Response Functions for Making Mock Maps

Doğa Tolgay

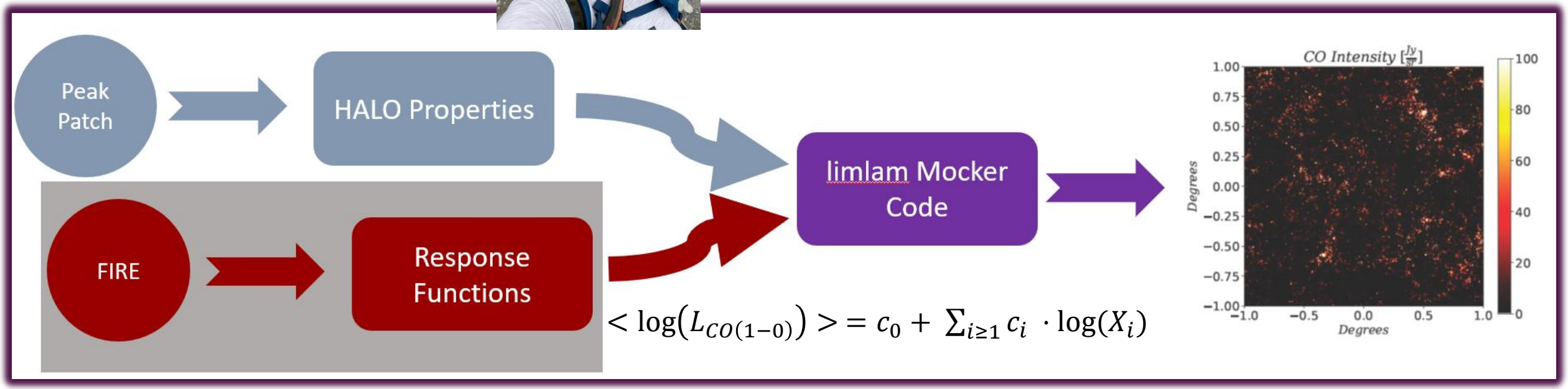
With

D. Chung, N. Carlson, J. R. Bond, and N. Murray

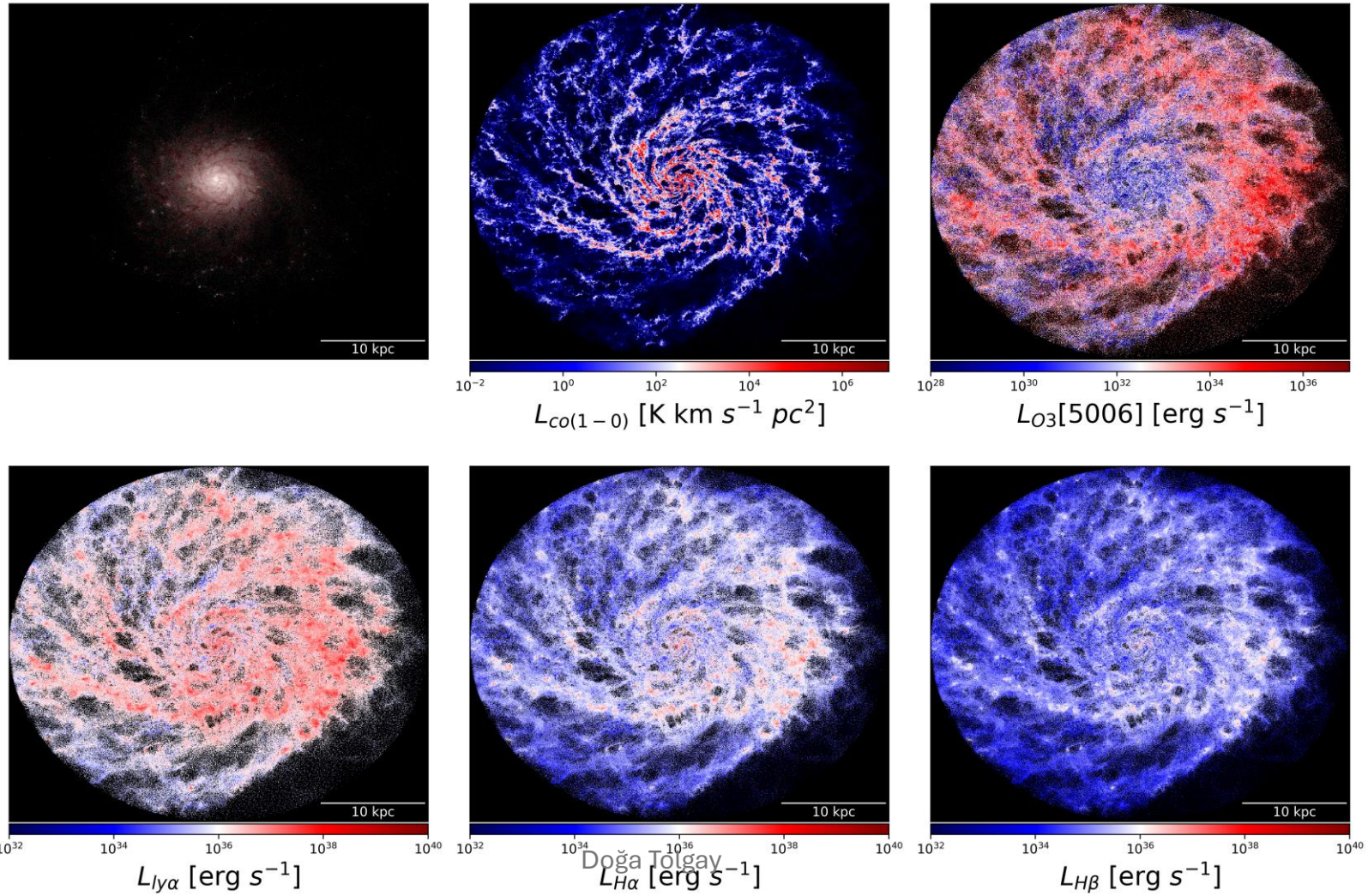
University of Toronto / Canadian Institute for Theoretical Astrophysics

Response Functions from FIRE applied on DM Halos to Produce Mock Maps

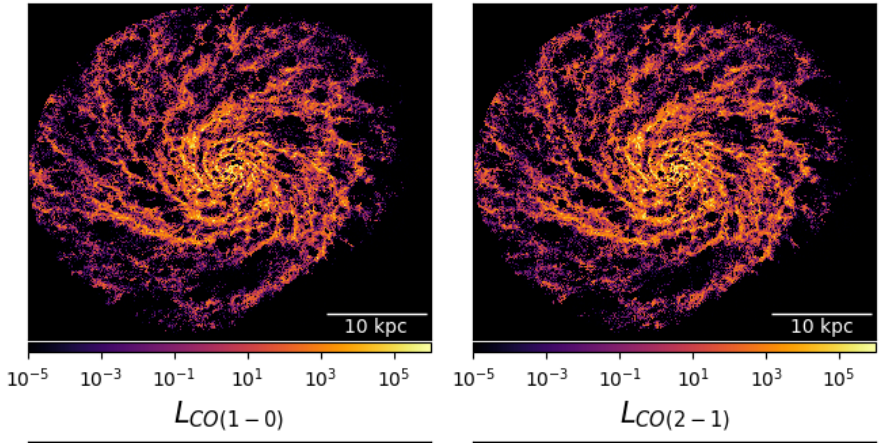
Nathan Carlson
Thursday
LIM and Cosmology

