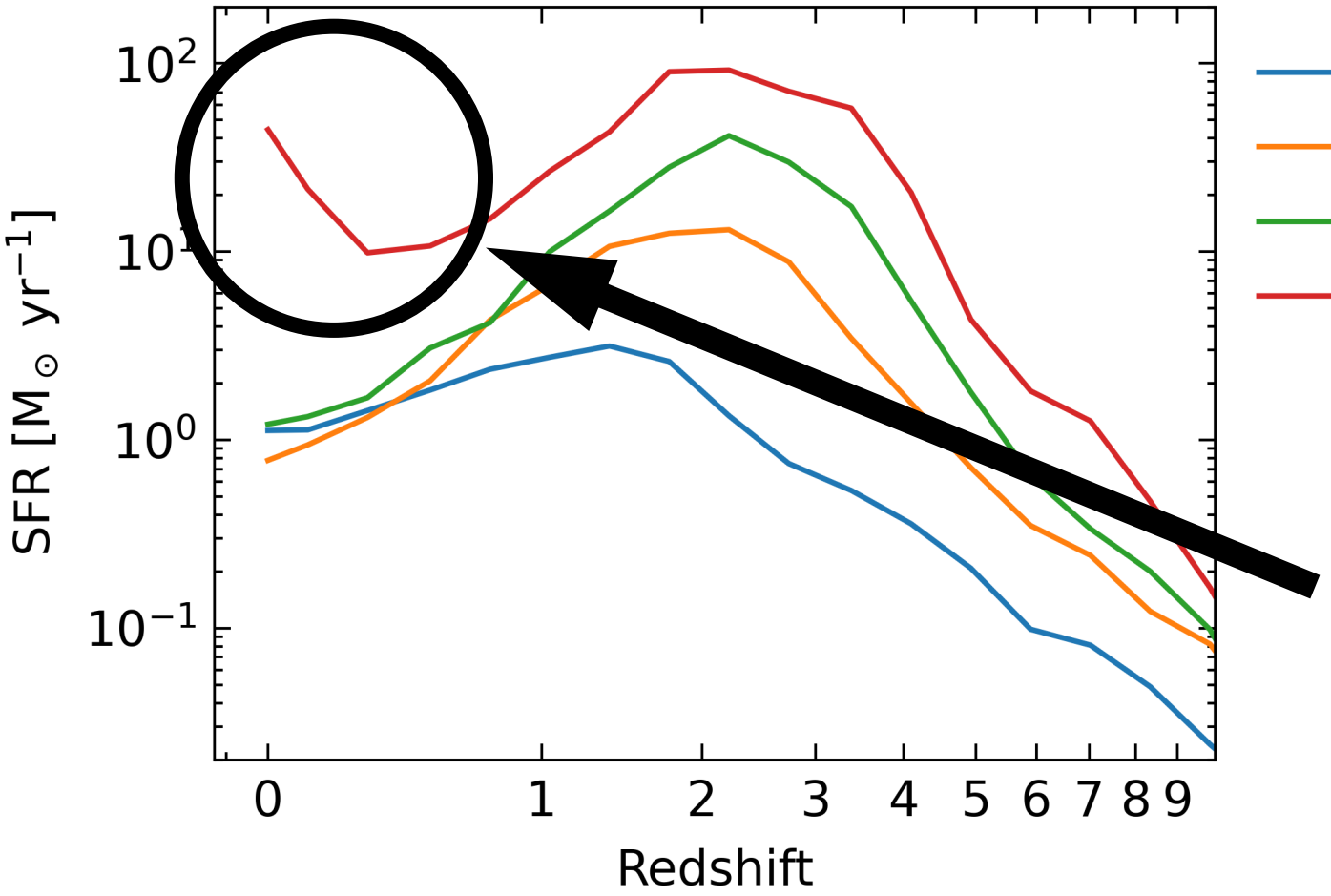
PROGRESS REPORT

(2025.04.11)

