Galactic Rain: Coupling Star Formation to Circumgalactic Gas

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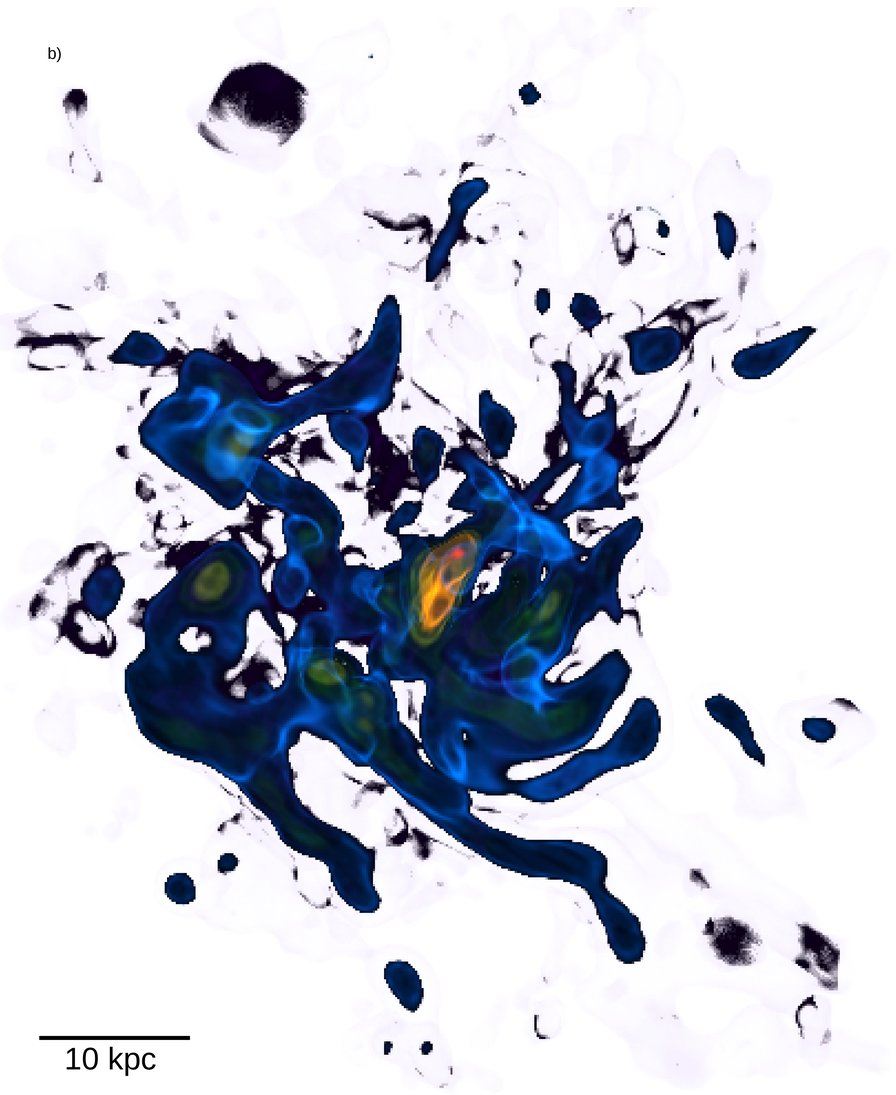
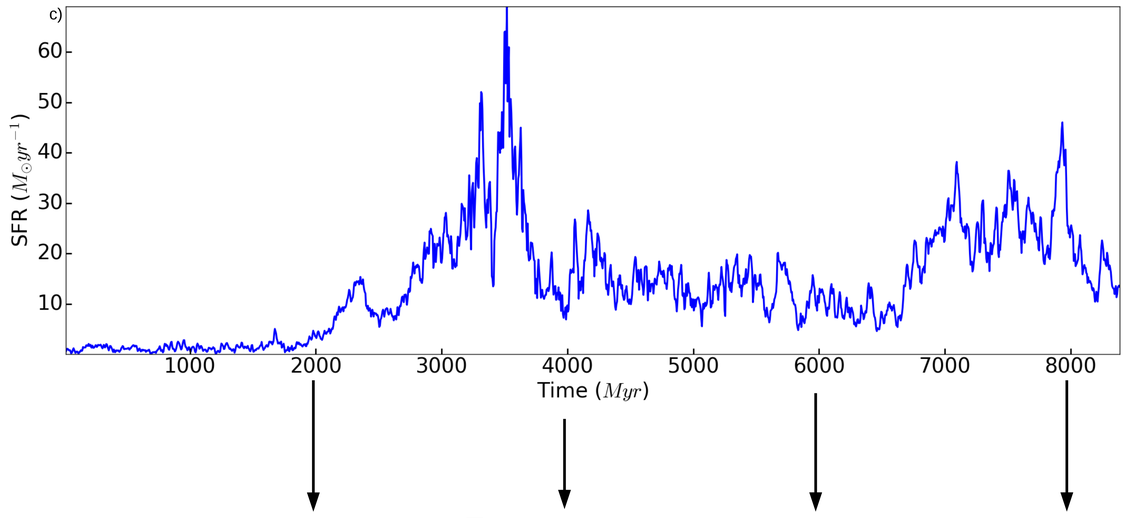
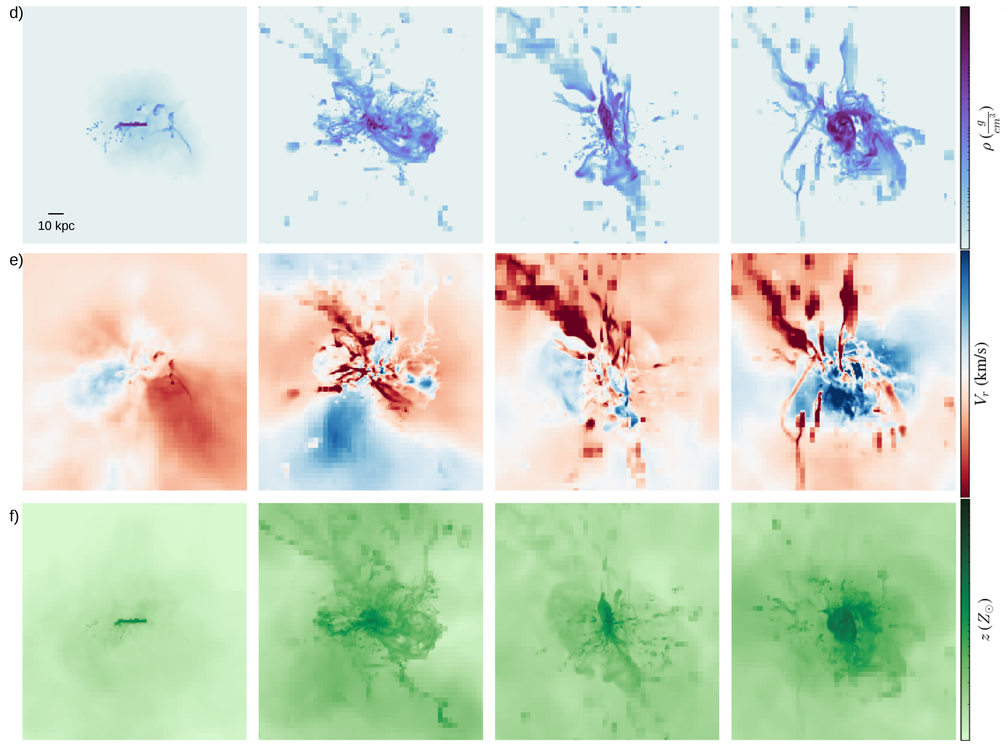
Context