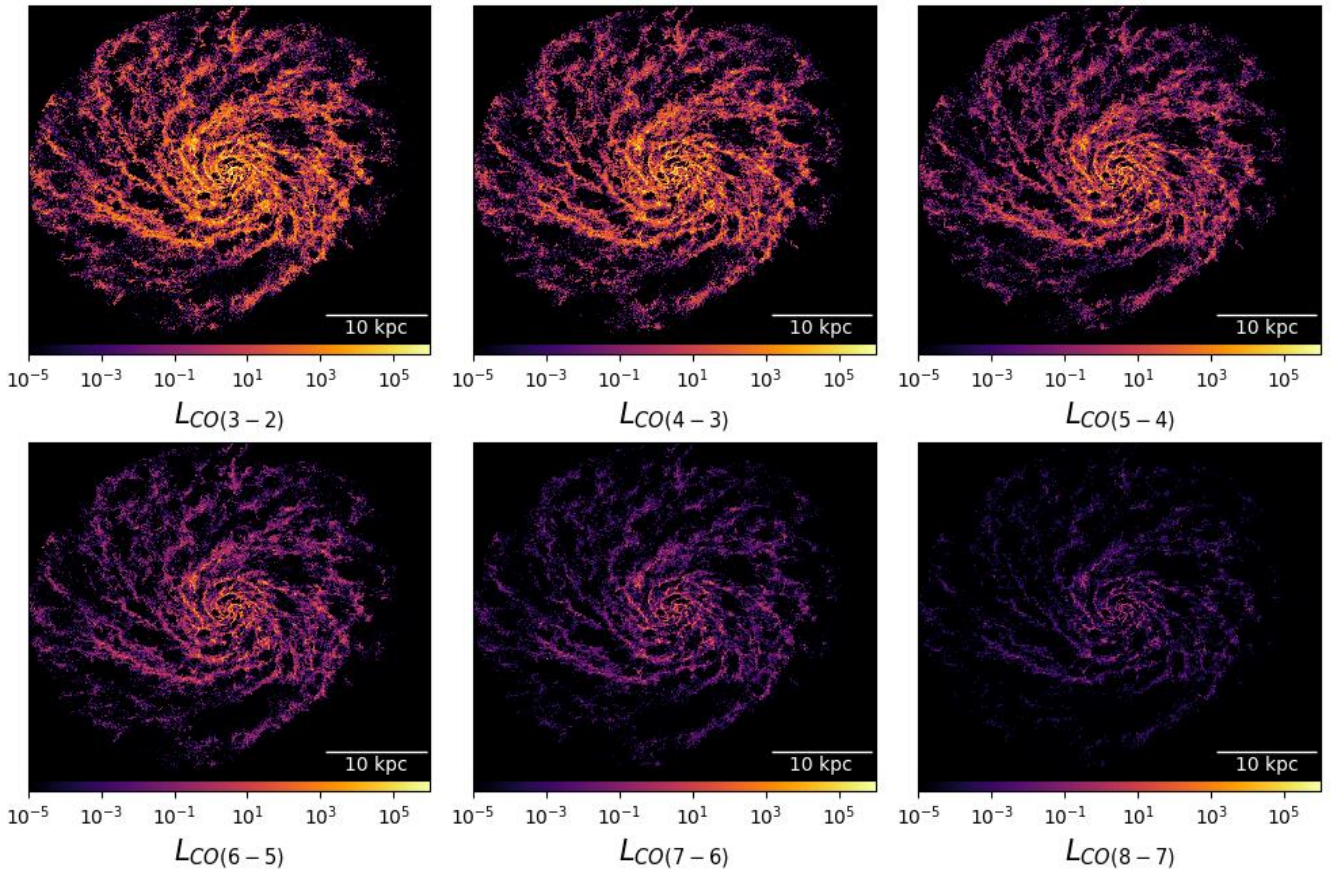


Molecular and Atomic Lines



CO Lines, CO(1-0) → CO(8-7)

