The Puzzles of Star Formation II (PoSF II)
Ringberg castle, May 4-7, 2025

# Shaping filaments

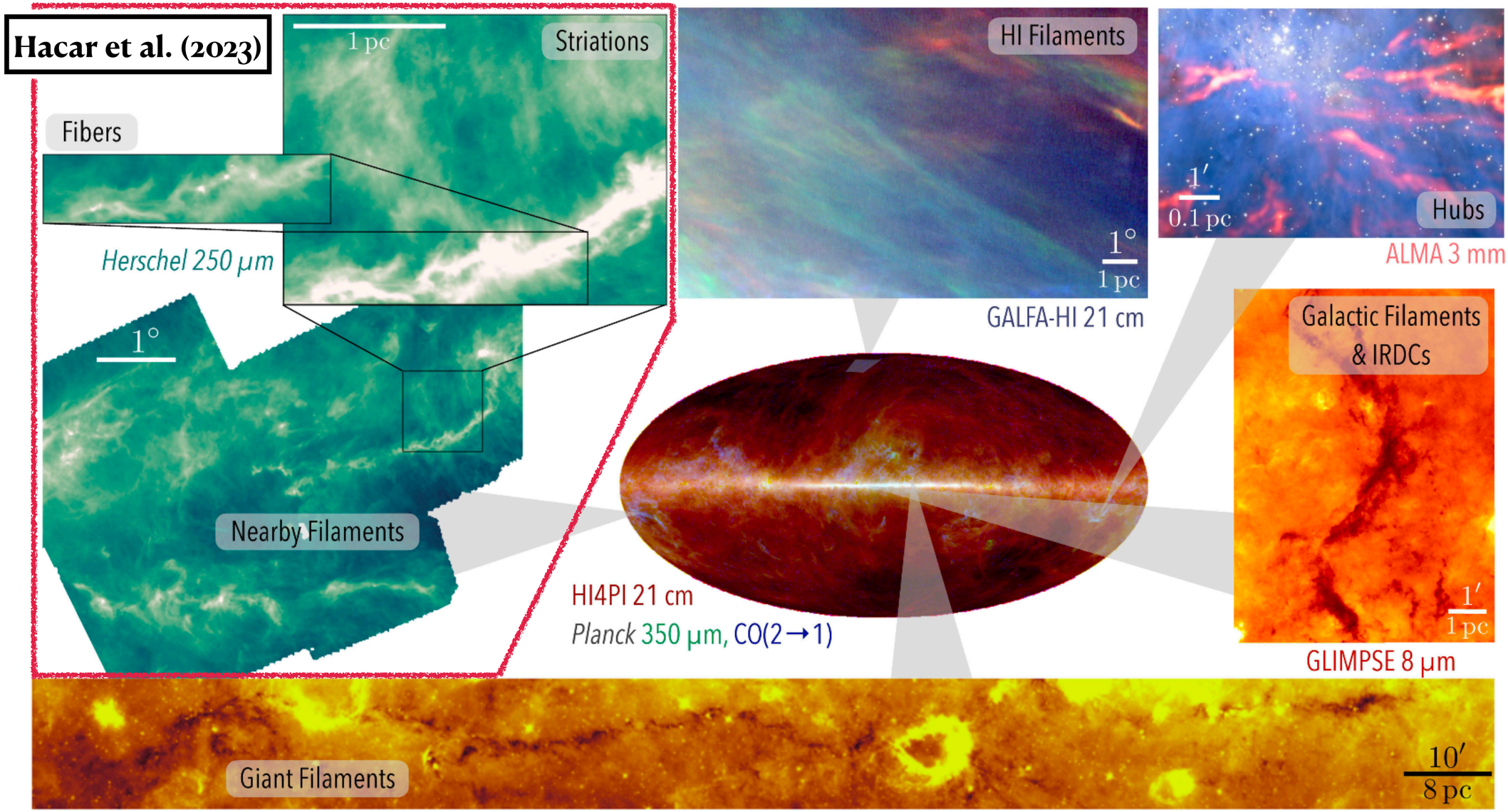
## The role of the interstellar environment

EMERGE ERC-StG

Andrea Socci, University of Vienna

# Filaments in the interstellar medium

## Filament families and nearby filaments



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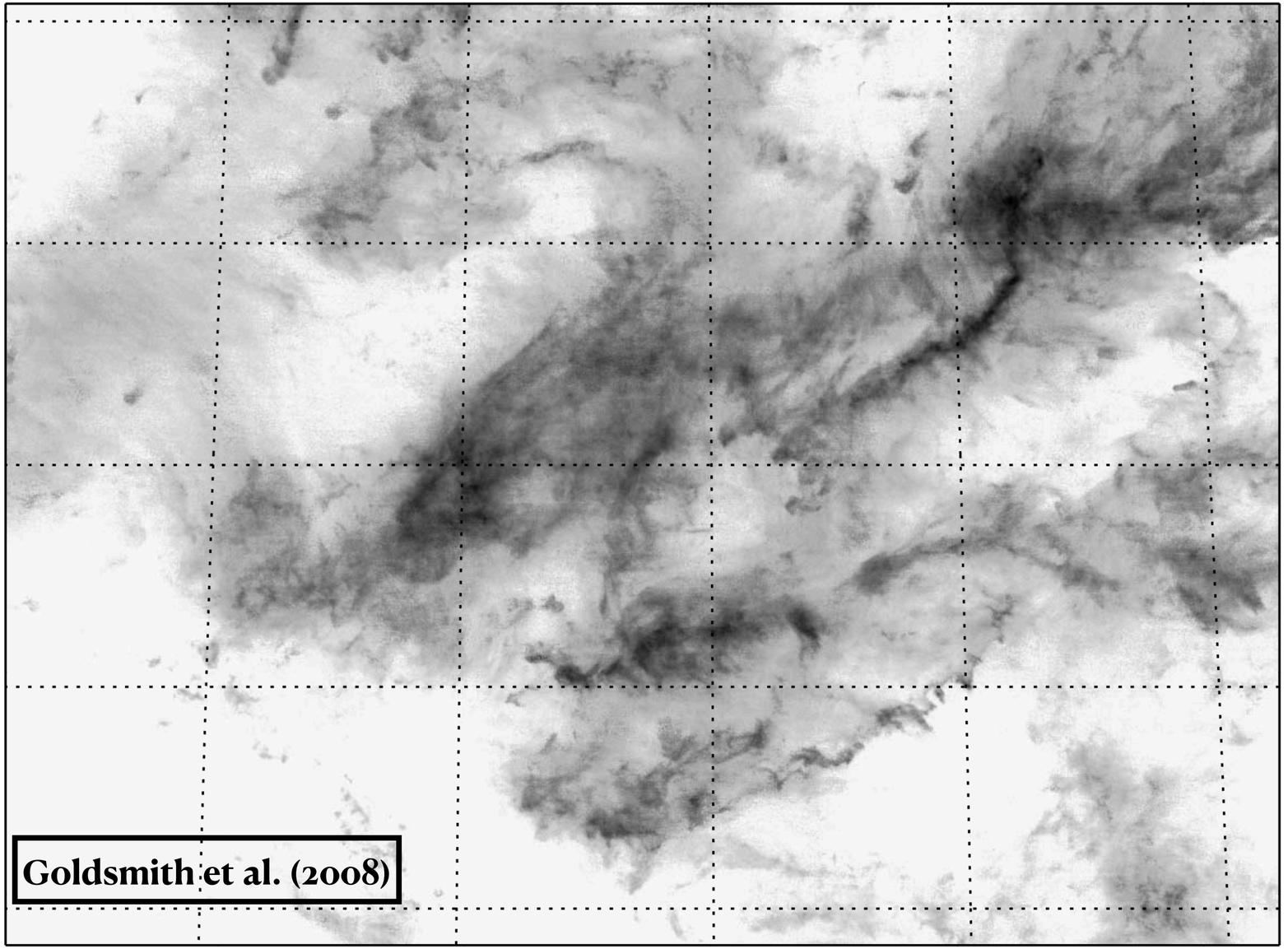
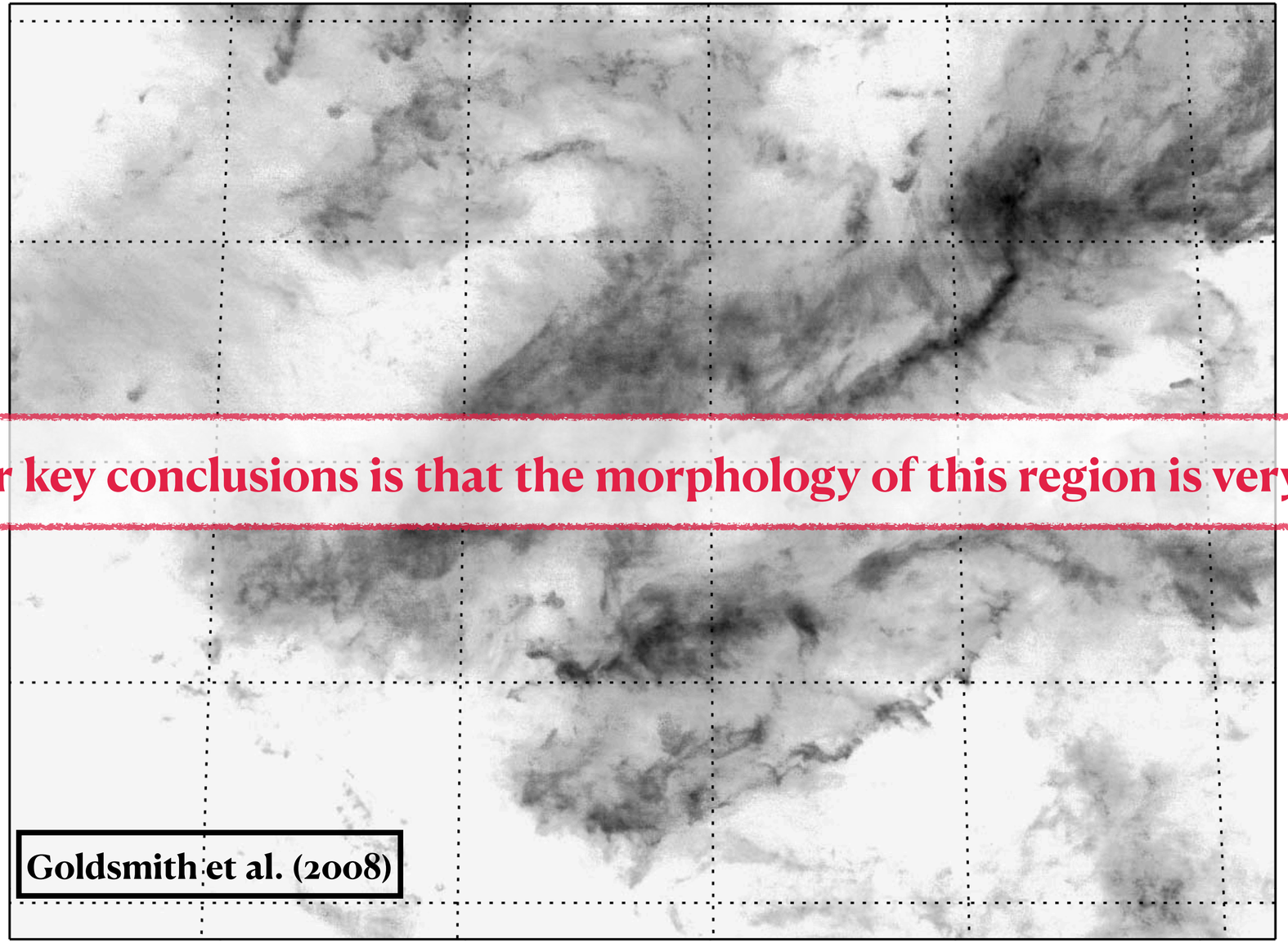
# Nearby filaments

