Effects of Early Forming Massive Stars

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Early Forming Massive Stars

Disruption of gas collapse, star formation, and cluster assembly

blah blah

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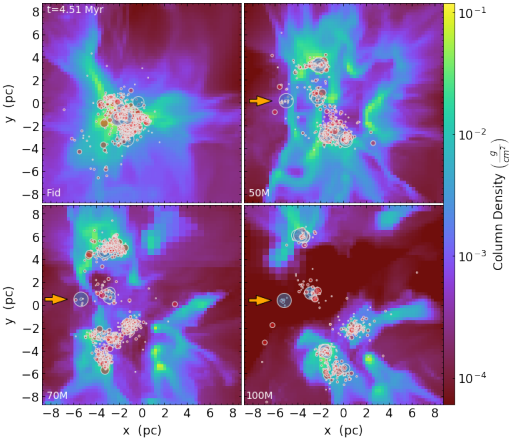
la dee dah

Torch

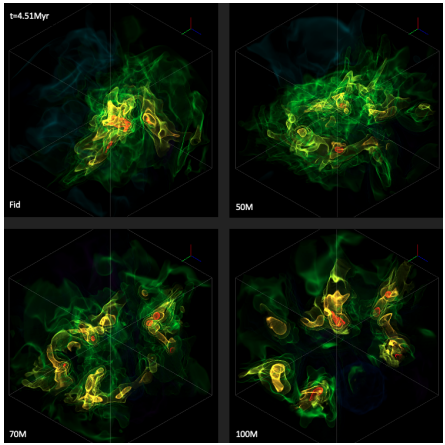
Stars from gas

- Couples N-body, stellar evolution, and feedback in `AMUSE` with self-gravitating magnetized gas in MHD code `FLASH`.
- Resolved dynamics of stars and gas; study star cluster formation within collapsing GMCs.
- Form stars from sink particles which each have a randomized star mass list sampled from the Kroupa (2001) IMF.

