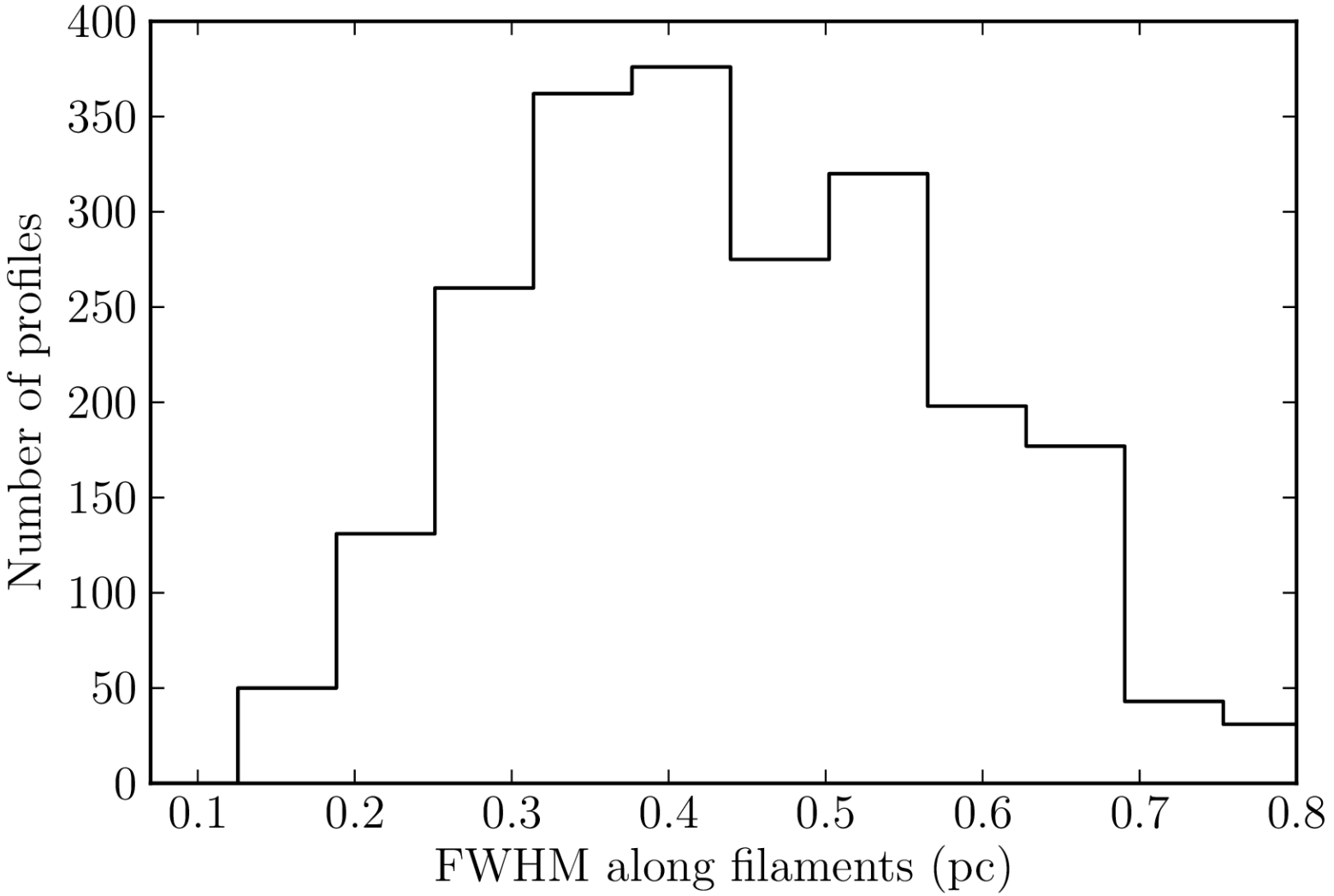
What makes a filament?

