EPoS 2024

WHAT COLLAPSES?

UNDERSTANDING THE ONSET OF STAR FORMATION
ACCORDING TO SIMULATIONS & SYNTHETIC OBSERVATIONS OF MASSIVE CLUMPS FRAGMENTATION

Nucara+ in prep.
Poster 21

A. Nucara (INAF-IAPS), A. Traficante (INAF-IAPS),
U. Lebreuilly (Paris-Saclay), S. Molinari (INAF-IAPS), P. Hennebelle (Paris-Saclay),
L. Testi (Alma Mater Studiorum - University of Bologna), N.-D. Tung (Paris-Saclay) , C. Mininni (INAF-IAPS) & the ECOGAL team

PROBING STAR-FORMATION MECHANISMS IN MASSIVE STAR-FORMING REGIONS: BRIDGING OBSERVATIONS AND SIMULATIONS THROUGH

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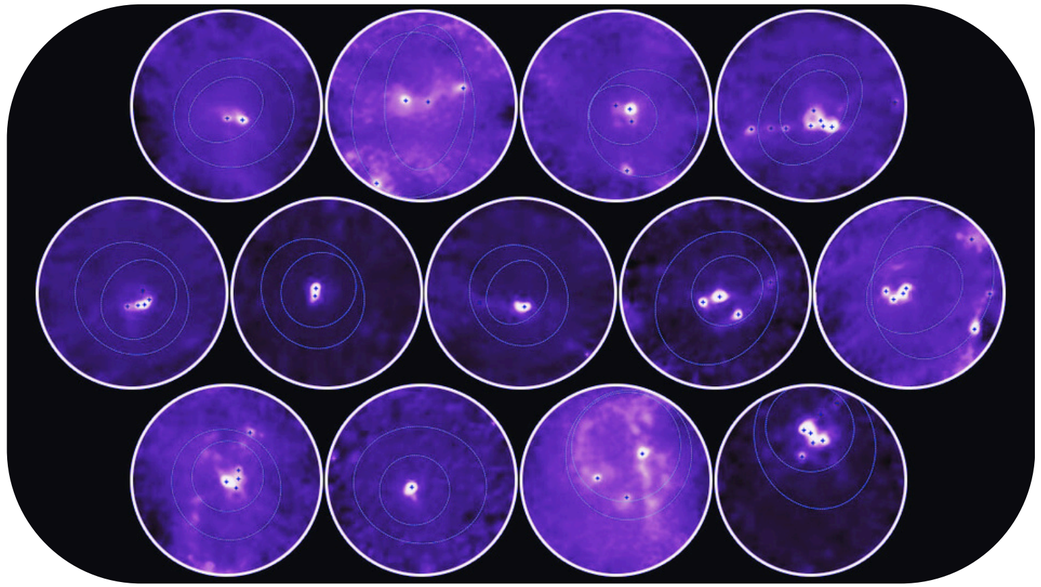
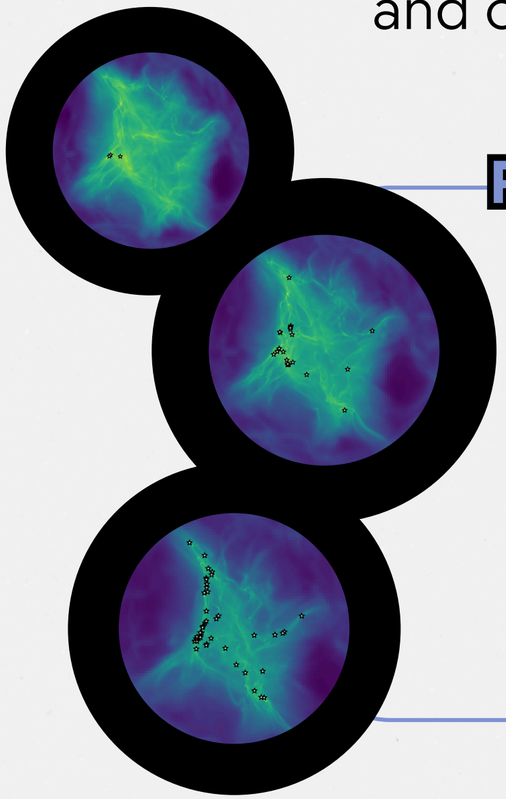
First science case

ALMA 1.3 mm observations of massive clumps fragmentation from **the SQUALO project**:
13 massive clumps at different evolutionary stages
different fragmentation modes



Traficante+ 2023 (Talk tomorrow)

Suite of **32 MHD RAMSES simulations** **[Lebreuilly+ in prep.]** of massive clumps fragmentation and cluster formation with different initial conditions for clumps and environment



RS1.0

Seed: 1, 2

M: (500,1000) $M_\odot$ R: (0.4,0.8) pc

$\mathscr{M}$: 7,10 μ: 10,100

3 projections, 8+ time steps

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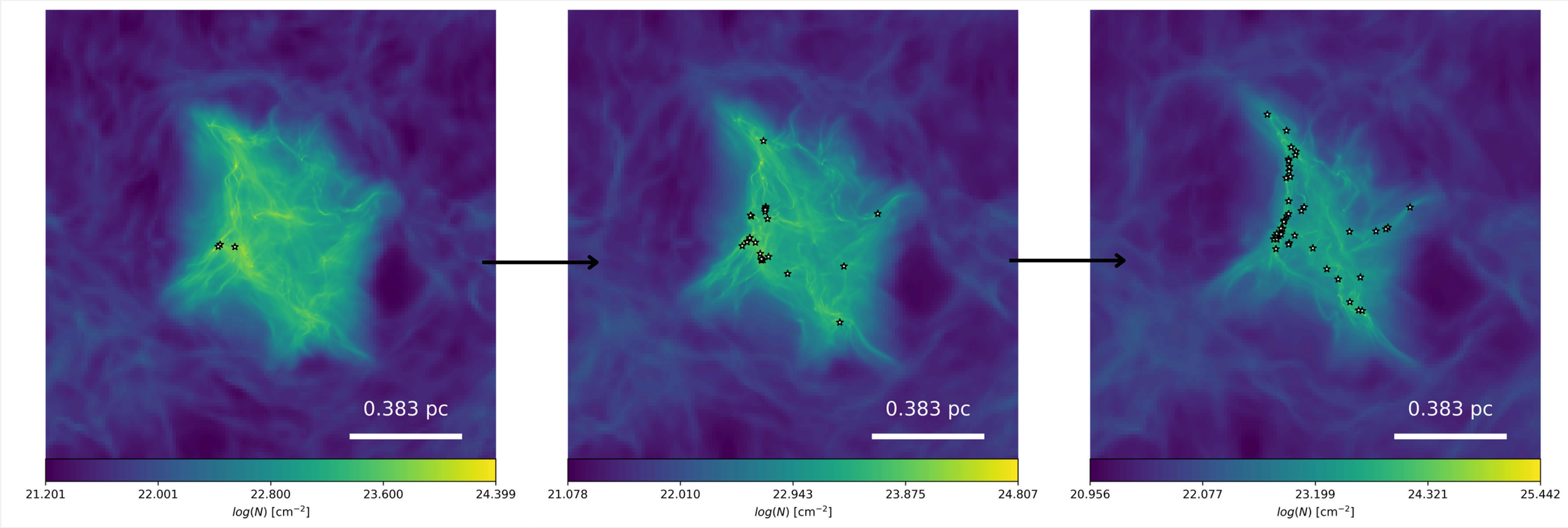