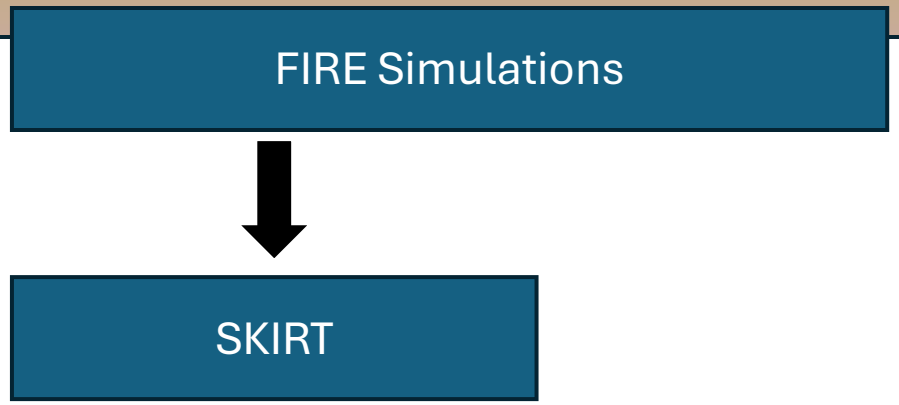




Post-processing Chain

FIRE Simulations

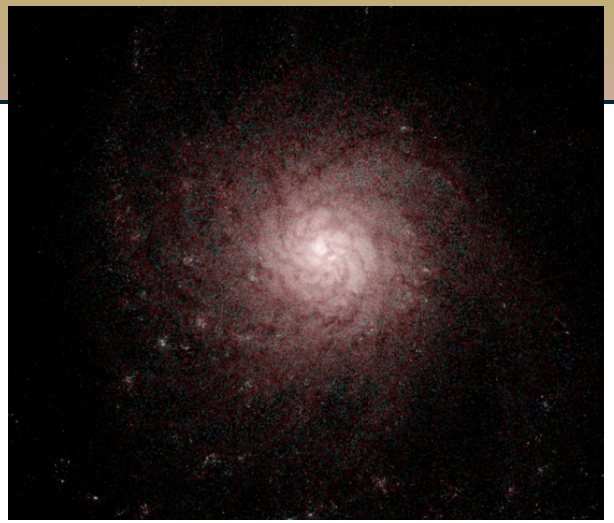
Post-processing Chain



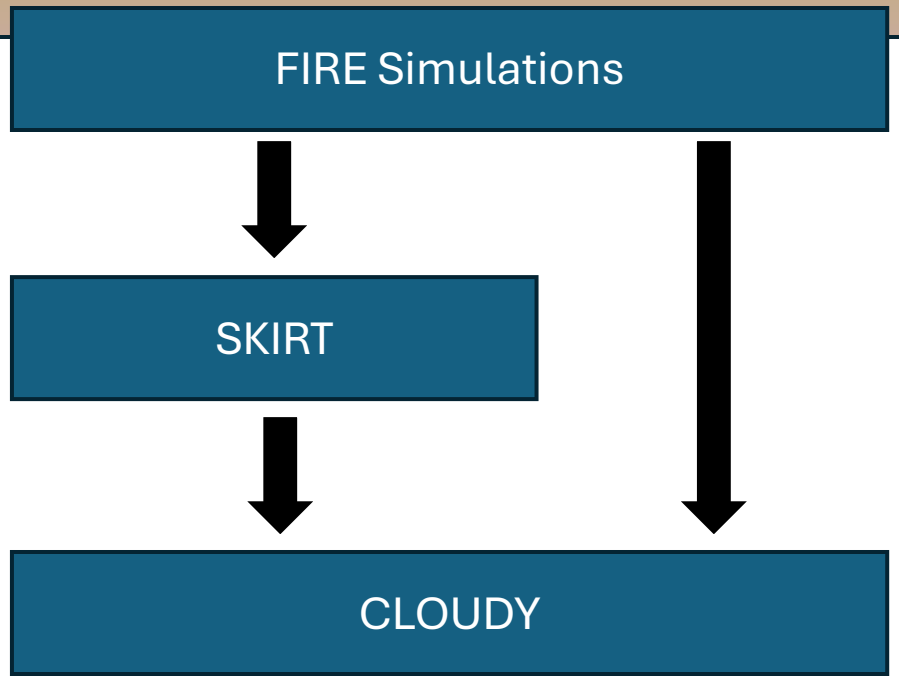
Post-processing Chain

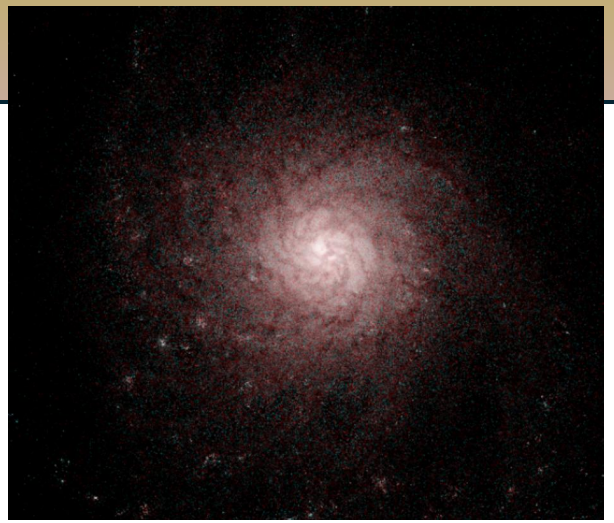
FIRE Simulations

SKIRT

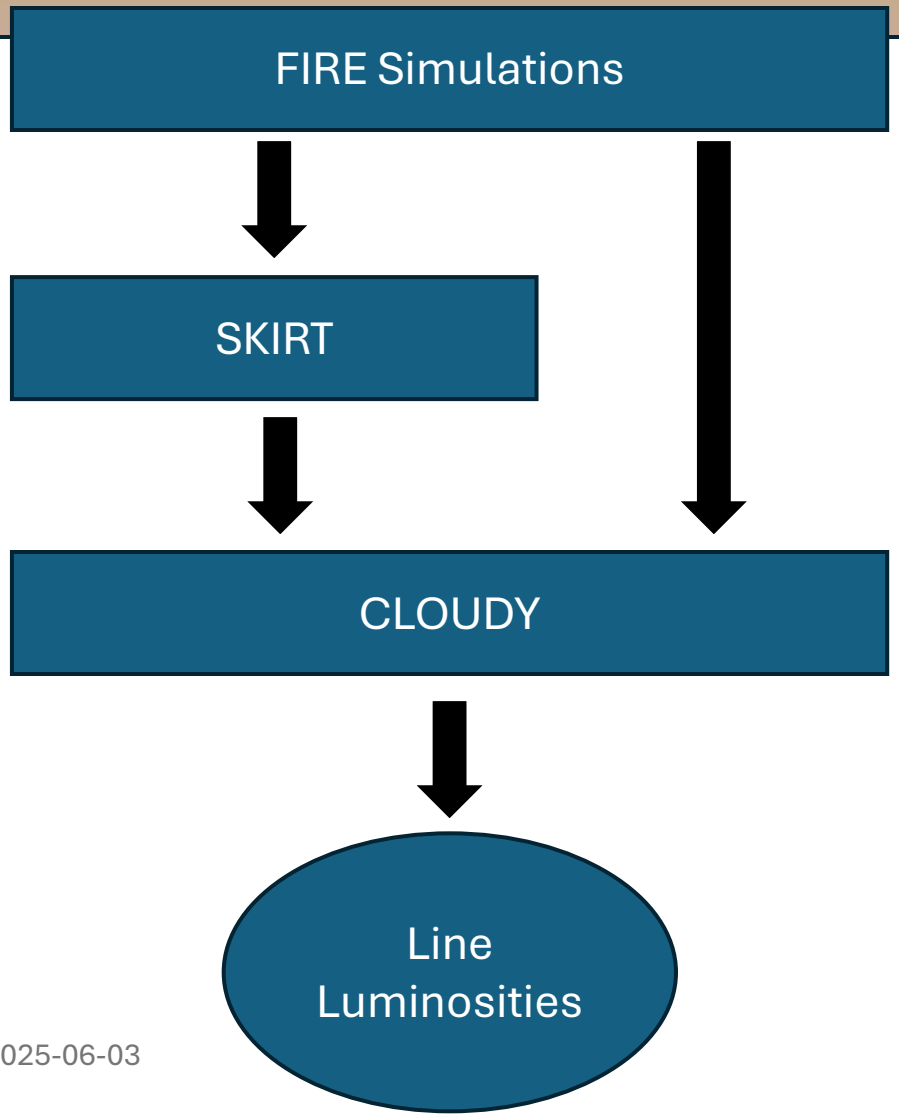


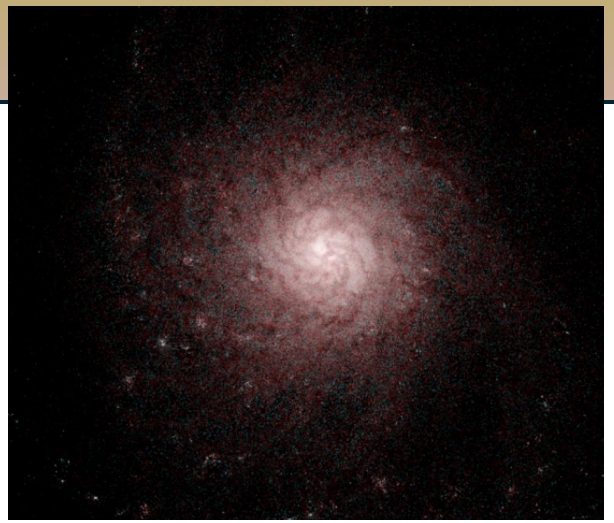
Post-processing Chain

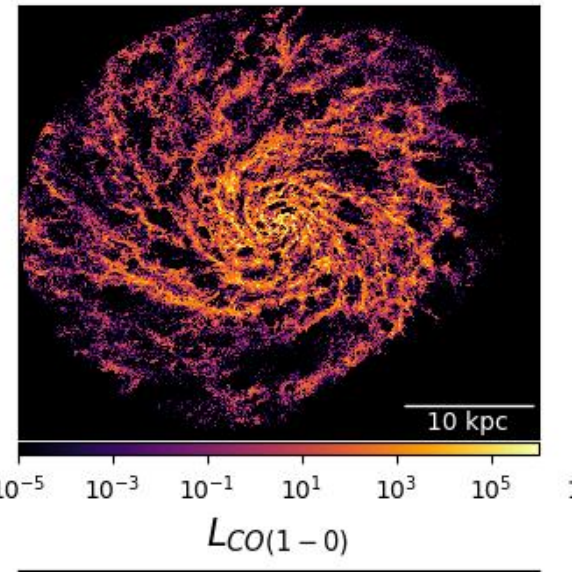




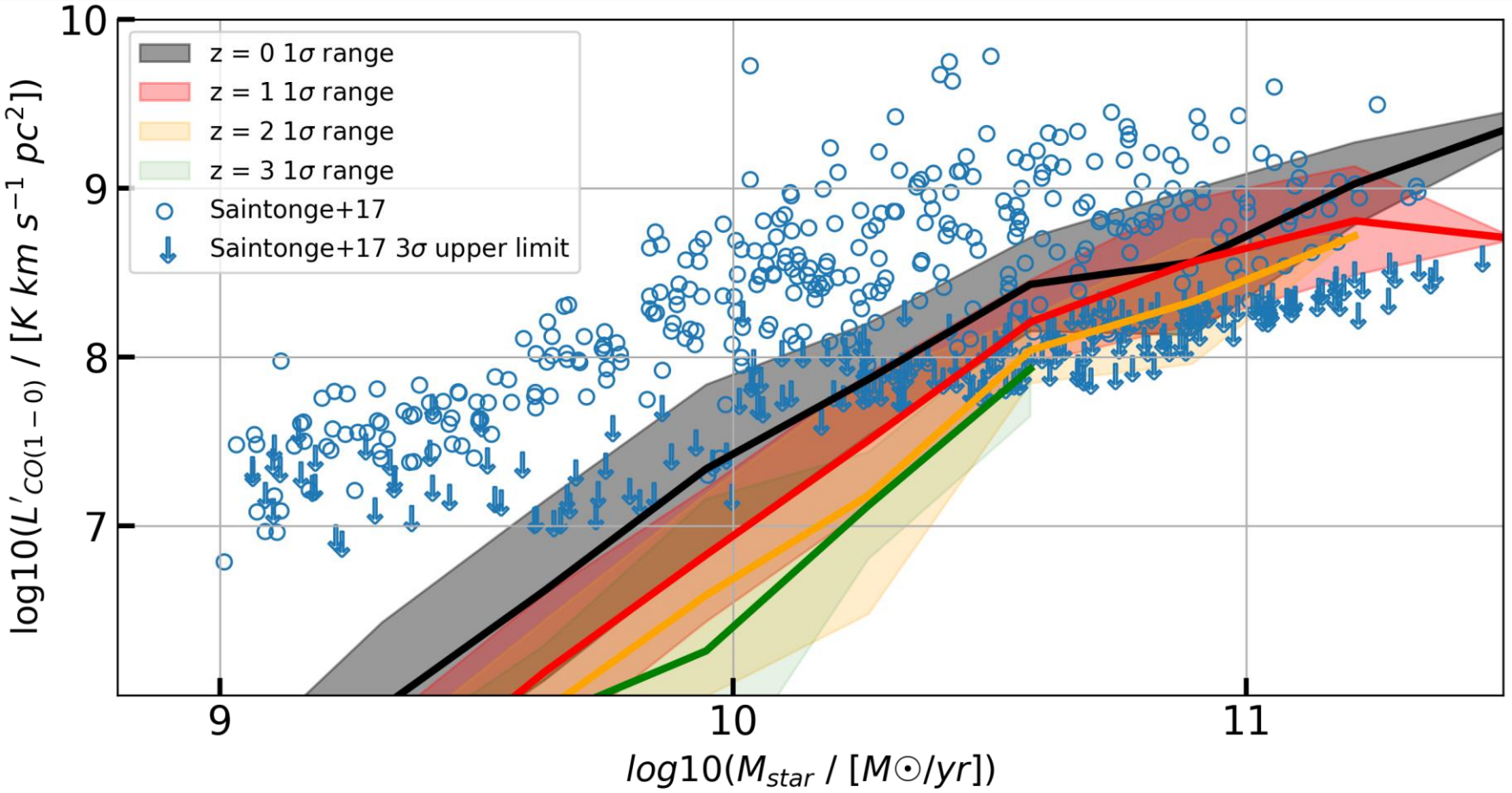
Post-processing Chain



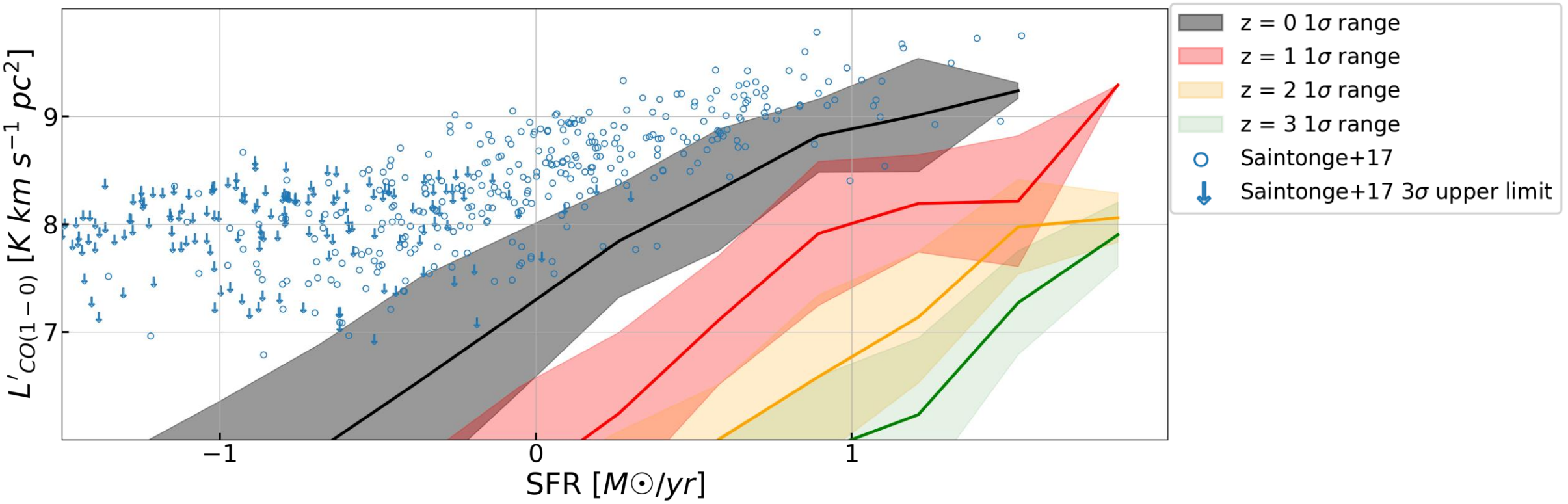




Comparison With Observations is Promising