- An elongated structure with at *least* a 3:1 length to width ratio

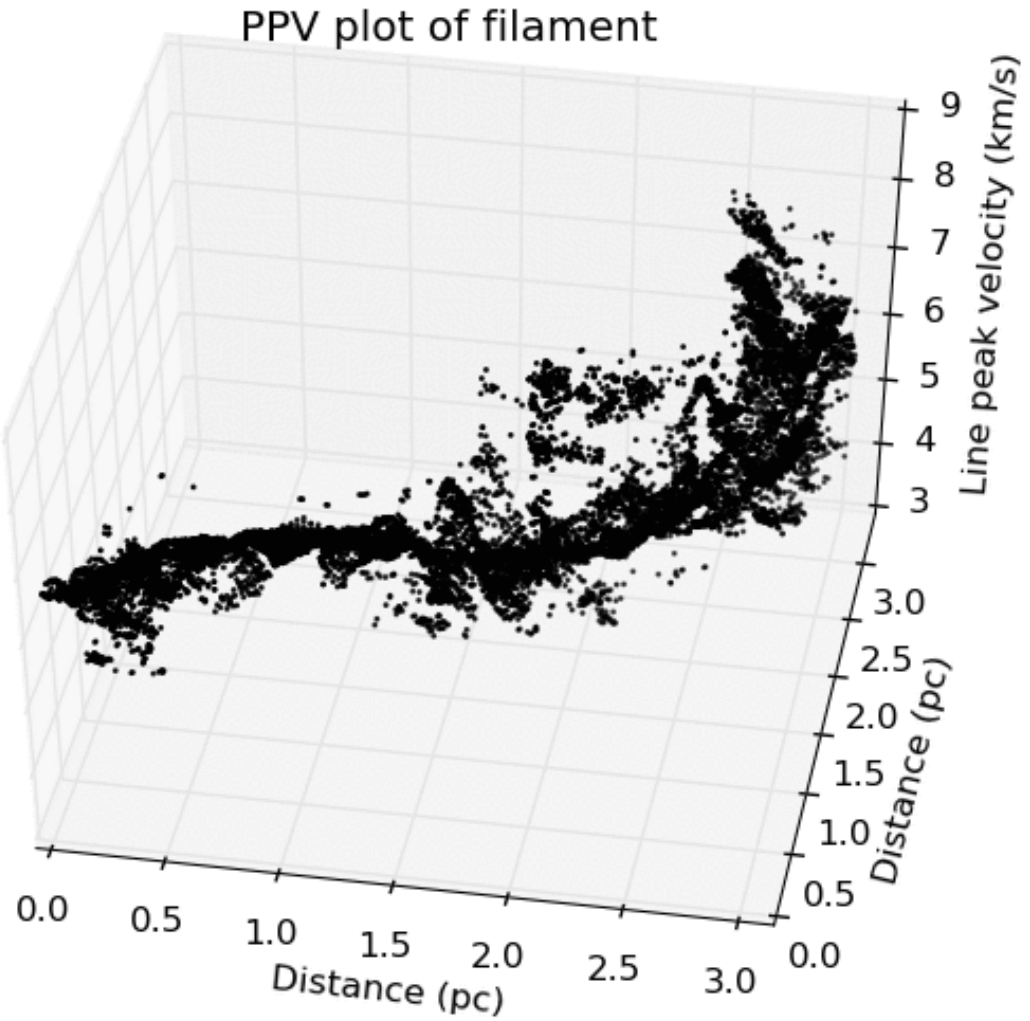




Width Distribution



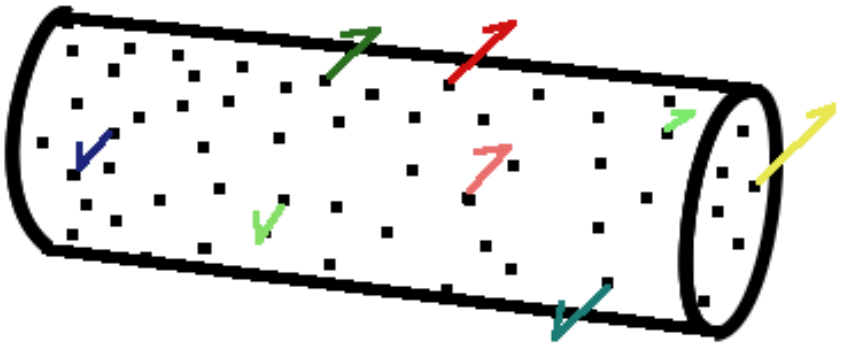
Filaments in integrated map



