Molecular Clumps & Cores in Colliding Flows

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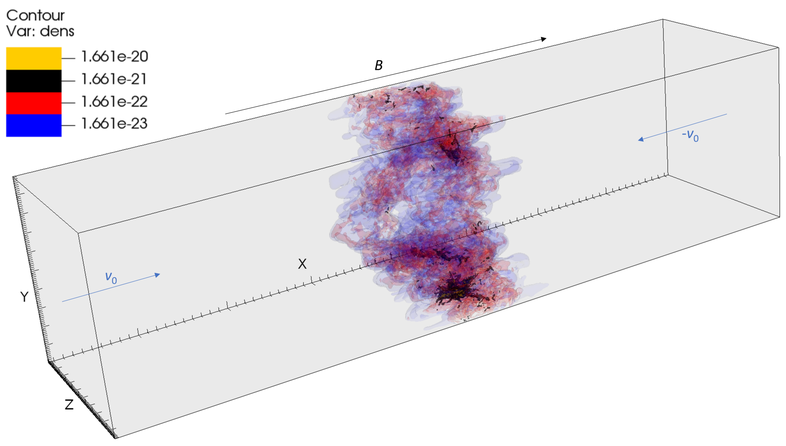
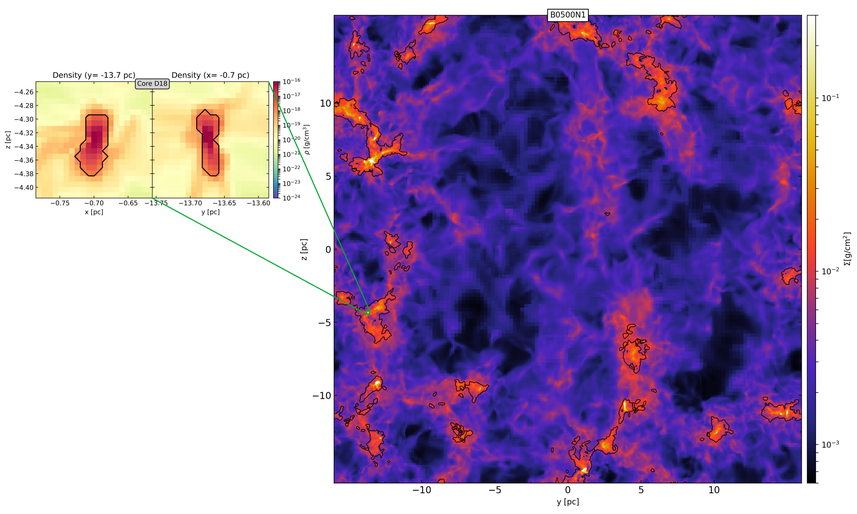
Simulations

- Code: Flash AMR
- Model: Two head-on flows of WNM
- Slightly supersonic inflow
- Initial B-field along flow
  0.01 µG | 1.25 µG | 2.5 µG | 5 µG
- Tree-based (self-)gravity
- Non-eq. chemistry (H^+, H, H2, C^+, CO)
- ~1600 AU resolution ($(32\ pc)^2 \times 128\ pc$ box)



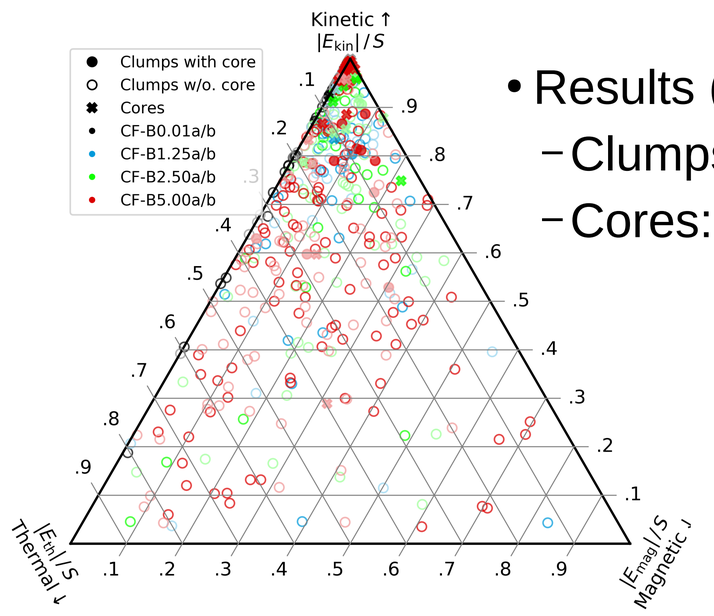
3D Clump & Core Detection

- 3D molecular clumps:
  - Connected molecular region
  - CO-abund. > 10^{-4} (~70% saturation)
- 3D cores:
  - Connected shielded space
  - Inside 3D clump
  - $A_{V,3D}$ > 8 mag
- Discard object if < 30 grid cells
- Not all clumps host cores!