GLOBAL CLUMP COLLAPSE + LOCAL FRAGMENTATION/COLLAPSE

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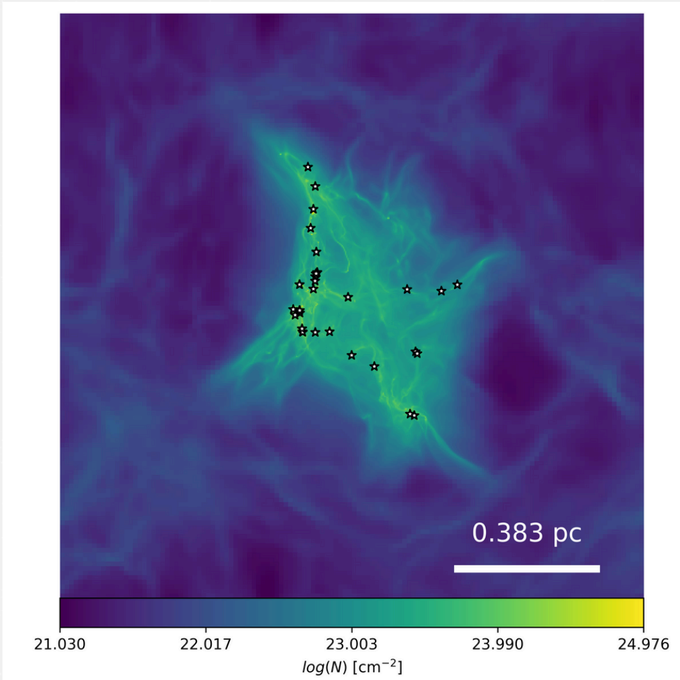

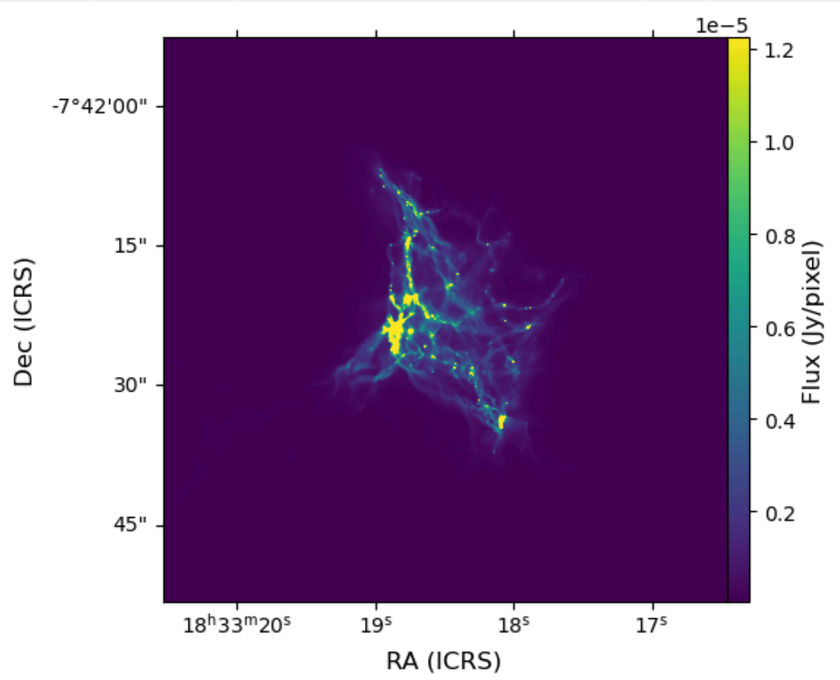

RADIATIVE TRANSFER @1.3 mm

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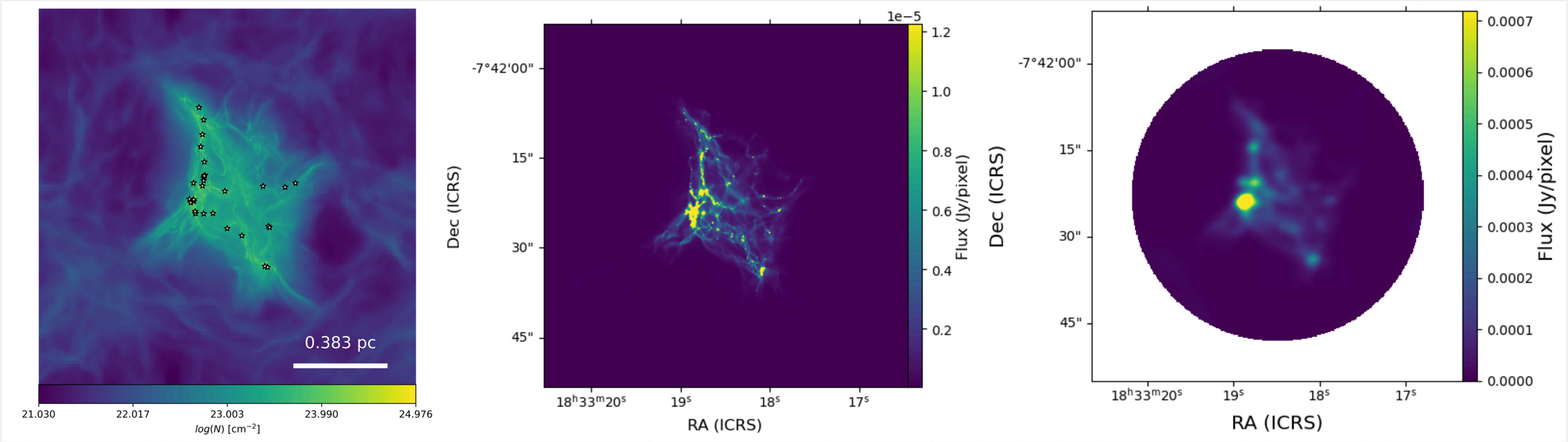