Filaments in integrated map

Filaments gravitationally unbound

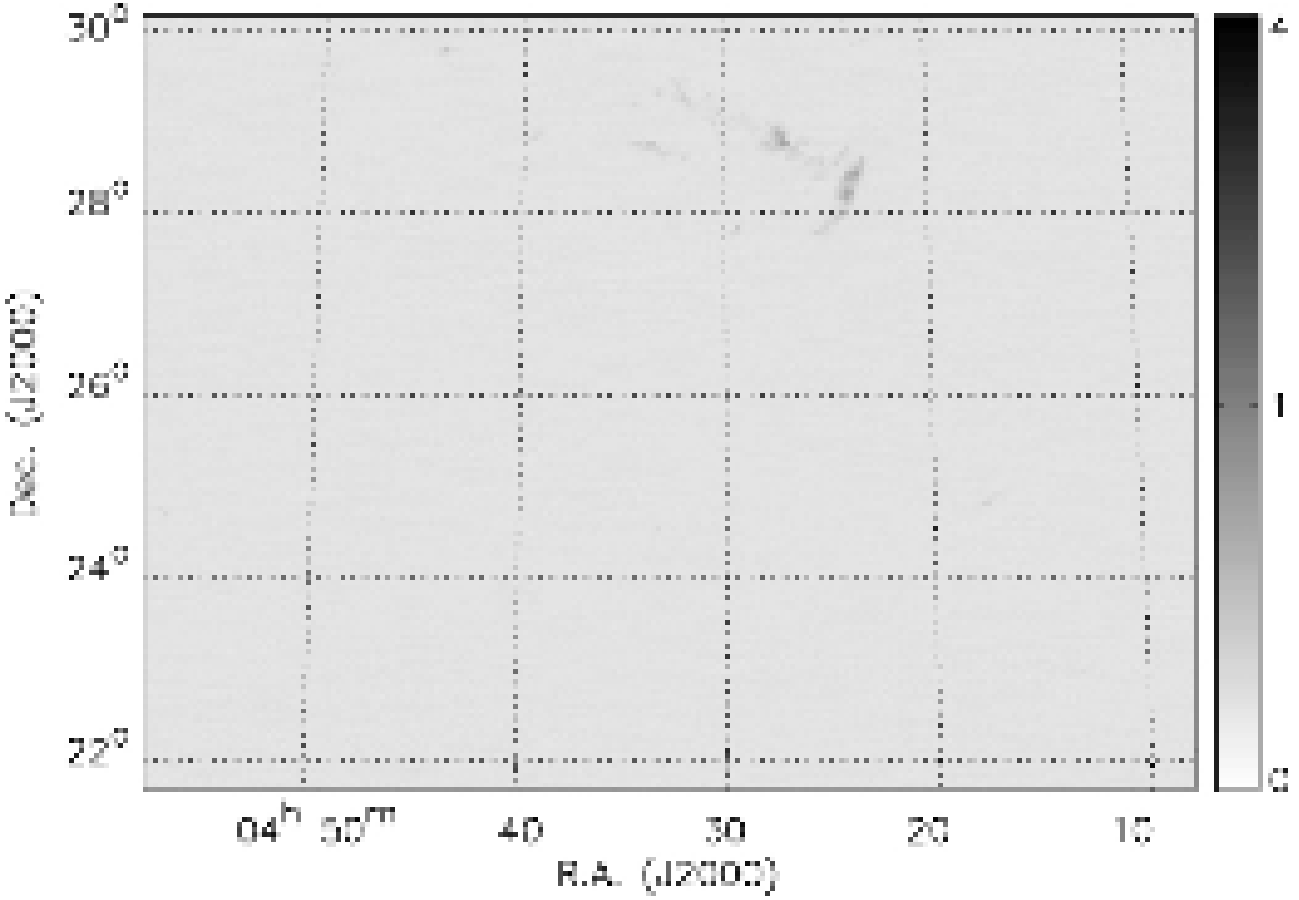
Now



After 1Myr

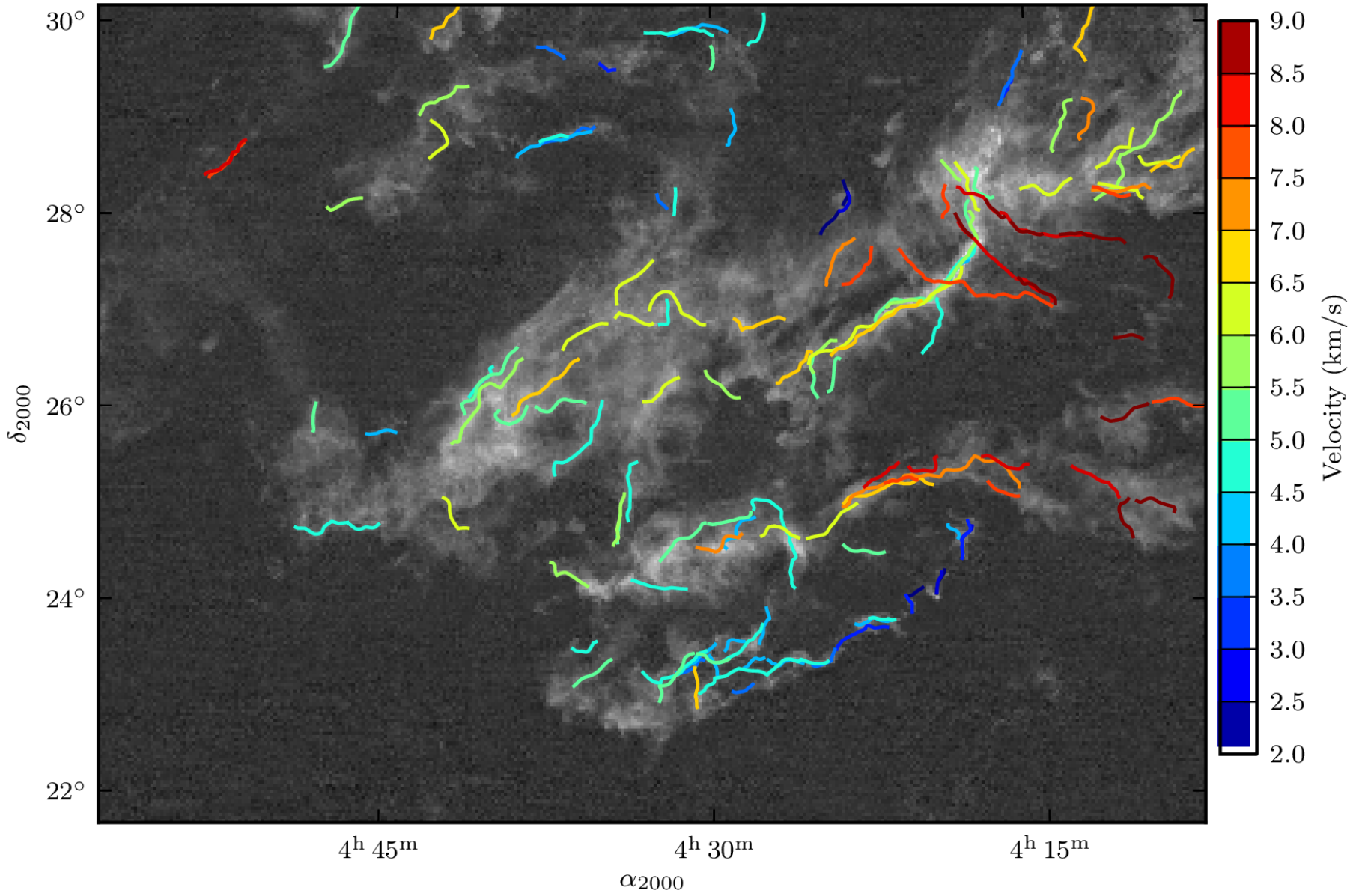
Even if cylinders now, they would disperse in a Myr

