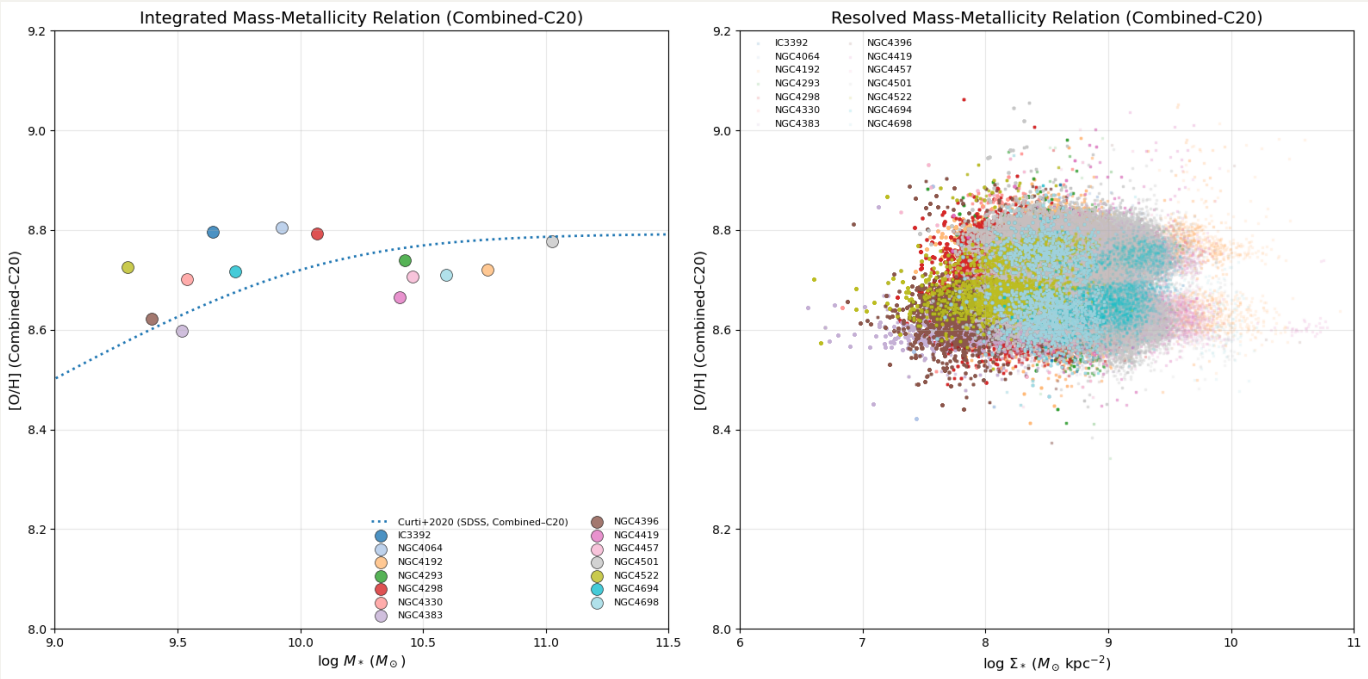
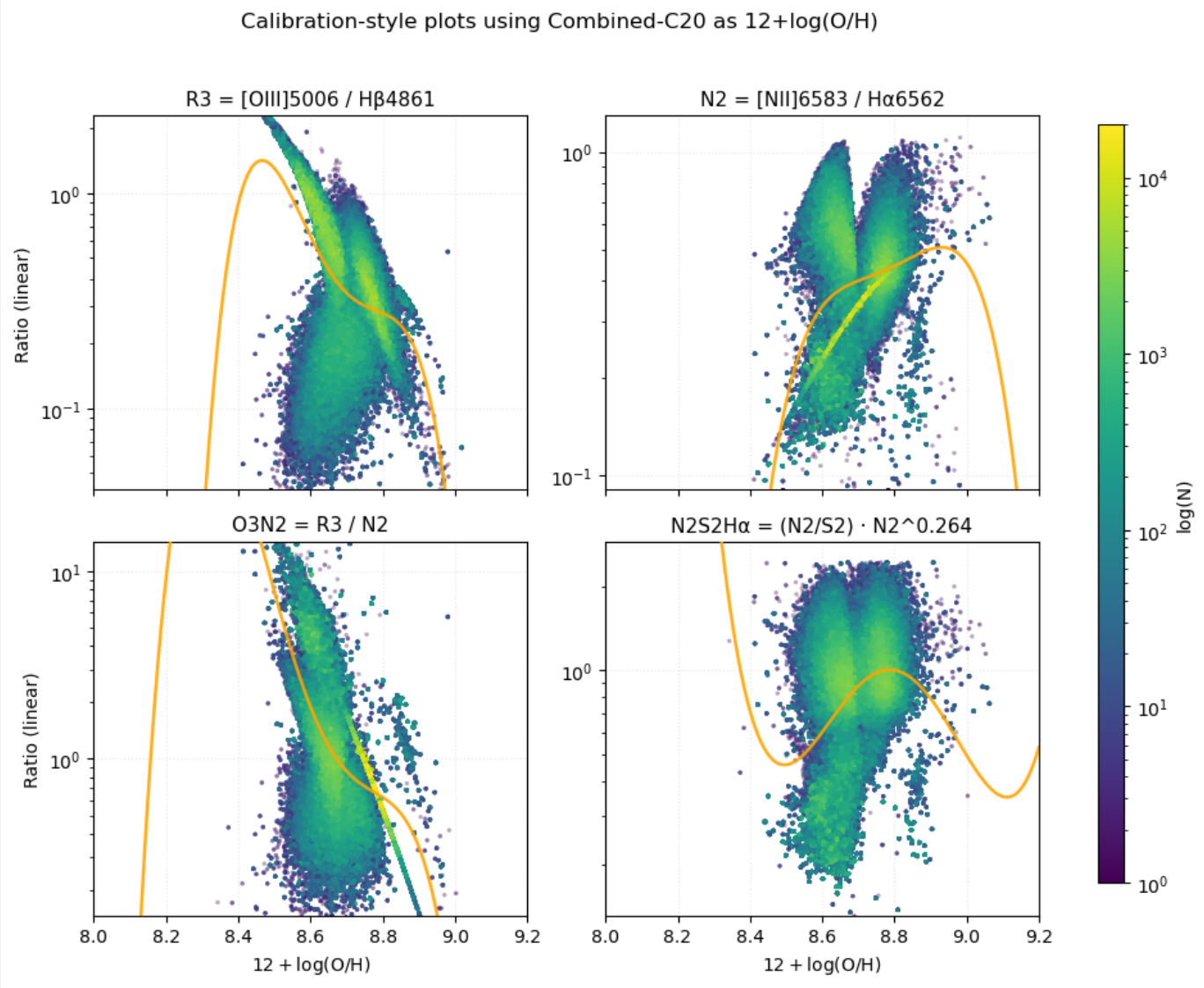
20250915 Inclination and Metallicity Test