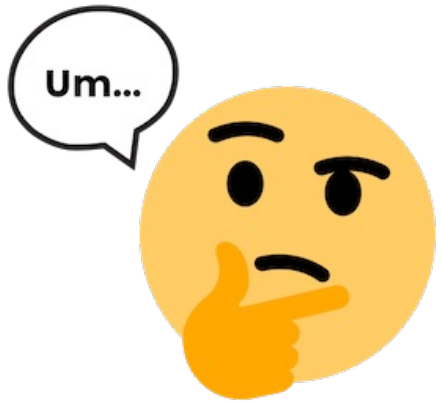
Daisuke Nishihama

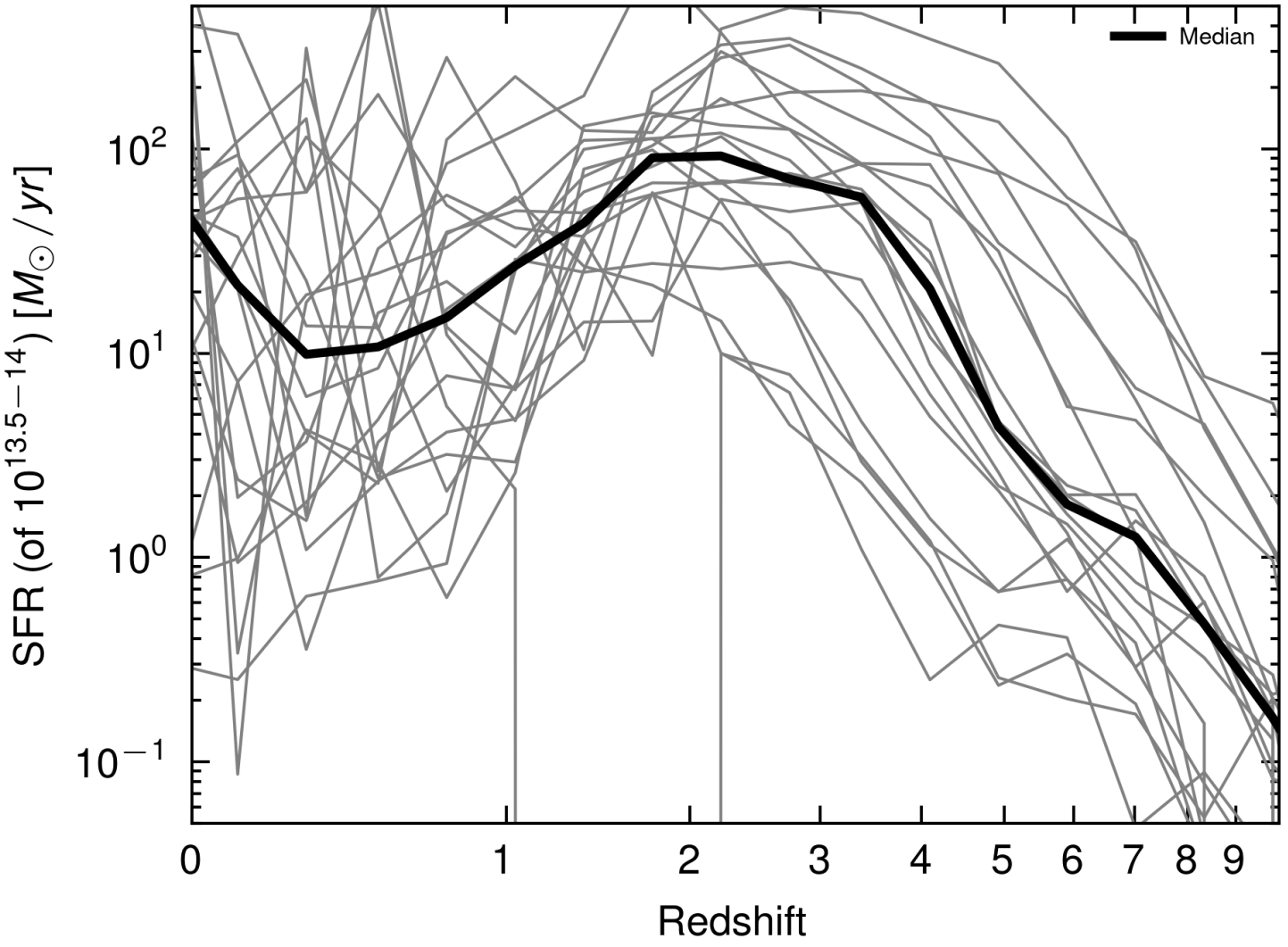
TODO: my assignment

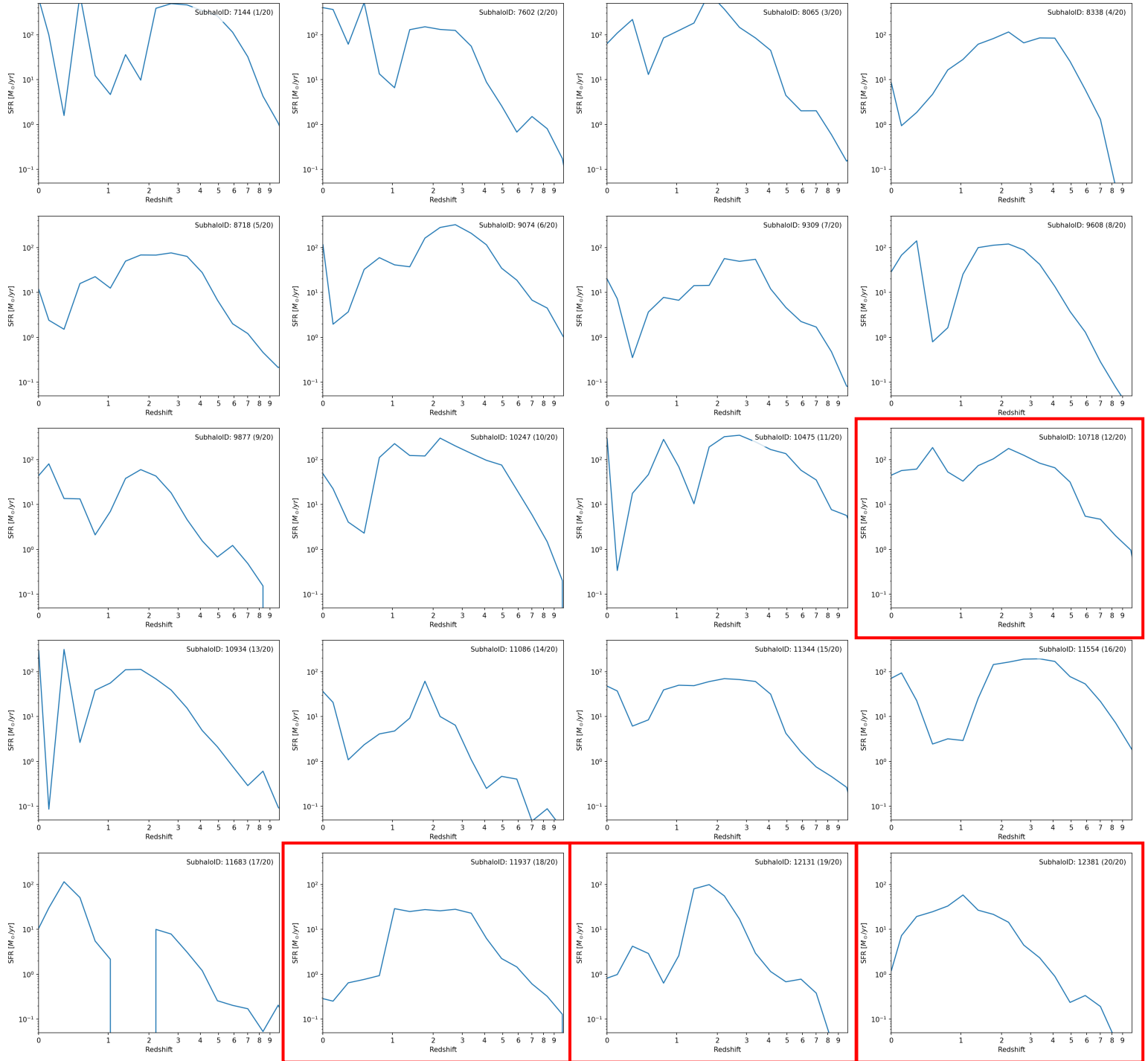


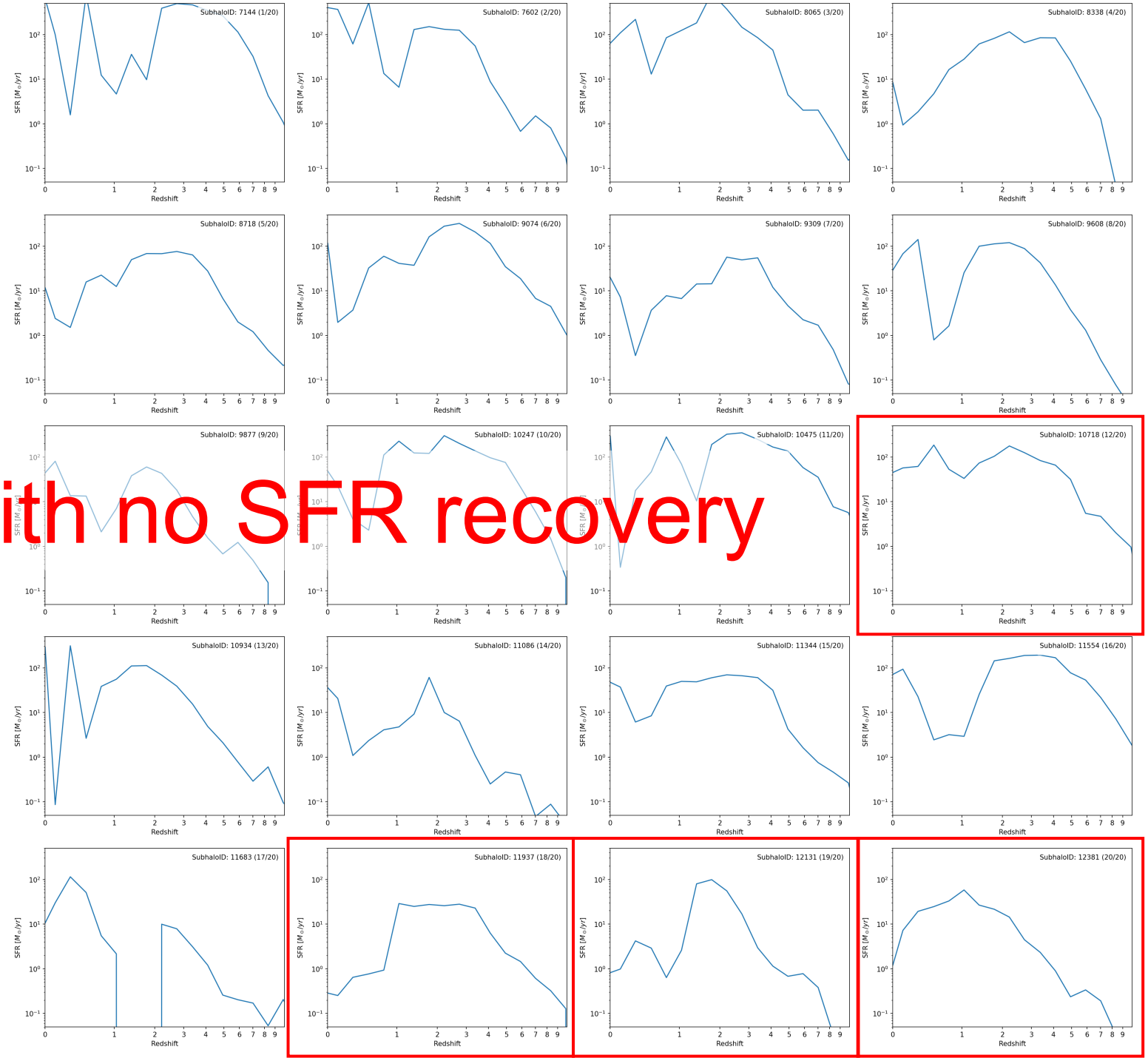
Why does the highest mass recover SFR at redshift 0?

Plotted lines of each halo's evolution are hard to see.





