# Filaments vs. Simulations deathmatch

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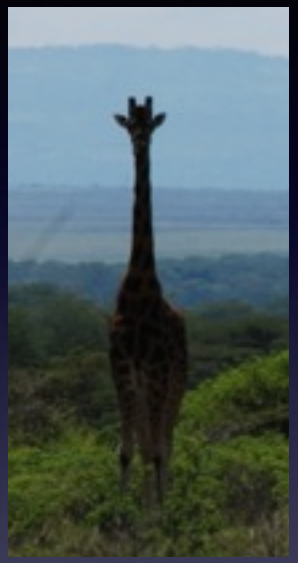
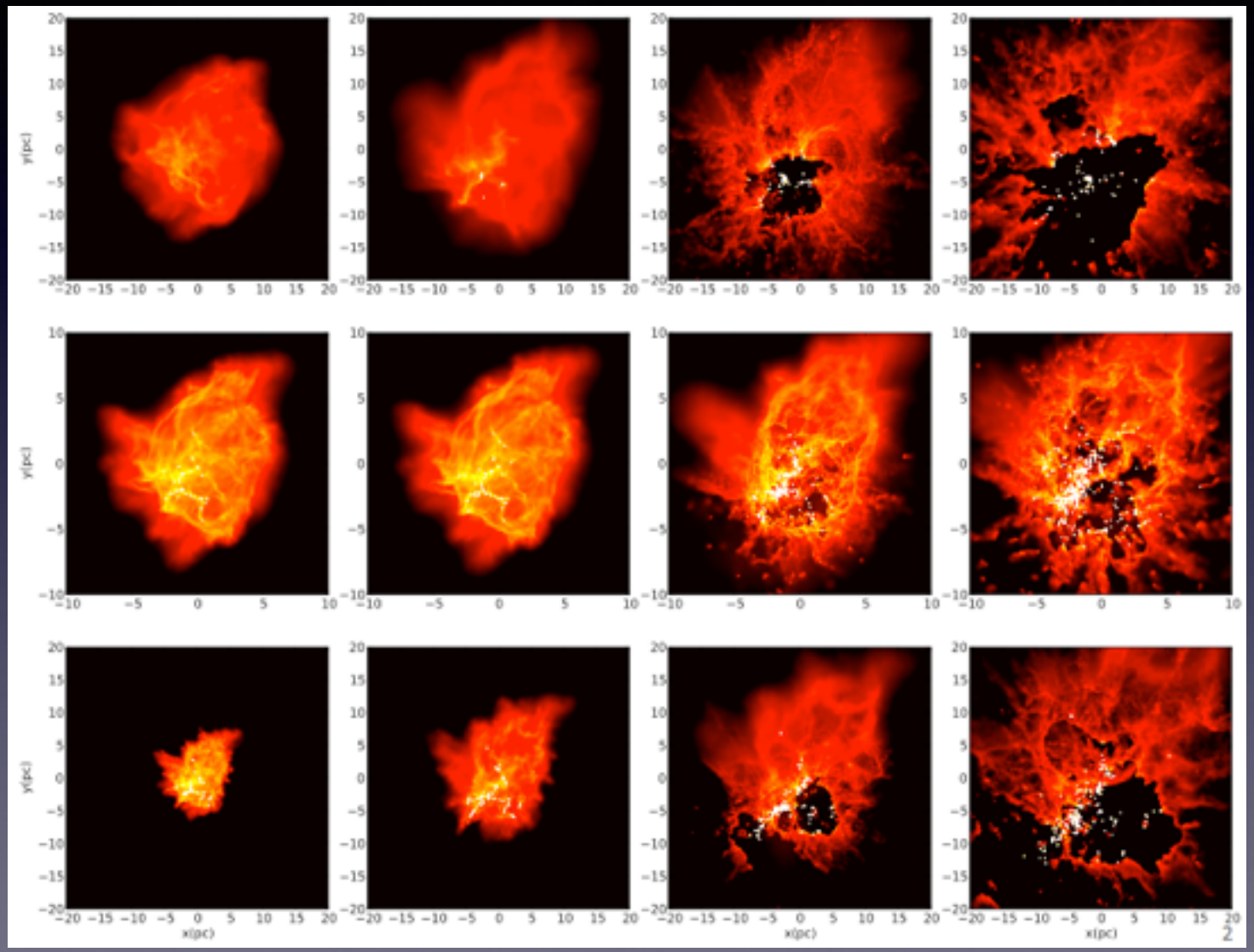
# Comparing Observations and Simulations of Filamentary Structures



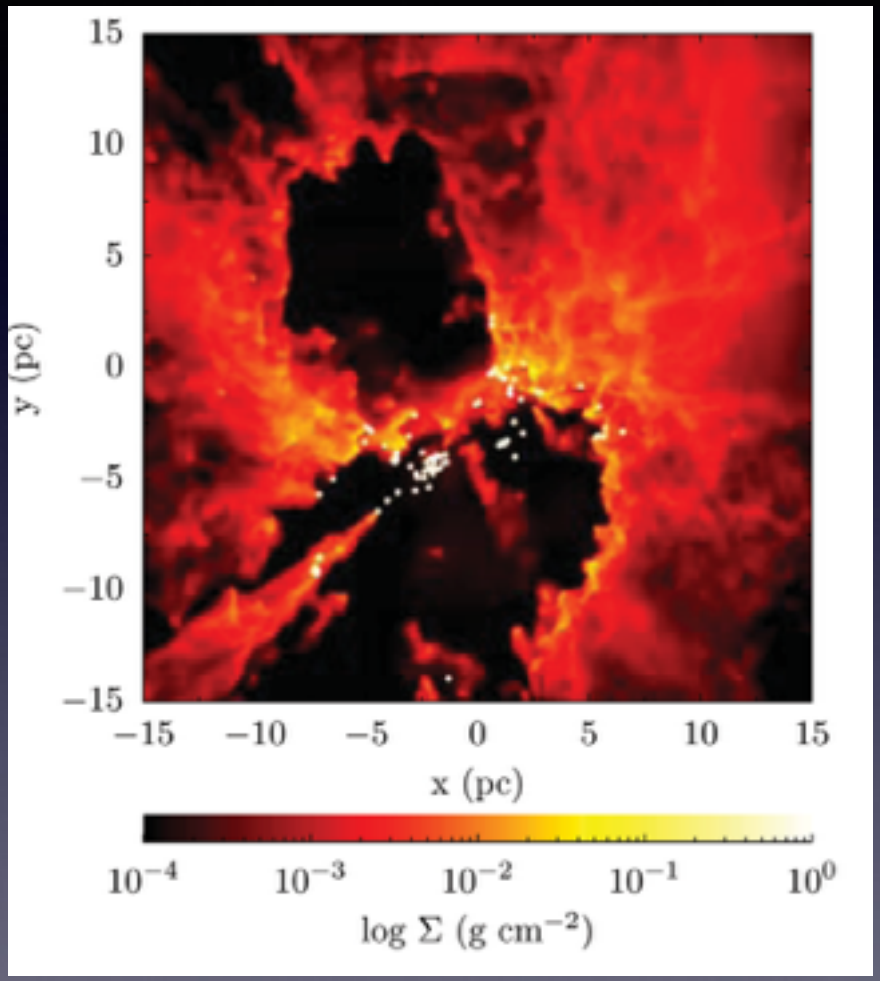
- Assembly of GMCs
  - Large-scale filamentary structures across the MW
- Formation of massive clumps
  - Filaments, cores and hubs
- Filaments and feedback
  - Star formation feedback and filamentary structures

# Massive SF Feedback




(Dale+12 Simulations Library)

# FUSION

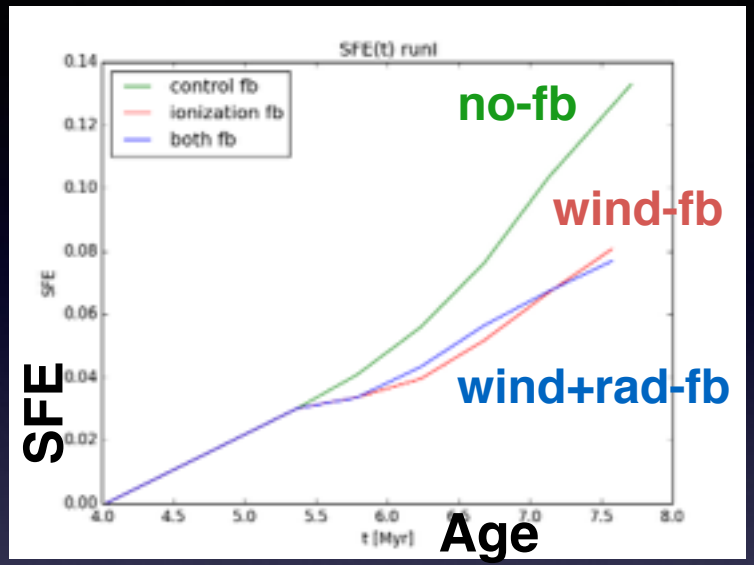



(Dale+ Simulations Library) (McLeod et al. 2014) (Herschel-HOBYS)