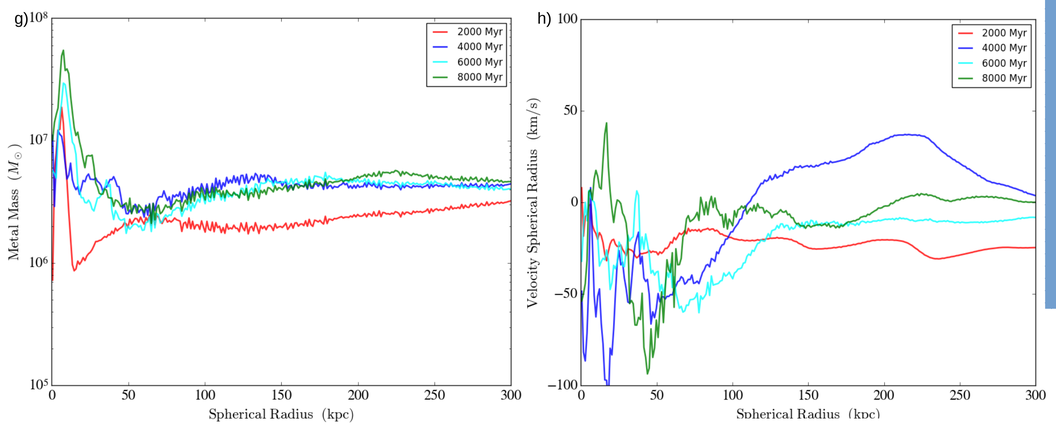
Observations suggest that about half of the mass in a galaxy is located outside of the disk; this gas is known as the *circumgalactic medium* or *cgm*. Due to its volume, this gas should have an impact on the overall dynamics of the galaxy and more specifically the star formation rate of the galaxy which in turn influences the dynamics of the cgm.

Here we present the basic stages of the feedback loop that balances the interplay between stars and the cgm demonstrated in numerical simulations.









Conclusions

The CGM and galactic interior are linked by a *delayed* feedback loop that is primarily mediated *not* by mass transport but by metal transport in and out of the galaxy that can be separated into **four** dynamic stages:

- **Enrichment**
- **Collapse**
- **Condensation**
- **Trim Out**

Future Directions

- Refining the distinction between numerical effects due to methodology and physically meaningful dynamics by further testing parameter space.
- Constrain possible future observations by generating mock spectra of the cgm in different dynamic stages.

Plot Guide

a) Volume Rendering of Density emphasizing galactic disk.

b) Another Volume Rendering emphasizing both the galactic disk and the cgm.

c) Star formation rate of the simulation in solar masses per year.

d) Density weighted projection of density along x axis of simulation on a log scale from 1e-27 to 1e-23 g/cm^3.

e) Projection of radial velocity weighted by density colored on a linear scale from -300 to 300 km/s.

f) Metallicity projected along the x axis weigthed by density colored on a log scale from 1e-1 to 10.

g) Total metal mass plotted against spherical radius

h) Density weighted profile of radial velocity.

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