Comparison with observations is promising for some variables, but not others



Best methods to uncover correlations...

Random Forest Tree with Feature Importance

Non-linear Correlations

Causations as well as correlations

Symbolic Regression

Machine learning to determine the latent formulas

Power Law relation with least scatter

Basic statistical method

Easy to interpret

Best methods to uncover correlations...

Random Forest Tree with Feature Importance

Non-linear Correlations

Causations as well as correlations

Symbolic Regression

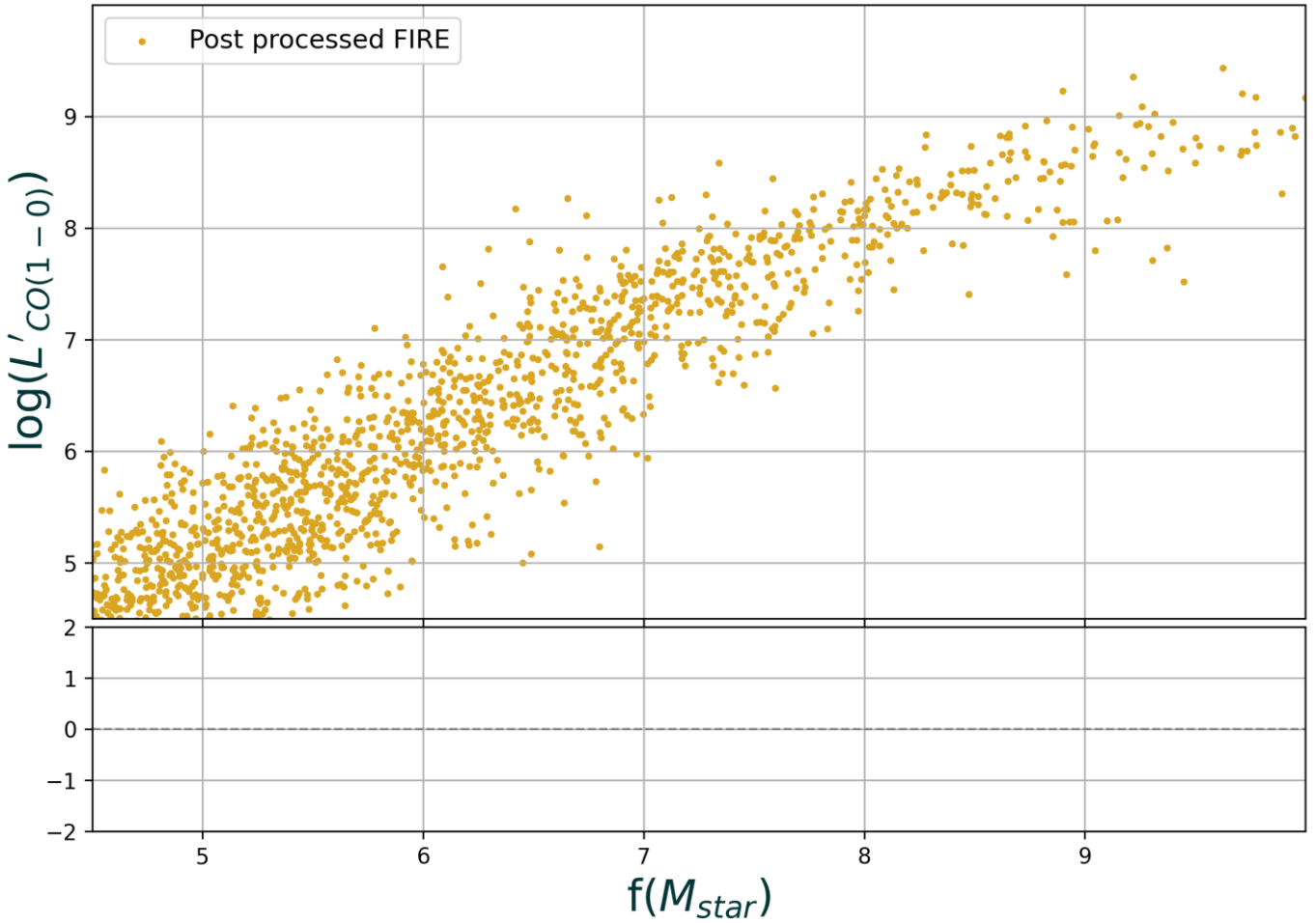
Machine learning to determine the latent formulas