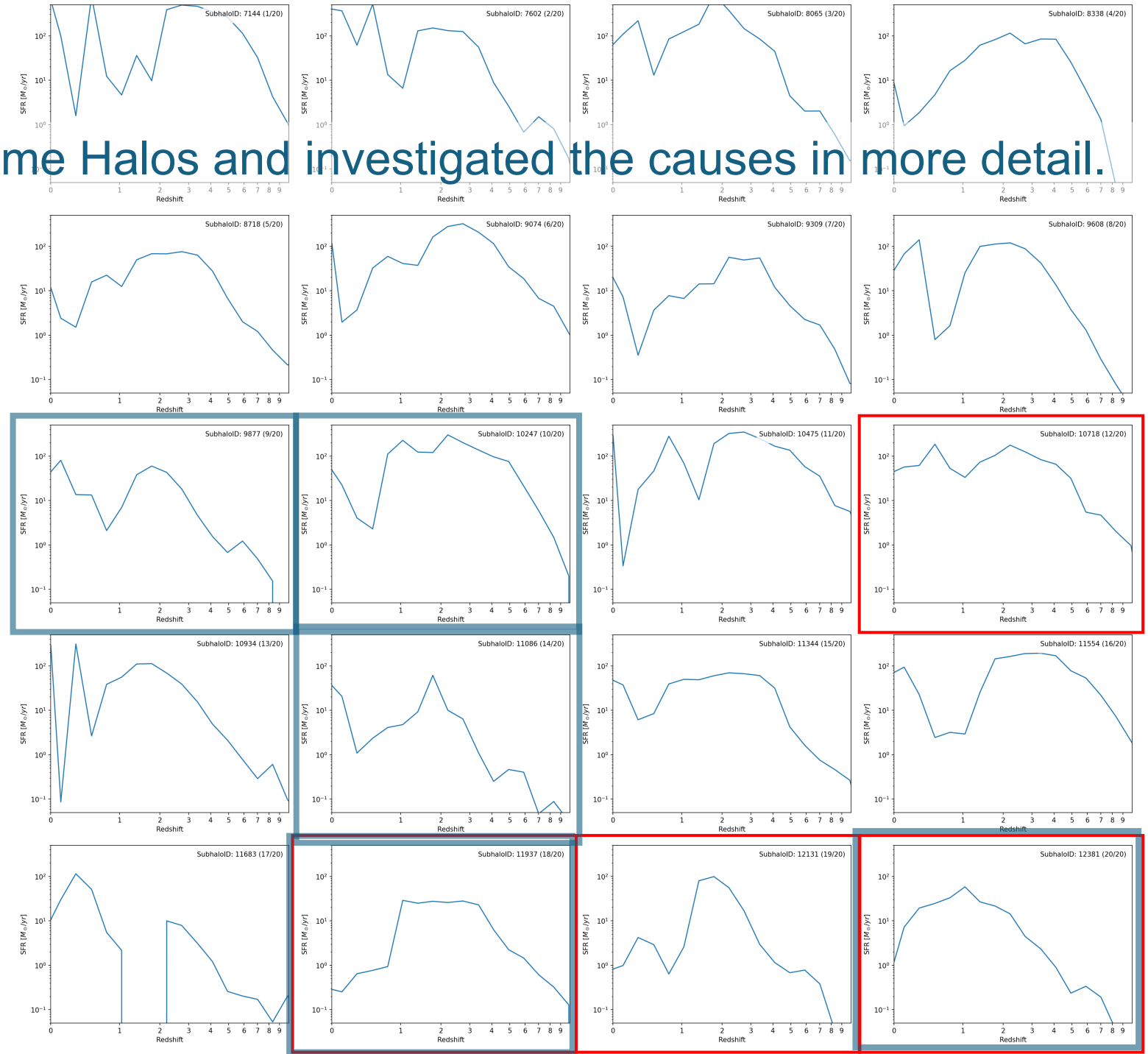

SubhaloID: 7144 (1/20)
SubhaloID: 7602 (2/20)
SubhaloID: 8065 (3/20)
SubhaloID: 8338 (4/20)
SubhaloID: 8718 (5/20)
SubhaloID: 9074 (6/20)
SubhaloID: 9309 (7/20)
SubhaloID: 9608 (8/20)
SubhaloID: 9877 (9/20)
SubhaloID: 10247 (10/20)
SubhaloID: 10475 (11/20)
SubhaloID: 10718 (12/20)
SubhaloID: 10934 (13/20)
SubhaloID: 11086 (14/20)
SubhaloID: 11344 (15/20)
SubhaloID: 11554 (16/20)
SubhaloID: 11683 (17/20)
SubhaloID: 11937 (18/20)
SubhaloID: 12131 (19/20)
SubhaloID: 12381 (20/20)
SFR [$M_\odot$/yr]
Redshift



Halo with no SFR recovery

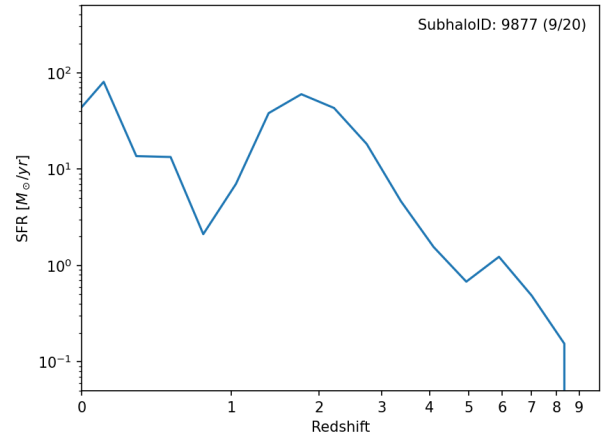
What’s the difference between Halo with recovery SFR and no one?

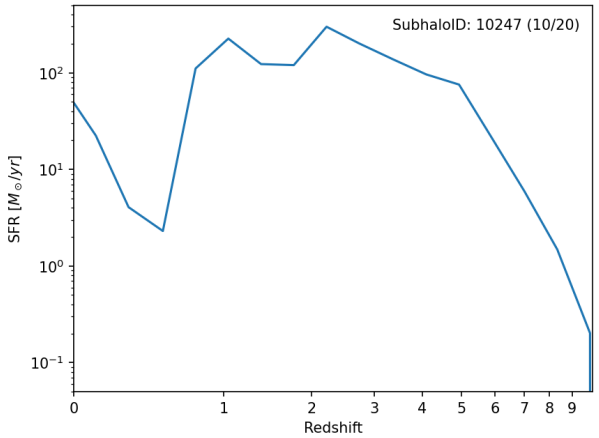
Selected some Halos and investigated the causes in more detail.

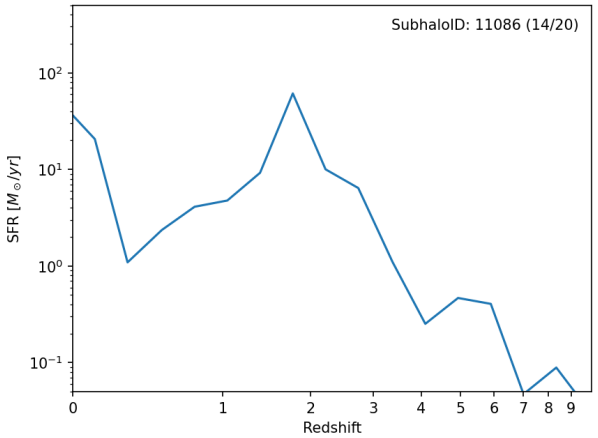


Analyze the detailed properties about some Halos

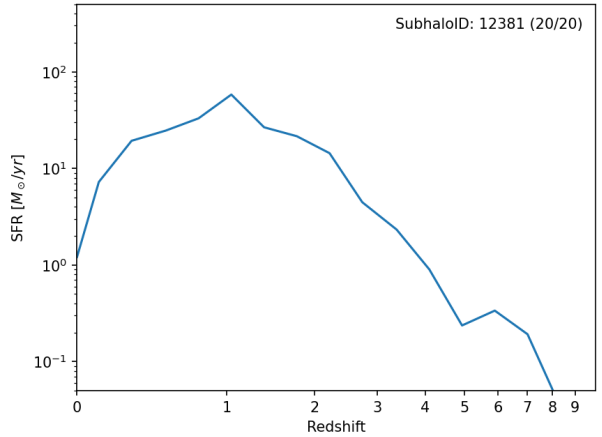
UP

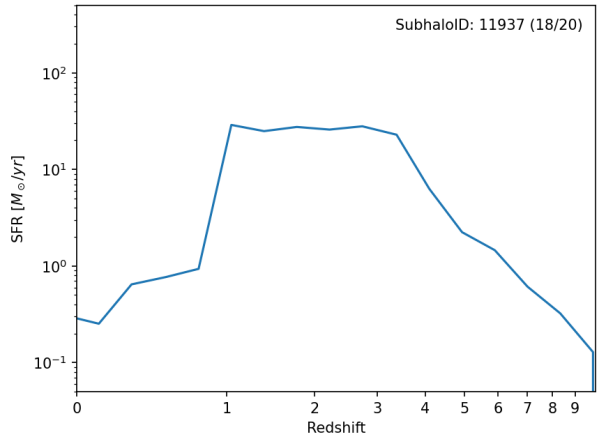






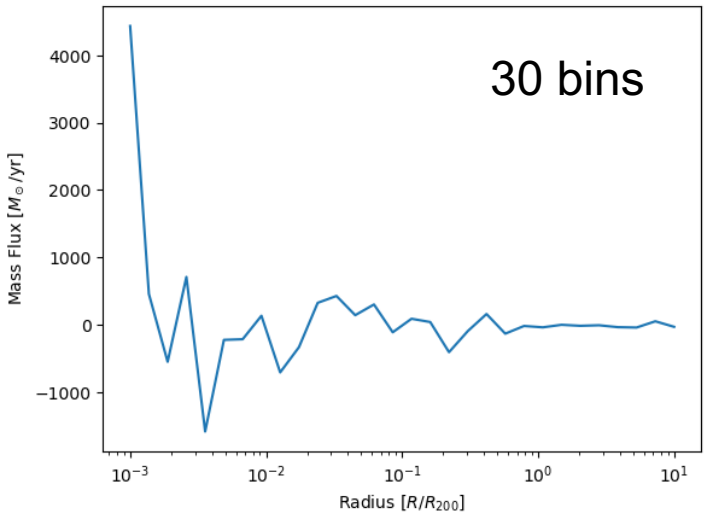
DOWN

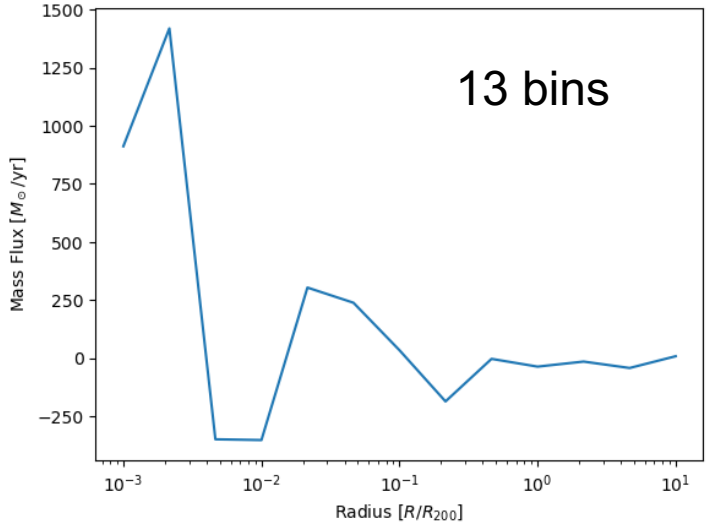


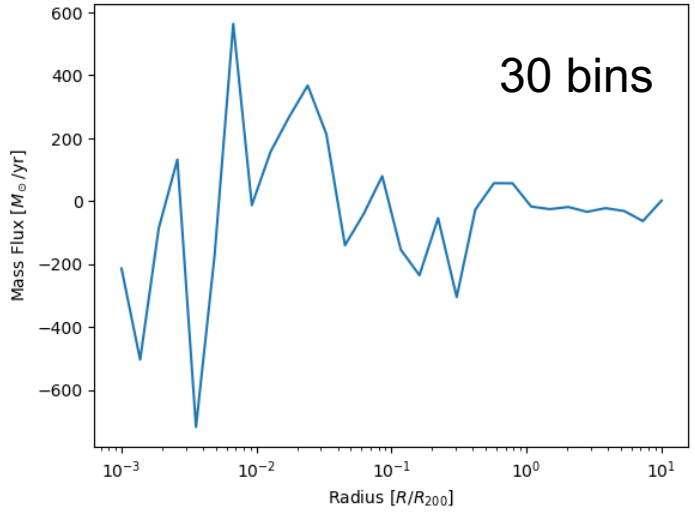


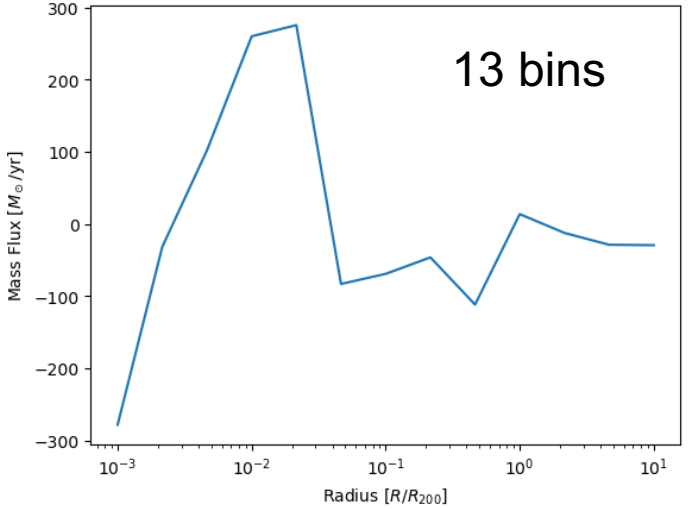
Mass flux

(Redshift 0)