## The Taurus complex



# Nearby filaments

## The Taurus complex

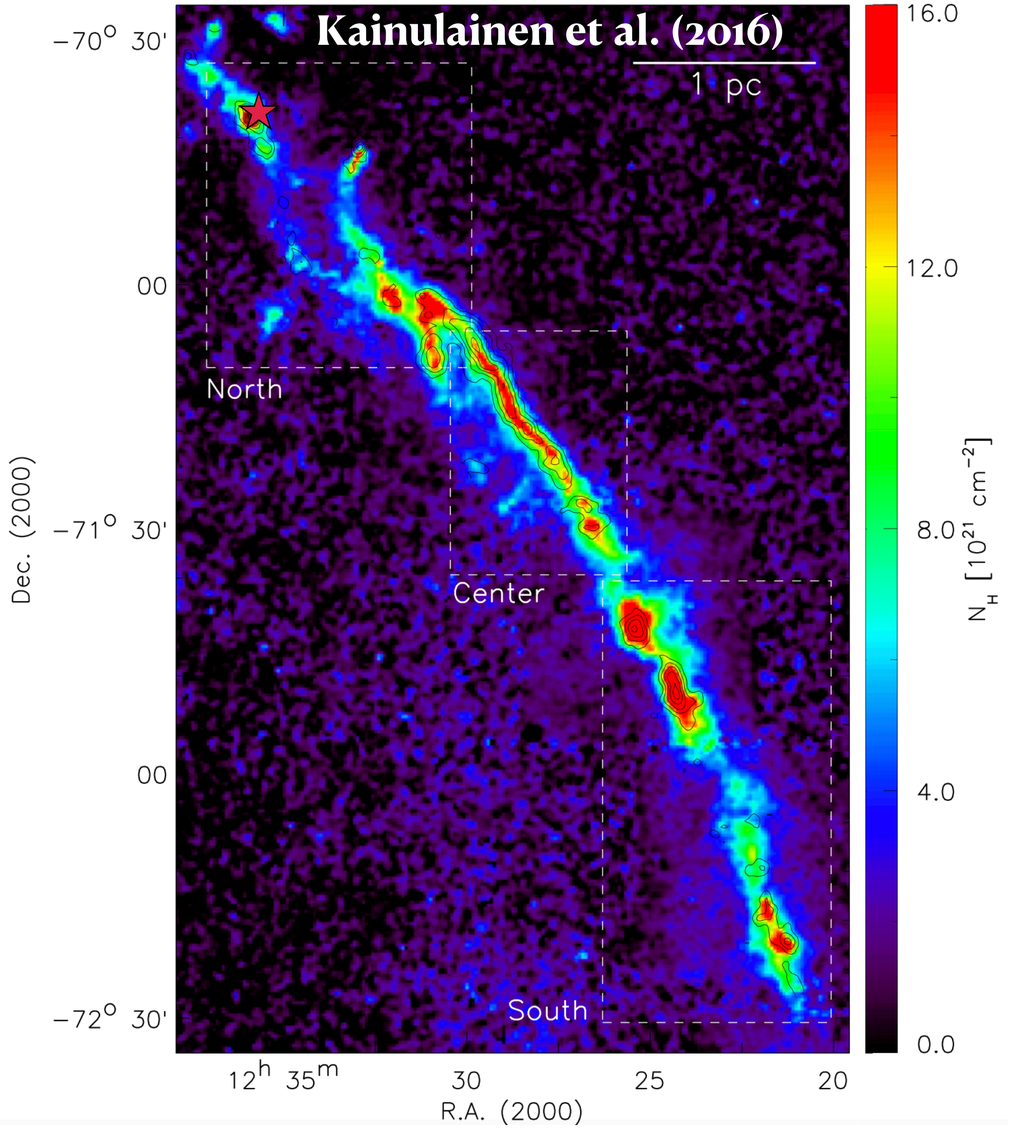


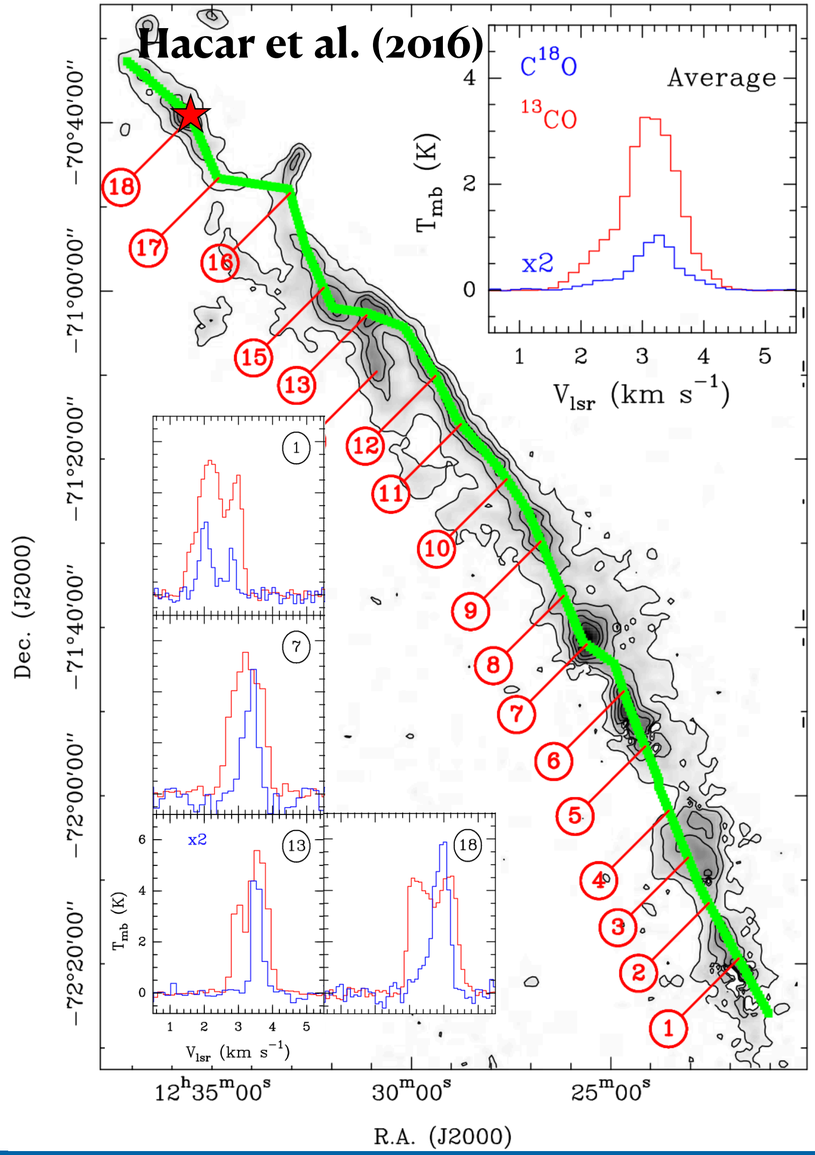
"One of our key conclusions is that the morphology of this region is very complex."