Power Law relation with least scatter

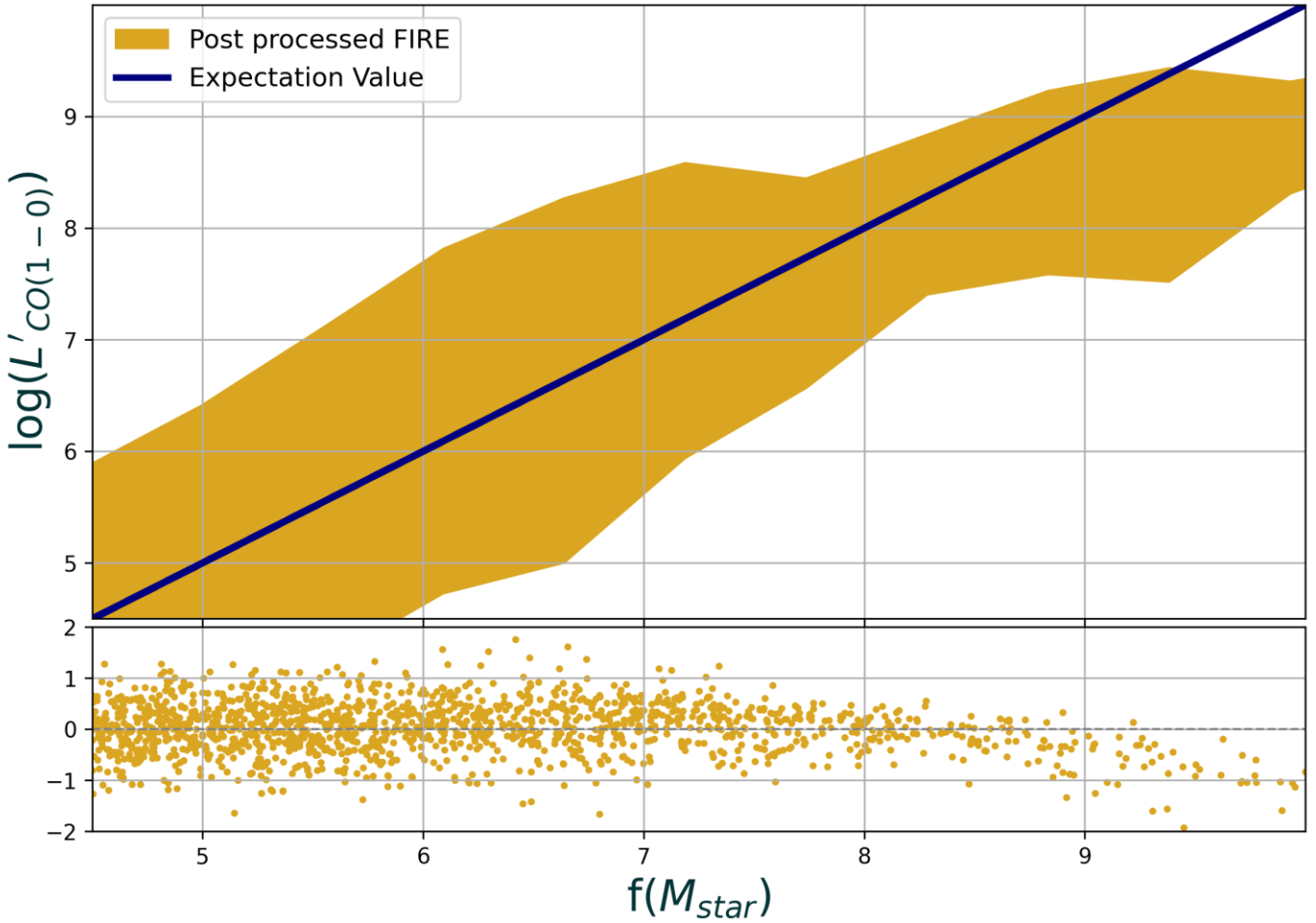
Basic statistical method

Easy to interpret

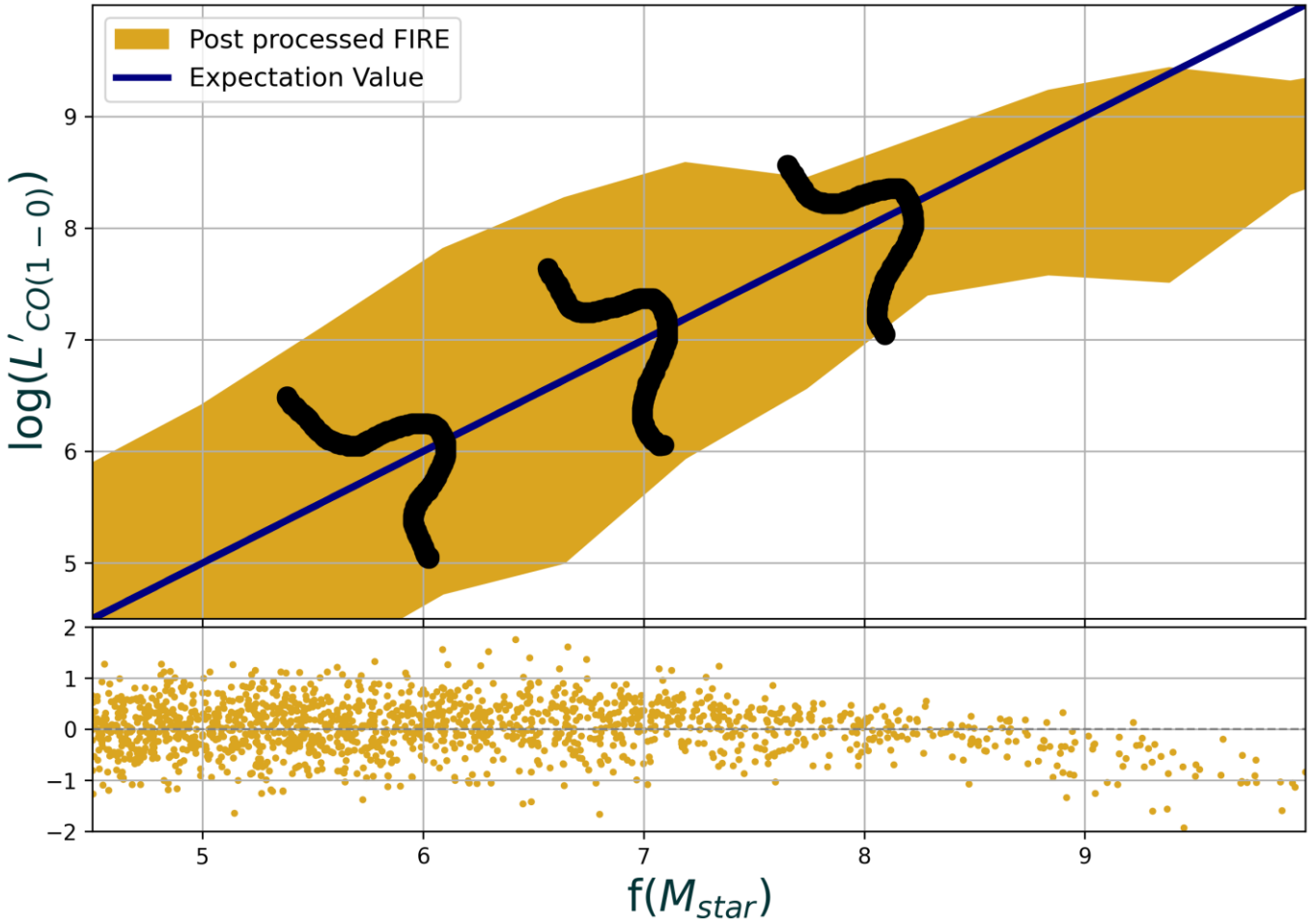
Response Function Formalism



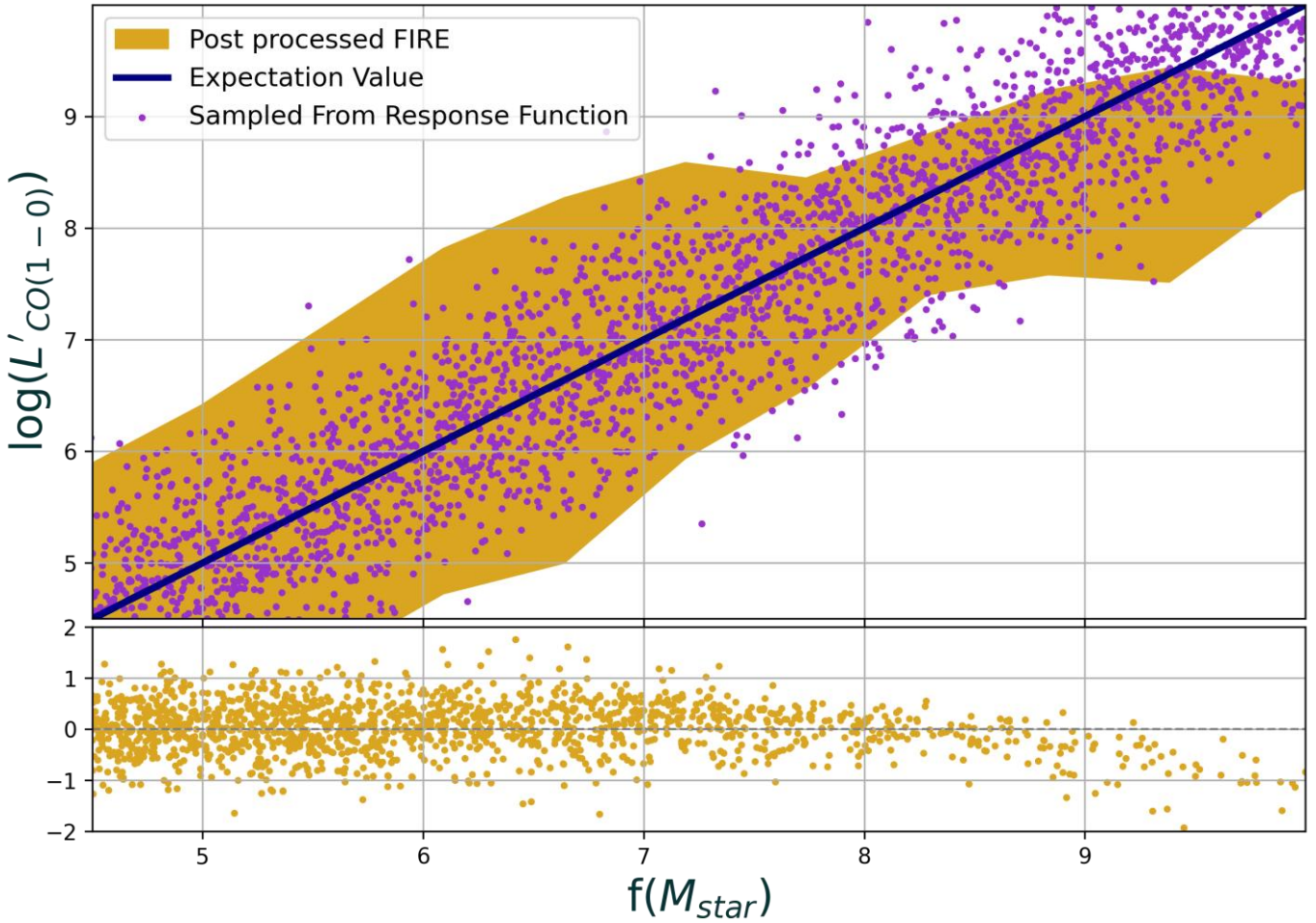