POST PROCESSING

ALMA synthetic observations w/ 7m+12m

WHICH STRUCTURES ARE INVOLVED IN THE COLLAPSE?

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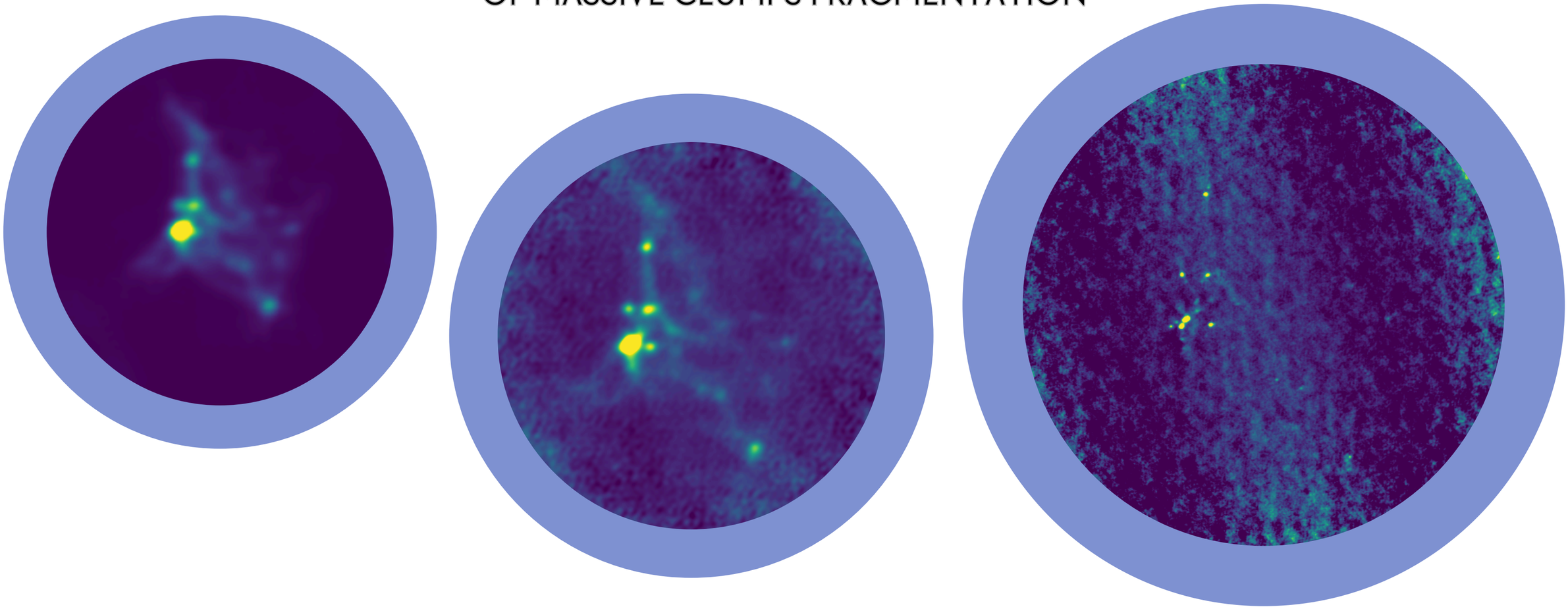

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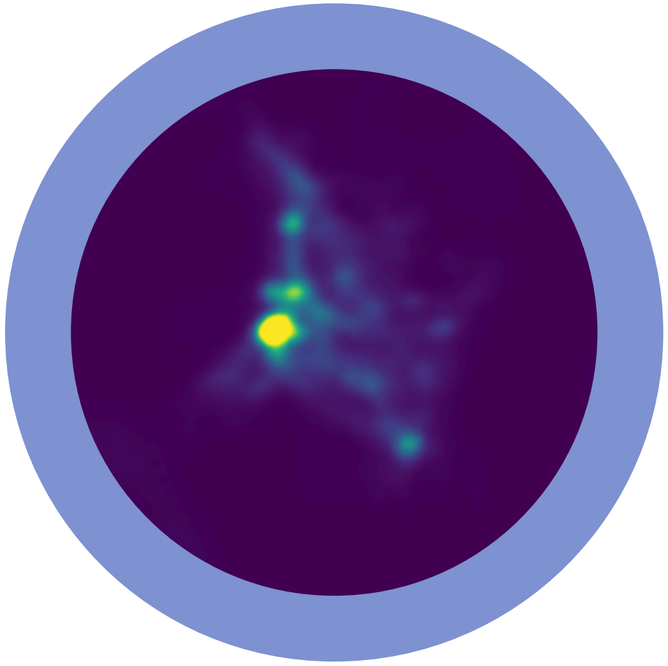
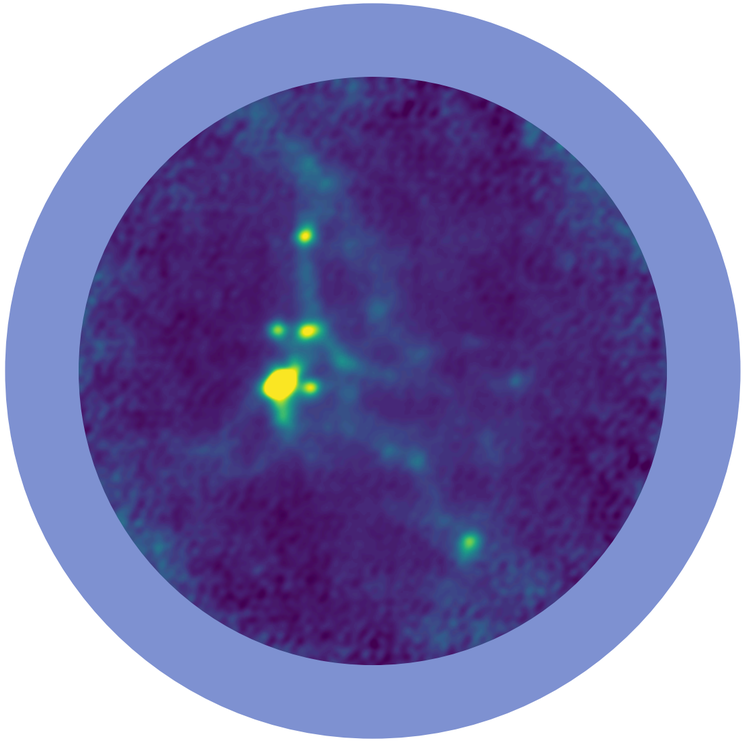