Filaments in velocity channels

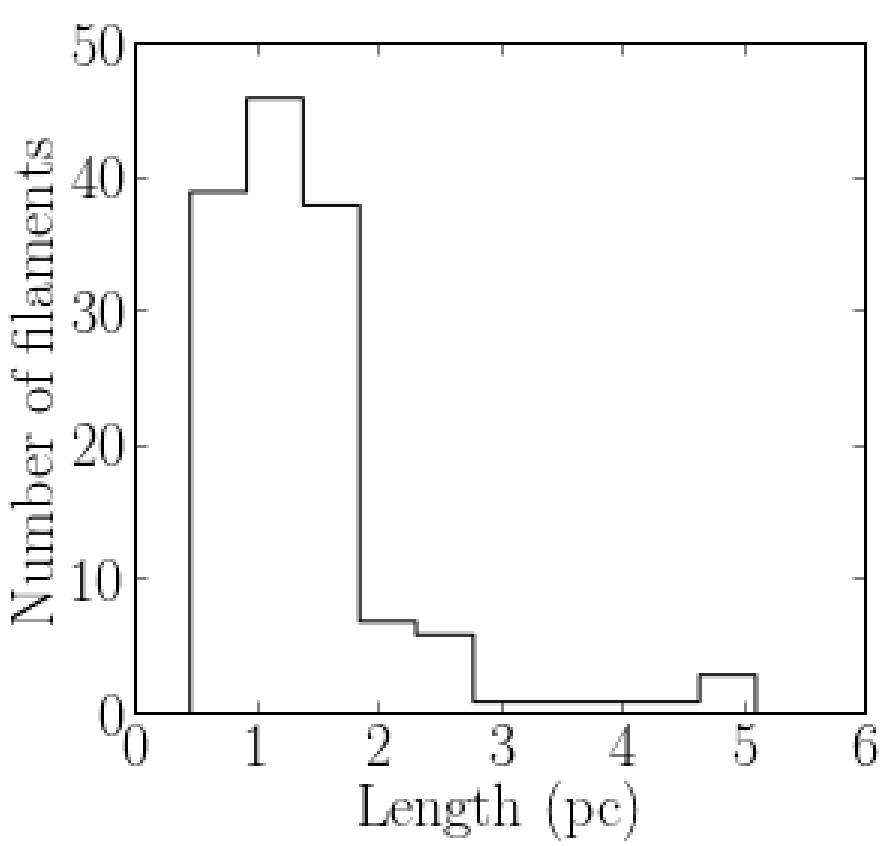


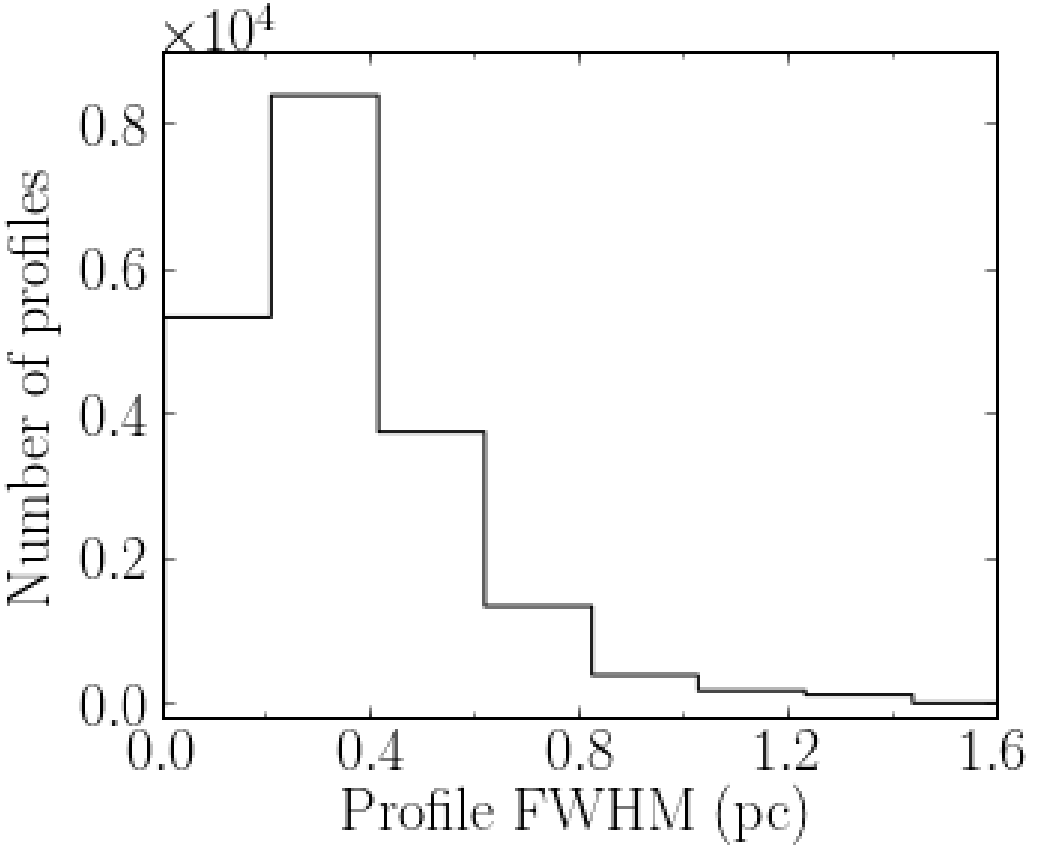
- 14 channel maps, 0.5 km/s width
- Same analysis reveals 143 filaments

