

# Discussion guidelines

to keep the discussion broad and inclusive...

1. Speak when you're called on by the chair.
2. Chair will give priority to people who have not yet spoken.
3. Chair will try to balance theorists and observers, juniors and seniors, females and males.
4. Don't summarize the talk you already gave, or will soon give.

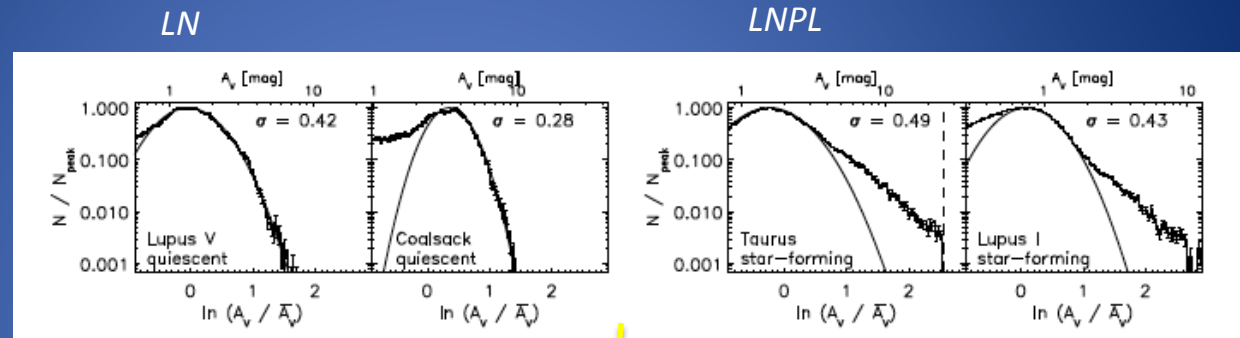
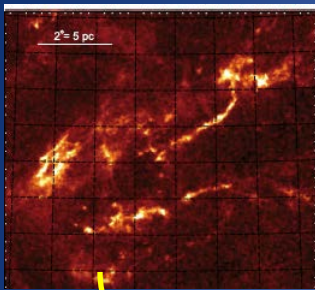
# Cloud Filament Questions

1. *How common* is filamentary structure (FS) in interstellar clouds?
2. What are the main *morphological forms* of FS on scales  $> \sim 1$  pc?
  - isolated and smooth *Musca*      isolated with embedded cores *Pipe*
  - elongated hub and branches *Serpens South, CrA*
  - more complex network *Orion*    velocity-resolved fibers *Taurus*
3. How does FS depend on *size scale? density? turbulent motions? magnetic field strength?*
4. How does FS vary with *gas or dust tracer*, and why?
5. Are filament *gas motions* more like “*ridges*” moving as solid bodies, or “*rivers*” of flow?
6. Do filaments have a characteristic *internal structure* ( $< \sim 1$  pc)? How does it depend on thermal pressure, turbulent flows, and self-gravity? Do filaments have a characteristic width?
7. Is filament internal structure consistent with *observed pdfs* in molecular clouds?



# Internal filament structure

Two widely observed large-scale features of molecular clouds with  $A_V > \sim 1$ :  
*filamentary structure* and *probability density functions (pdfs) which have LN or LNPL shape*



How are these properties related?

Kainulainen et al. 2009

Any pdf (not just LN) can constrain cloud structure *if...*

most of the cloud structure is similar  
 $N(b)$  decreases monotonically with  $b$   
pdf is differentiable

*Then...* pdf( $N$ ) can be inverted to give characteristic *density profile*  $N(b)$

LN or LNPL pdf  $\rightarrow$  decrease of  $N(b)$  is exponential or power-law, may match Plummer, but not equilibrium models

# Density profiles from pdf inversion

probability invariance  $p(s)ds = p(V)dV$

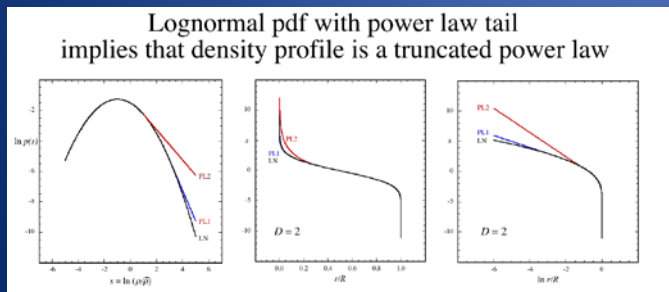
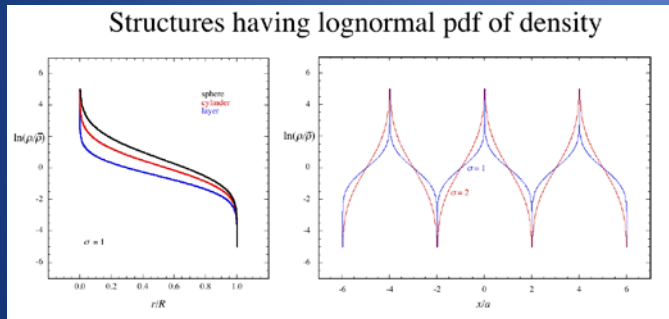
pdf  $p(s) = \frac{1}{\sqrt{2\pi}\sigma_s} \exp[-(s - \bar{s})^2 / (2\sigma_s^2)] \Rightarrow$

$n$  profile  $s(x) = \ln(n/\bar{n}) = \sqrt{2}\sigma_s \operatorname{erfc}^{-1}[2(x/R)^D] - \sigma_s^2/2$

$\bar{s}$  = mean of  $s$ ;  $\sigma_s$  = standard deviation of  $s$ ;

$x$  = coordinate;  $R$  = max  $x$ ;  $D$  = symmetry dimension (1,2,3)

density profiles from LN, LNPL pdf  
spherical, cylindrical, planar symmetry



column density profile with  
beam smoothing and background