7000 AU



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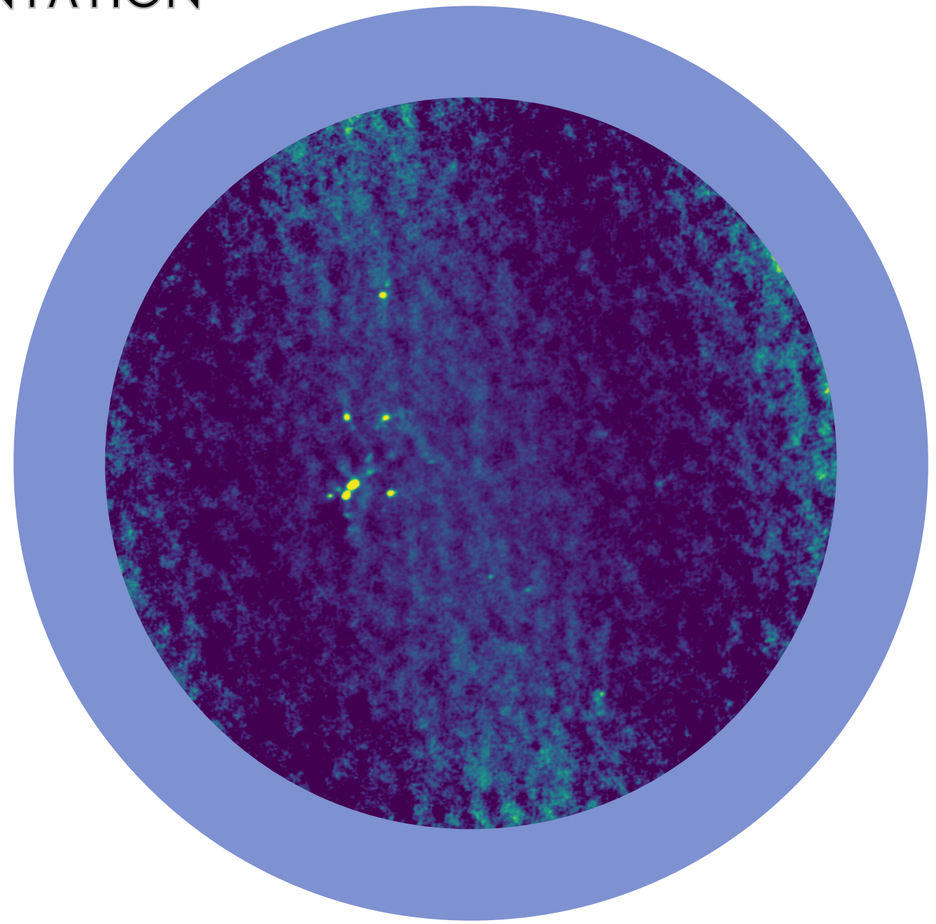

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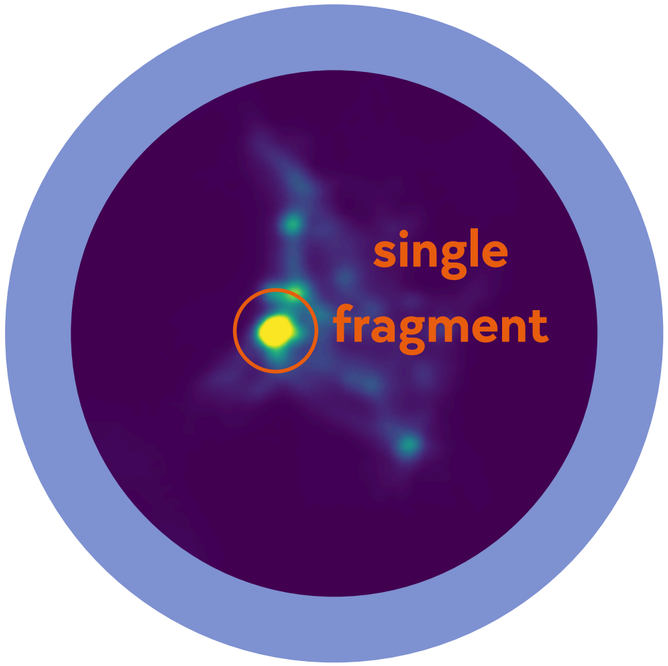