A Controlled Experiment

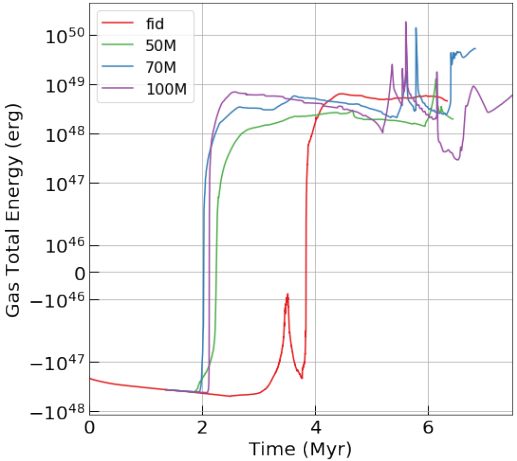


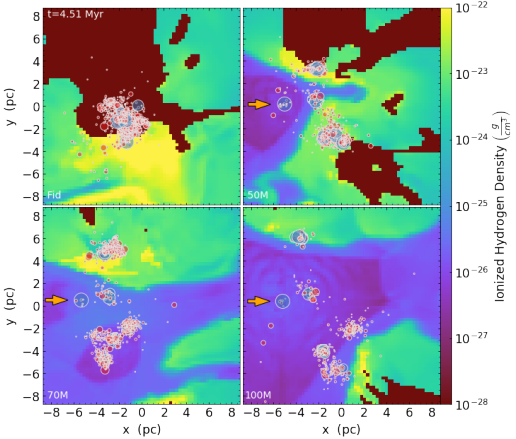
Lewis et al. in prep



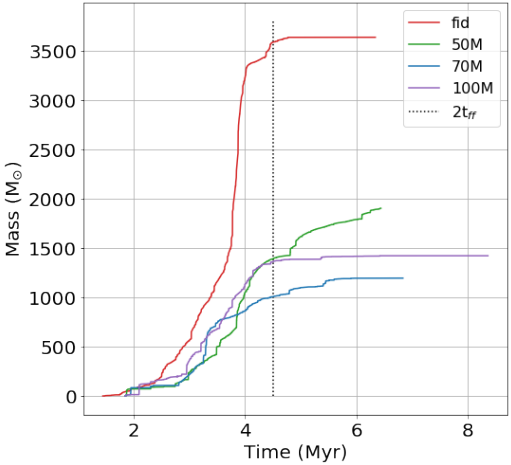
Lewis et al. in prep

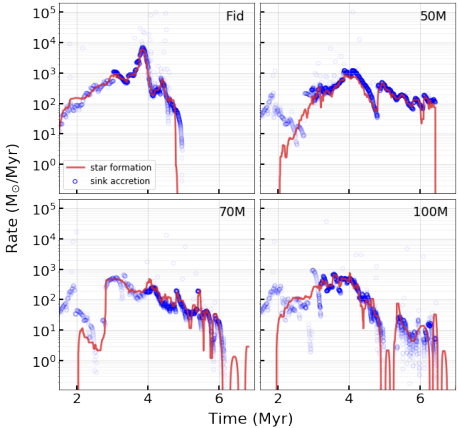
Effects on Gas



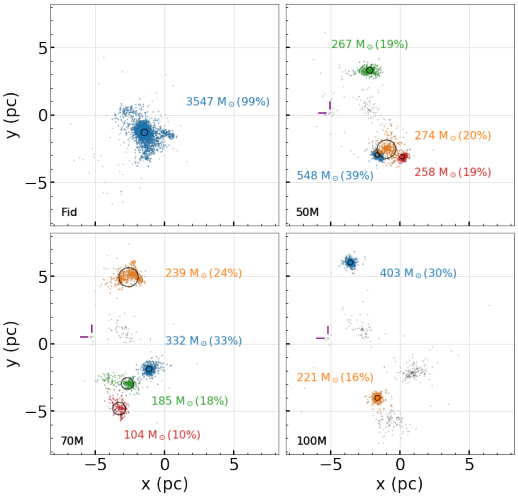


Effects on Gas Accretion and Star Formation





Effects on Star Clustering, Cluster Assembly



Effects of Early Forming Massive Stars

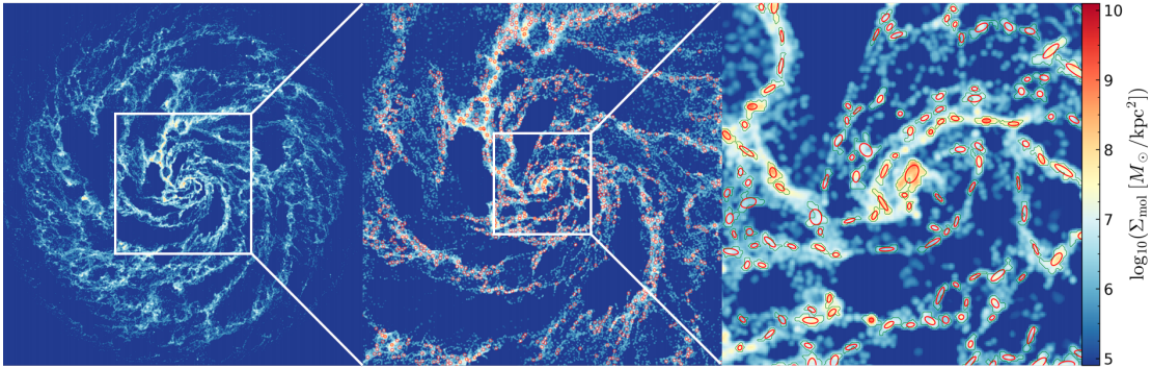
- Significantly disrupt the natal gas structure, resulting in fast evacuation from the star forming region.
- The star formation rate is suppressed, reducing the total mass of stars formed.
- Early forming massive stars stifle the hierarchical assembly process of massive star clusters, instead promoting the formation of spatially separate and energetically unbound subclusters.

The Problem with Initial Conditions

- Self consistent galactic scale simulations with resolution down to sub-tenth parsec scales and include Nbody individual stellar dynamics and individual stellar feedback all at once? A little tough.

- Creating our own isolated clouds from scratch? "Creative liberties..."