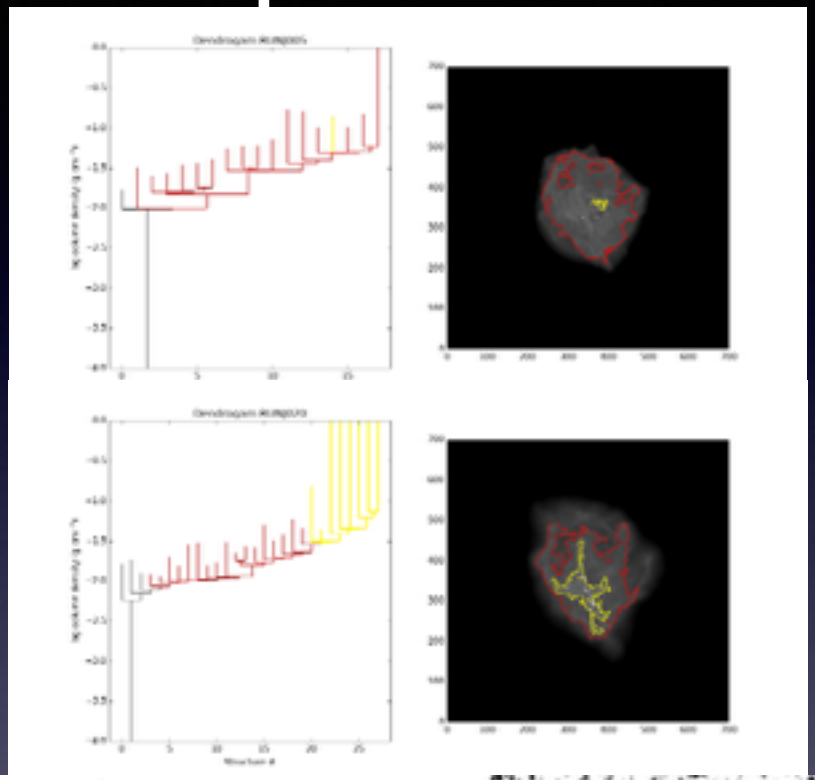
Develop quantitative comparison metrics: T, ρ, dM/dt, $M_{gas}$ (cold/hot/ionised), $v_{gas}$, $v_{exp}$, SFR, SFE

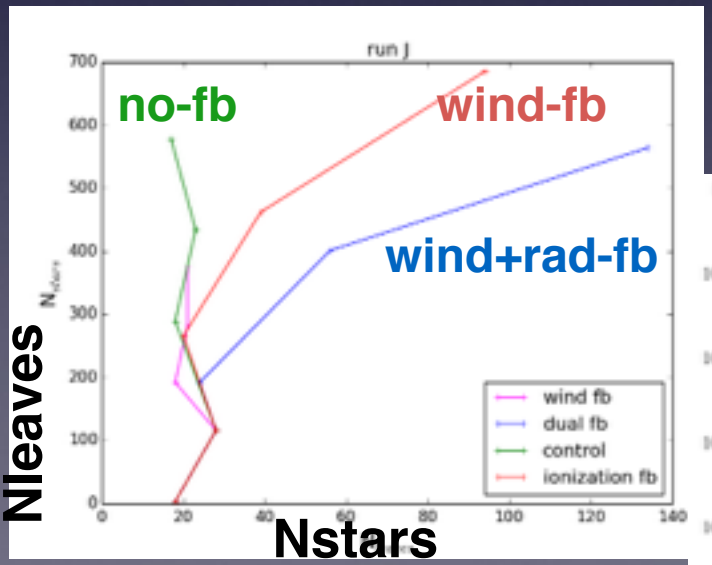
Dendrogram leaves and stellar distributions