Filaments in velocity channels

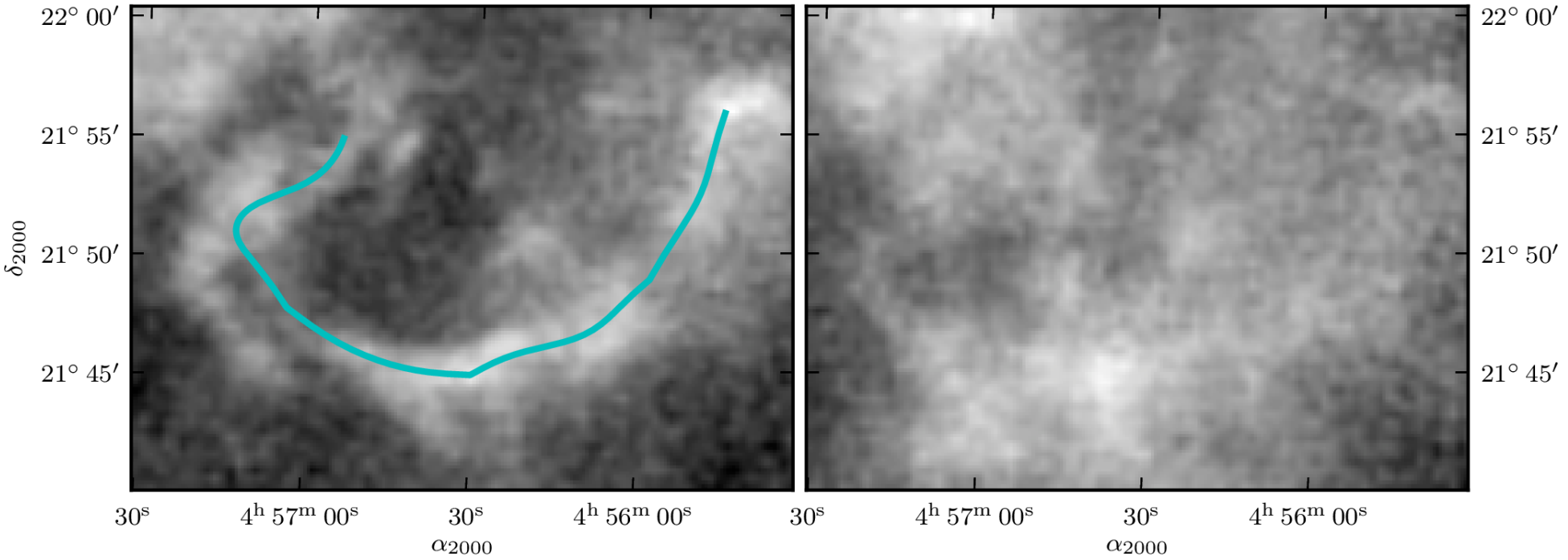


Filaments in velocity channels

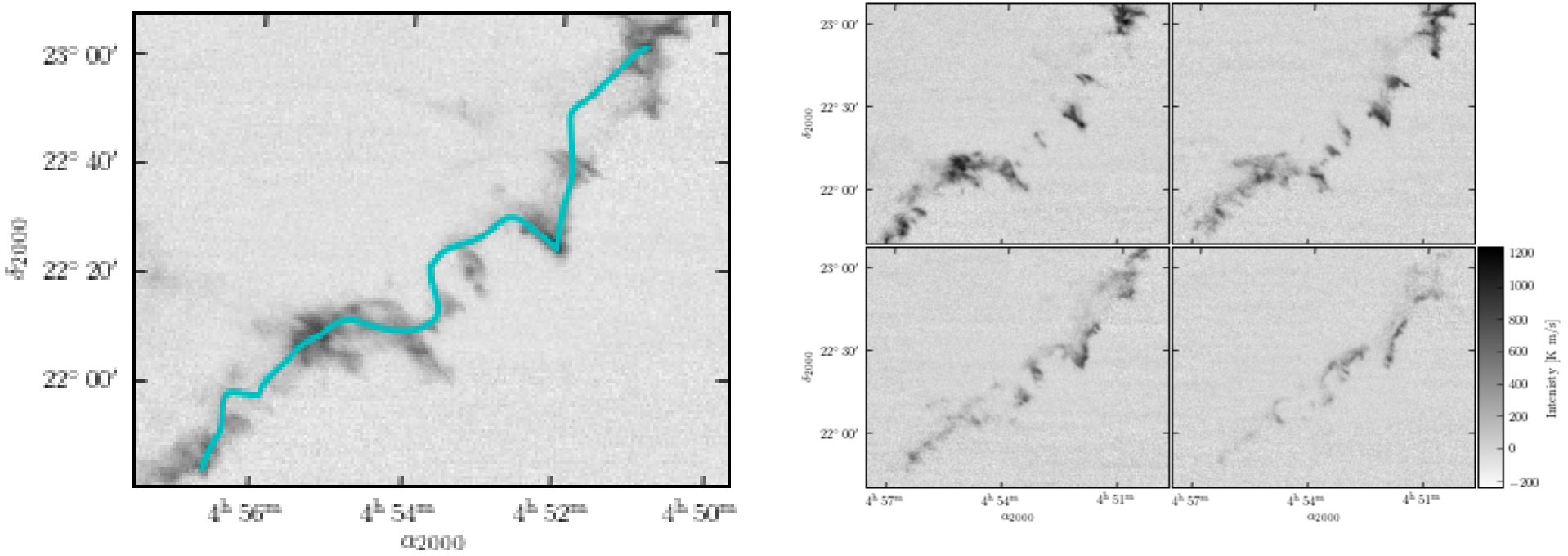




Projection effects - I