Goldsmith et al. (2008)

# Prototypical nearby filaments: Musca

## The monolithic structure



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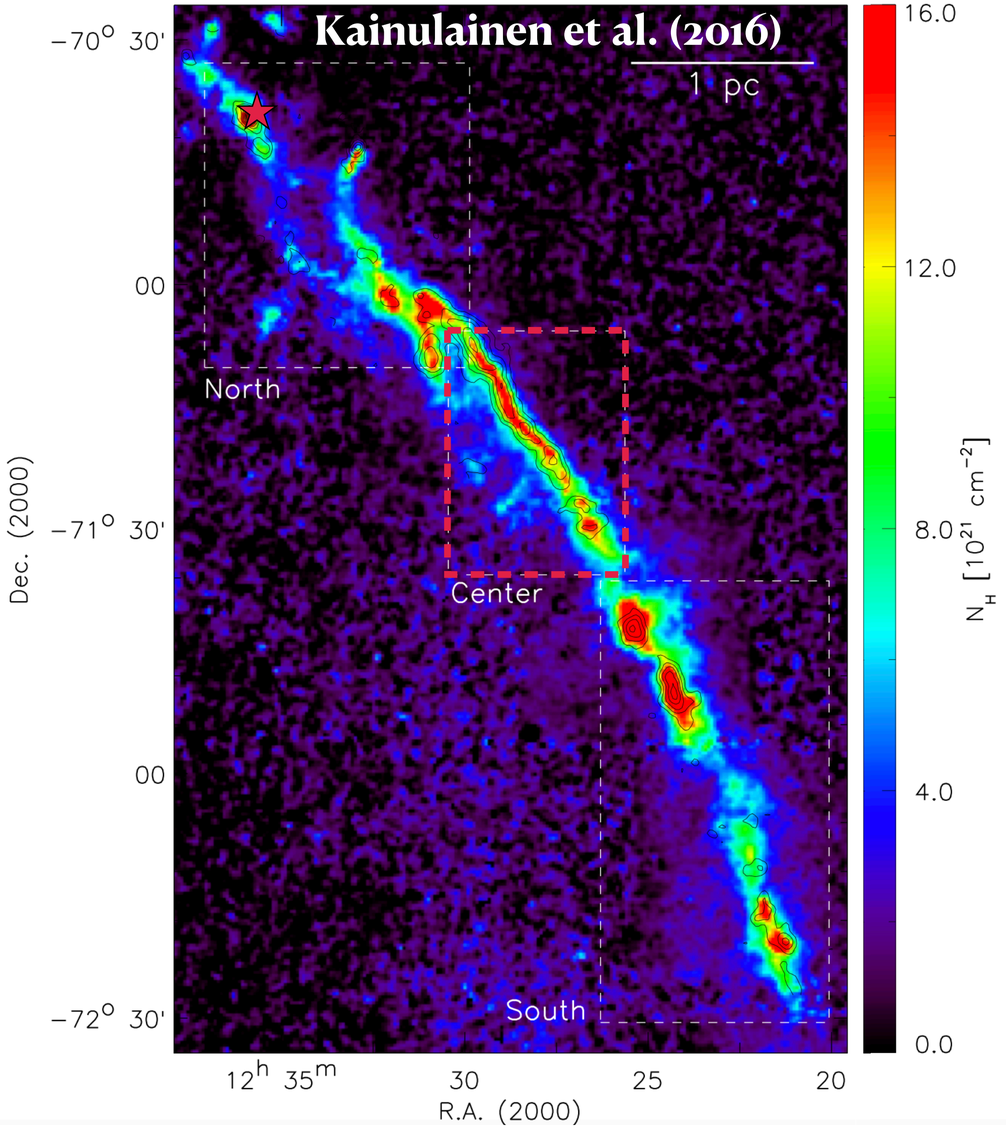
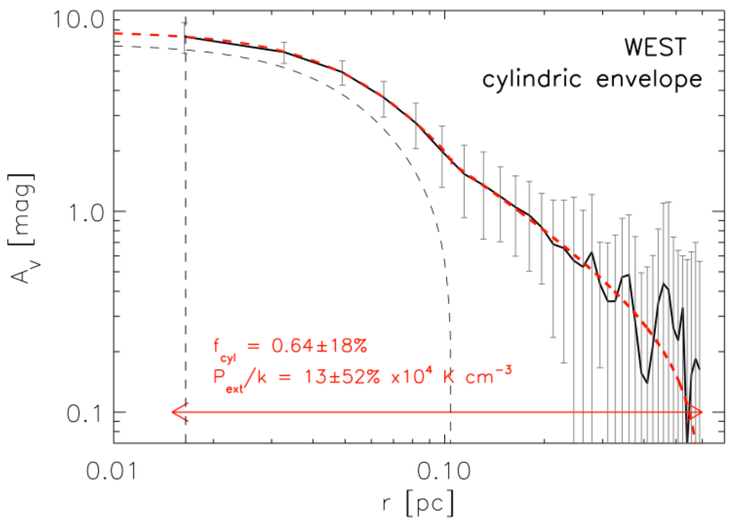
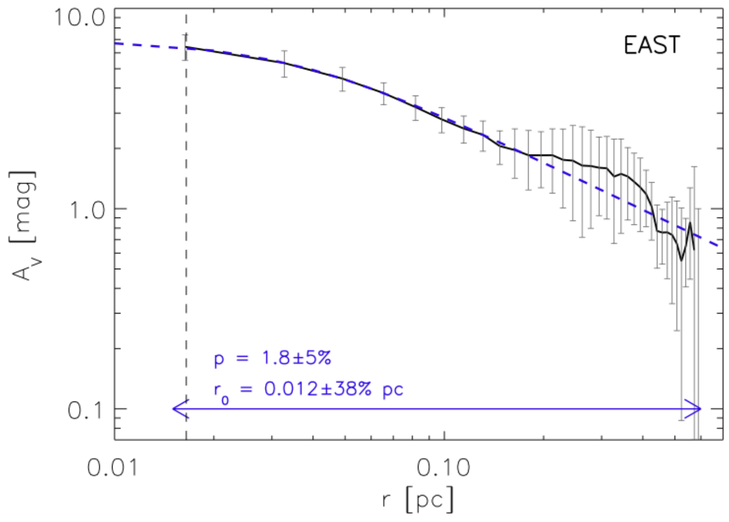
# Prototypical nearby filaments: Musca

## The radial profile and pressure measurement




$$P_{\rm ext}/k = 1.3 \times 10^5 \ {\rm K \ cm^{-3}} \sim 10 \times P_{\rm ISM}$$