Minor fix at Combined-C20 method

I found that my previous way to get Combined-C20 metallicity is a bit wrong and i now fix it. But it doesn't affect out conclusion that Combined-C20 method is not applicable to our data as that will cause bimodality.

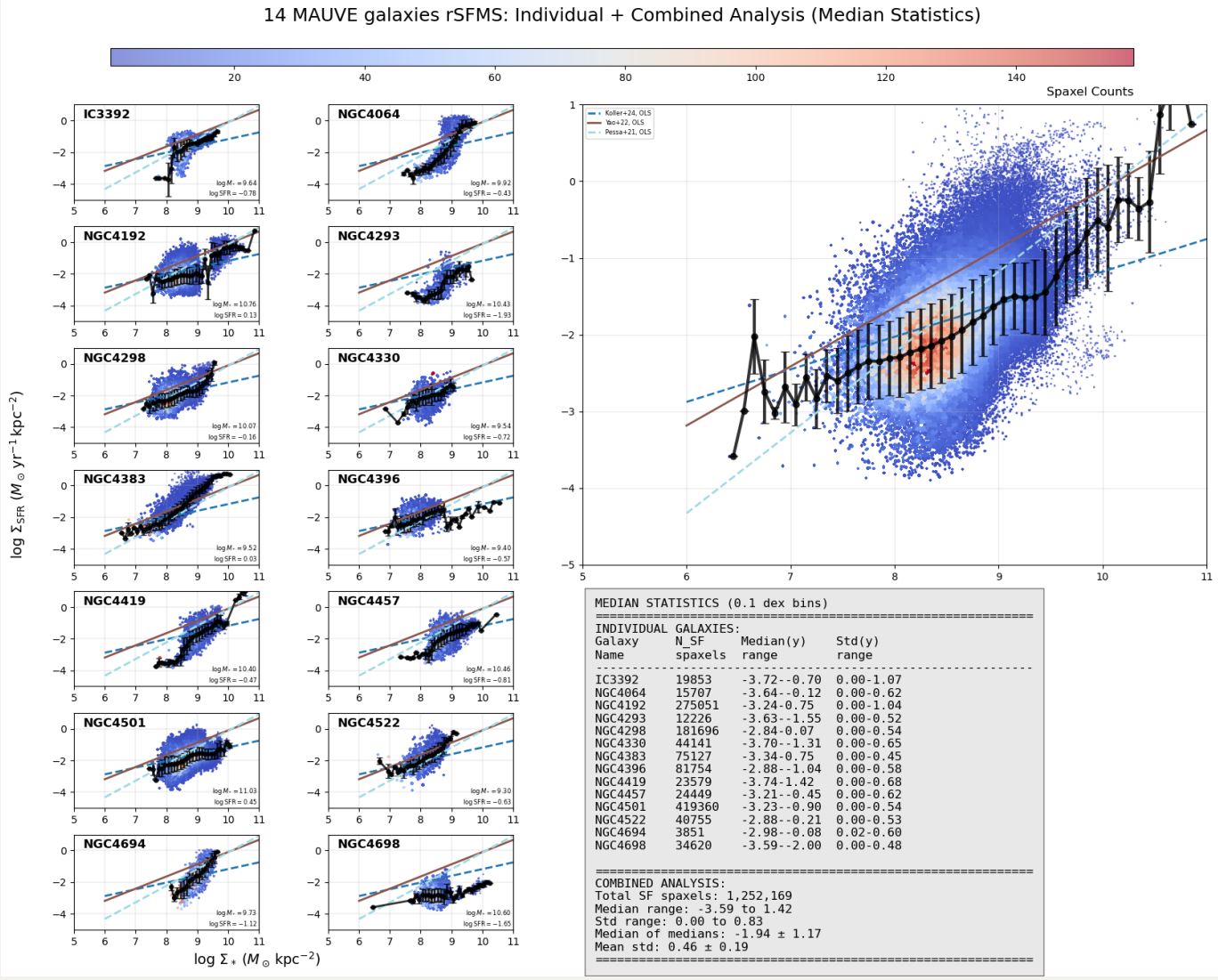


Therefore, when checking the indicators with Combined-C20 metallicity, we can further see that it is not suitable.