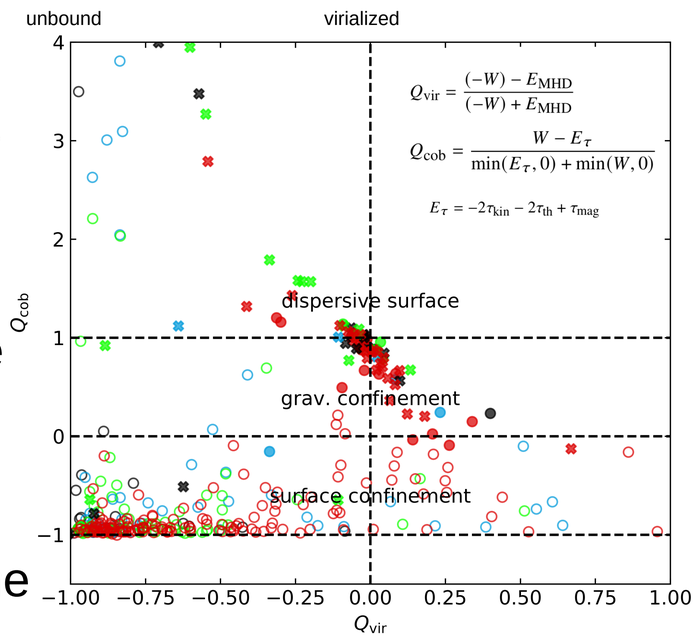
Clump & Core Analysis: Full Virial Theorem[1,2]

- Evaluation of:
  - Volume & surface terms: Kinetic, Thermal, Magnetic
  - Gravitational energy (inc. tidal) & Eulerian surface flux



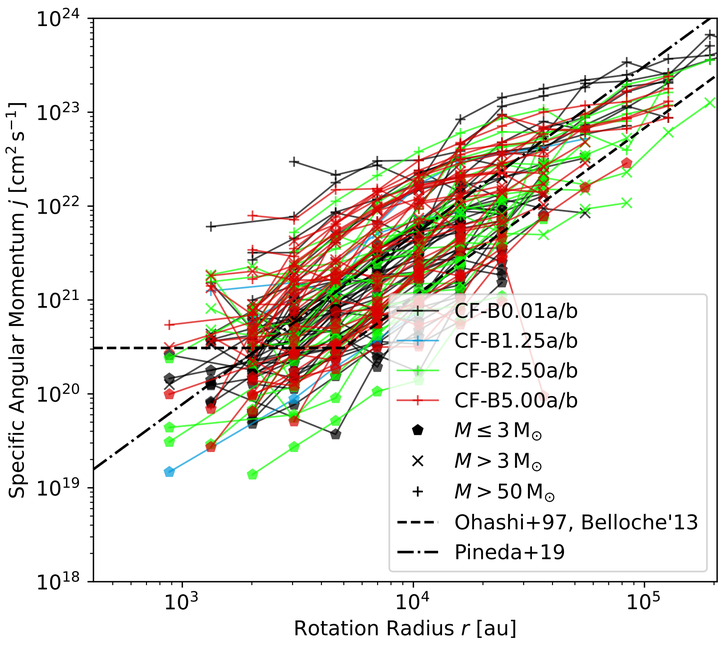
- Results (MHD Term Balance):
  - Clumps: Mostly $E_{kin} \sim E_{th} > E_{mag}$
  - Cores: Kinetically dominated

- Results (Confinement):
  - Clumps: Mainly weak surface confinement
  - Cores: Gravity confinement, some surface dispersion
    ➔2D std. virial ratio mostly fine



Core Analysis: Angular Momentum

- Evaluation of the 3D core's specific angular momentum j
  (Abs. value, radially binned)



- Results:
  - Slopes $j \sim r^\alpha$ (< 3 $M_\odot$): ~1.55
    (Similar to obs. [3,4,5])
  - Scatter connected to geometric complexity

Contact

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References

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4 Belloche A. (2013)
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