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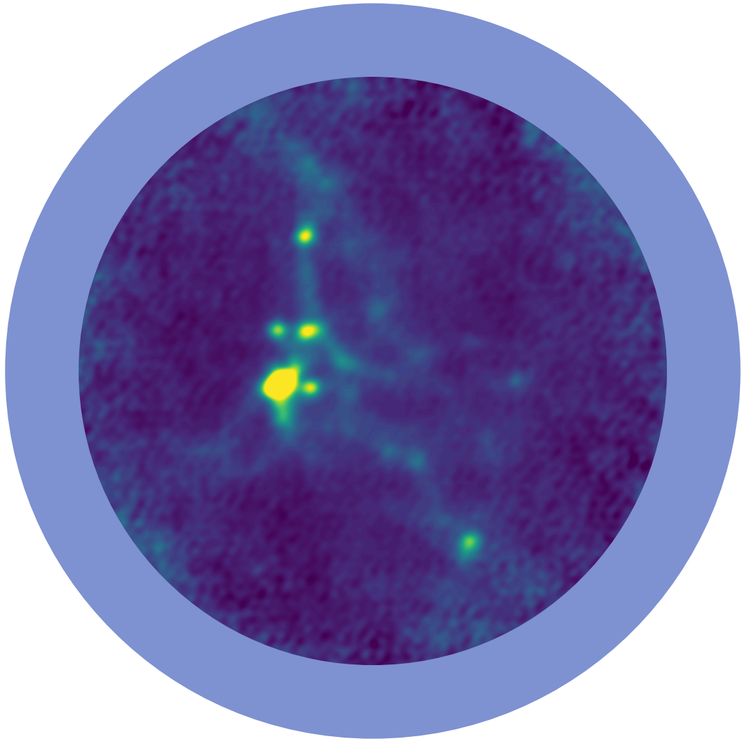

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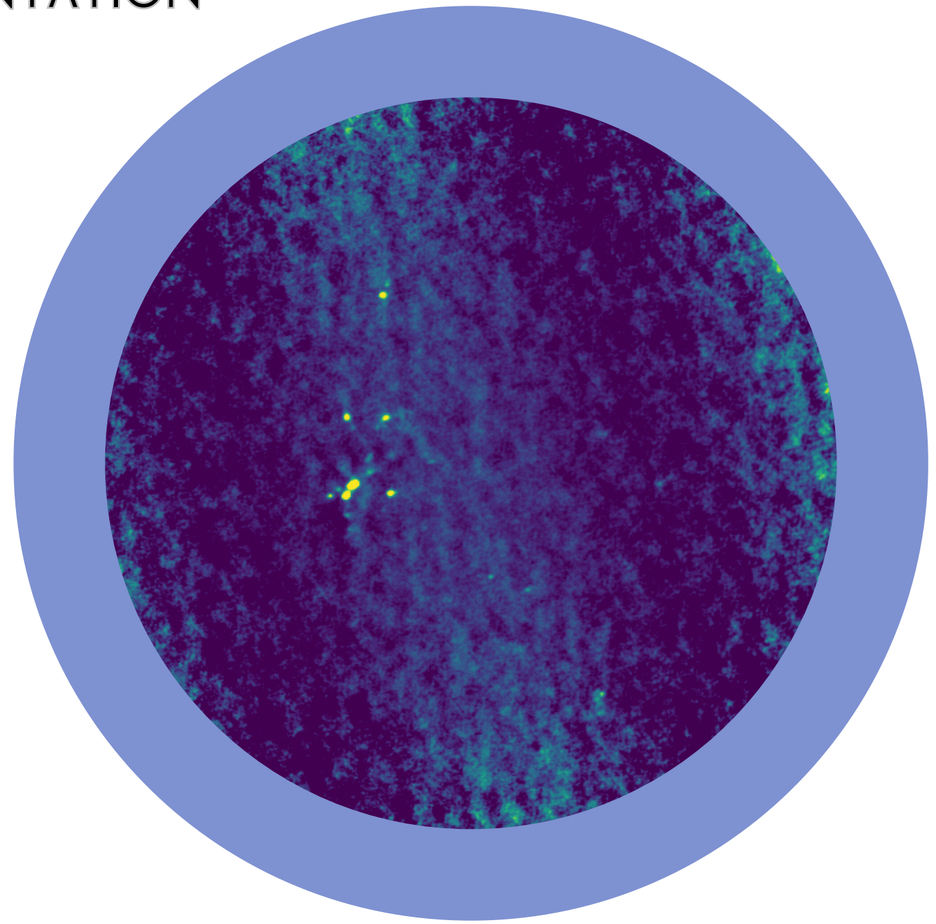

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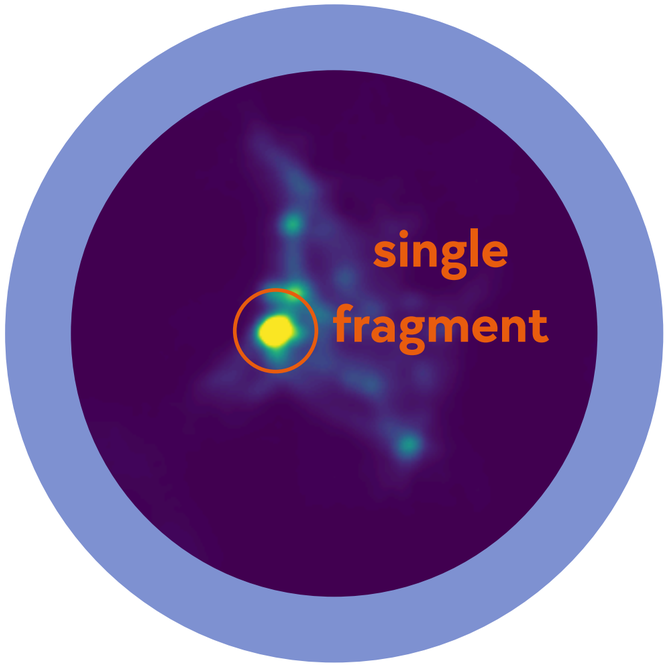