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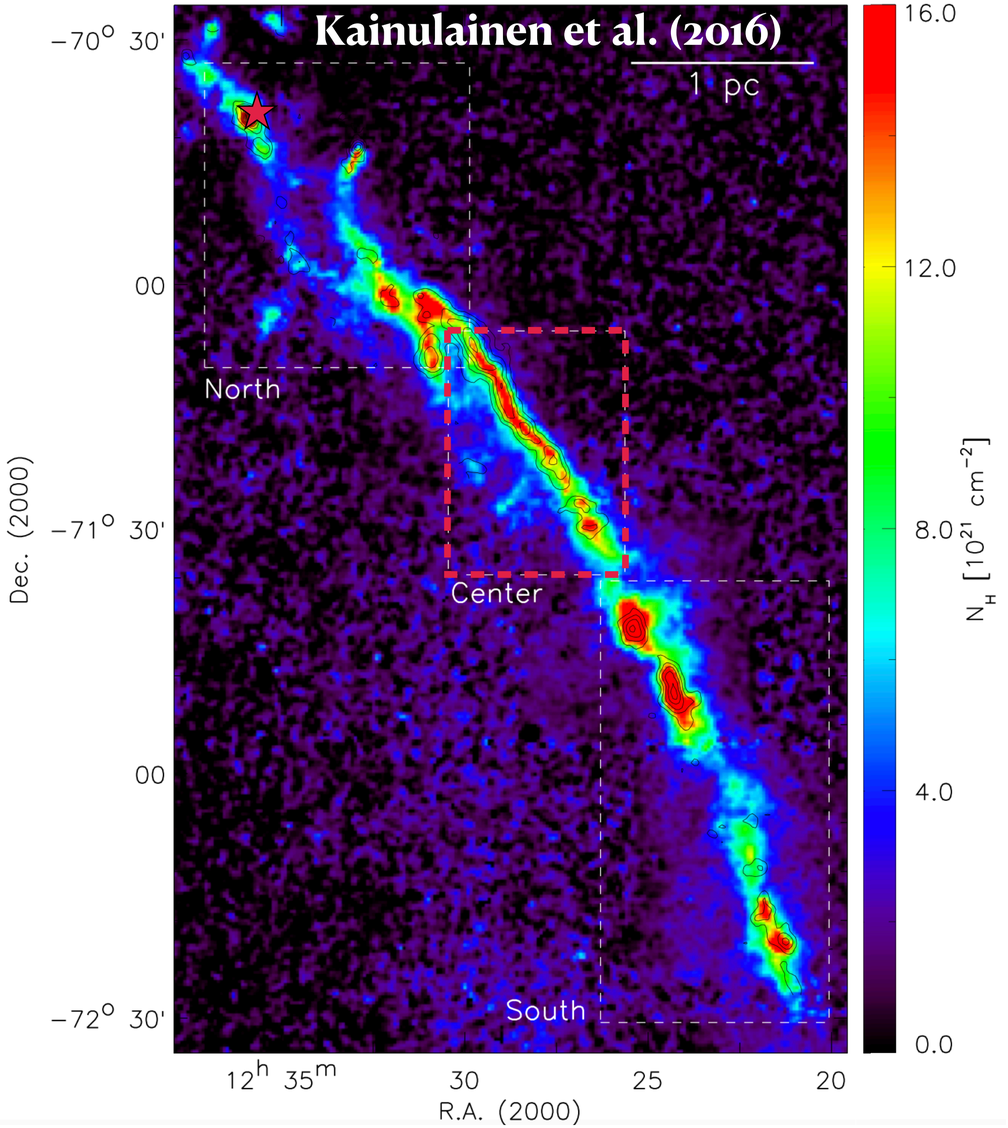
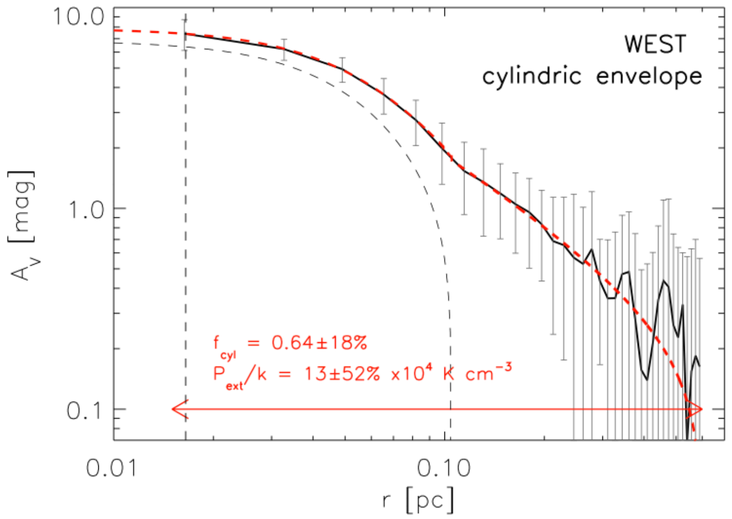
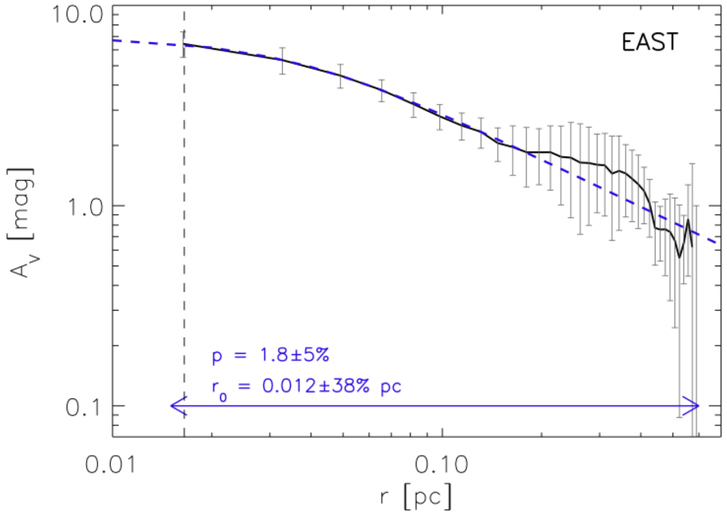
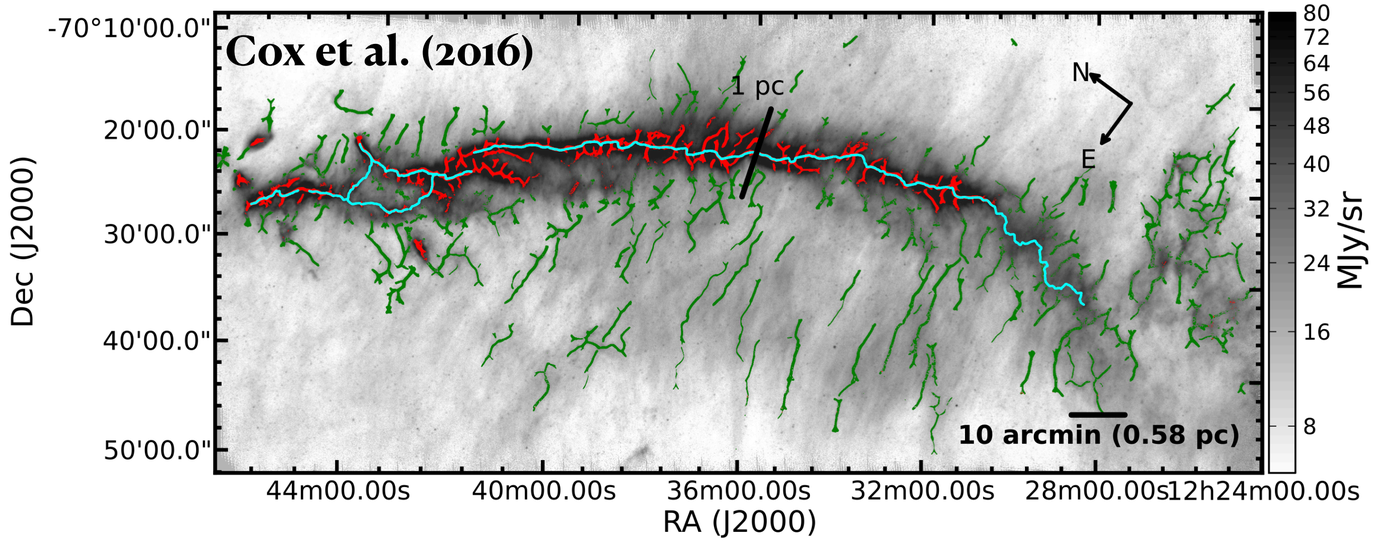
# Prototypical nearby filaments: Musca