Response Function Formalism



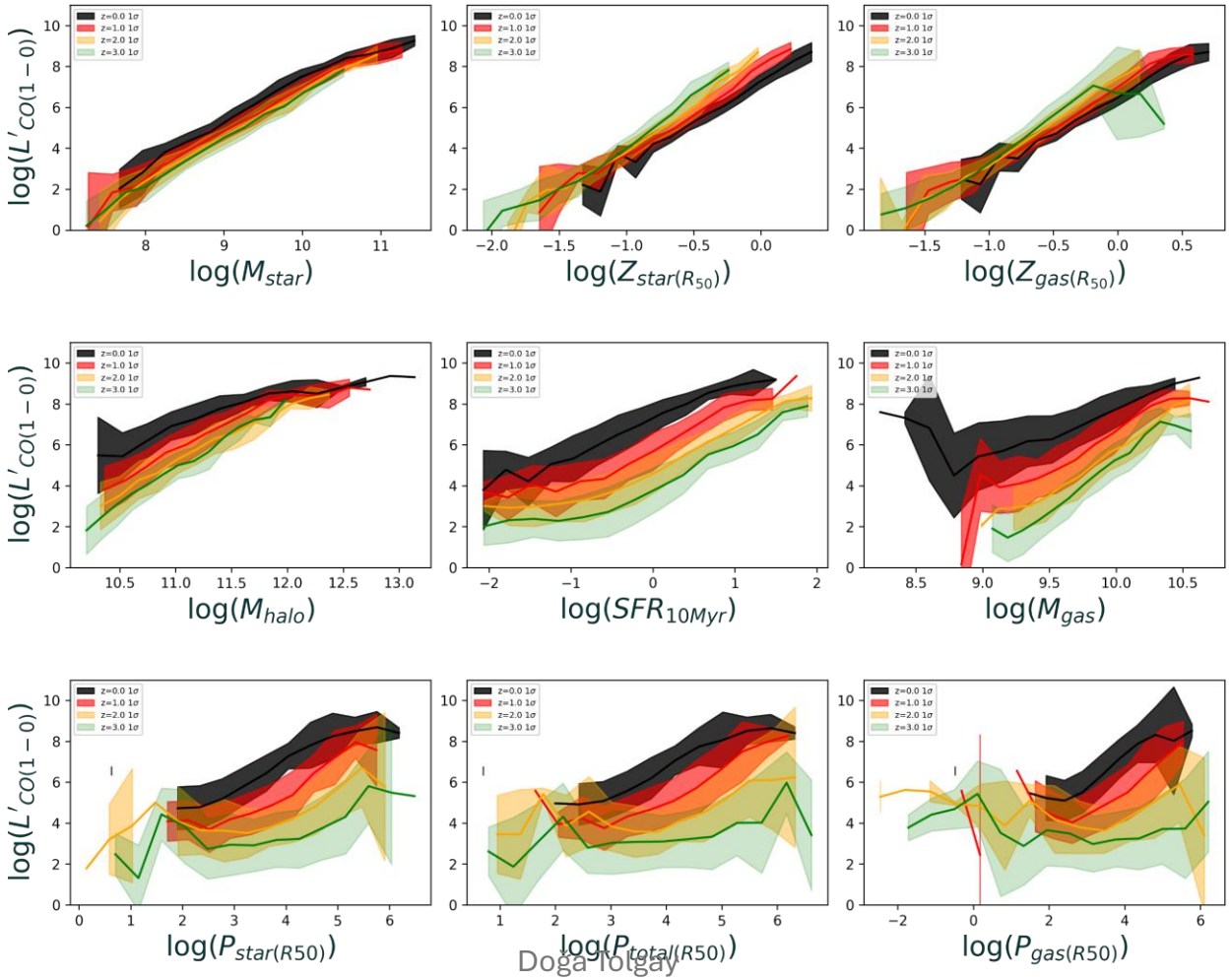
Response Function Formalism



Response Function Formalism

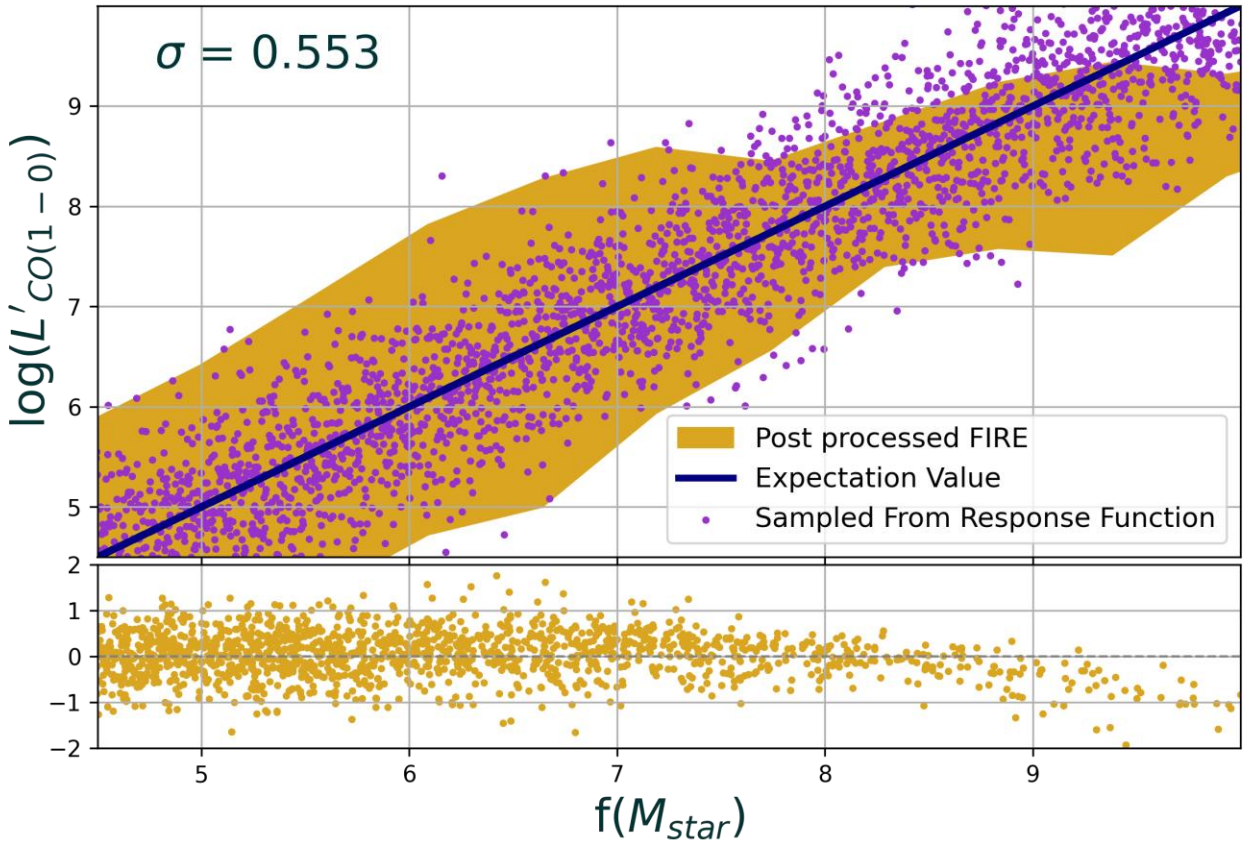


Best galactic property to correlate with $L_{CO(1-0)}$?