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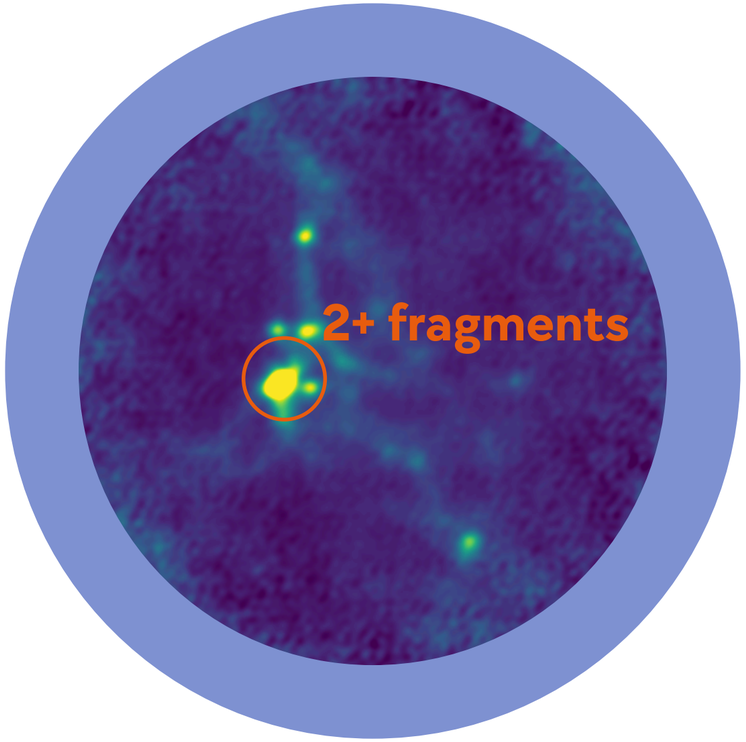

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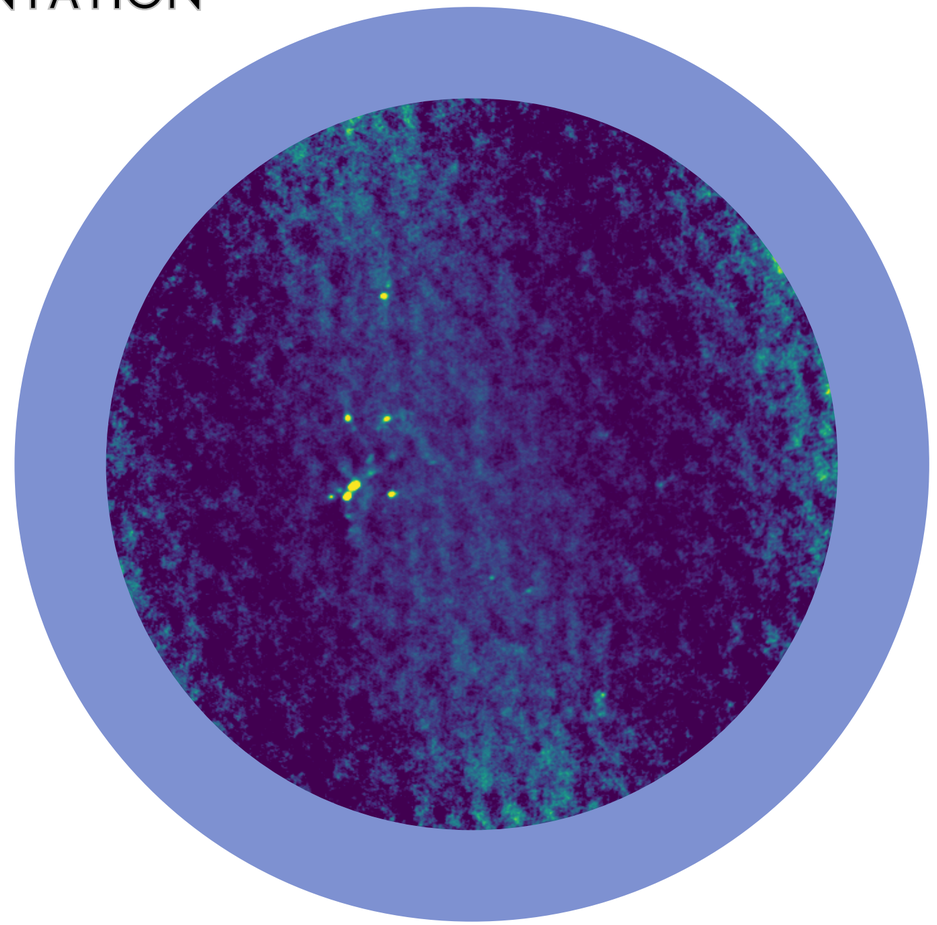

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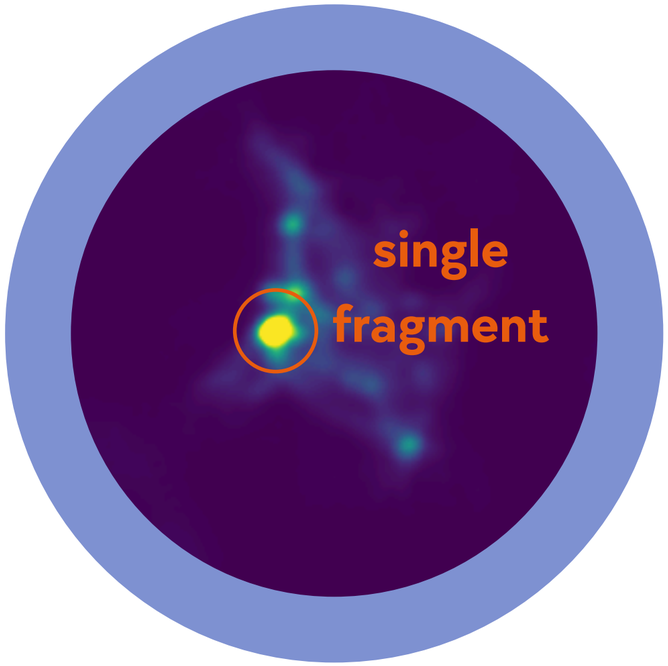

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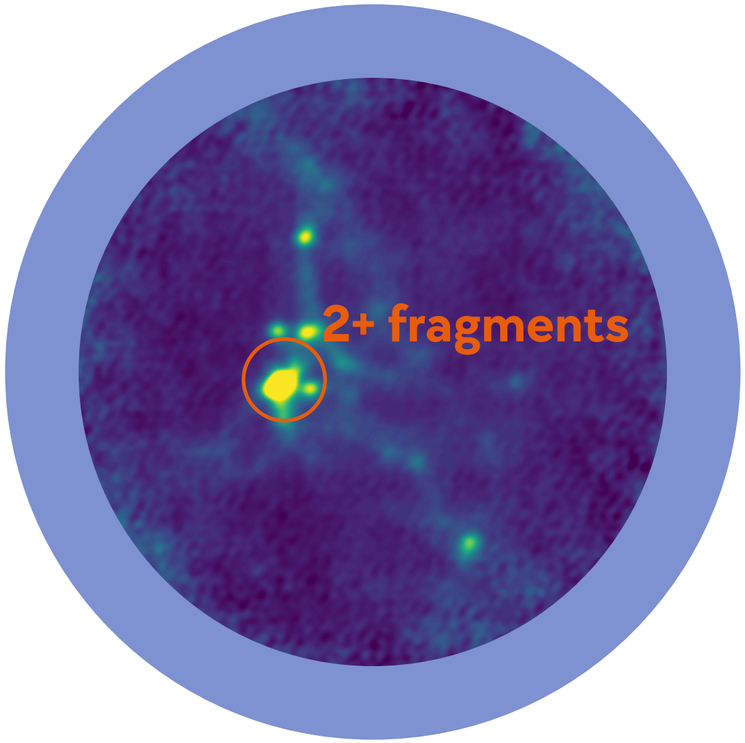