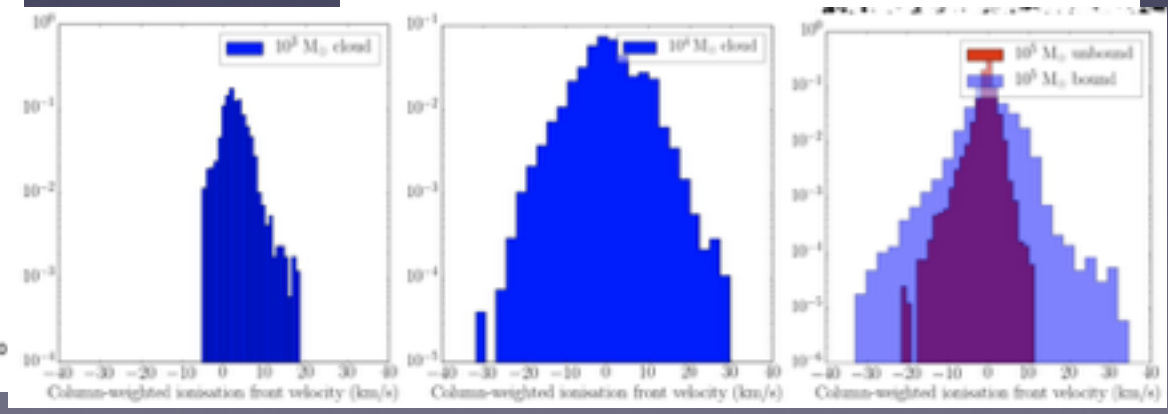
# Some metrics examples




Time



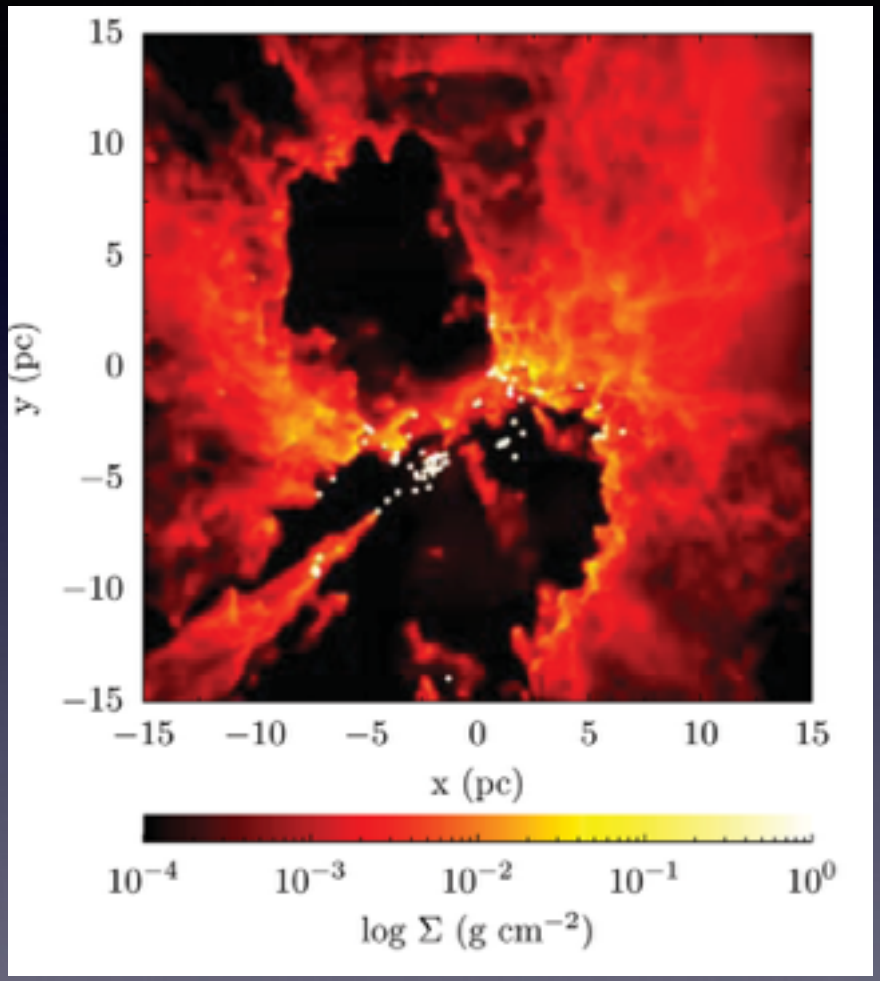


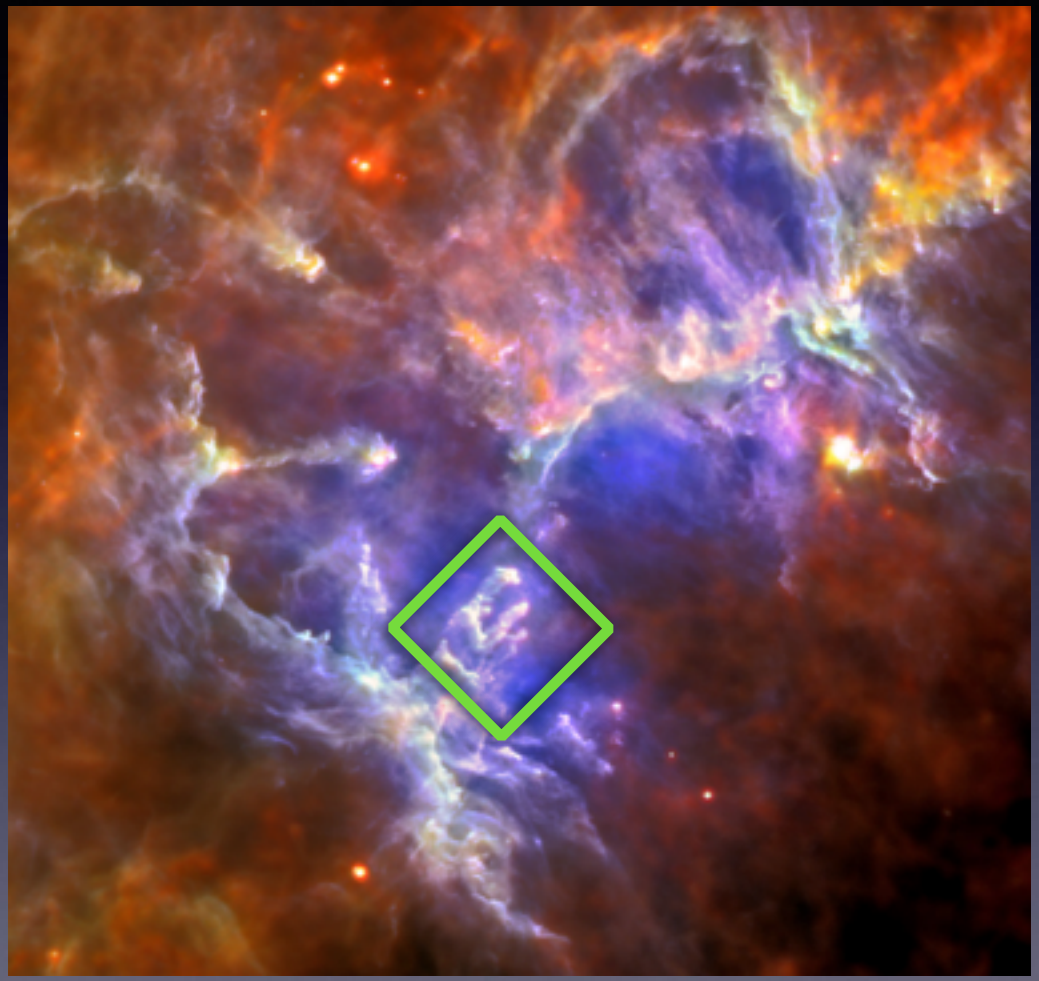




(McLeod+14)

los intensity weighted velocity

# FUSION



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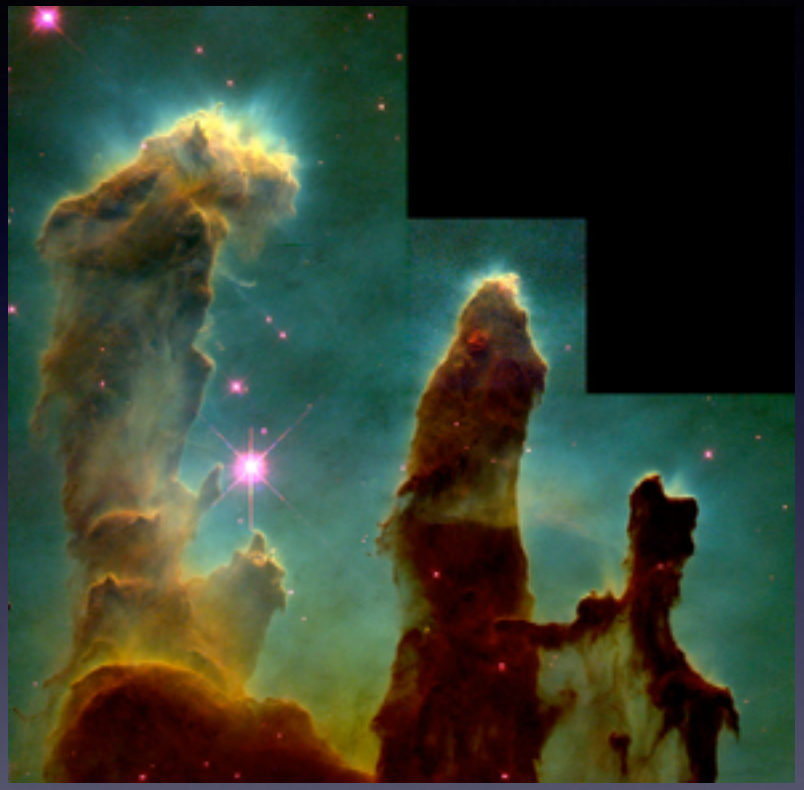
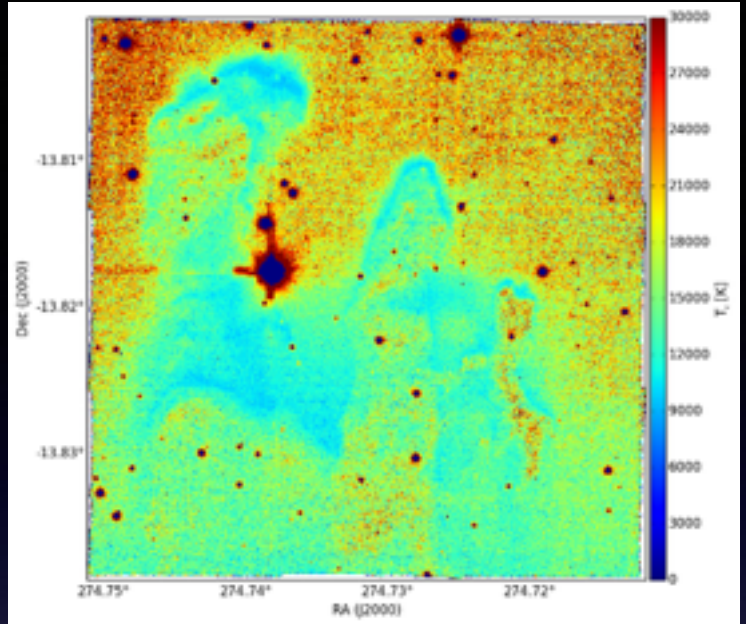


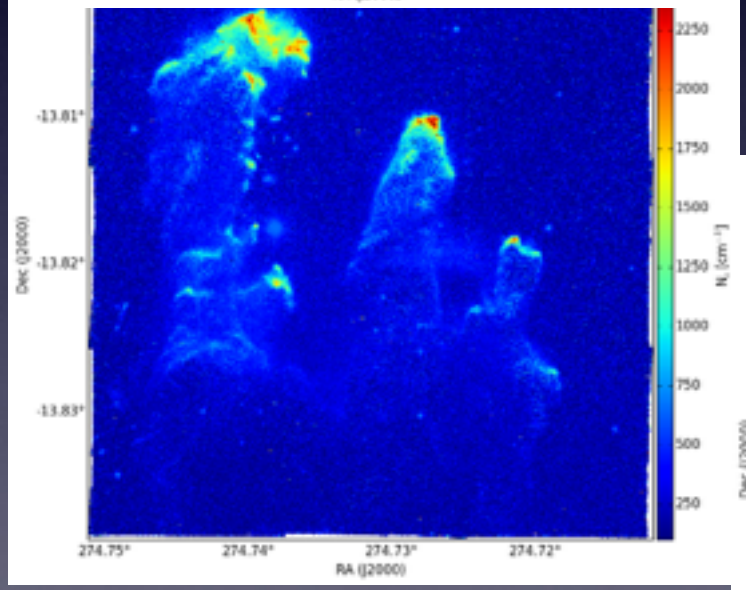
HST

VLT/MUSE

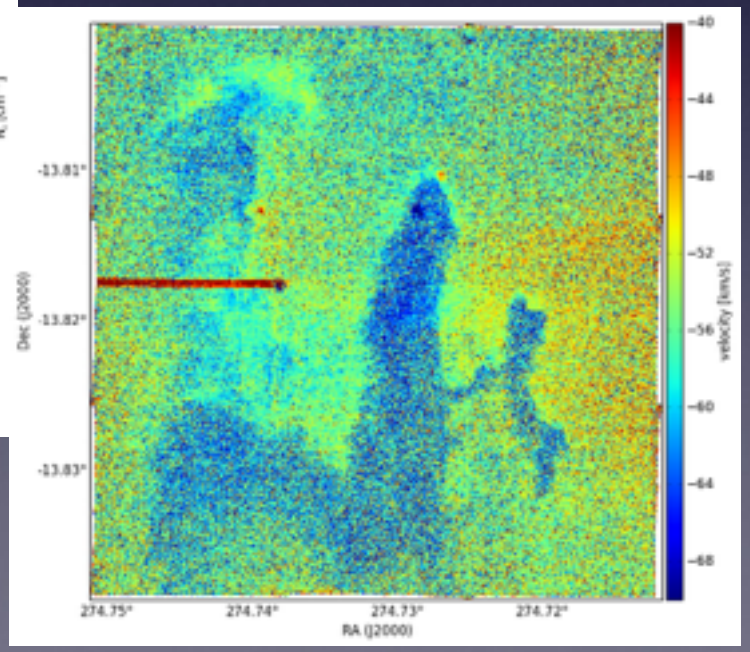
(McLeod et al. 2014)