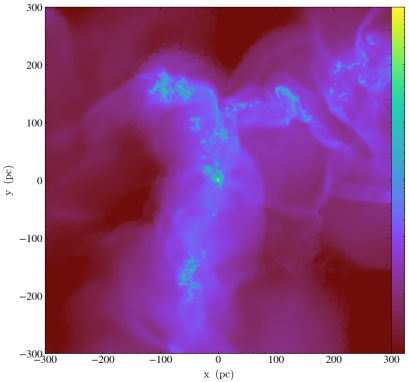
Clouds from Galactic Simulations



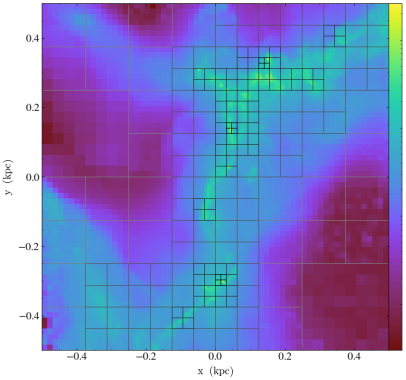
GMC identification [Li, H. et al. 2020]

From AREPO to FLASH

Try CIC Mapping?



Cloud from raw AREPO data represented using SPH kernels



Cloud-in-cell mapping onto AMR FLASH grid

Voronoi Mesh to AMR Grid

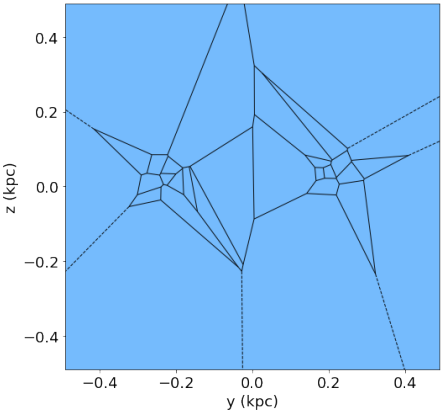


Figure: Voronoi mesh from 20 points

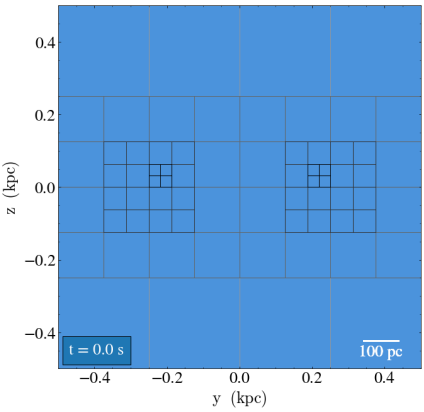
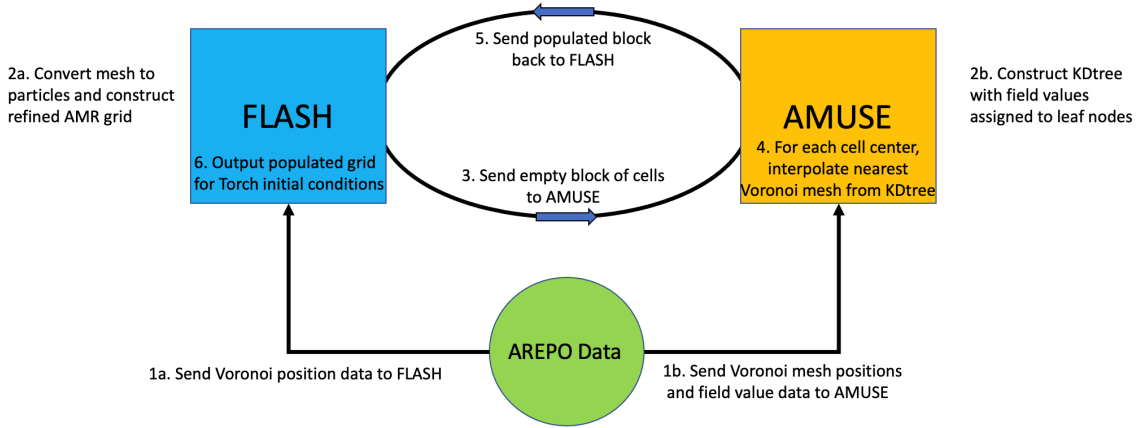


Figure: AMR grid from 20 points

VorAMR: Logic path



VorAMR: The Big Wins

- Significantly expands Torch's horizon and moves Torch to "completion".
- Opens wide avenue of collaboration; code bases do not have to be exclusive!
- More accurate visualizations (no more estimating Voronoi meshes as SPH kernels in `yt`).

Thank You!

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Questions?