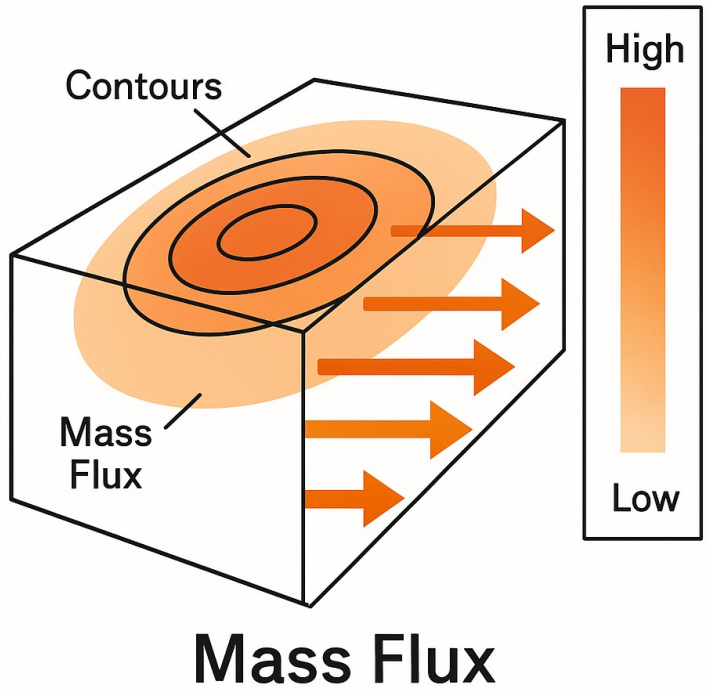


✏️ Definition of Mass Flux: How to calculate

$$\dot{M} = 4\pi r^2 \rho \dot{r}$$

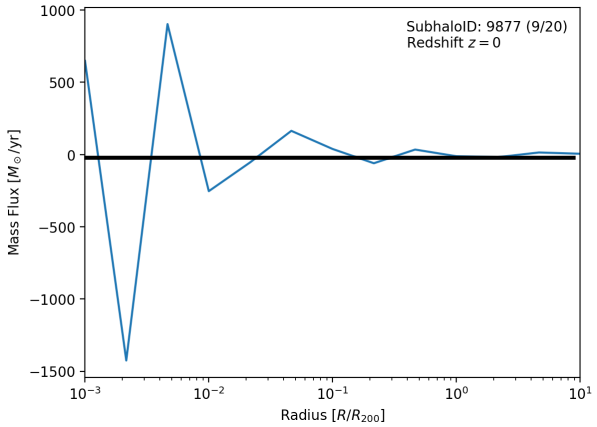
$$\dot{r} = \vec{v} \cdot \hat{r} = \frac{(v_x, v_y, v_z) \cdot (x - cx, y - cy, z - cz)}{\|\vec{r}\|}$$

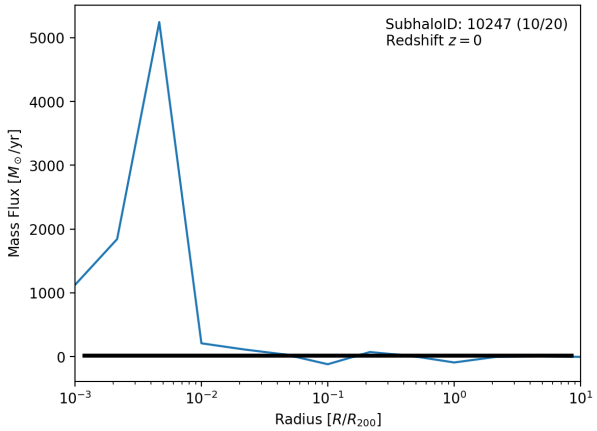
(Illustration)