# FUSION



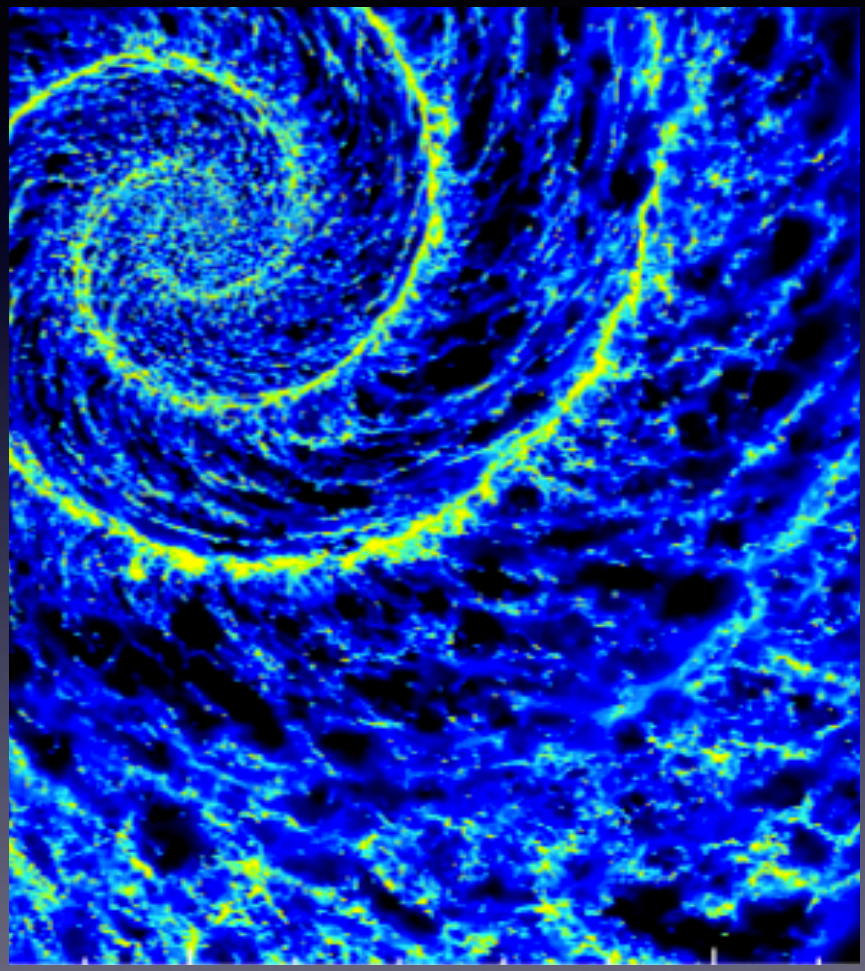

VLT/MUSE




(McLeod et al. 2014)

# GMC-scale Filaments

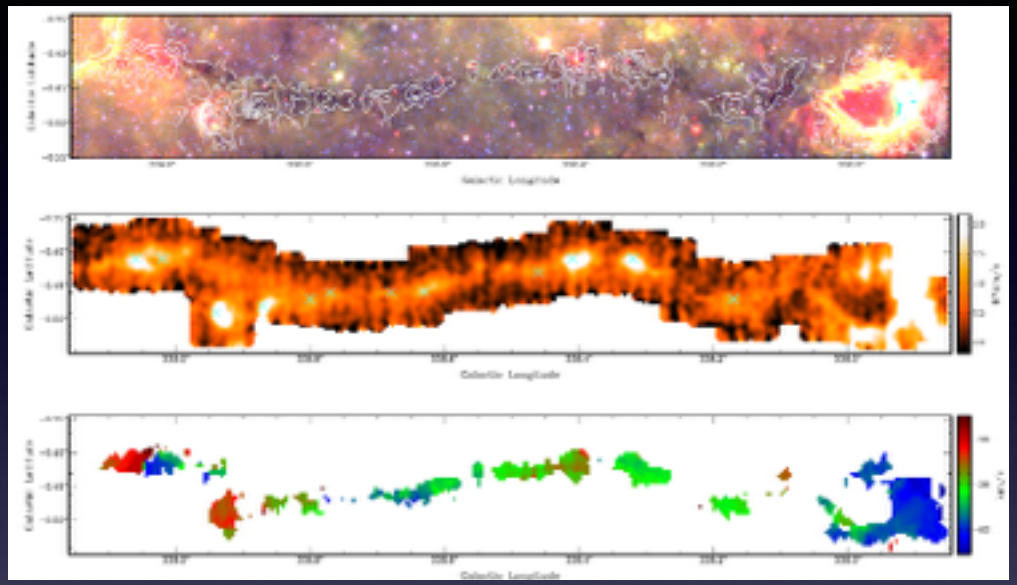
(M51 Hubble Heritage)



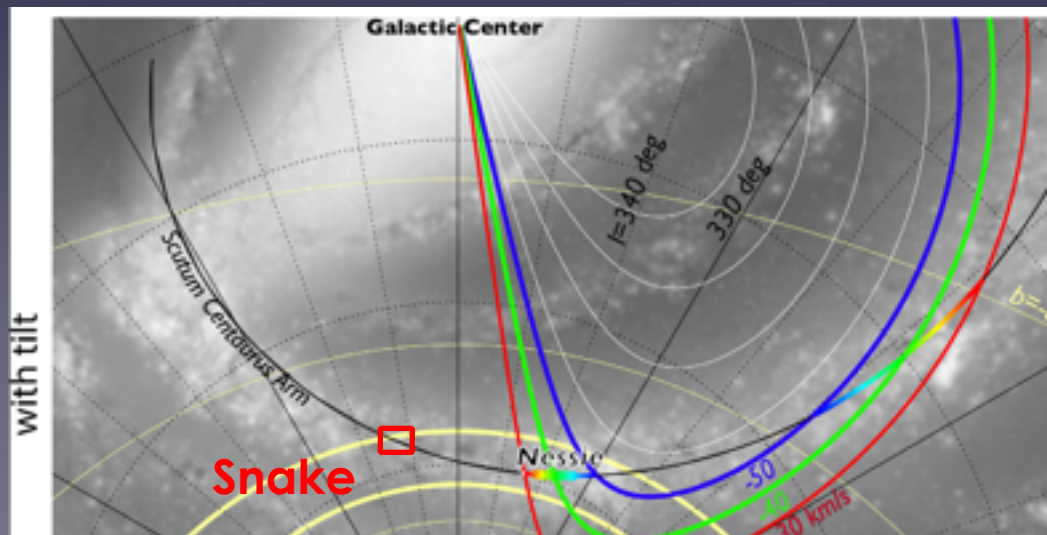
(Simulation Dobbs et al.)

# Arms Filaments


(Snake, Wang et al. 2014a)

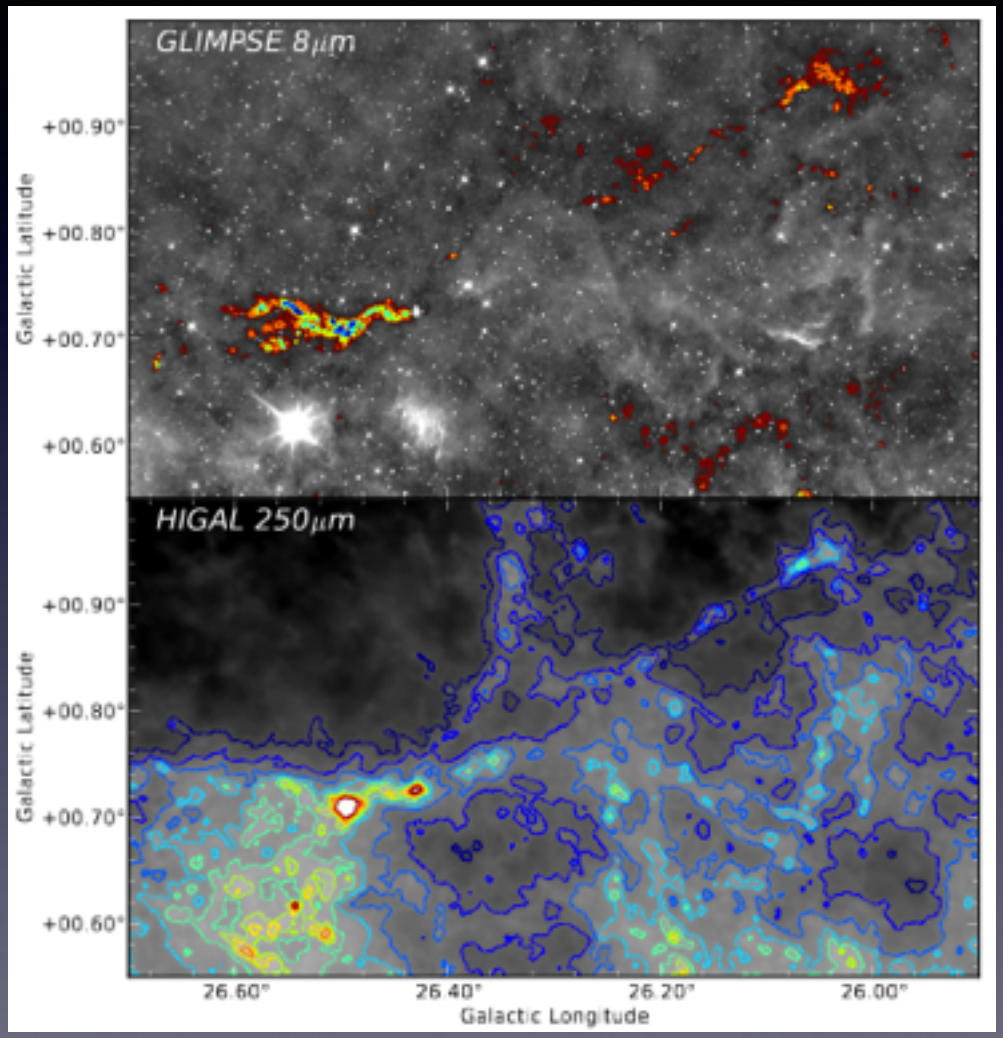


(Nessie, Jackson et al. 2010)

