Pop III IMF Working Group

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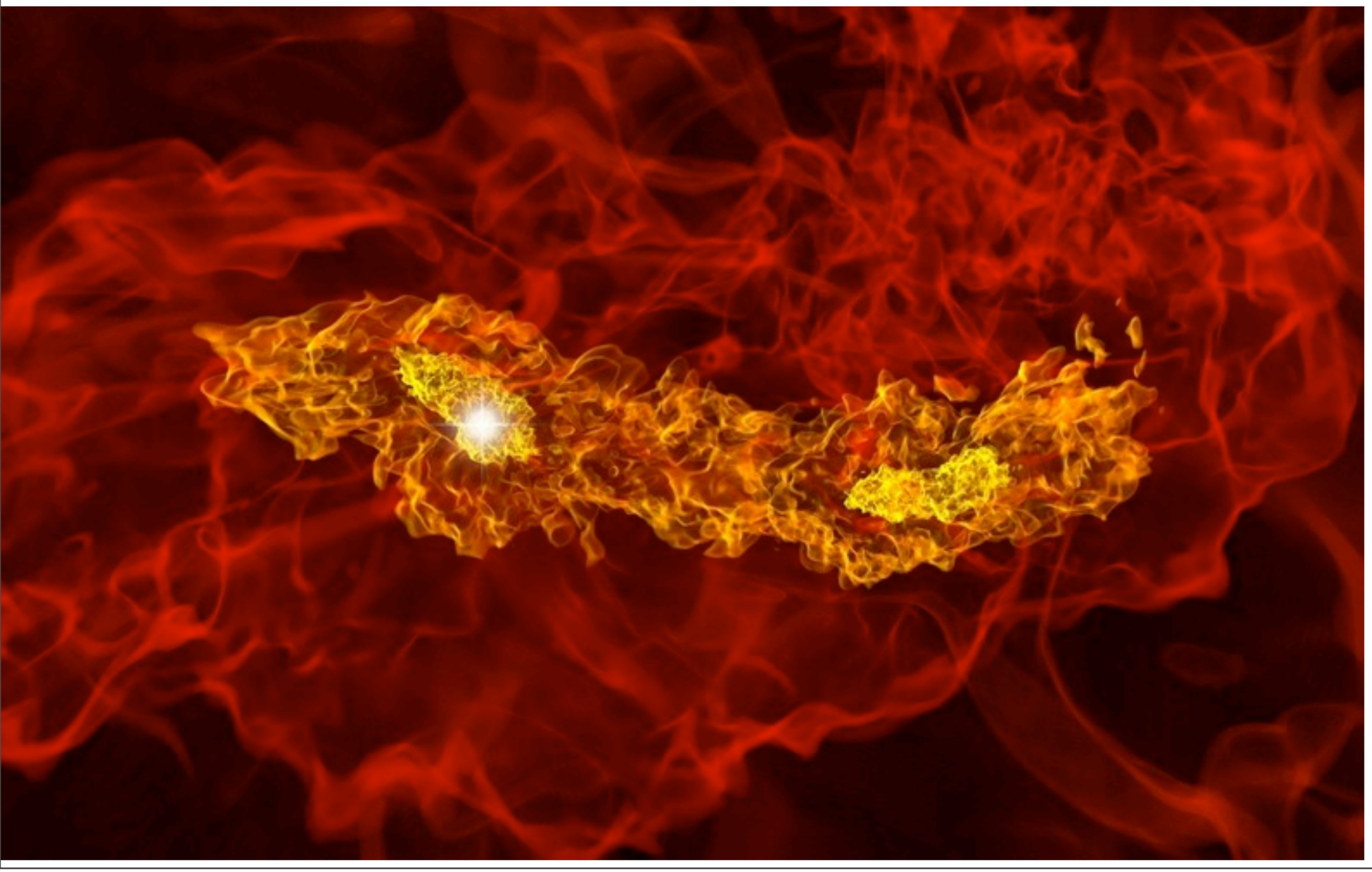

Submitted Questions

- How wrong is the "consensus picture" of Pop III star formation? (A single massive star per halo). Are the simulations missing some important piece of physics?
- Bottom line - much physics is missing, including:
  1. dust
  2. radiative feedback on small scales
  3. disks and fragmentation therein
  4. sink particles
  5. B-fields
- Active groups focus on different physics with different codes and different initial conditions - nobody has "all the physics" and so intercomparisons are often difficult.
- Another big programmatic issue: how to balance simulations that include "all the physics" with ensembles that range over halo conditions, environment, and uncertainties in physical inputs (e.g. chemical reaction rates). No consensus so chaos will continue to reign. (As it should.)

Submitted Questions

- What are the most useful realistic Pop III IMF constraints that we can derive from metal-poor stars in the galactic halo, given current uncertainties in explosive nucleosynthesis models?

- Supernovae? PISNe if they exist, but they are rare in any case, and not particularly transient. They may also exist at $0.1 Z_{\odot}$).

- GRBs? But how to accurately diagnose the metallicity of the progenitor or the host?

- NIR background - not really discussed by the WG, other than it's not clear how one would usefully constrain Pop III

Pop III.1 vs. III.2

- This terminology captures a (seemingly) simple physical distinction - stars formed with and without external influences.
- BUT:
  - It has no obvious observational discriminant.
  - Sign and magnitude of radiative, chemical, and other feedback effects are highly uncertain, so "Pop III.2" is built on shifting sands - it could turn out to be anything.
- SO: Has this terminology outlived its original purpose? Does it just confuse? No real consensus, but also no strong support for maintaining the terminology.

Submitted Questions

- How is our ability to simulate Pop III formation limited by uncertainties in atomic and molecular physics? What are the key atomic and molecular processes that need to be better known to improve our understanding of the primordial IMF?

- We definitely need good three-body rates. This is going to be very hard to find experimentally!
- We also need to specify in our papers what the critical rates are, so that one can justify such experiments!

Submitted Questions

- What is the impact of magnetic fields on Pop III star formation, and at what scales?
  - Didn't really get to this.
- Dark stars: are they significantly different from Pop III stars? (Iocco, Freese?)
  - Didn't really get to this