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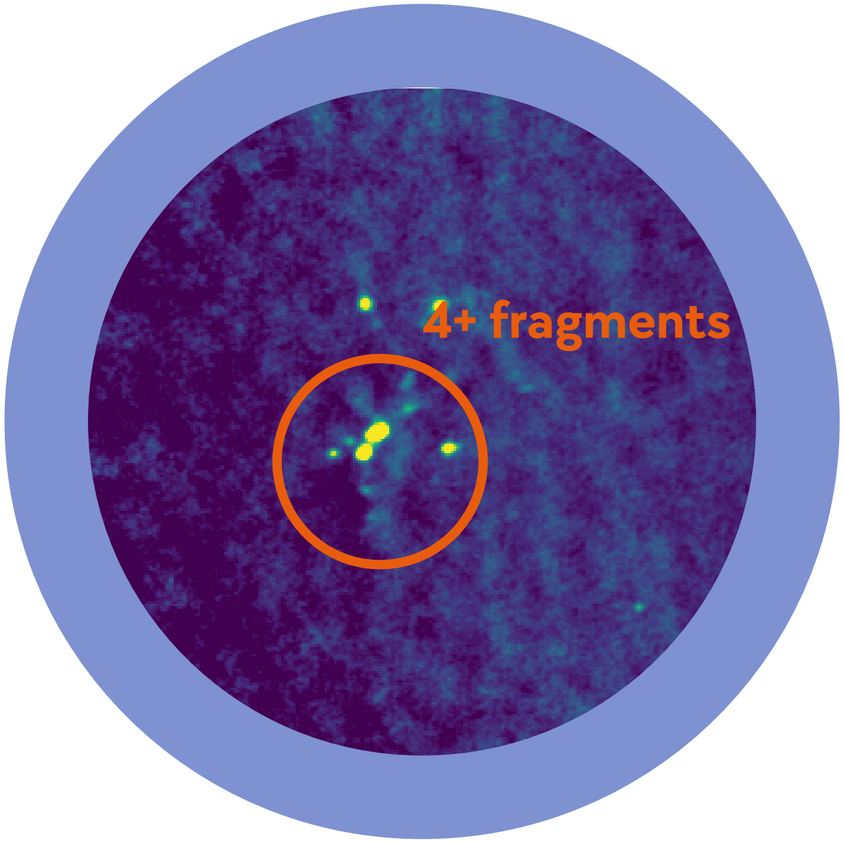

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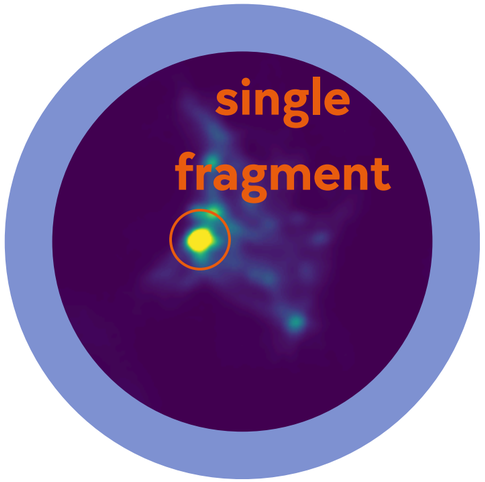

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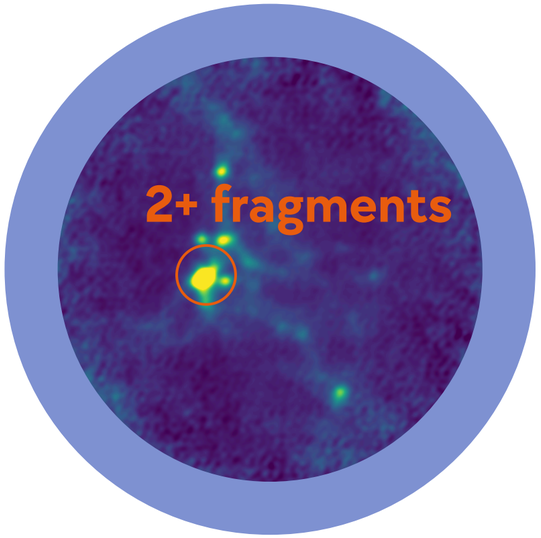

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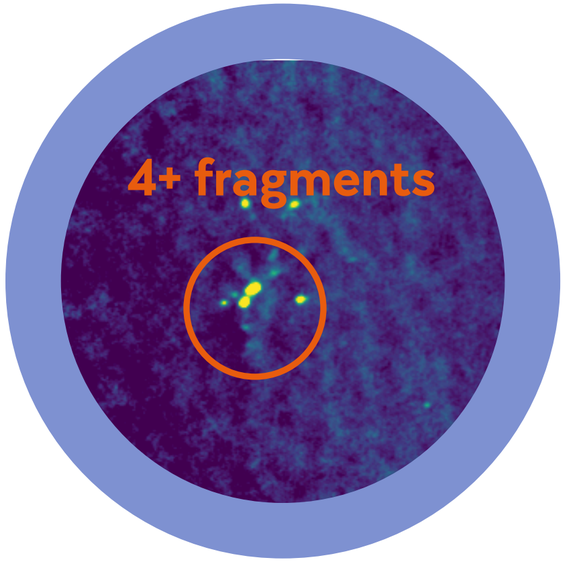