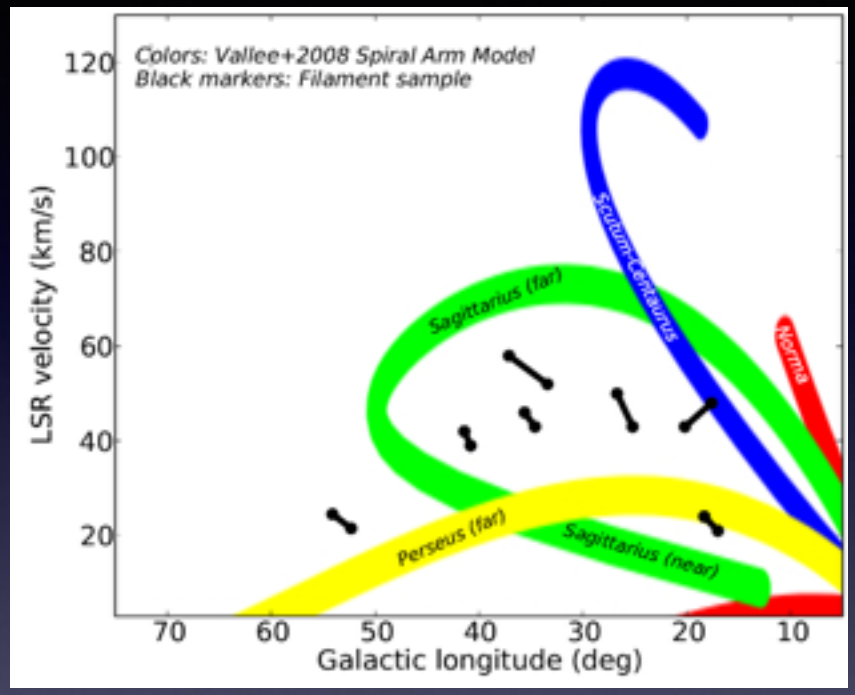



(Goodman et al. 2014)

# More Filaments




(Ragan et al. 2014)



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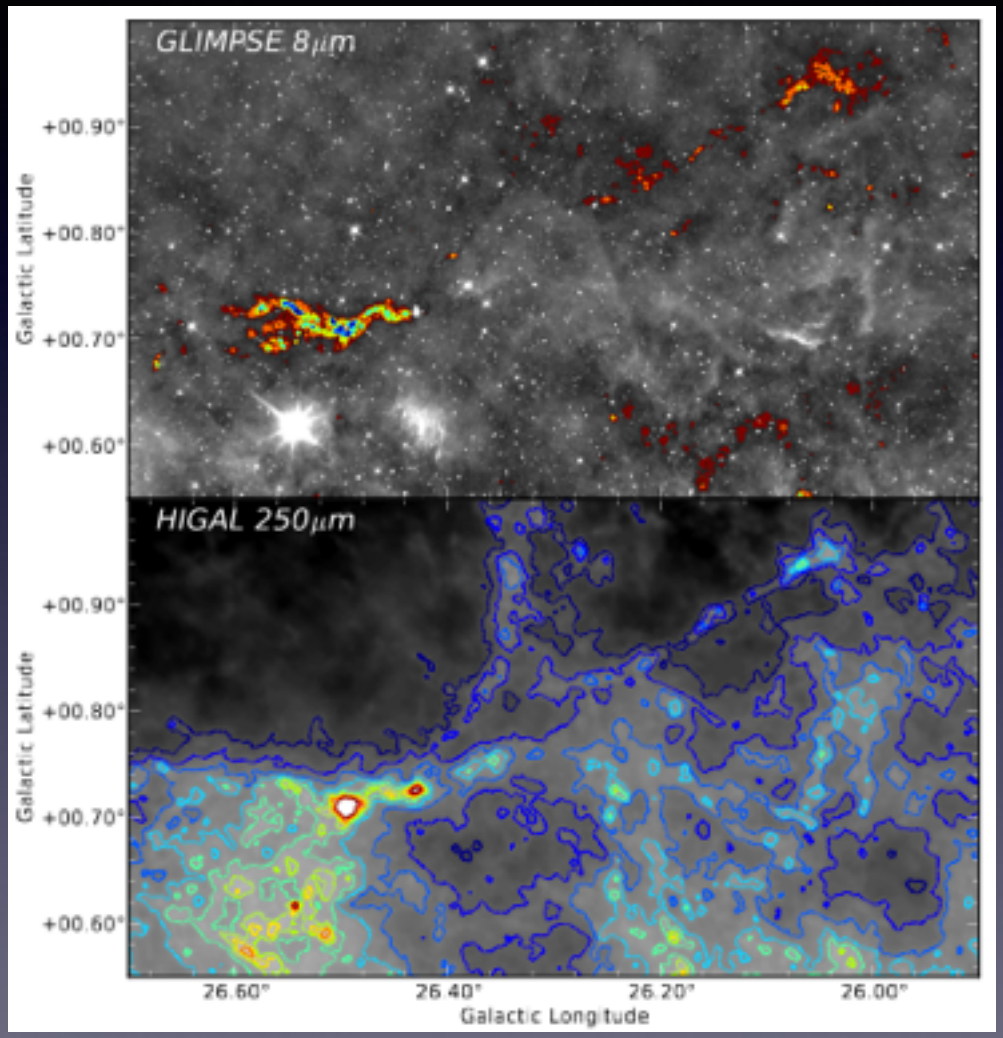
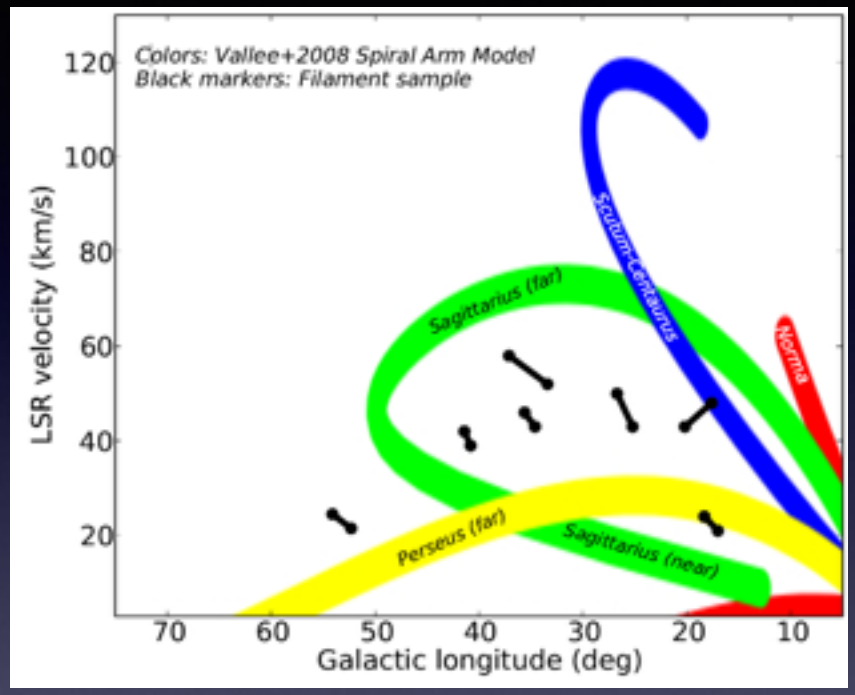



(Ragan et al. 2014)




# Looking from within

(M51 Hubble Heritage)