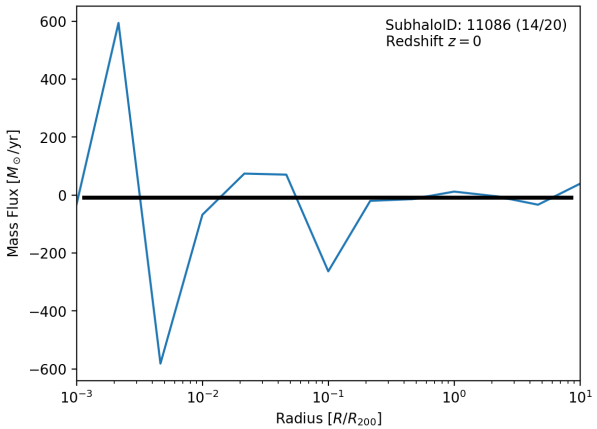


Radial Mass Flux at z = 0

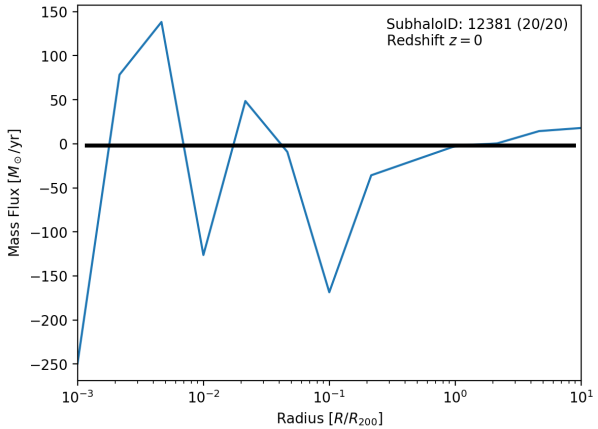
UP

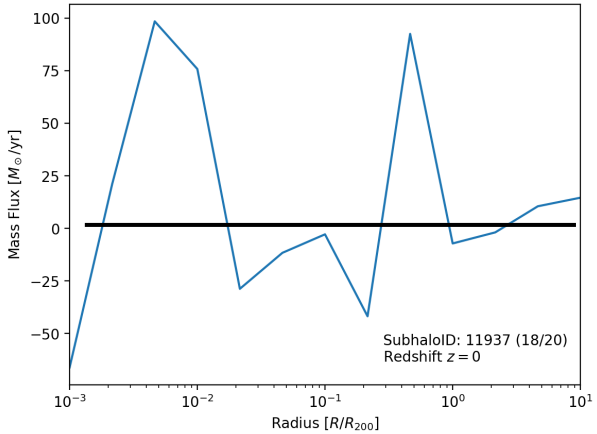






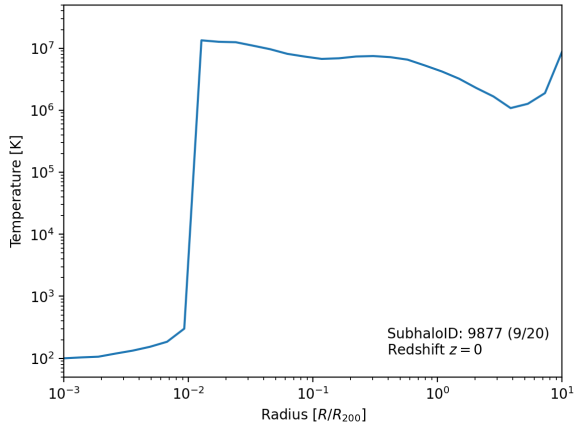
DOWN

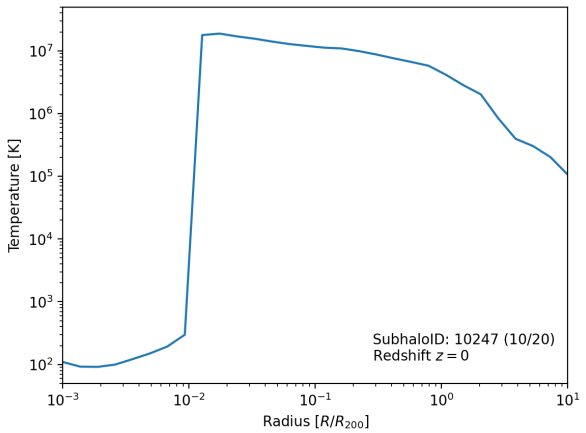


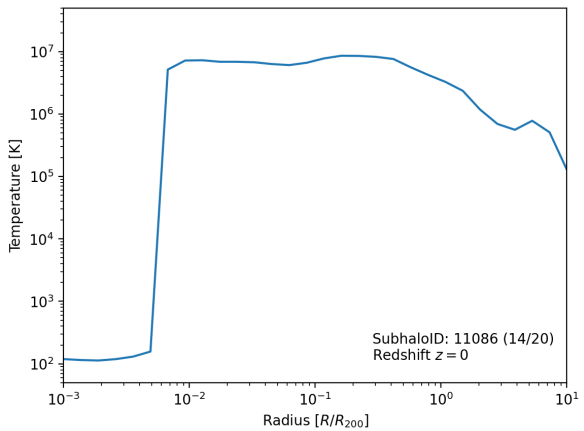


Radial Temperature at z = 0

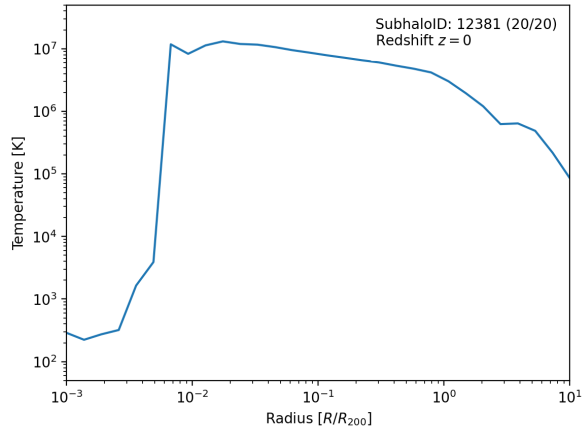
UP

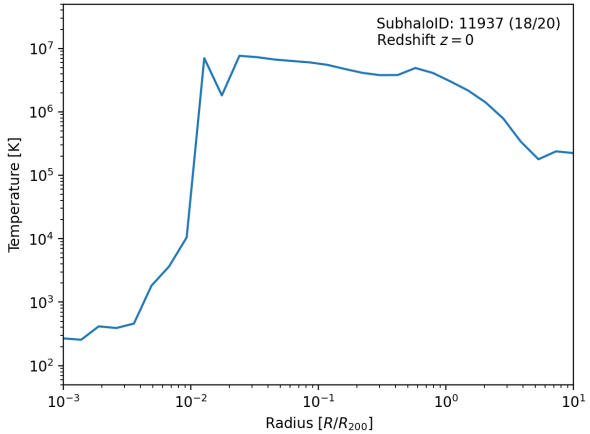






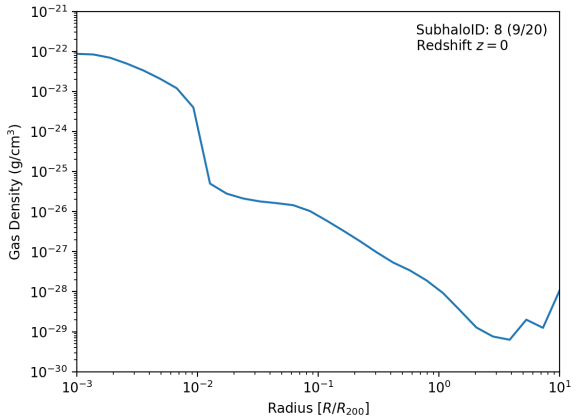
DOWN