## A candidate accretion process



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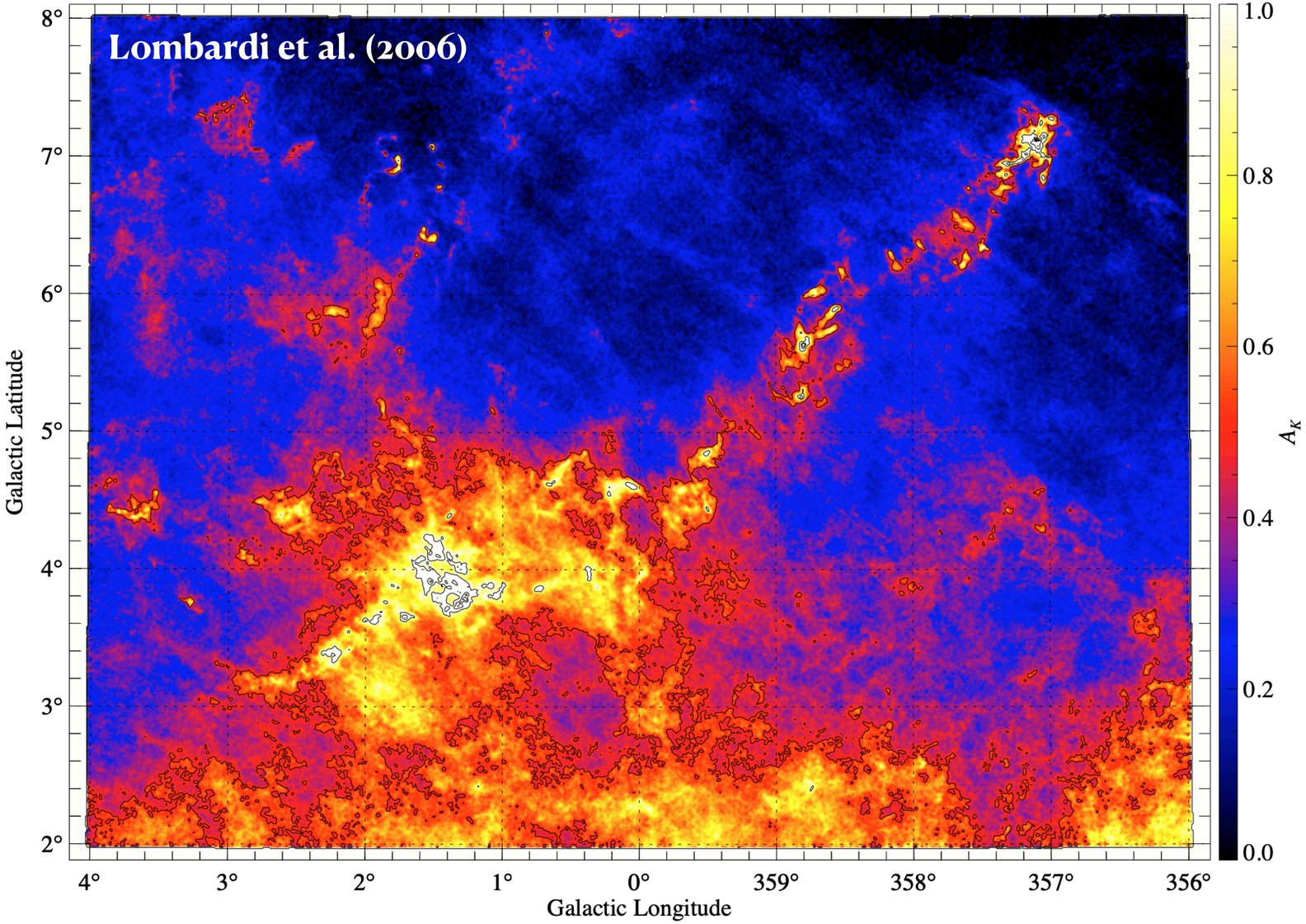
# Prototypical nearby filaments: Pipe

## The overall structure



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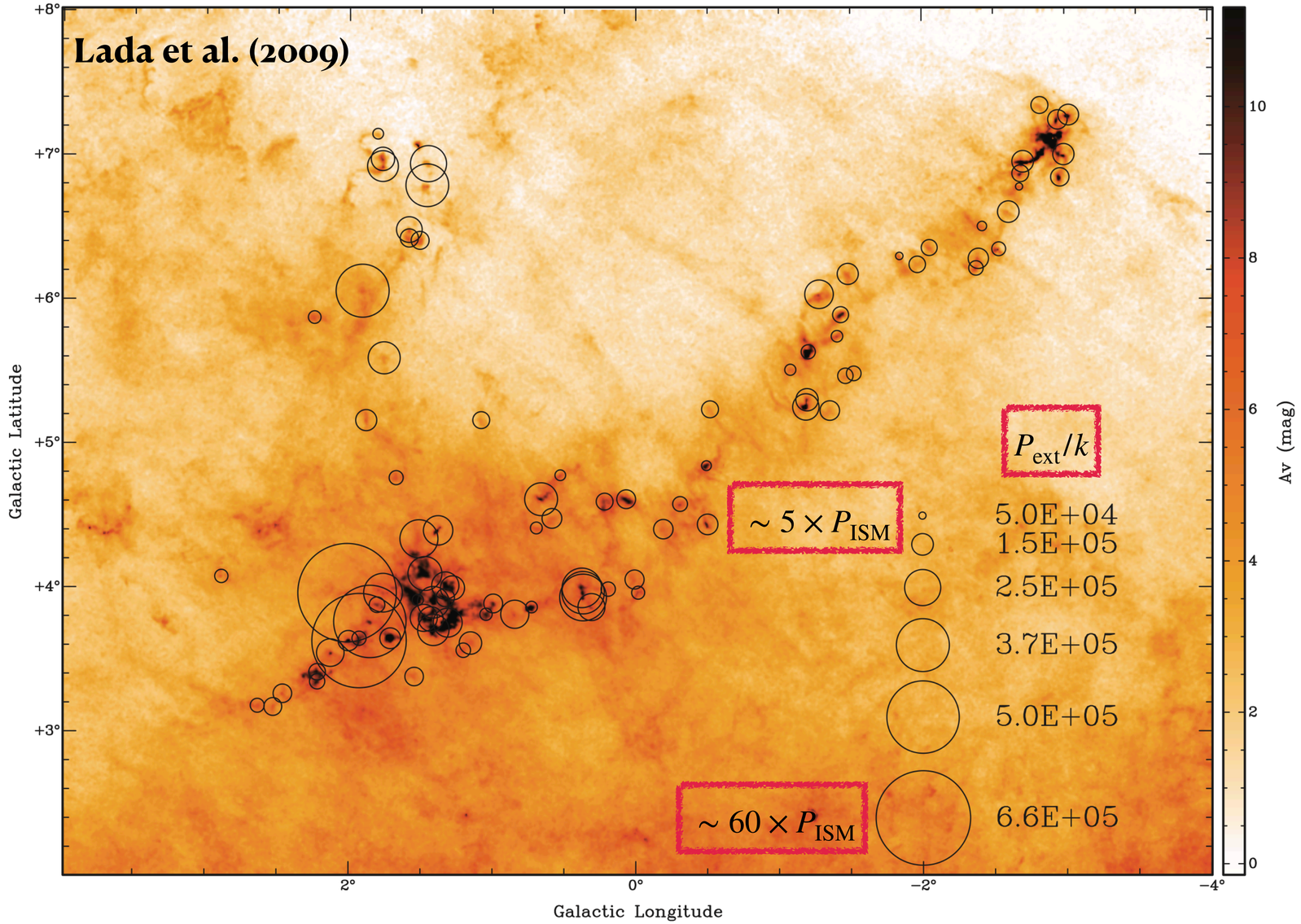
# Prototypical nearby filaments: Pipe

## The pressurised cores



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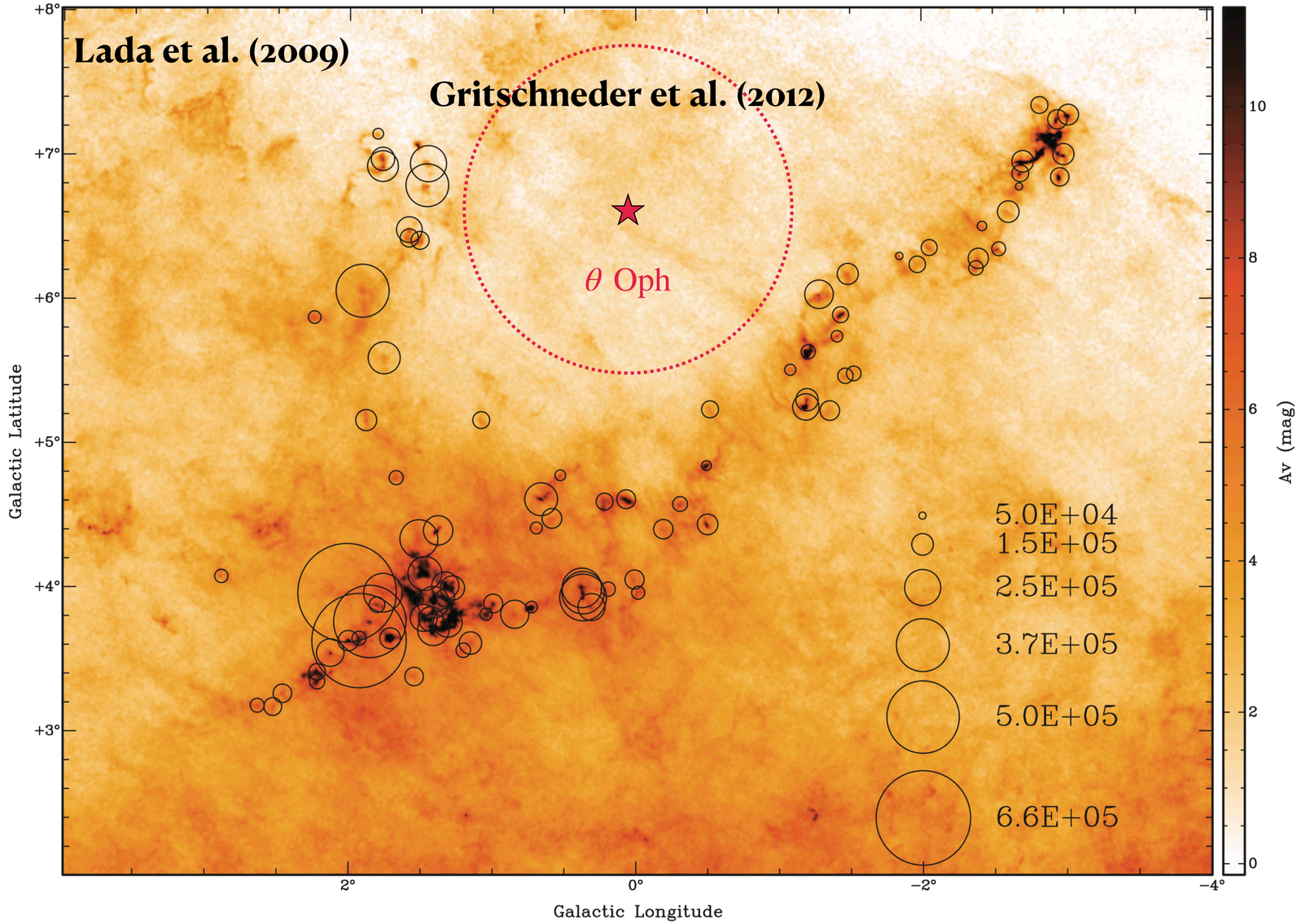
# Prototypical nearby filaments: Pipe