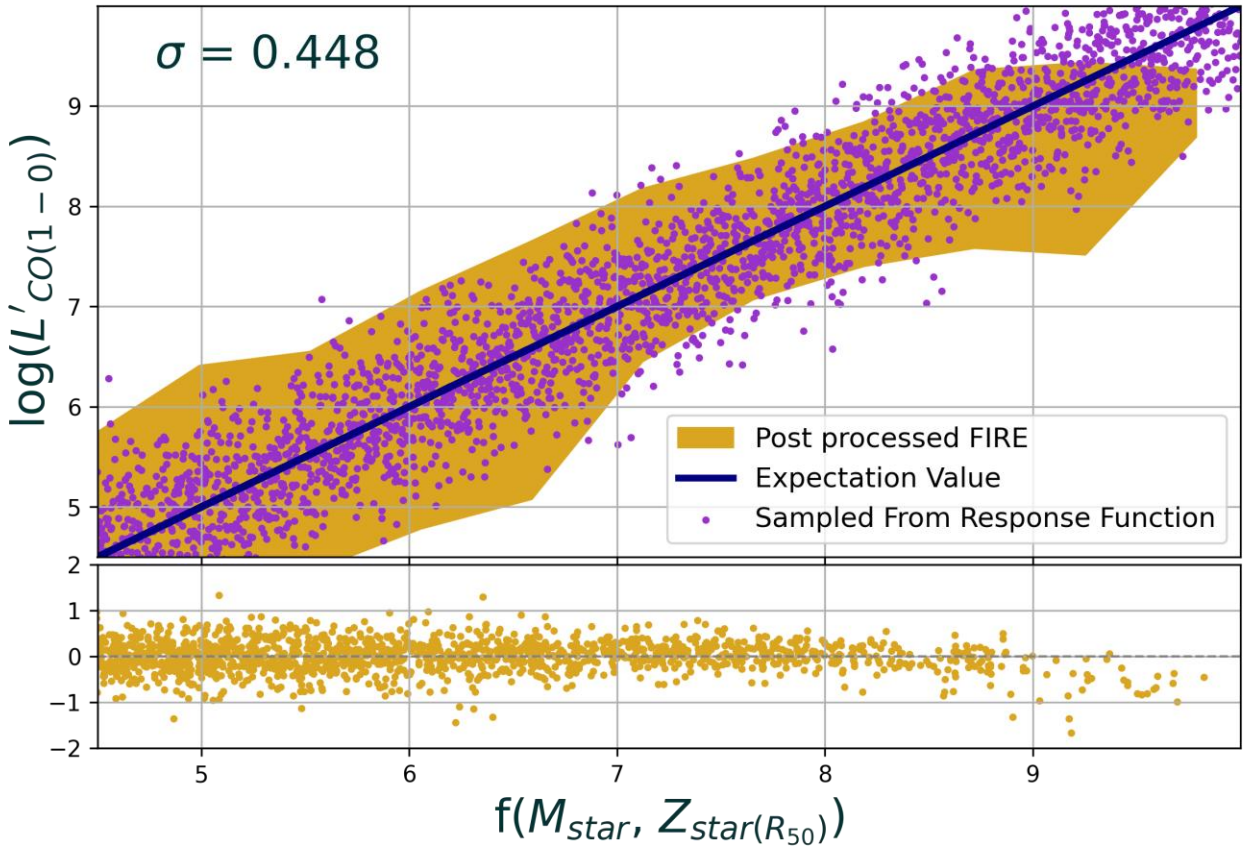


Using Multiple Variables Fits Better

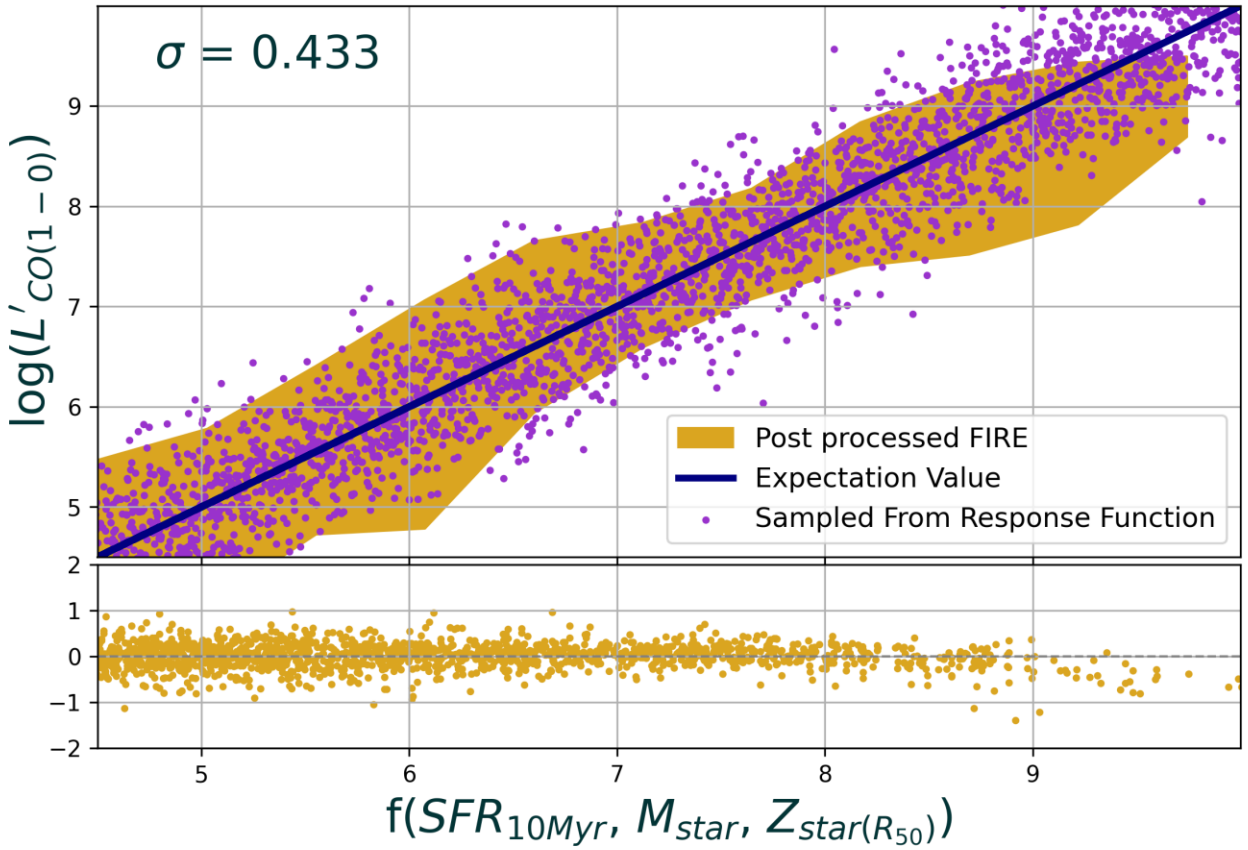
Using Multiple Variables Fits Better



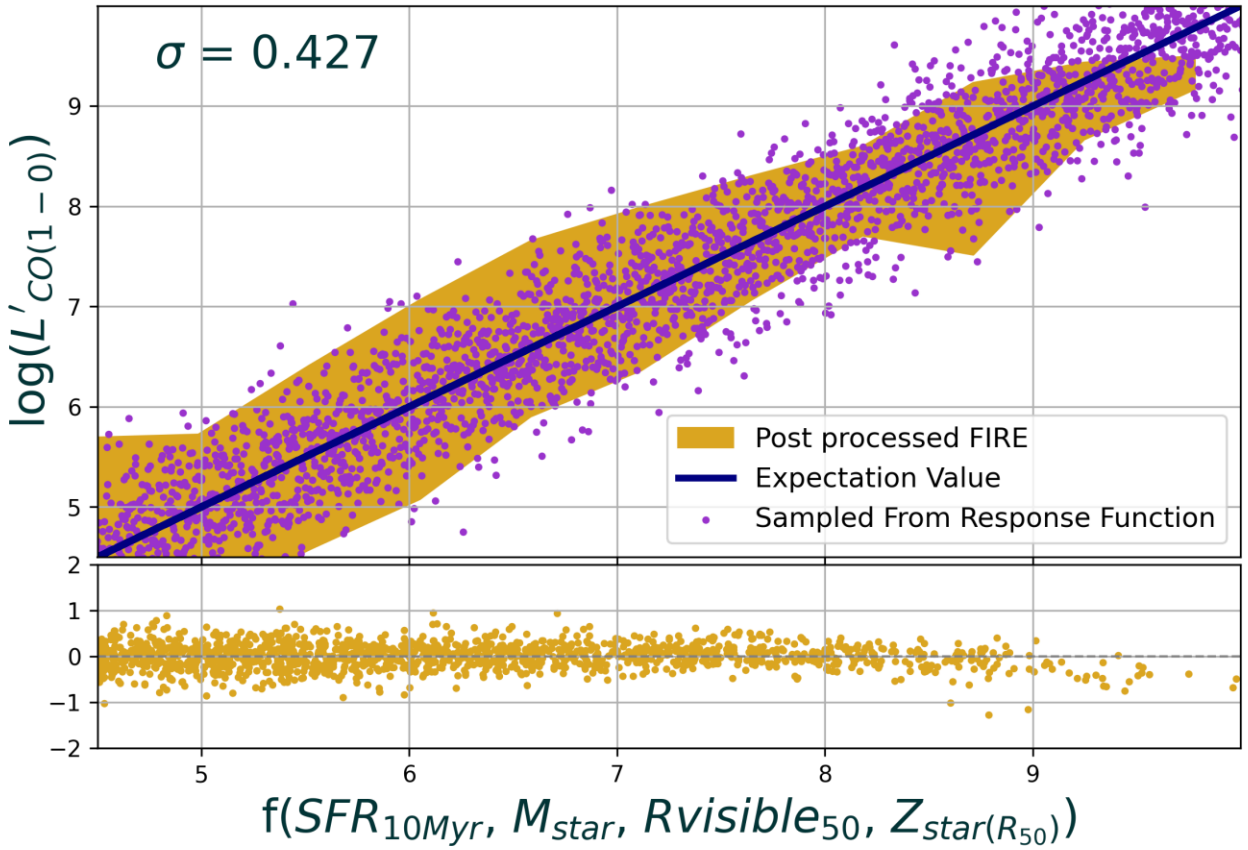
Using Multiple Variables Fits Better



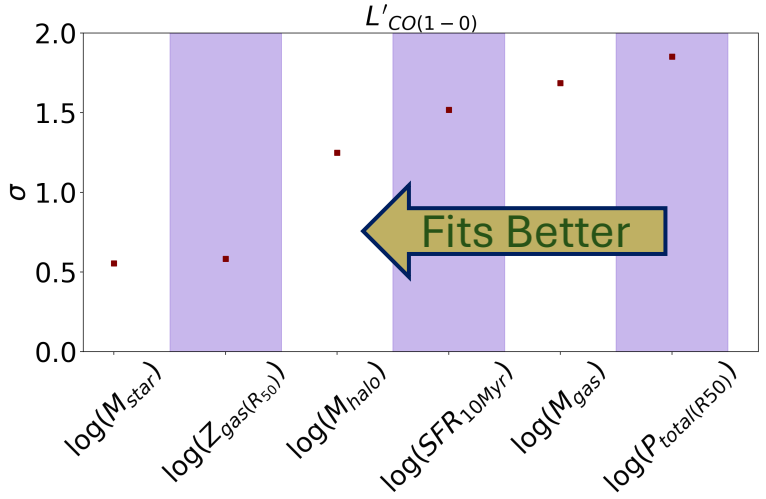
Using Multiple Variables Fits Better

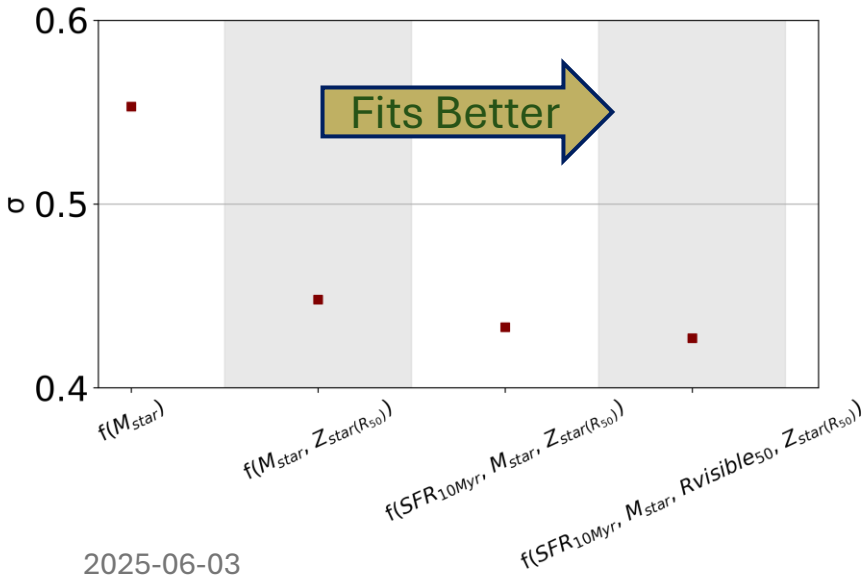


Using Multiple Variables Fits Better



Conclusions





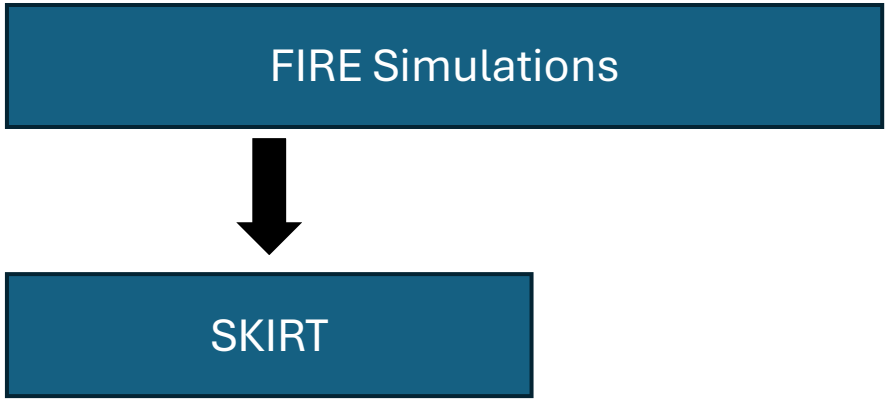