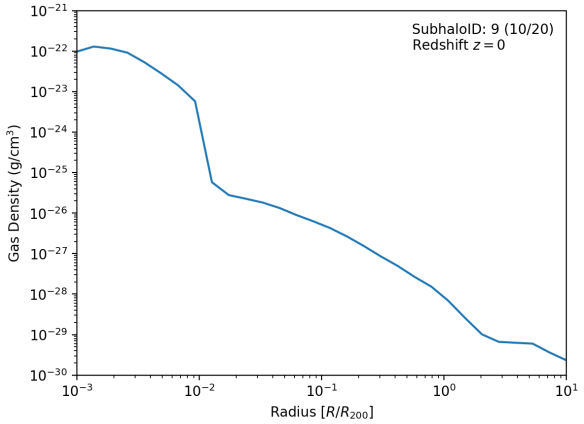


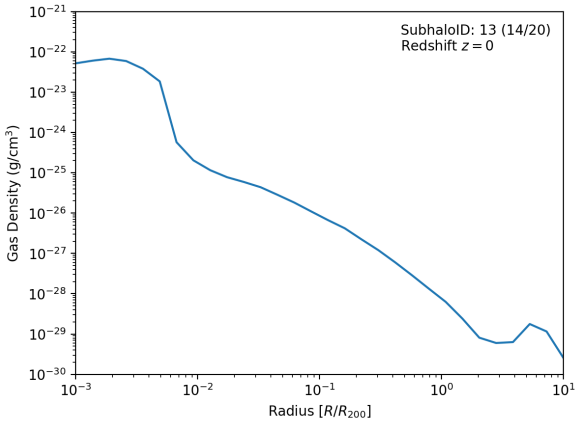


Radial Density at z = 0

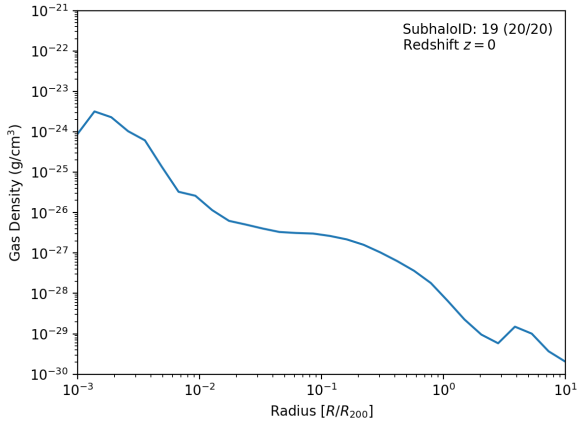
UP

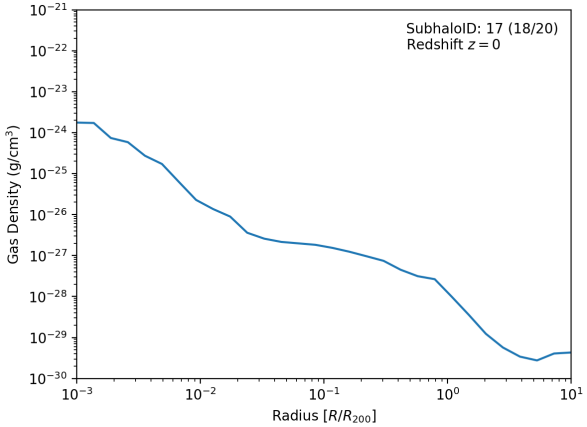




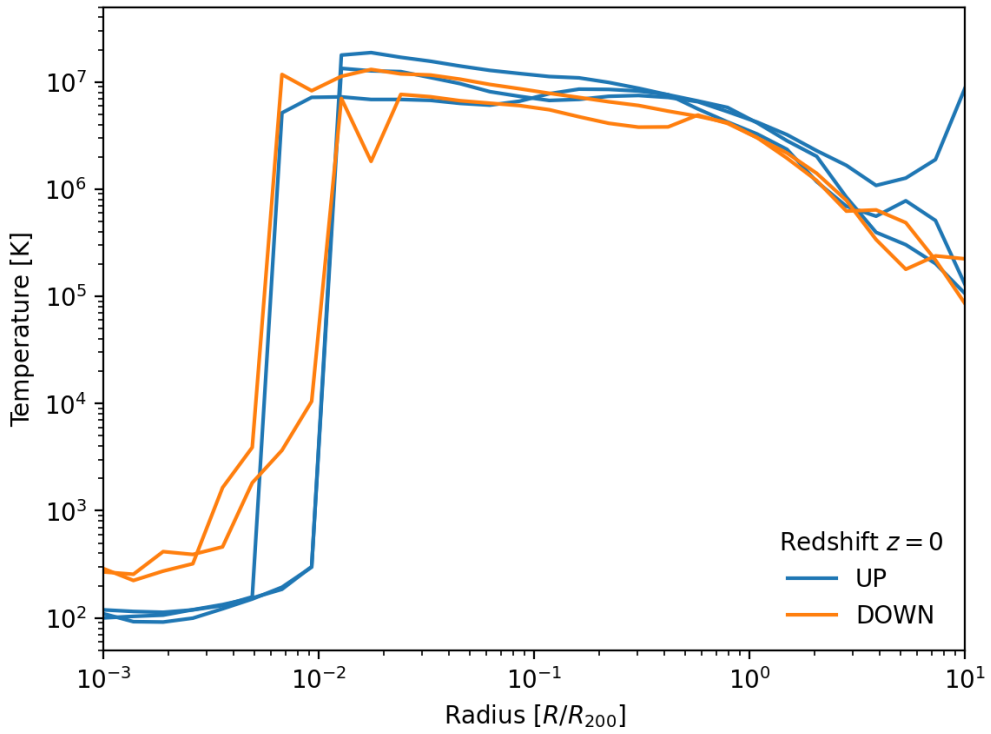


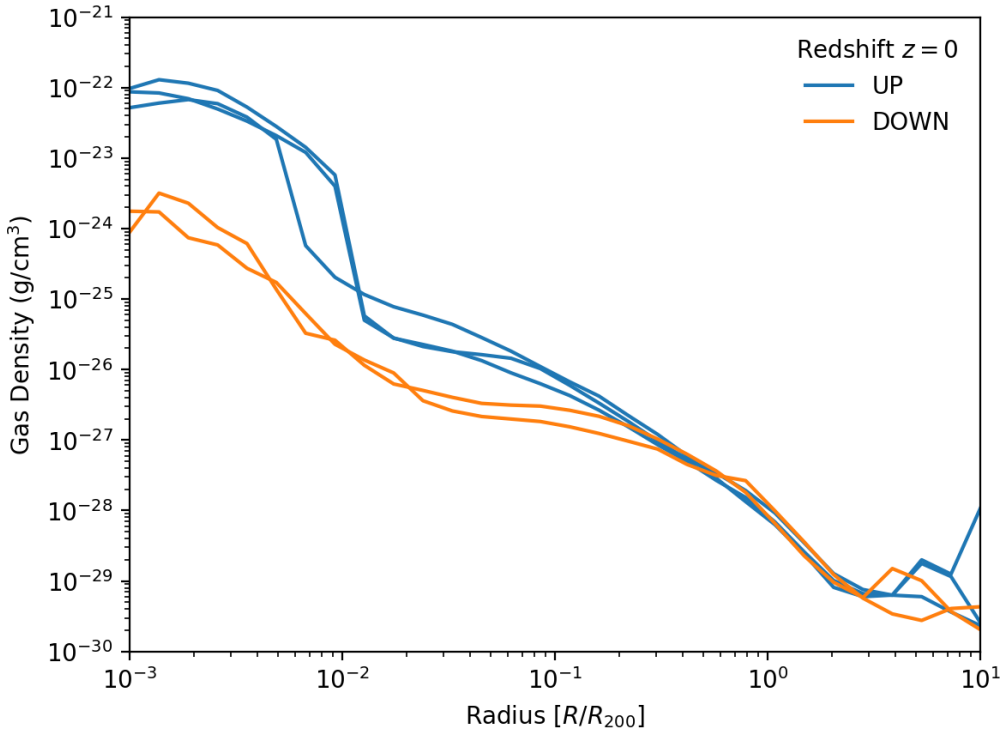
DOWN





Comparison of Radial Temperature & Density



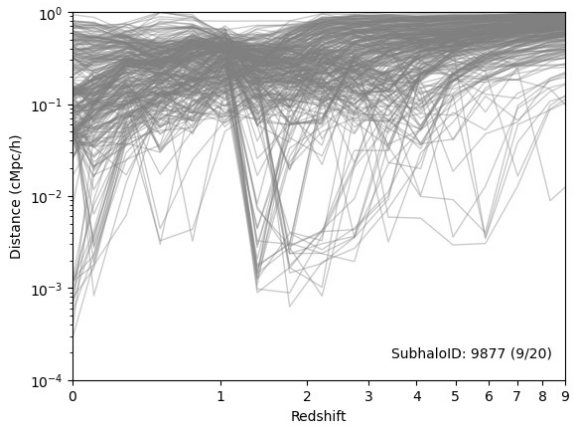


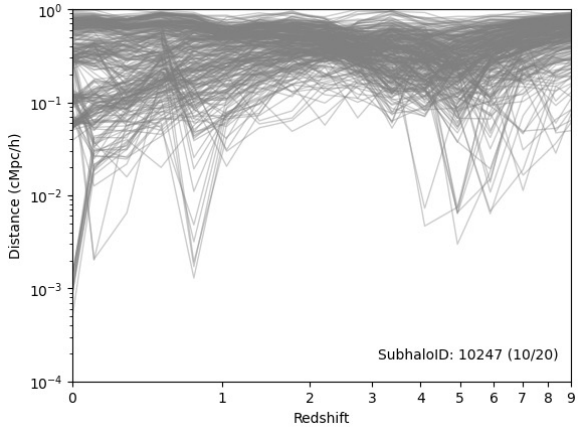
2 factor

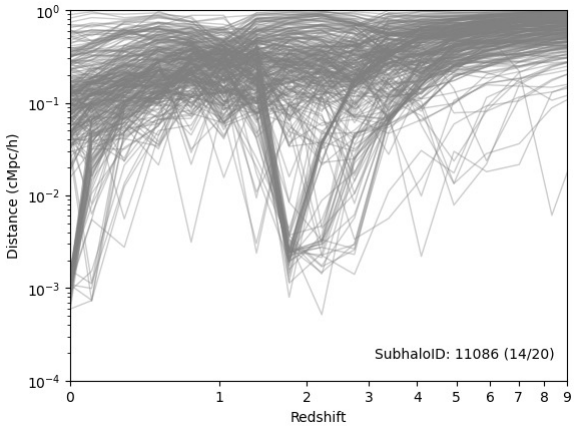