## The local feedback



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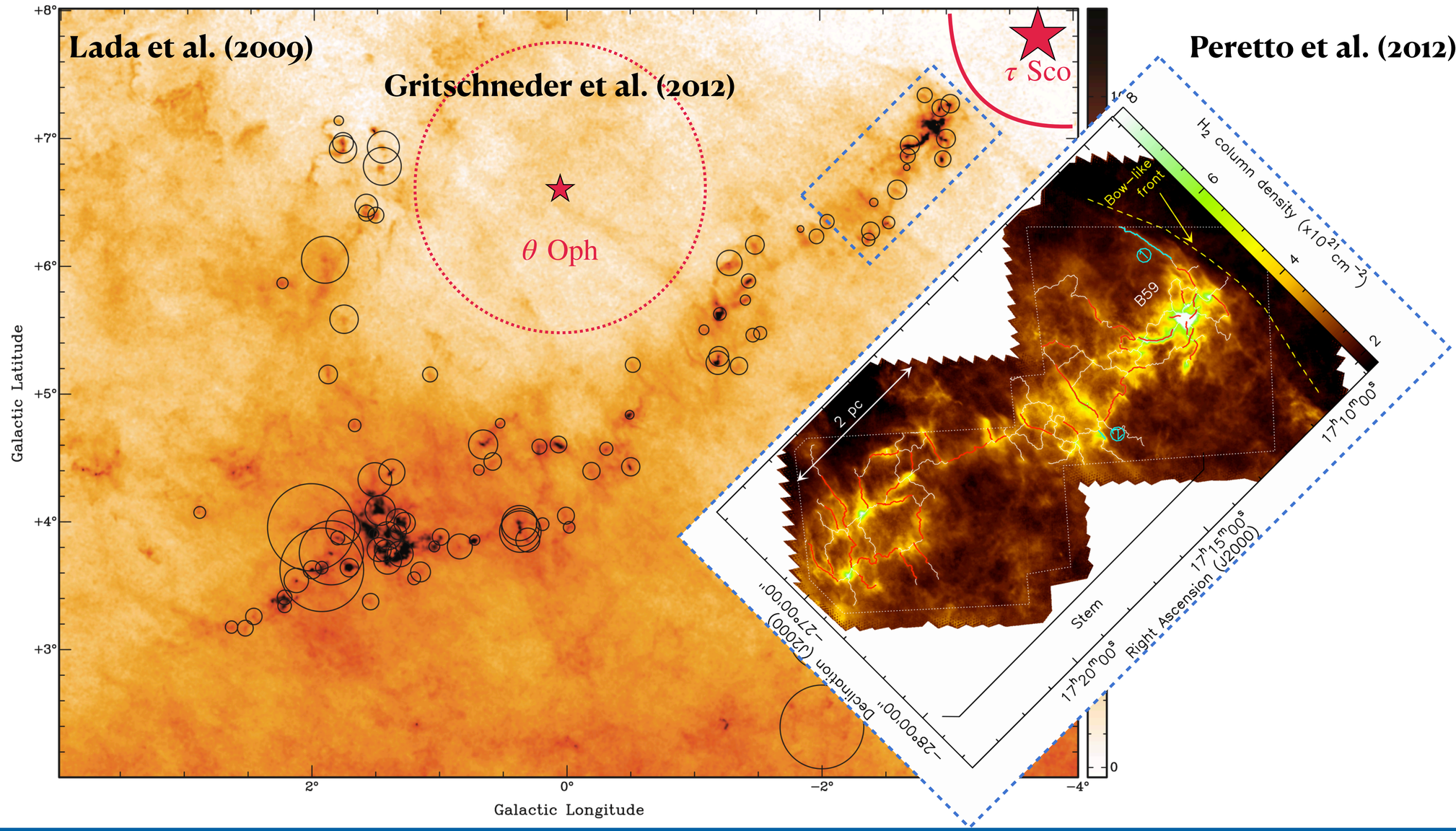
# Prototypical nearby filaments: Pipe

## The large-scale compression



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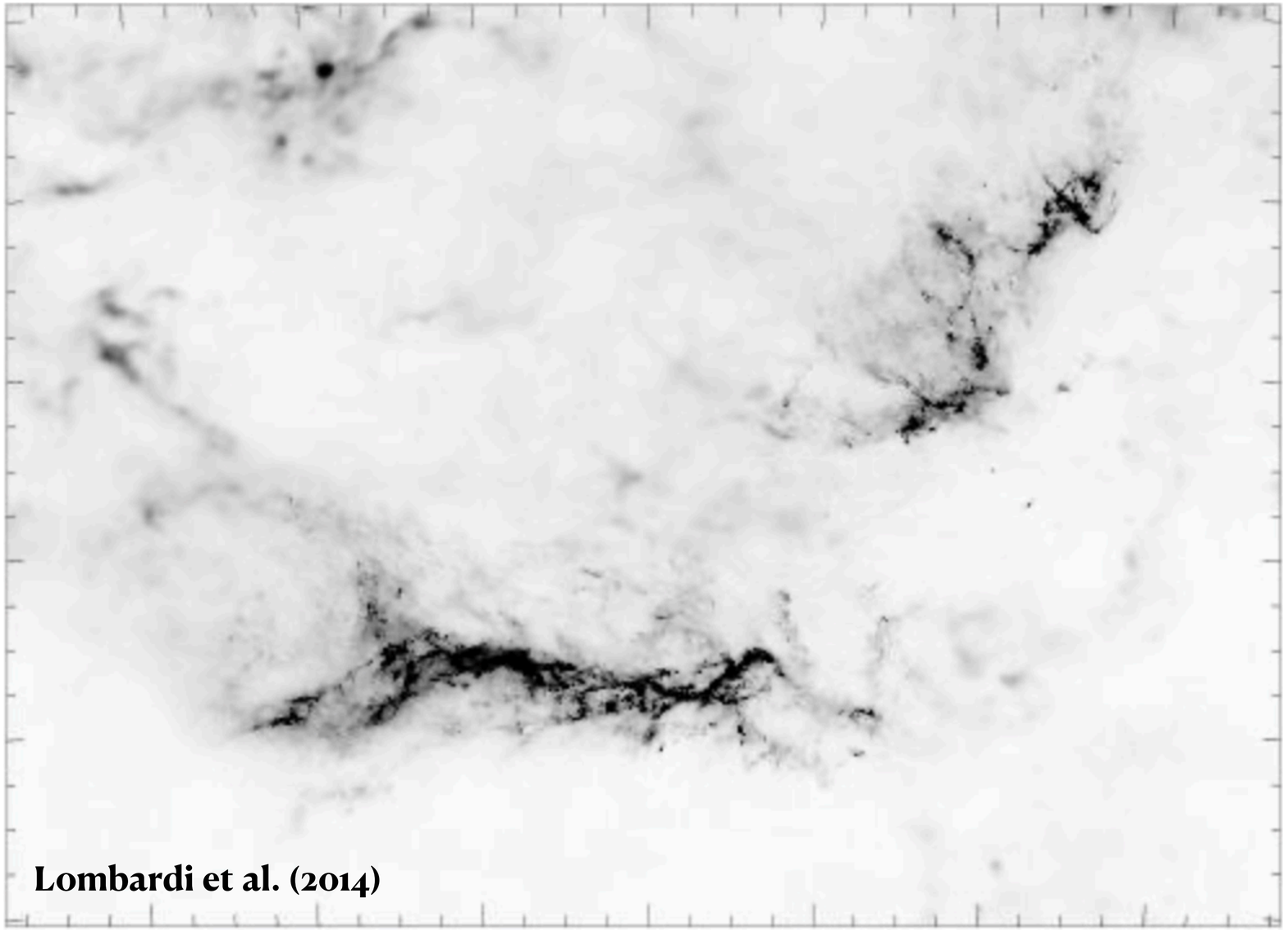
# Prototypical nearby filaments: Orion