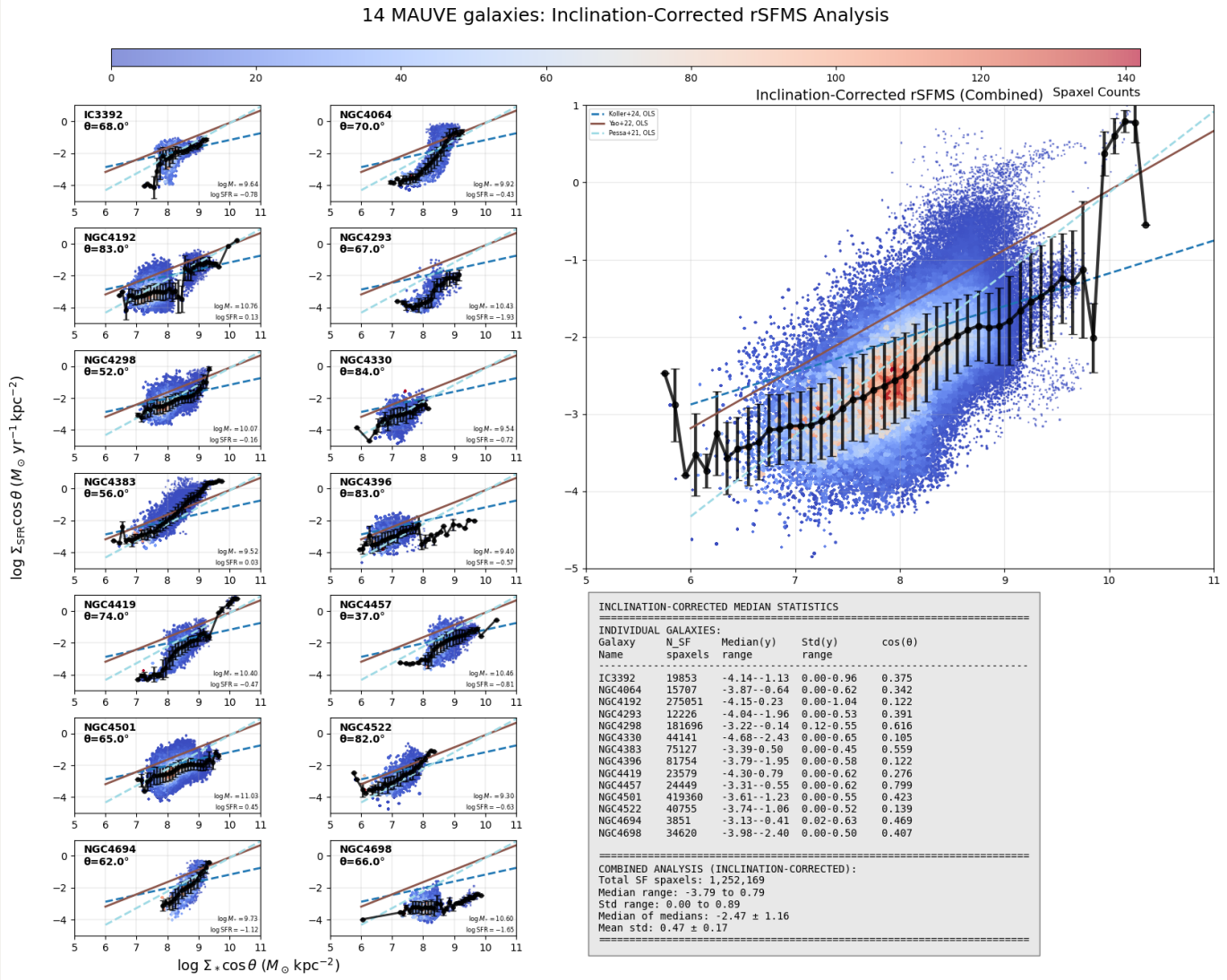


Inclination correction on rSFMS

First the observed rSFMS:

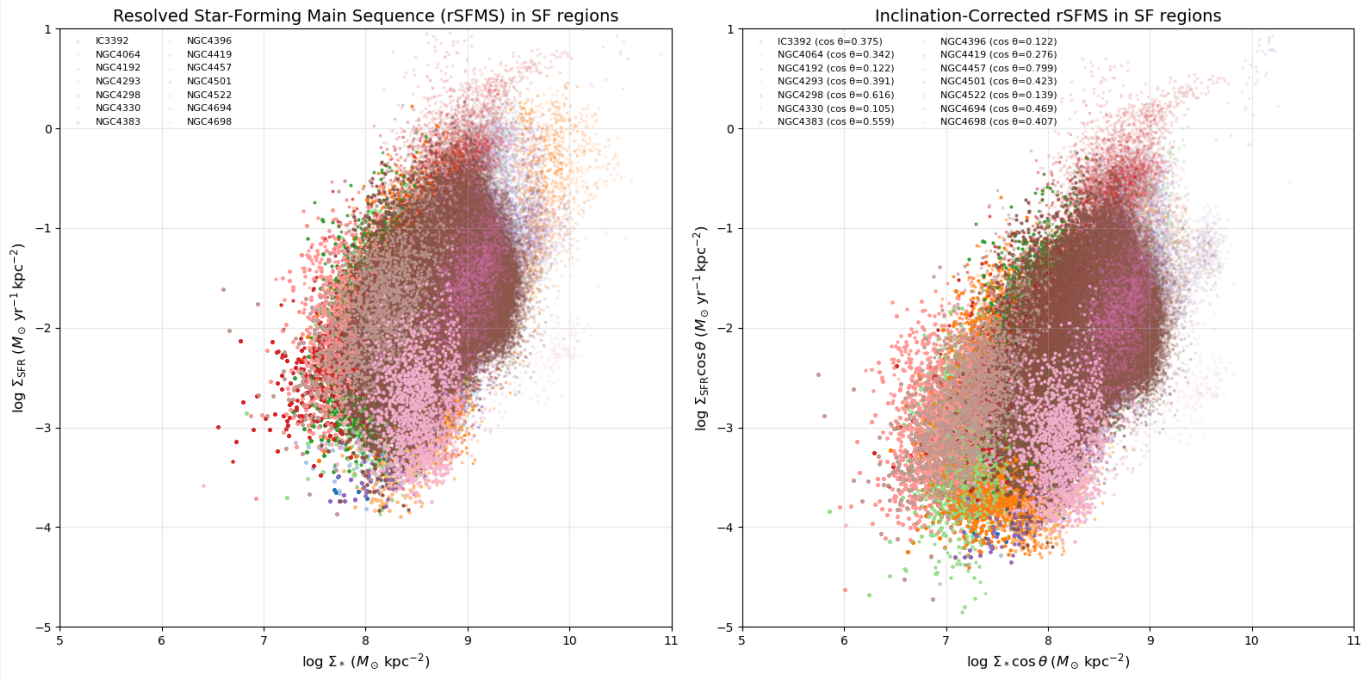


Then simply assuming thin disc to get inclination corrected rSFMS



Comparison:

Looks like scatter is slightly larger.