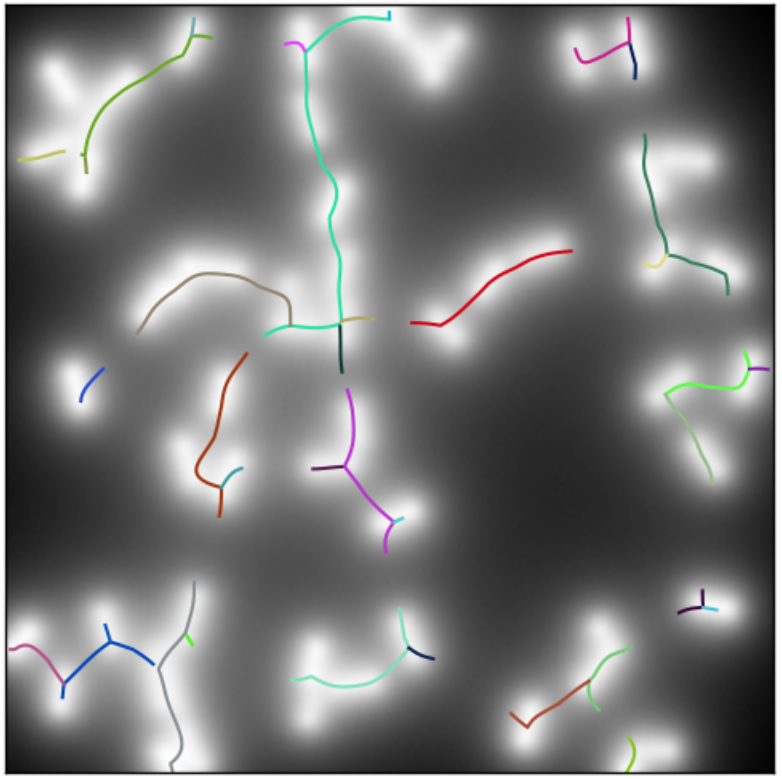


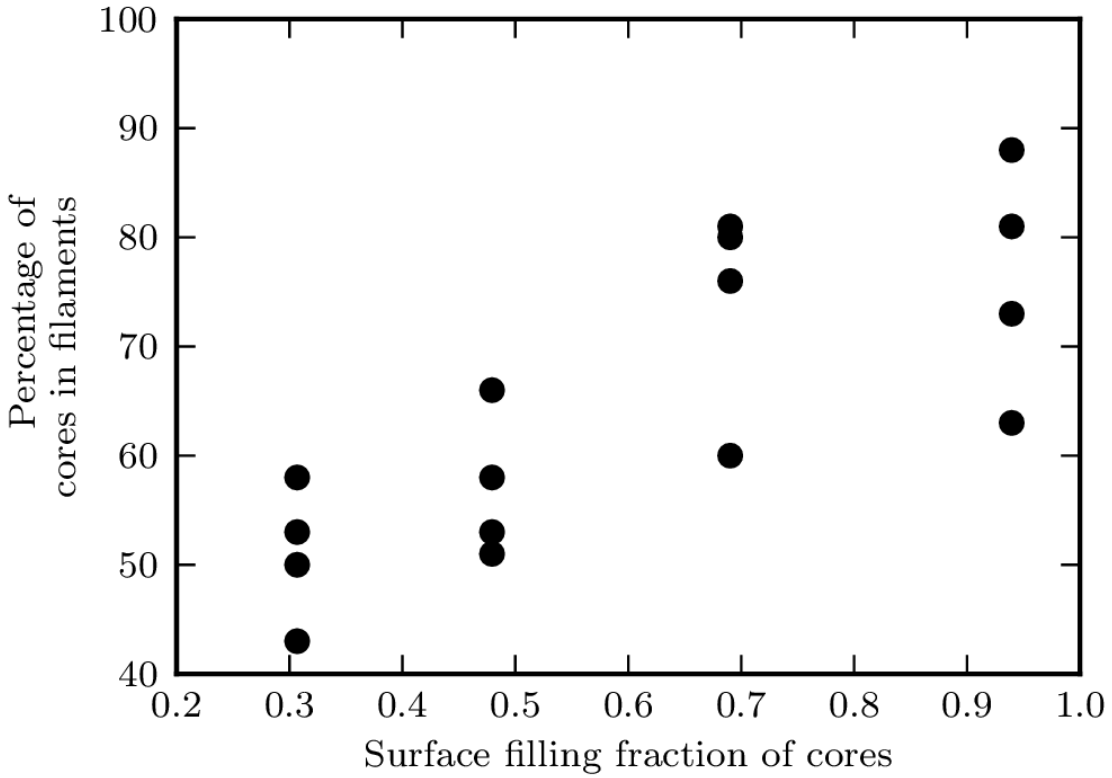
Projection effects - II



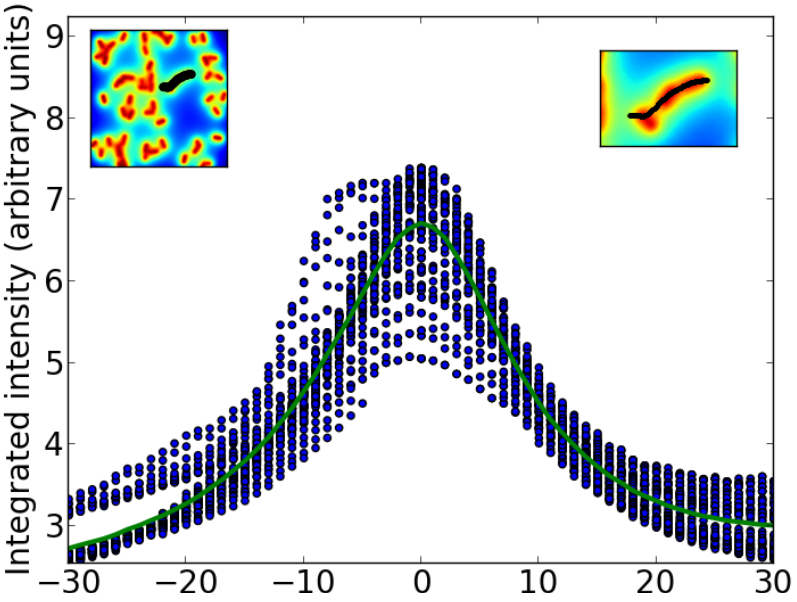
Can cores adjacent in projection produce similar observables?