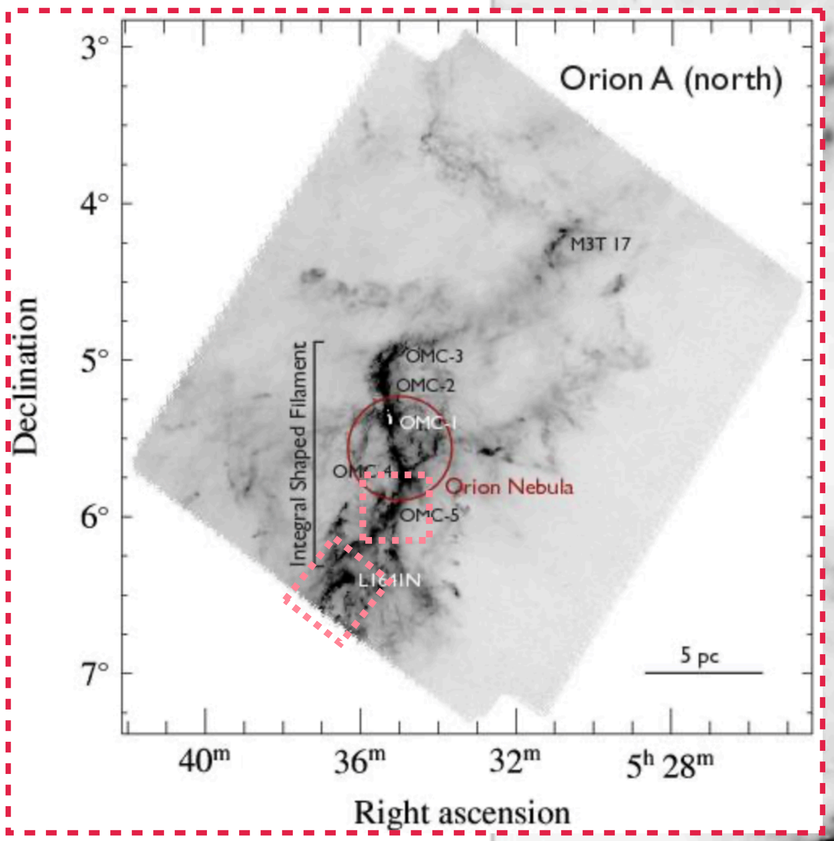
## The Orion A & B clouds

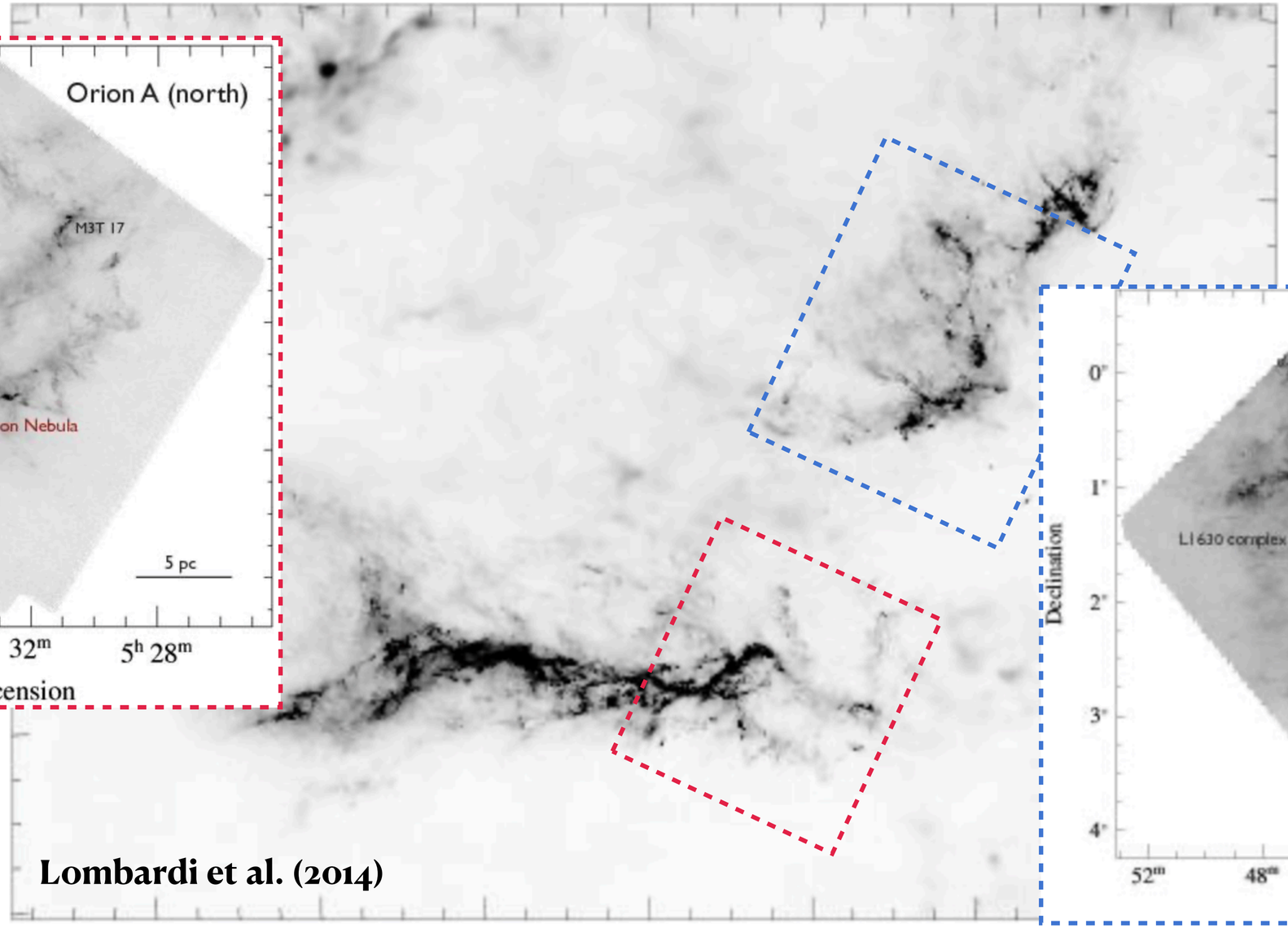


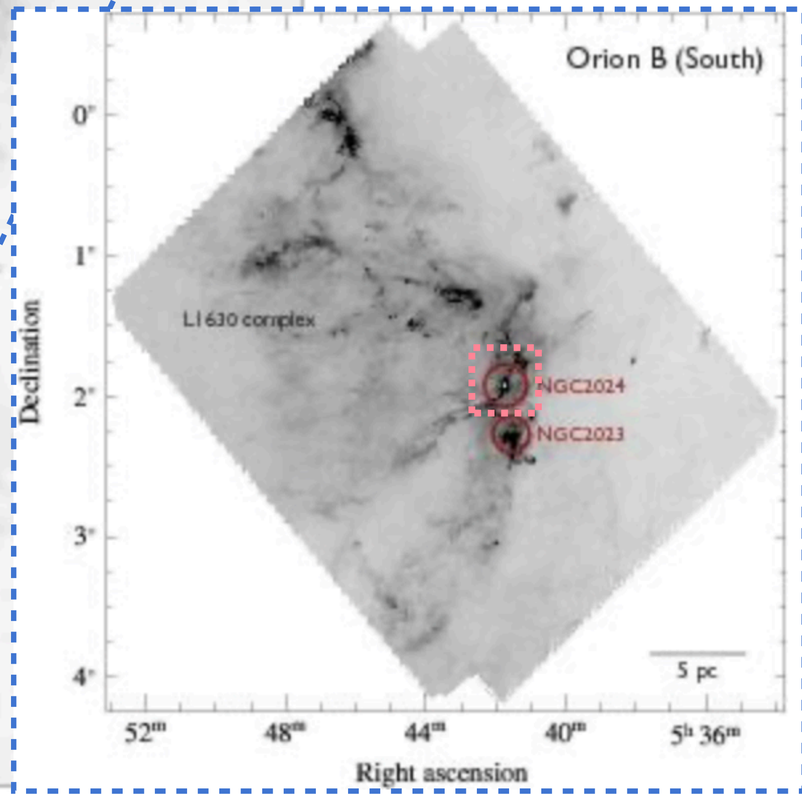
Lombardi et al. (2014)