Try parameters from Curti+2020

The FMR from Curti+2020 is

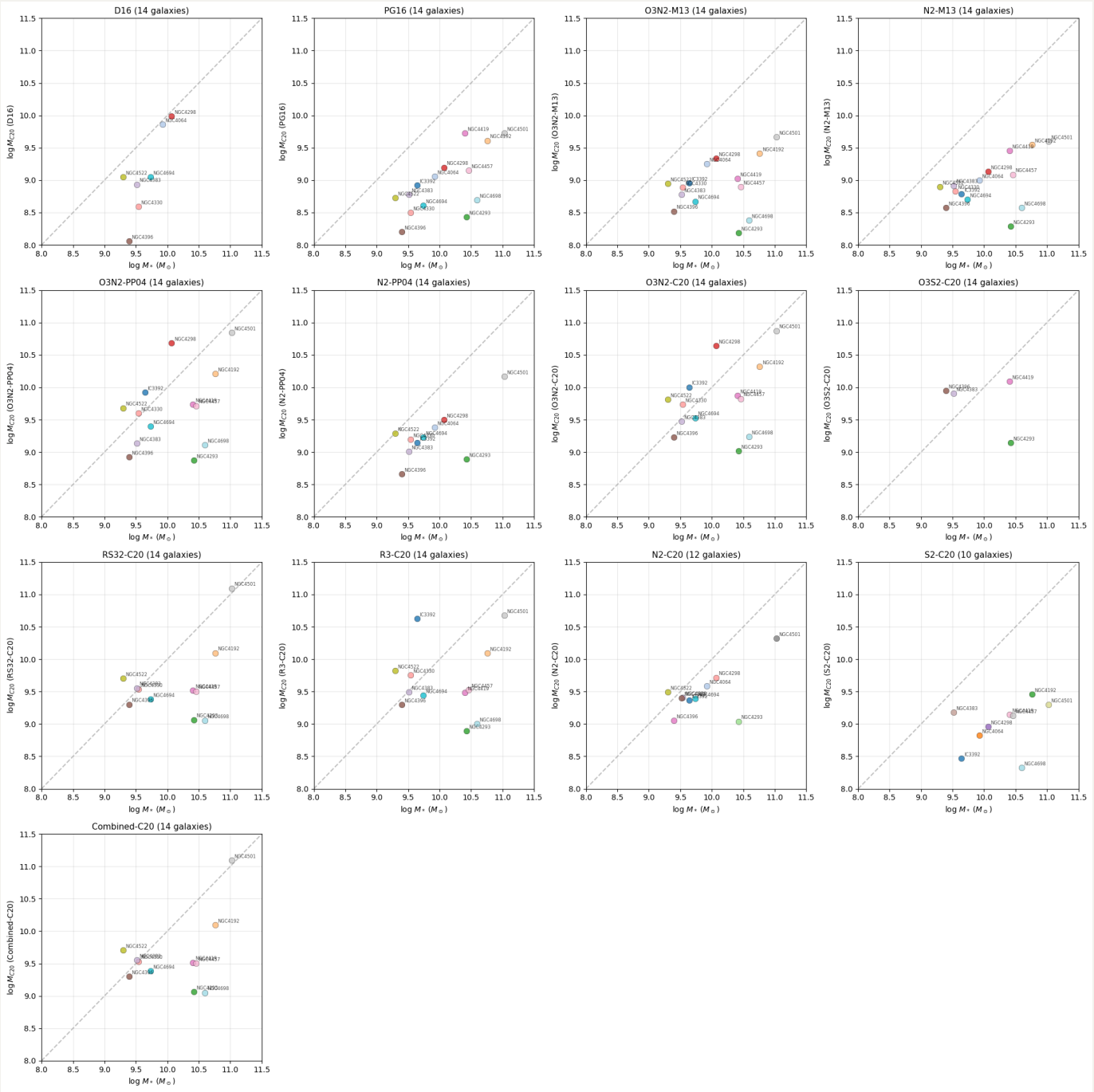
$$Z(M, \mathrm{SFR}) = Z_0 - \gamma/\beta \log\left(1 + (M/M_0(\mathrm{SFR}))^{-\beta}\right), \tag{1}$$

where $\log(M_0(\mathrm{SFR})) = m_0 + m_1 \log(\mathrm{SFR})$ or $M_0(\mathrm{SFR}) = 10^{m_0}\mathrm{SFR}^{m_1}$.

Then, I can rewrite into

$$\log_{10}(M)_{\mathrm{C20}} = m_0 + m_1 \log_{10}(\mathrm{SFR}) - \frac{1}{\beta}\log_{10}(10^{\frac{\beta}{\gamma}(Z_0 - Z)} - 1) \tag{2}$$

with $Z_0 = 8.779, m_0 = 10.11, m_1 = 0.56, \gamma = 0.31, \beta = 2.1$ and so I can plot it in the y-axis. That means it should lie on the one-to-one dashed line if the data can perfectly recreate the Curti+2020 FMR surface.


D16 (14 galaxies)
PG16 (14 galaxies)
O3N2-M13 (14 galaxies)
N2-M13 (14 galaxies)
O3N2-PP04 (14 galaxies)
N2-PP04 (14 galaxies)
O3N2-C20 (14 galaxies)
O3S2-C20 (14 galaxies)
RS32-C20 (14 galaxies)
R3-C20 (14 galaxies)
N2-C20 (12 galaxies)
S2-C20 (10 galaxies)
Combined-C20 (14 galaxies)
log M_{C20} (D16)
log M_{C20} (PG16)
log M_{C20} (O3N2-M13)
log M_{C20} (N2-M13)
log M_{C20} (O3N2-PP04)
log M_{C20} (N2-PP04)
log M_{C20} (O3N2-C20)
log M_{C20} (O3S2-C20)
log M_{C20} (RS32-C20)
log M_{C20} (R3-C20)
log M_{C20} (N2-C20)
log M_{C20} (S2-C20)
log M_{C20} (Combined-C20)
log M_* ($M_\odot$)