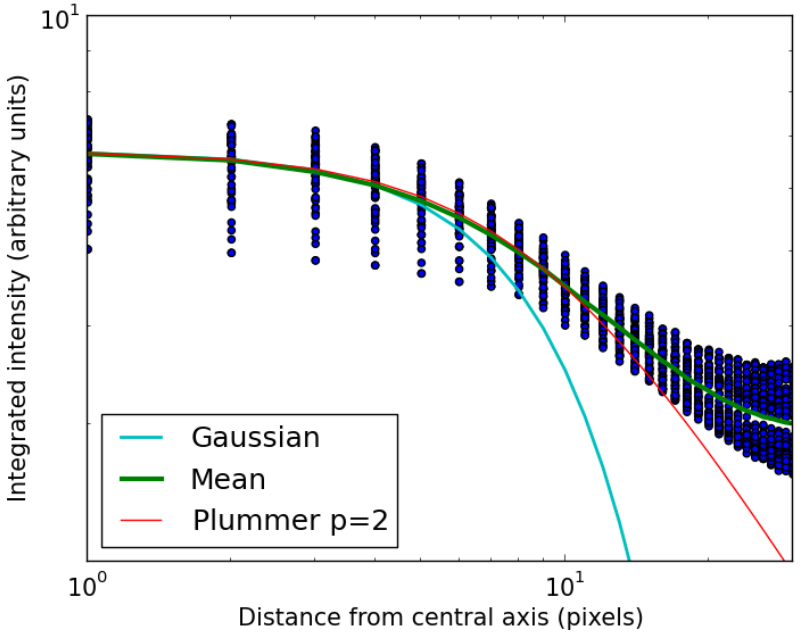
Projection effects - II

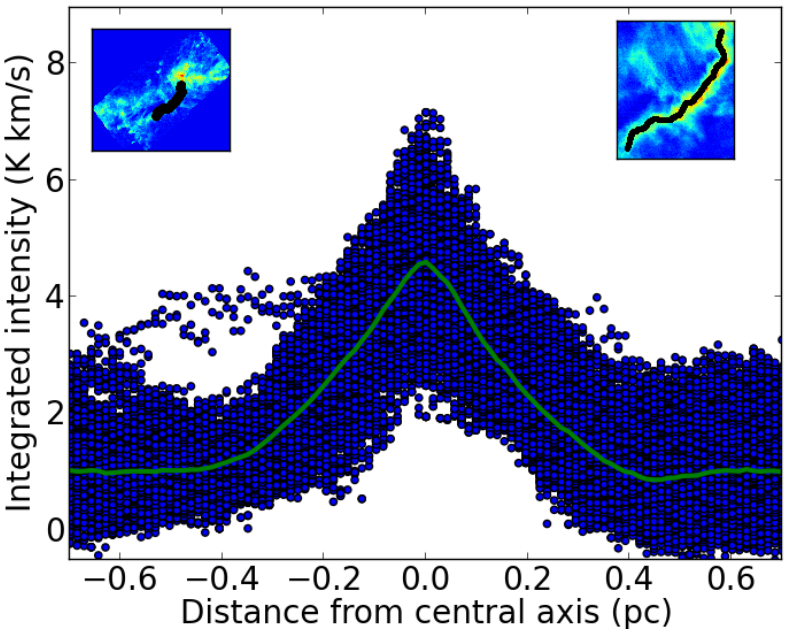


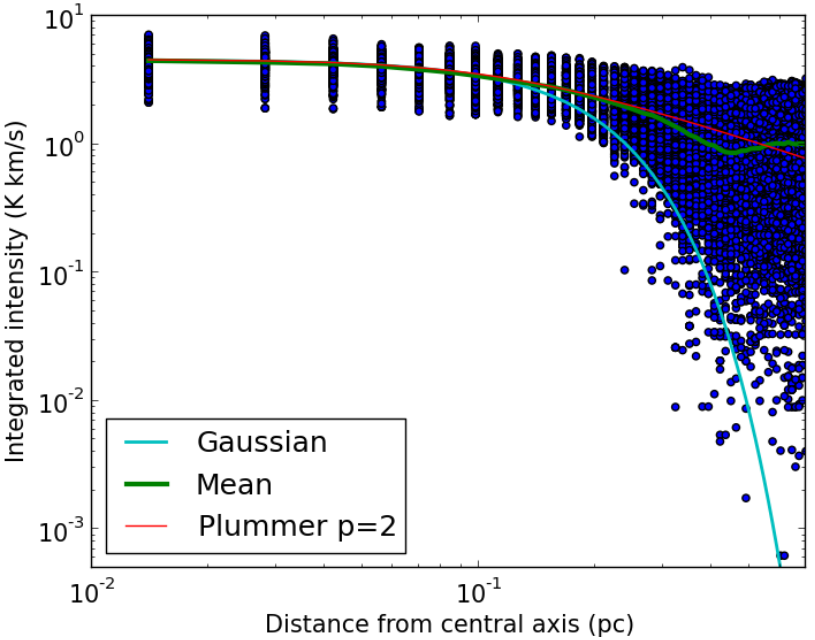


Proiection effects - II

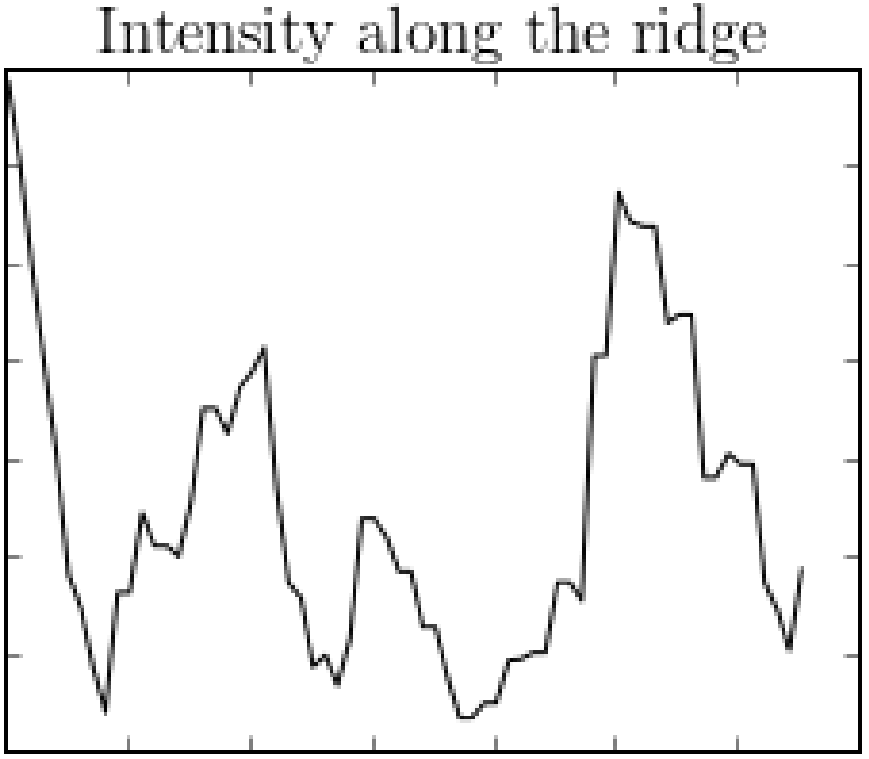


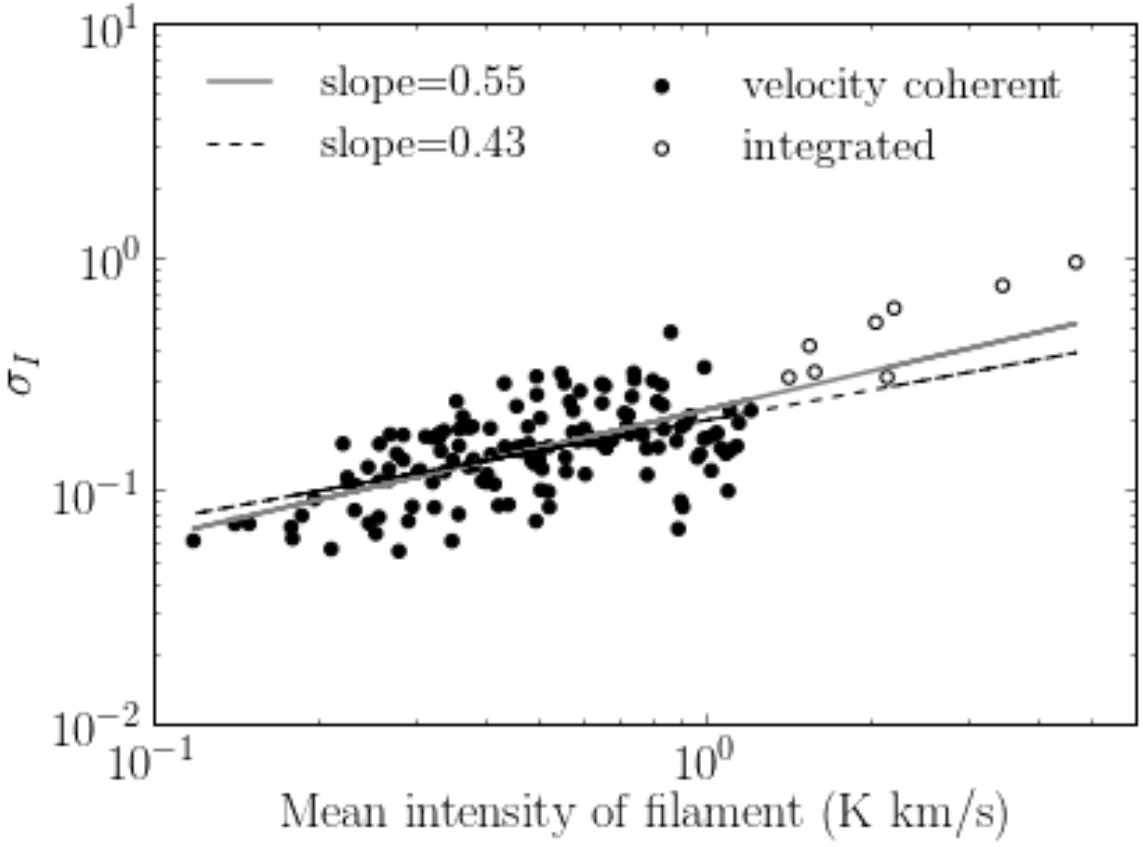






Hint of stochastic origin?





$$\sigma_I \propto I^{1/2}$$

Conclusions

- Integrated emission filaments have widths that peak at 0.4 pc with a large spread (0.18 pc)
- Velocity structure of integrated intensity filaments implies they can not remain a cylinder for 1Myr
- Filaments in velocity channels have profile widths that peak at 0.25 pc with a large spread
- Two projection effects