2 order

Surrounding particles

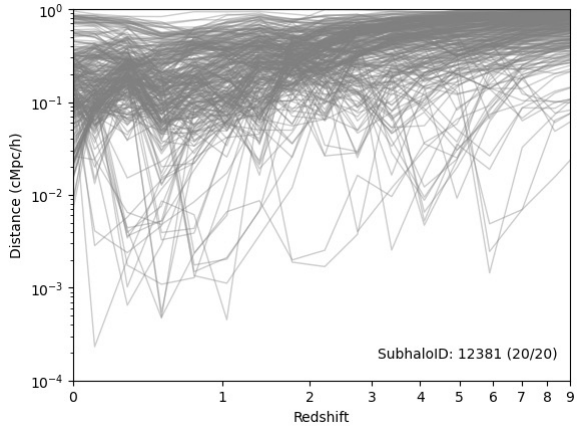
UP

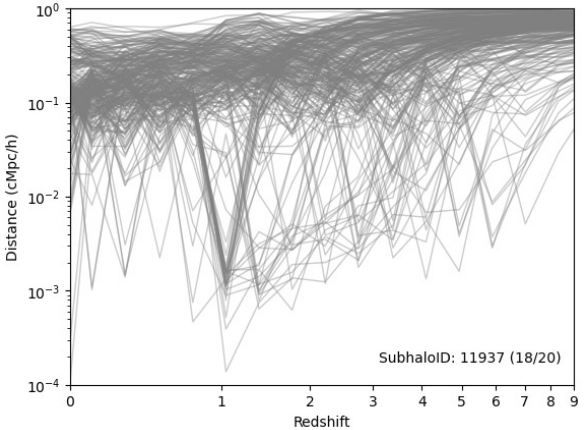




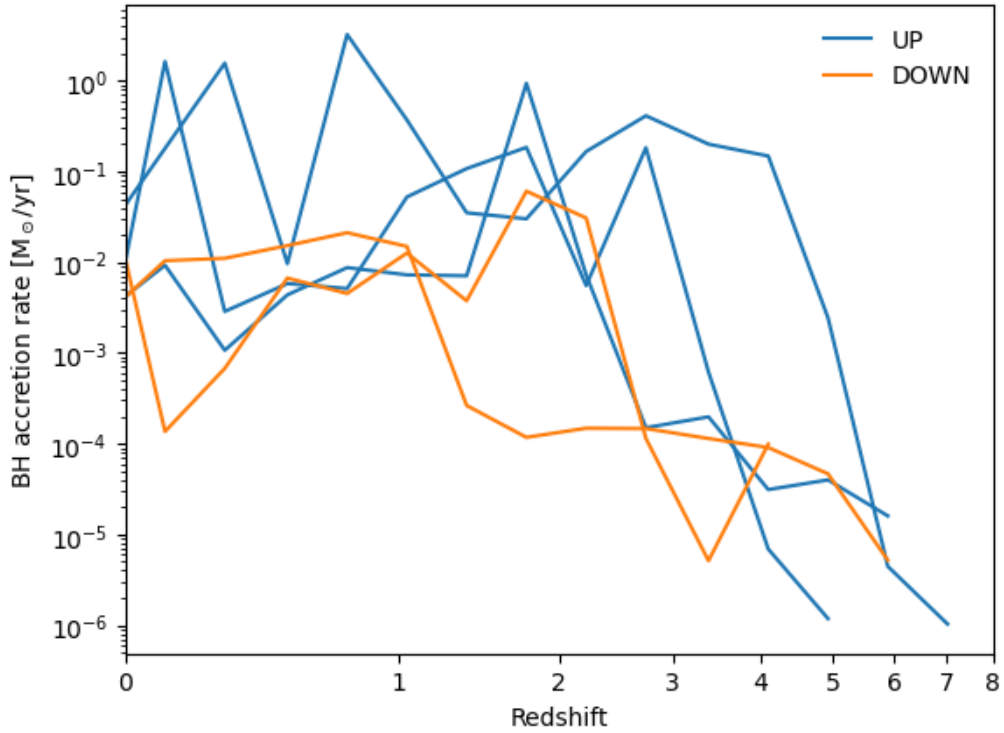


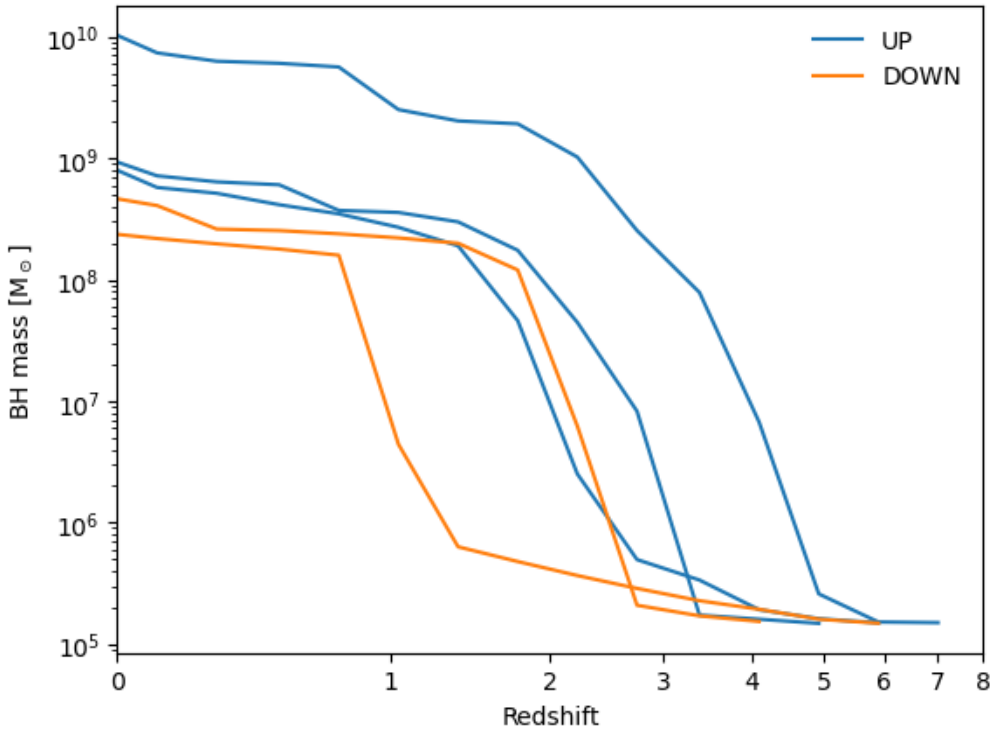
DOWN



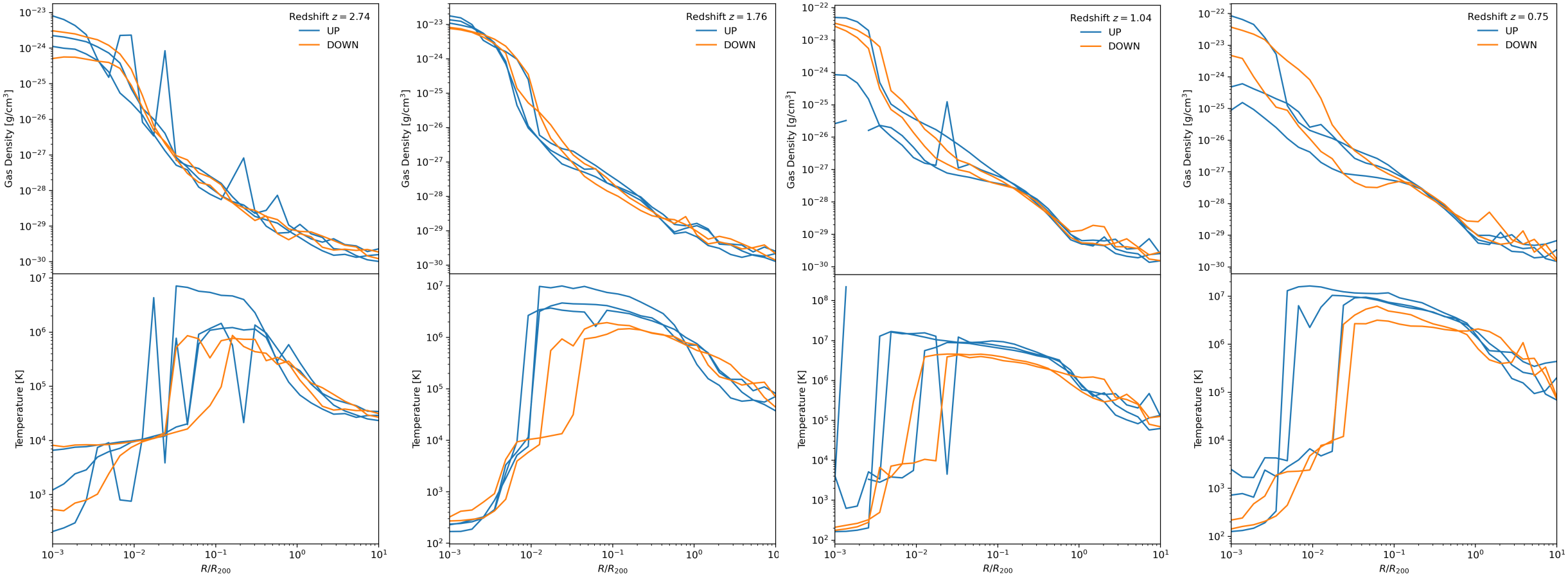


BH properties

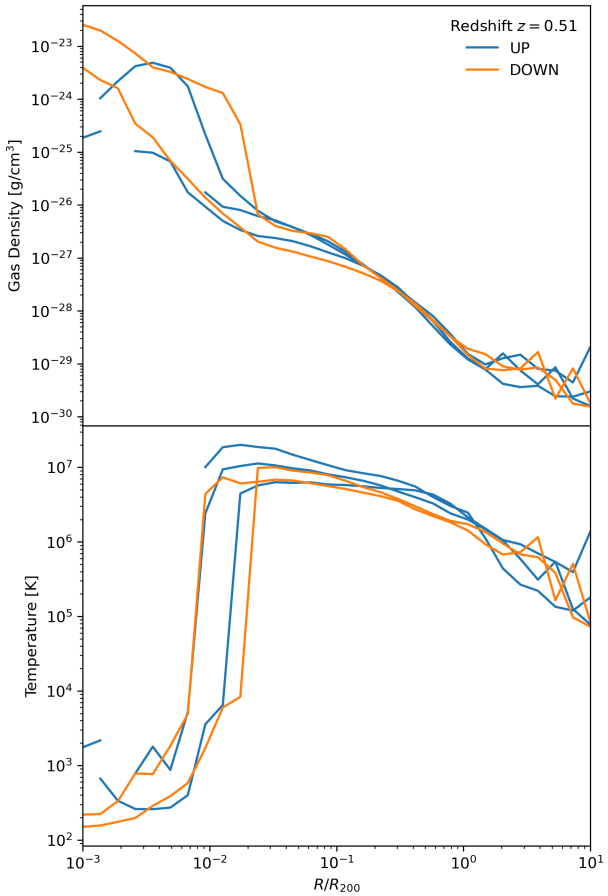


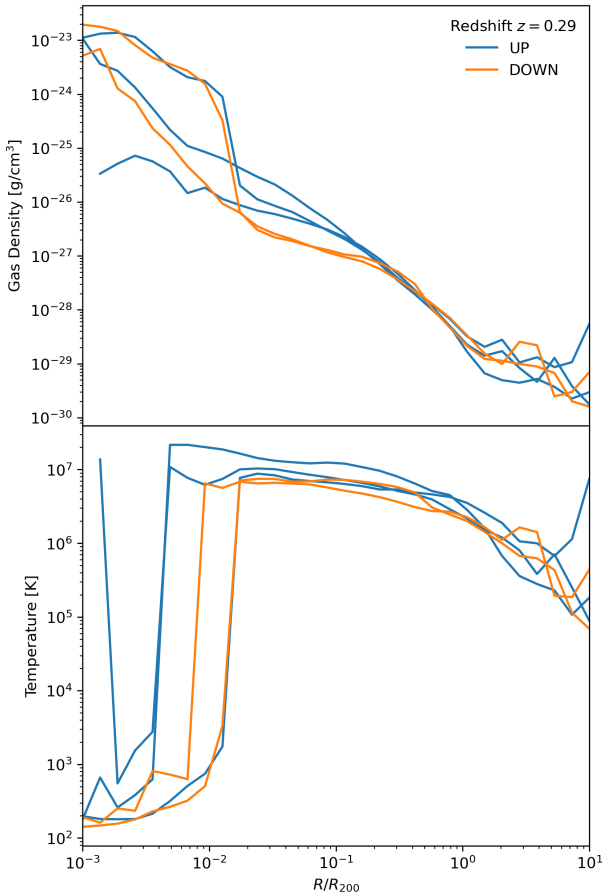


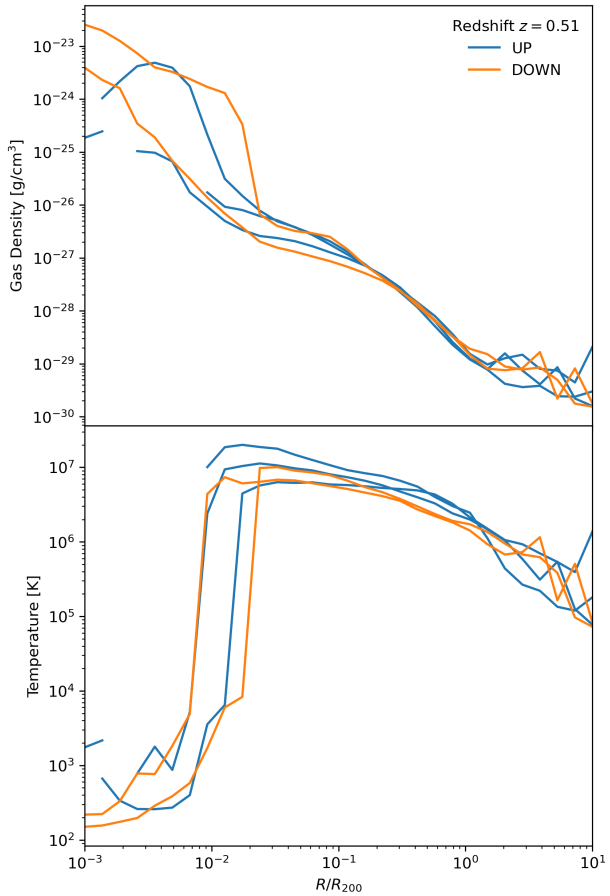
Evolution of Temperature and Density radial profile(1)