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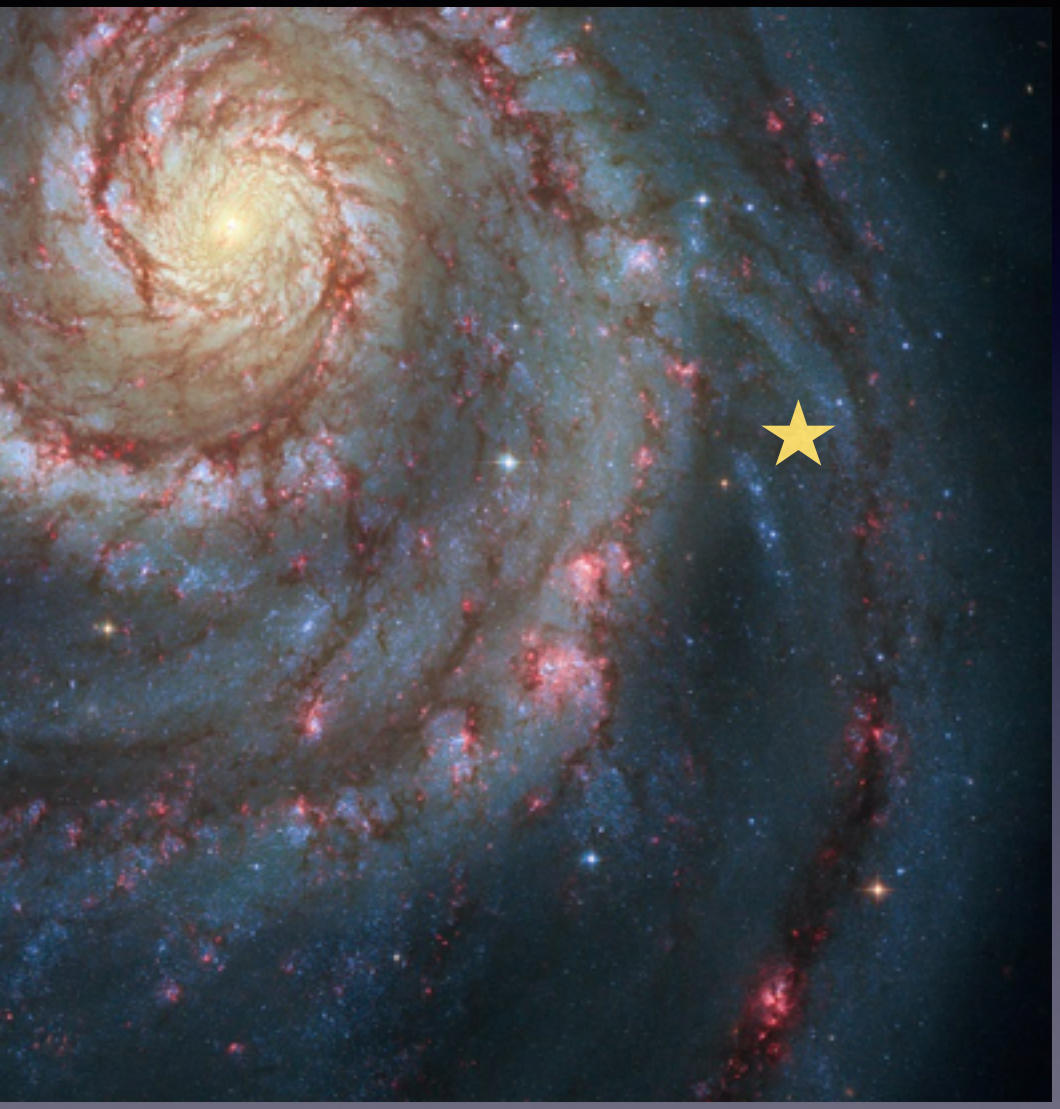

(M51 Hubble Heritage)

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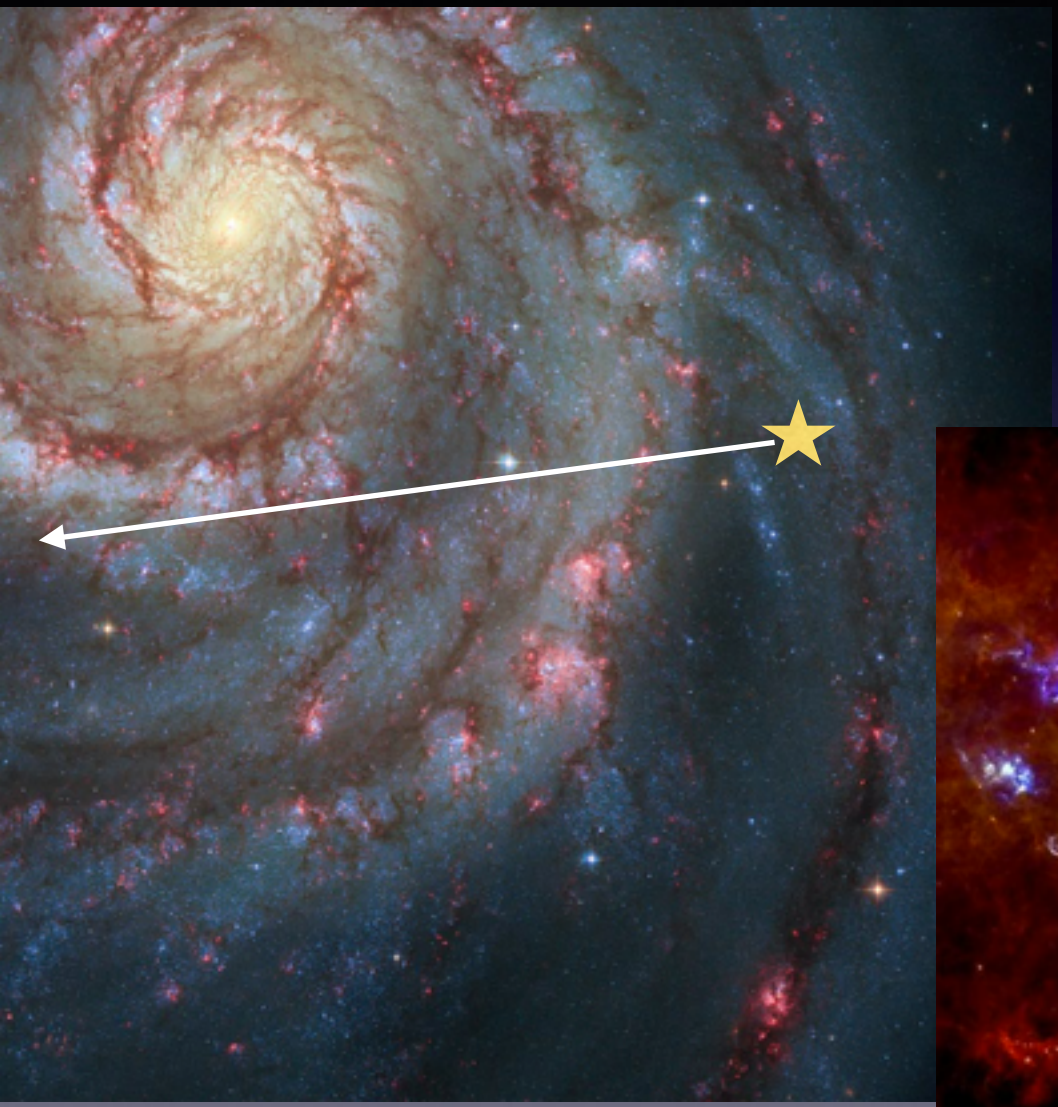
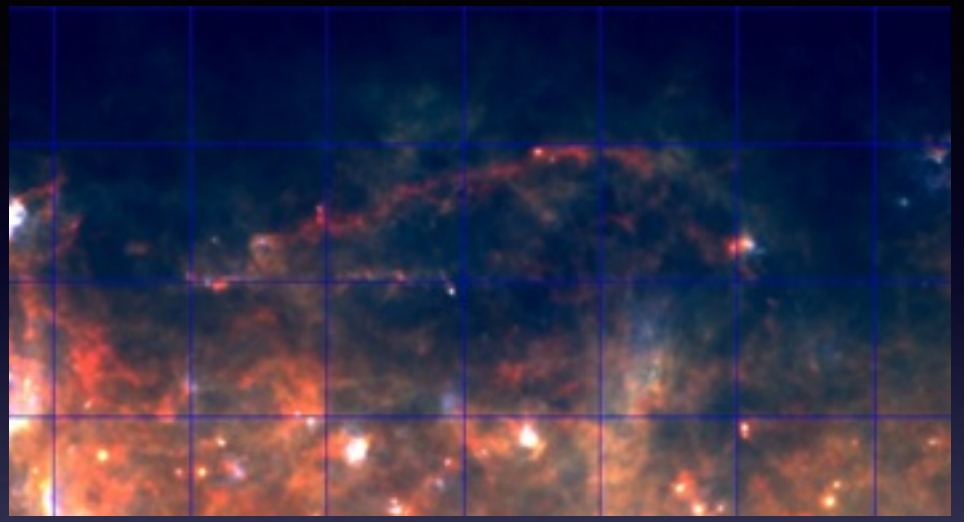


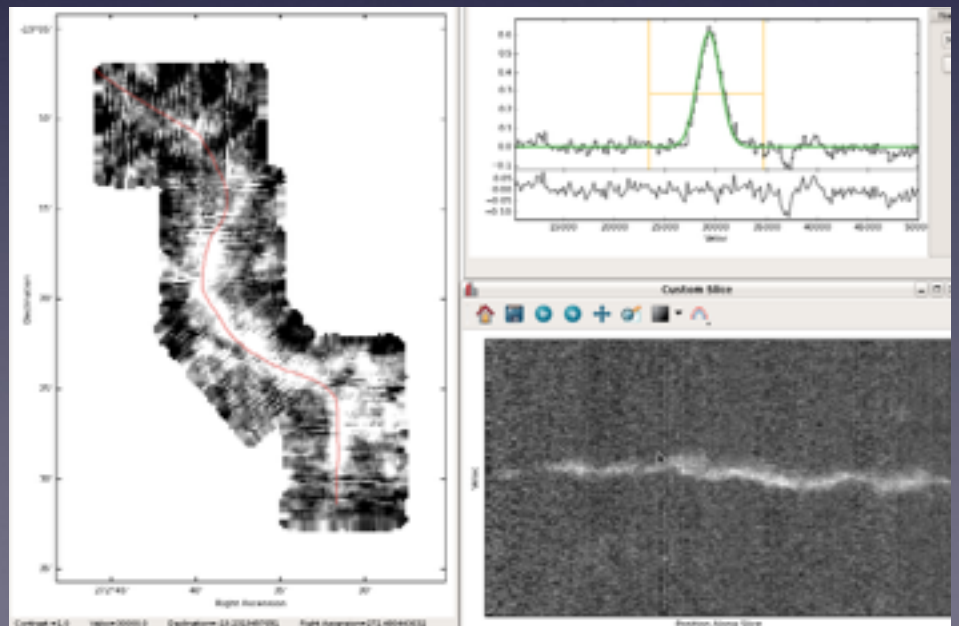
(M51 Hubble Heritage)