# Prototypical nearby filaments: Orion

## Orion A & B sub-regions






Lombardi et al. (2014)



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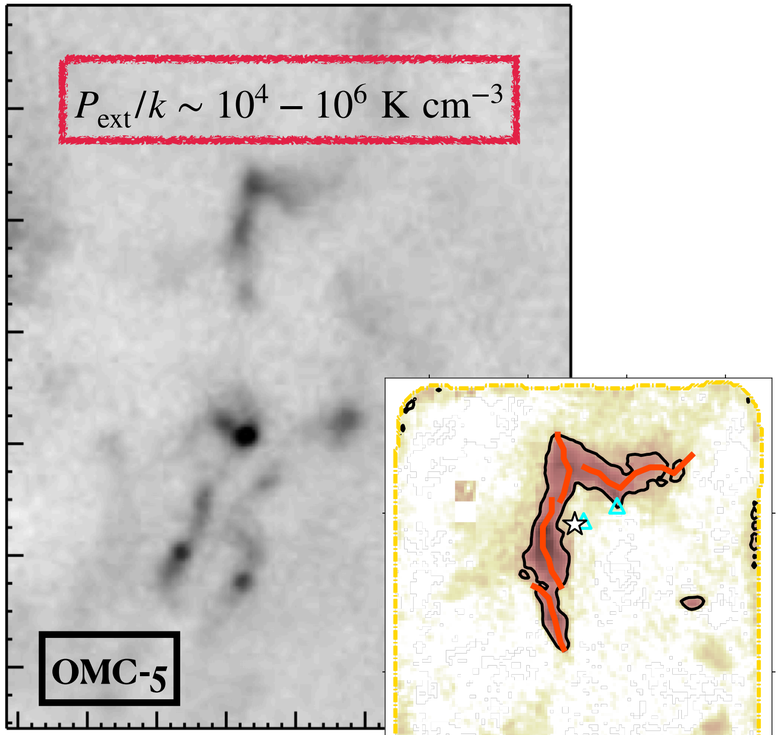
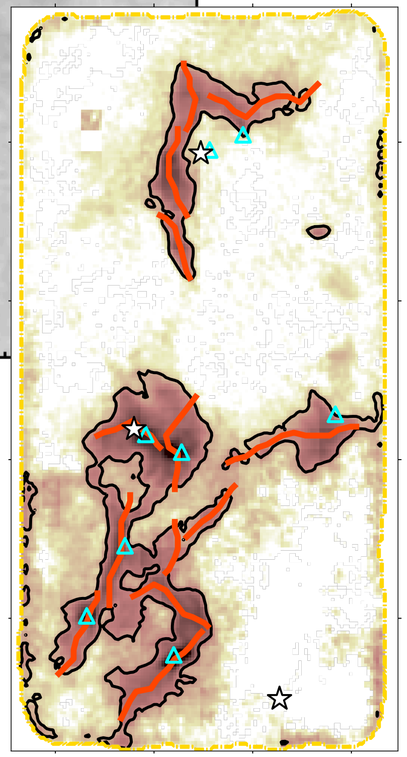
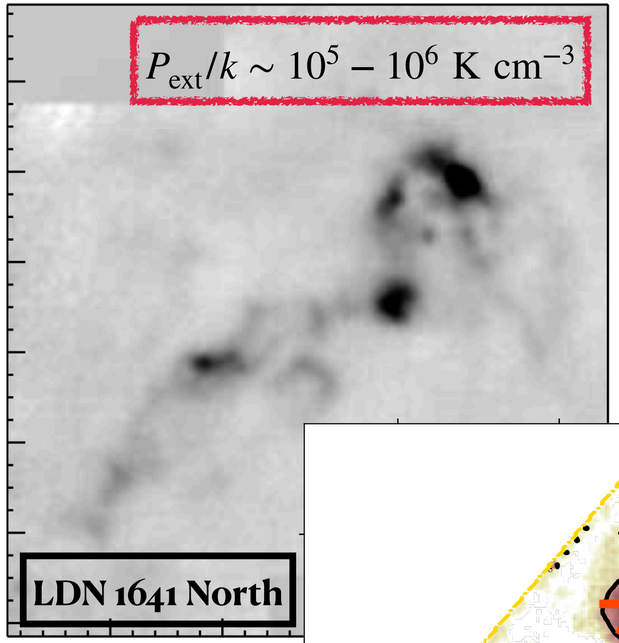
# Prototypical nearby filaments: Orion

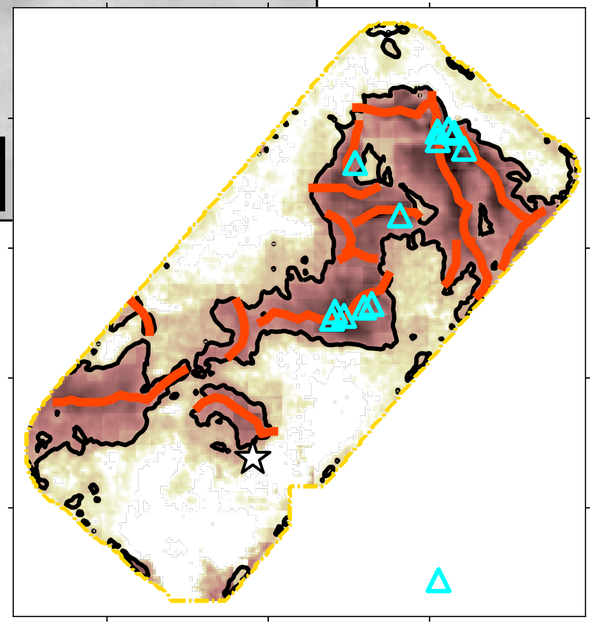
## LDN 1641, OMC-5, NGC 2024 as prototypes

Johnstone et al. (2006)

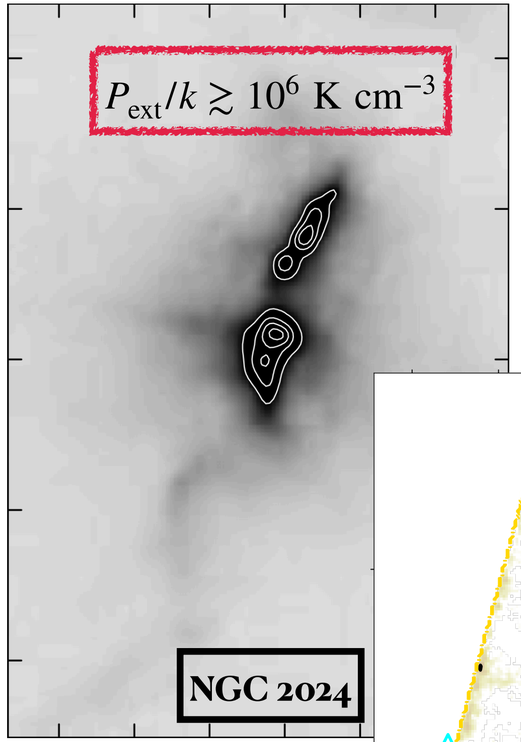


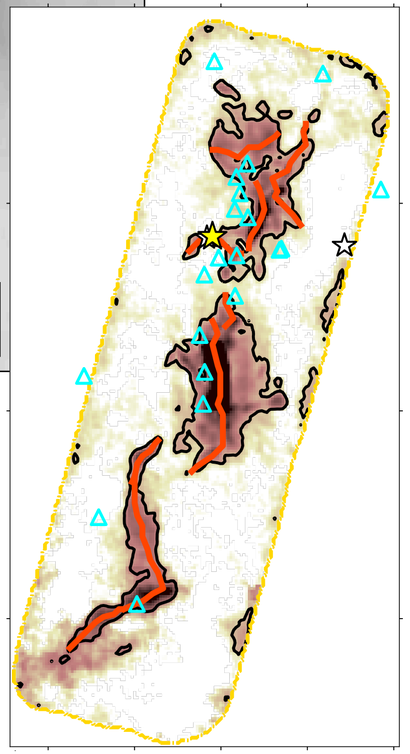





Socci et al. (2024)





Andrea Socci, University of Vienna

# Points for discussion

- Are we able to fully characterise the interstellar environment?
- How can we connect the large-scales (> 1 pc) to the small scales (< 0.1 pc)?
  - Which effects dominate, and at which scales?
  - How they influence the properties and star-formation potential of filaments?
- How can we achieve a “cheap”, yet comprehensive, description of the interstellar environment?
- Can we infer the evolution of filaments over time from their environment?
- …