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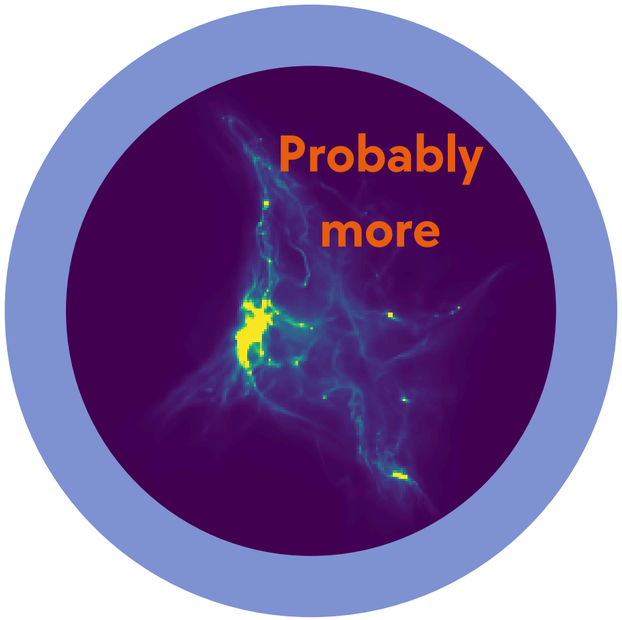
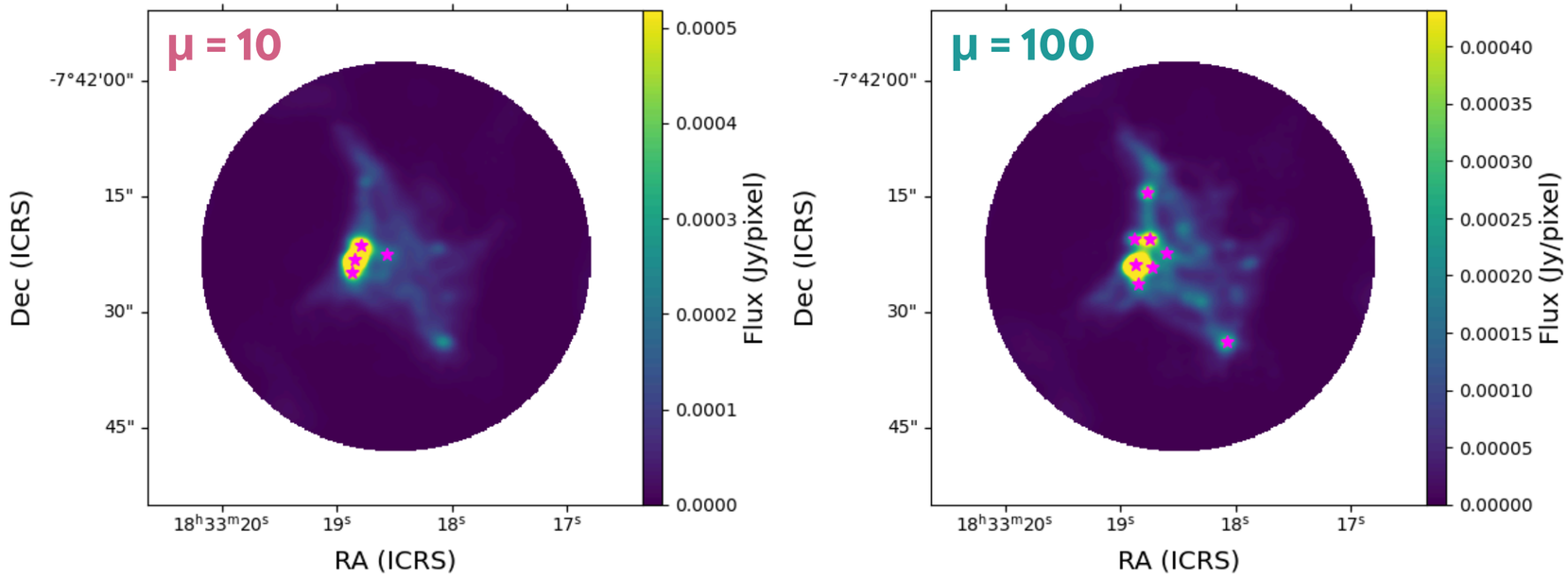
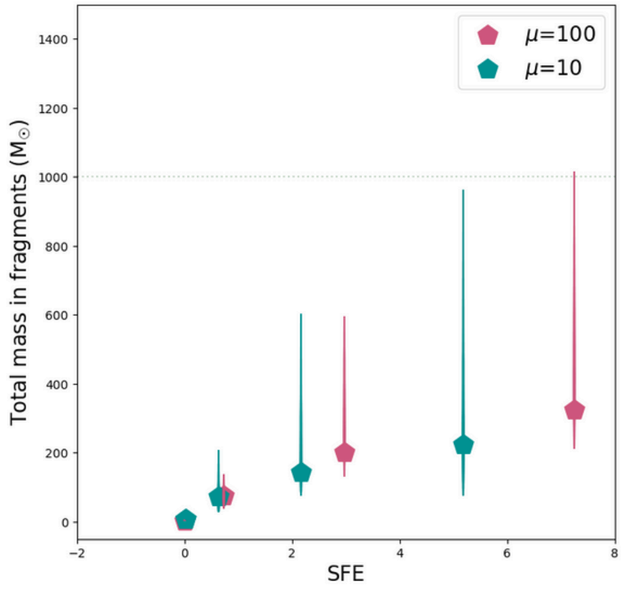


SIMS

Fragmentation properties: preliminary results from synthetic observations





Exploration of the **impact of the mass-to-magnetic-flux ratio**, μ = 10 vs. 100, on the fragmentation properties of a 1000 $M_\odot$ clump under identical initial conditions of Seed = 1, R = 0.4 pc, and $\mathscr{M}$ = 10 at SFE ∼5%.

- ***Strong magnetic field --> low fragmentation level***. Magenta stars mark the 4 and 8 fragments identified with *Hyper* at 5σ.
- ***Similar amount of mass accreted onto fragments regardless of magnetic field strength***

Nucara+ in prep. - Poster 21

Thank you!

Questions? *alice.nucara@inaf.it*