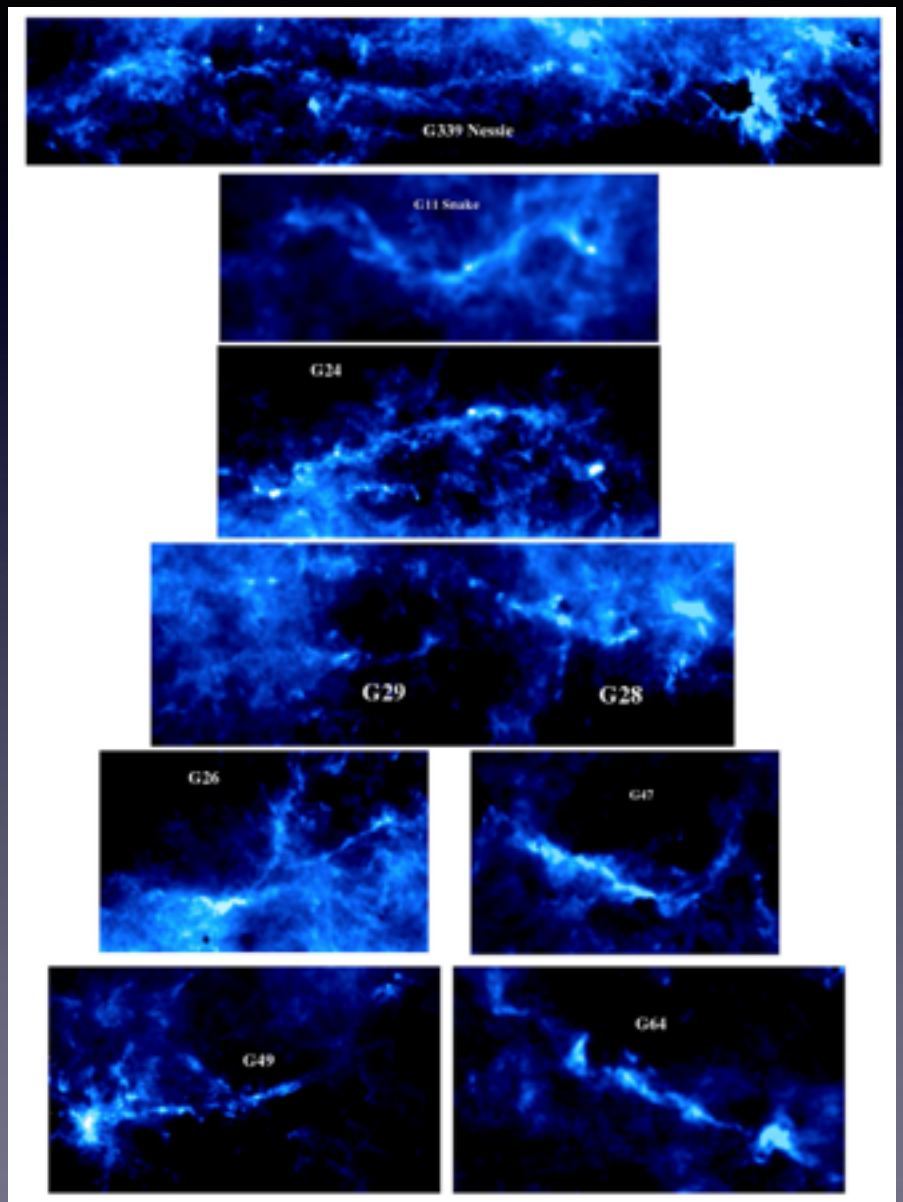
(Herschel HIGAL Molinari+)

# Cold Filaments

(Wang et al. 2014b)





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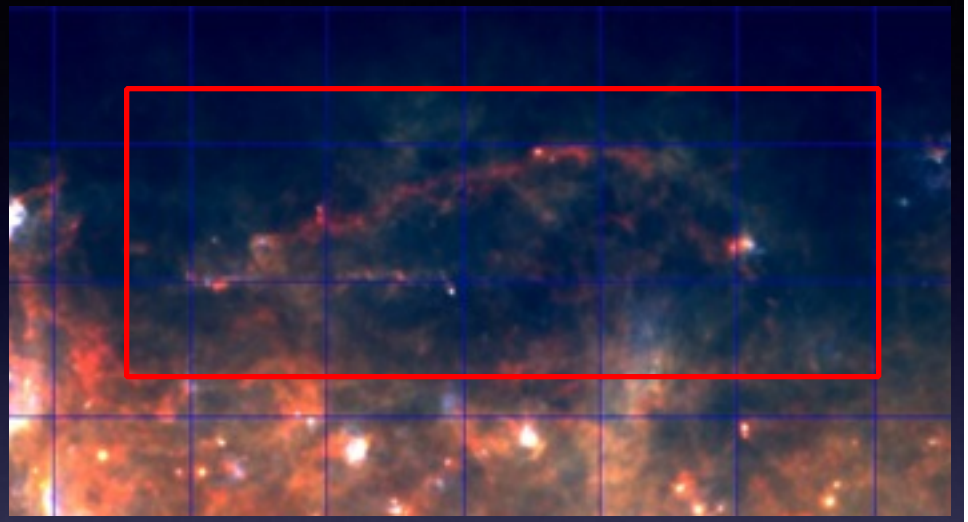
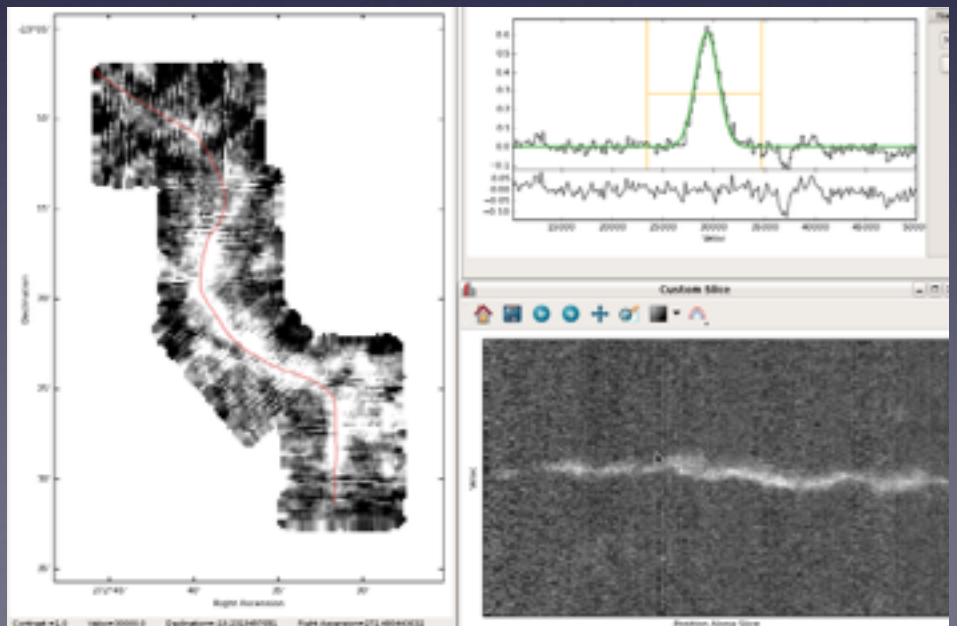
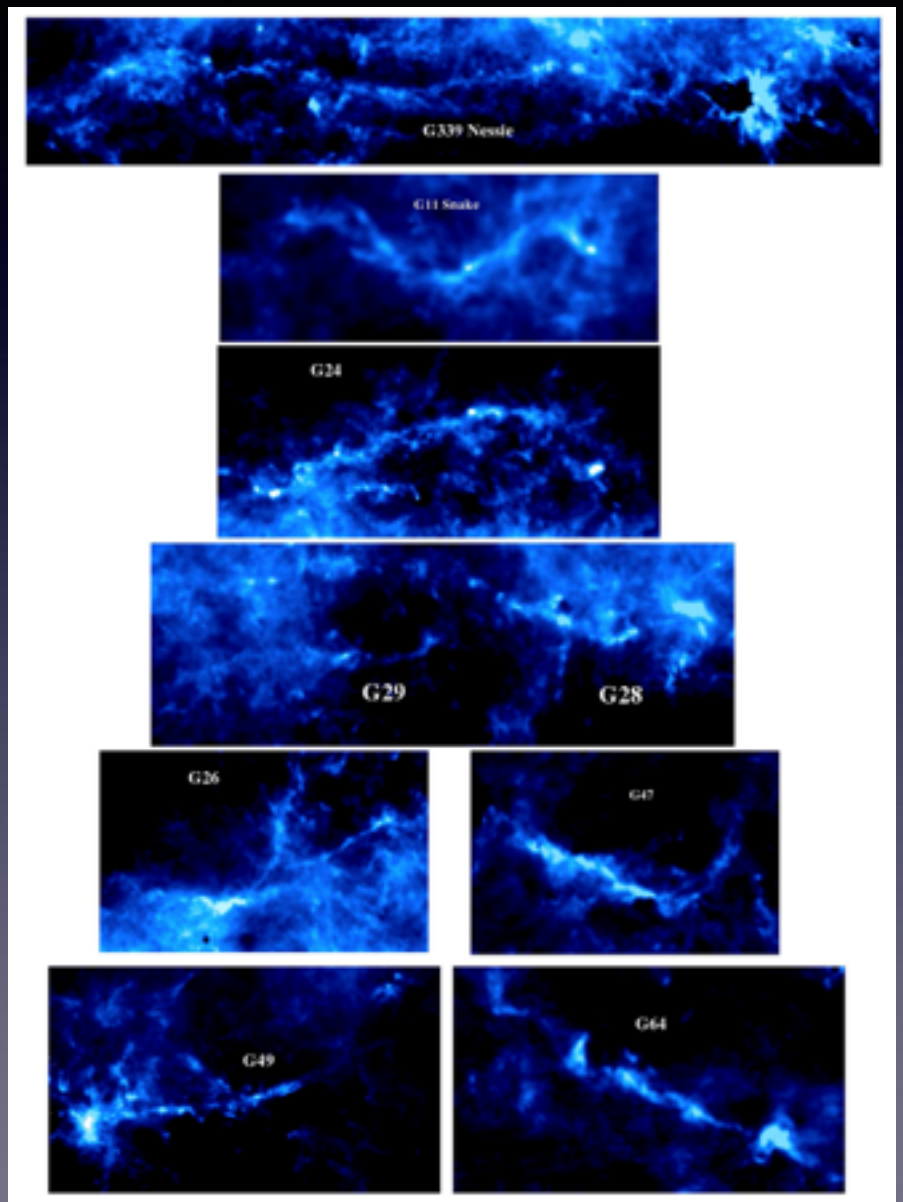
(Wang et al. 2014b)