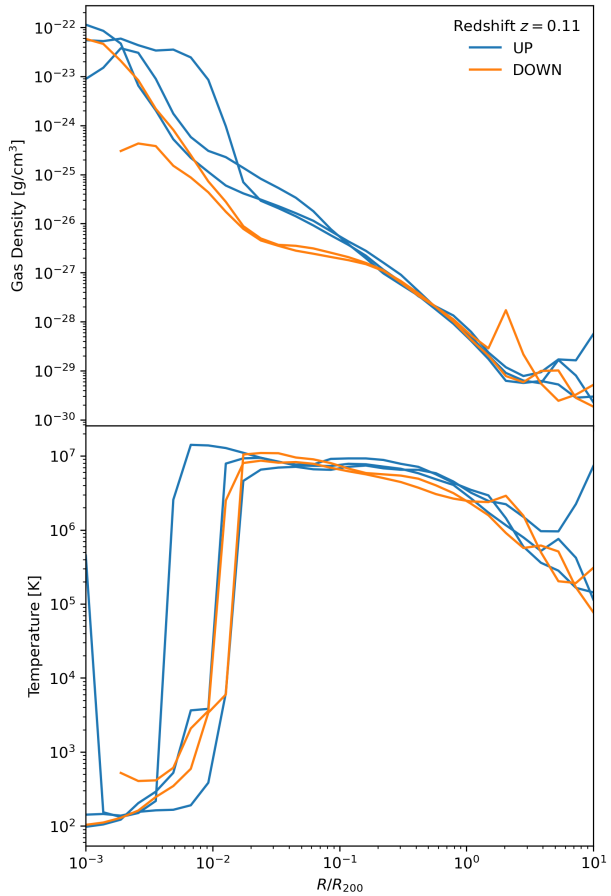


Evolution of Temperature and Density radial profile(2)



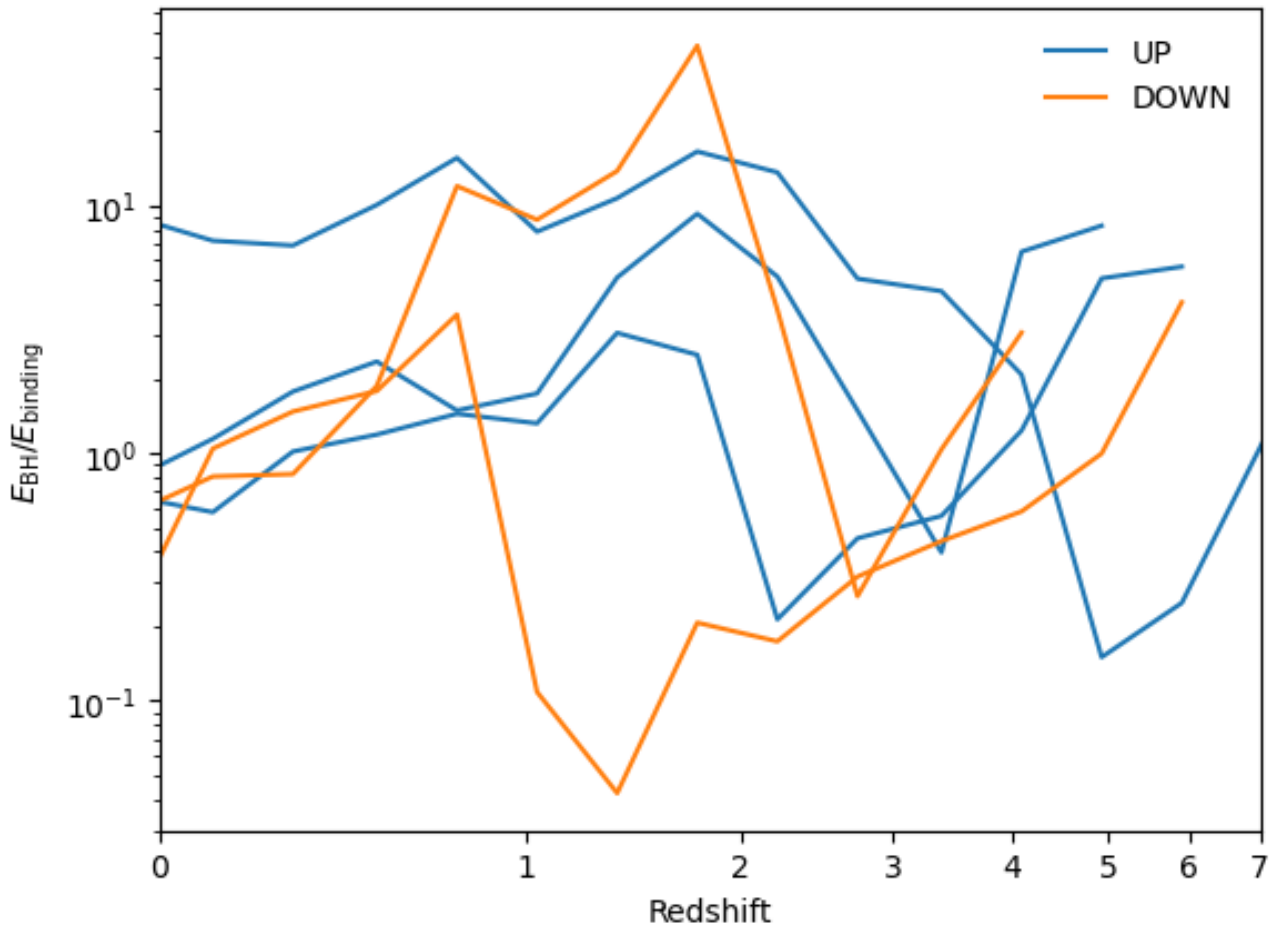






See page14 if you want to see redshift 0

EBH / Ebinding



$$E_{\rm BH} = \frac{\varepsilon_{\rm FB}\varepsilon_{\rm rad}}{1-\varepsilon_{\rm rad}} M_{\rm BH} c^2/4$$

$$E_{\rm binding} = \frac{1}{2} f_{\rm bary} M_{\rm vir} V_{\rm vir}^2$$

(Chen+'20, Terrazas+'20)

Various definition of E_{BH} / $E_{binding}$ energy

☑ $$\frac{E_{\rm BH}}{E_{\rm binding}} = \frac{\frac{\varepsilon_{\rm FB}\varepsilon_{\rm rad}M_{\rm BH}c^2}{4(1-\varepsilon_{\rm rad})}}{\frac{1}{2}f_{\rm bary}M_{\rm vir}V_{\rm vir}^2}$$

☐ $$\frac{E_{\rm BH}}{E_{\rm gal}} = \frac{\varepsilon_{\rm rad}M_{\rm BH}c^2}{M_{\rm gal}\sigma^2}$$

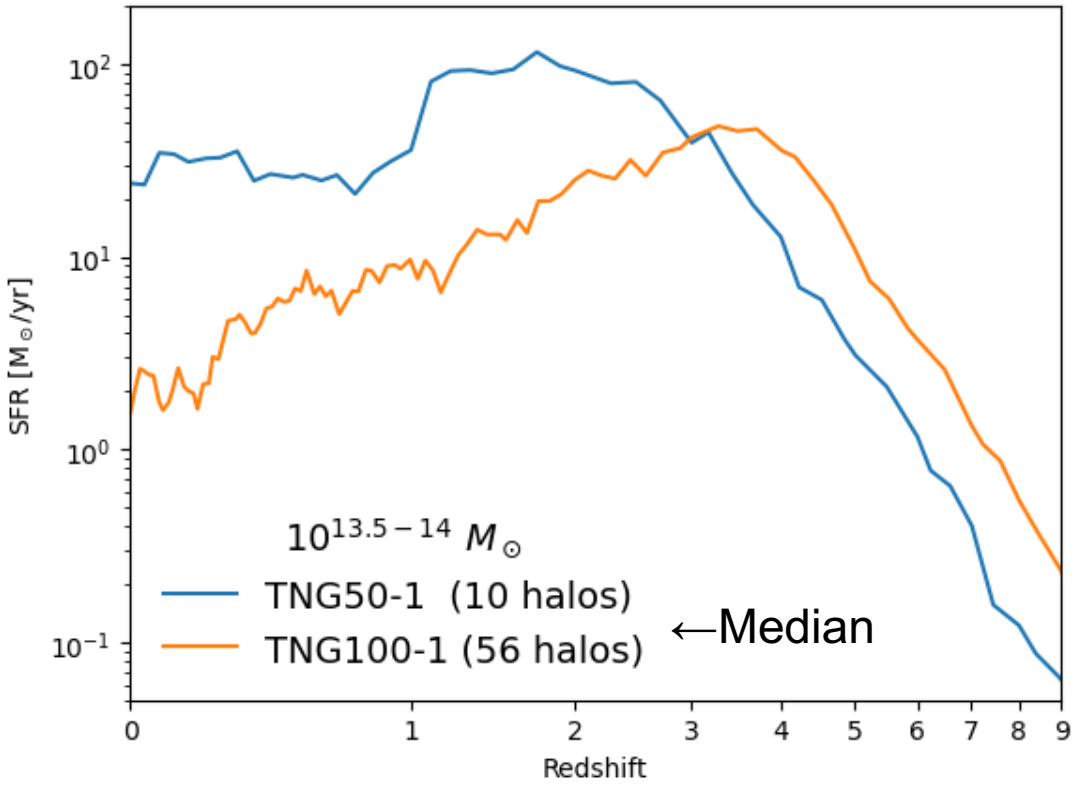
☐ $$\frac{E_{\rm BH}}{E_{\rm gal,half}} = \frac{\varepsilon_{\rm rad}M_{\rm BH}c^2}{M_{\rm gal,half}\sigma^2}$$

What about TNG100?

- Is this a problem specific to CROCODILE?
- Unlike it, the box size of TNG50 is 35 cMpc/h

Check TNG50 and TNG100

TNG50: 35 cMpc/h cubic
TNG100: 75 cMpc/h cubic



- Compared to TNG100, TNG50 shows less quenching around redshift 0.
- This could possibly be due to the box size.
- No sign of SFR recovery was observed.

So, executing L100N1024_Cvisc100pi run
(preparing…)

Also checking CAMEL projects