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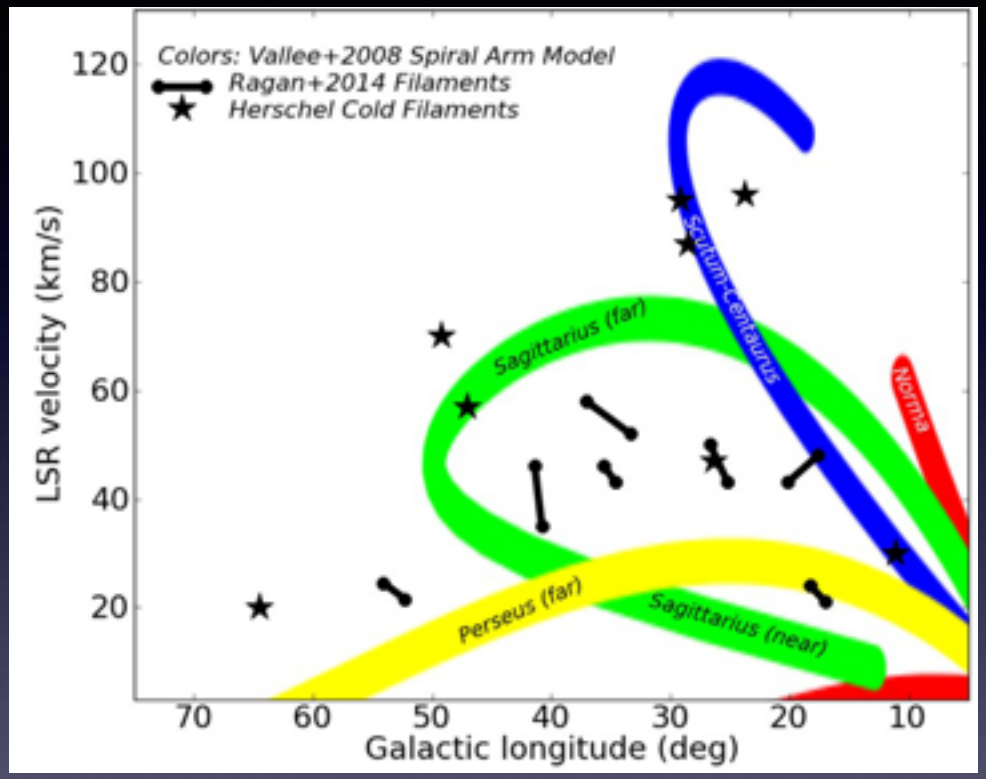
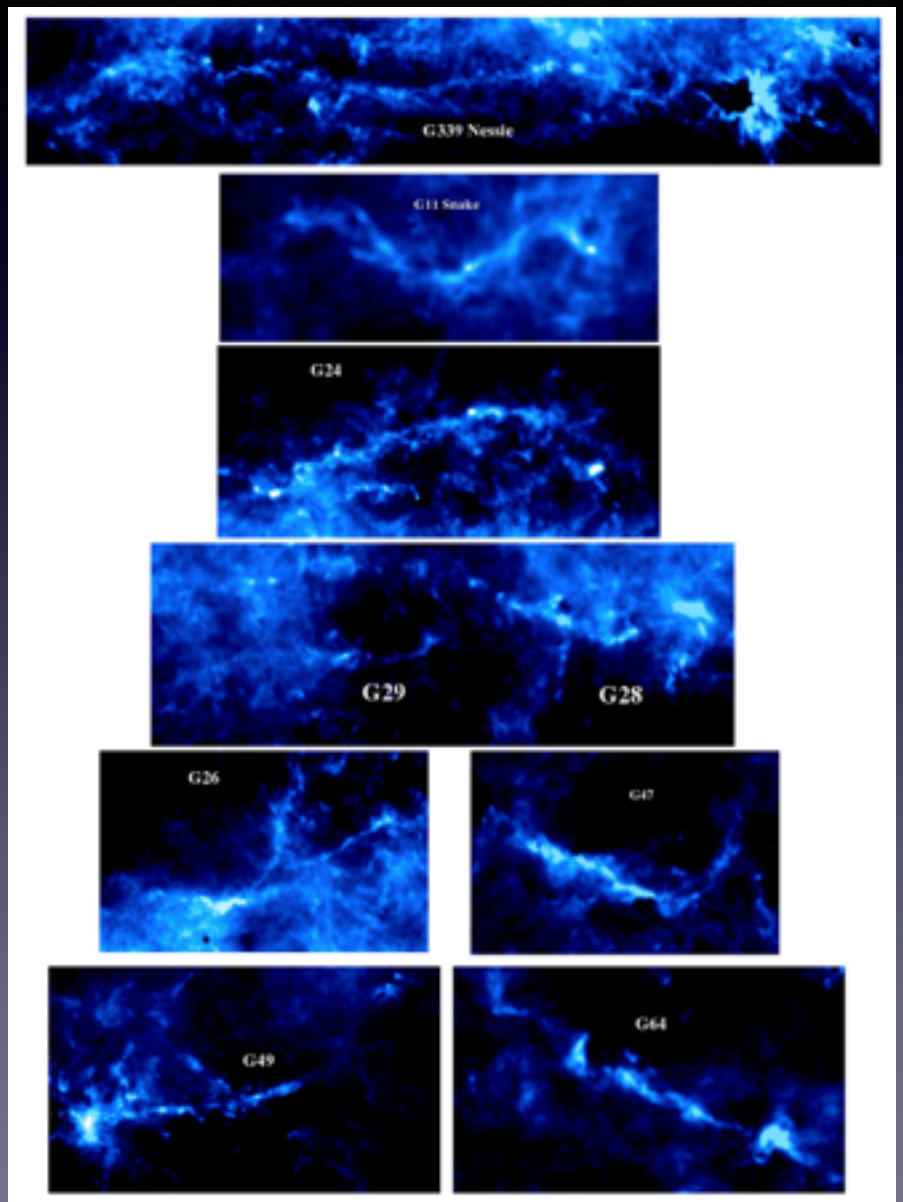



(Wang et al. 2014b)

T~ 20 K
N~ $10^{22}$ $cm^{-2}$
L ~ 30-100 pc
M~ 2-20 $10^5$ $M_{sun}$



# Summary

- Comparison with numerical simulations require a careful comparison with "statistical" metrics
  - All simulations produce "filaments" these days
  - Can we relate what we observe with the physical processes?
- The time of simple metrics is over
  - Modern simulations all produce a PDF as observed (see IMF)
- Spine and ribs of the MW
  - Combination of Herschel and molecular line surveys allow to extract the filamentary structure within the MW
  - Samples are still very incomplete, but initial comparison with simulations is possible