- The reliability of mock maps hinges on the accuracy of response functions that exhibit minimal scatter.
- While incorporating multiple variables can reduce scatter, the marginal benefit decreases with each additional variable.
- In the absence of a specific observable, another can be substituted to compensate for it.

Extra Slides

Post-processing Chain

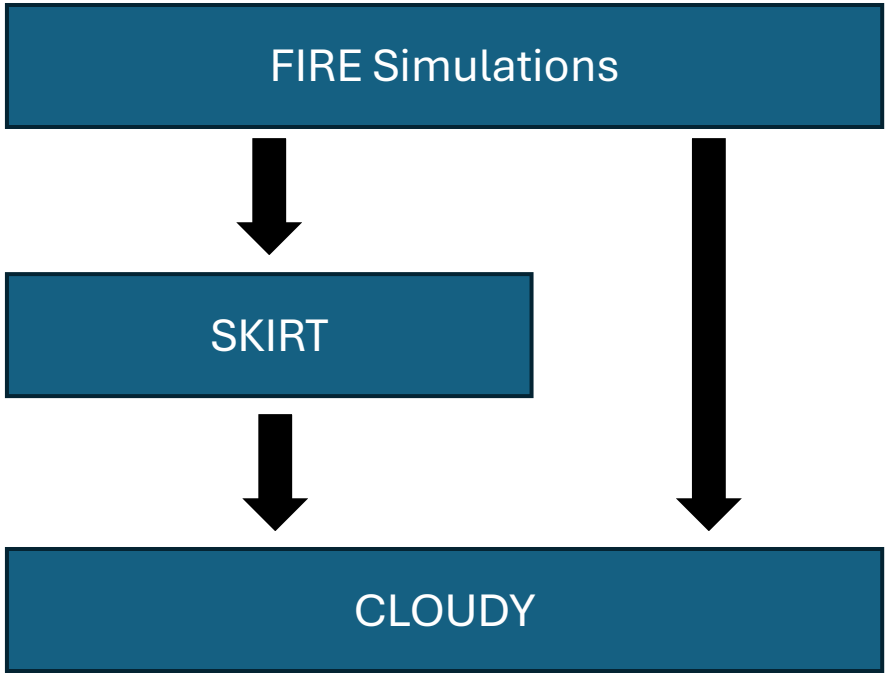
FIRE Simulations

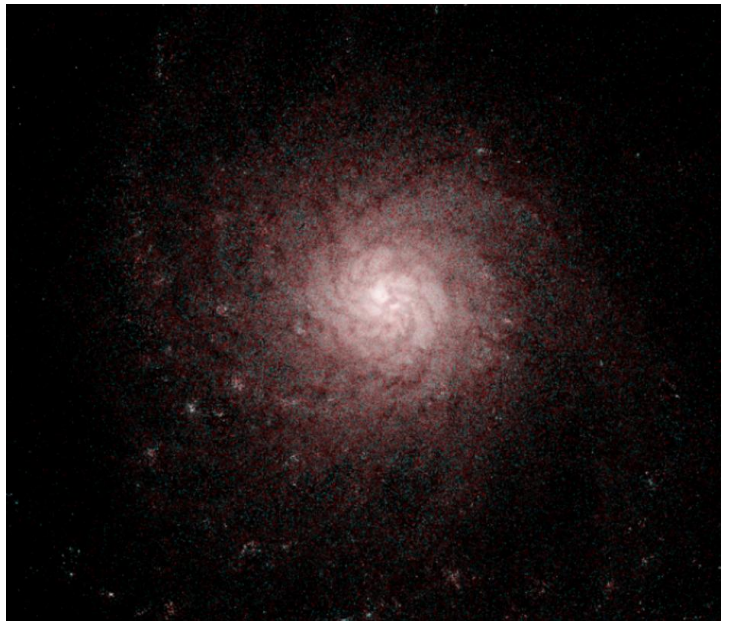
Post-processing Chain

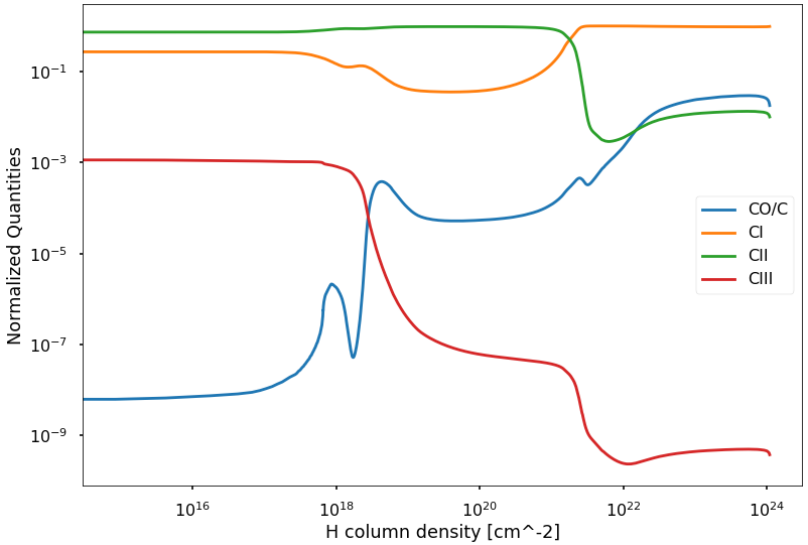


Post-processing Chain

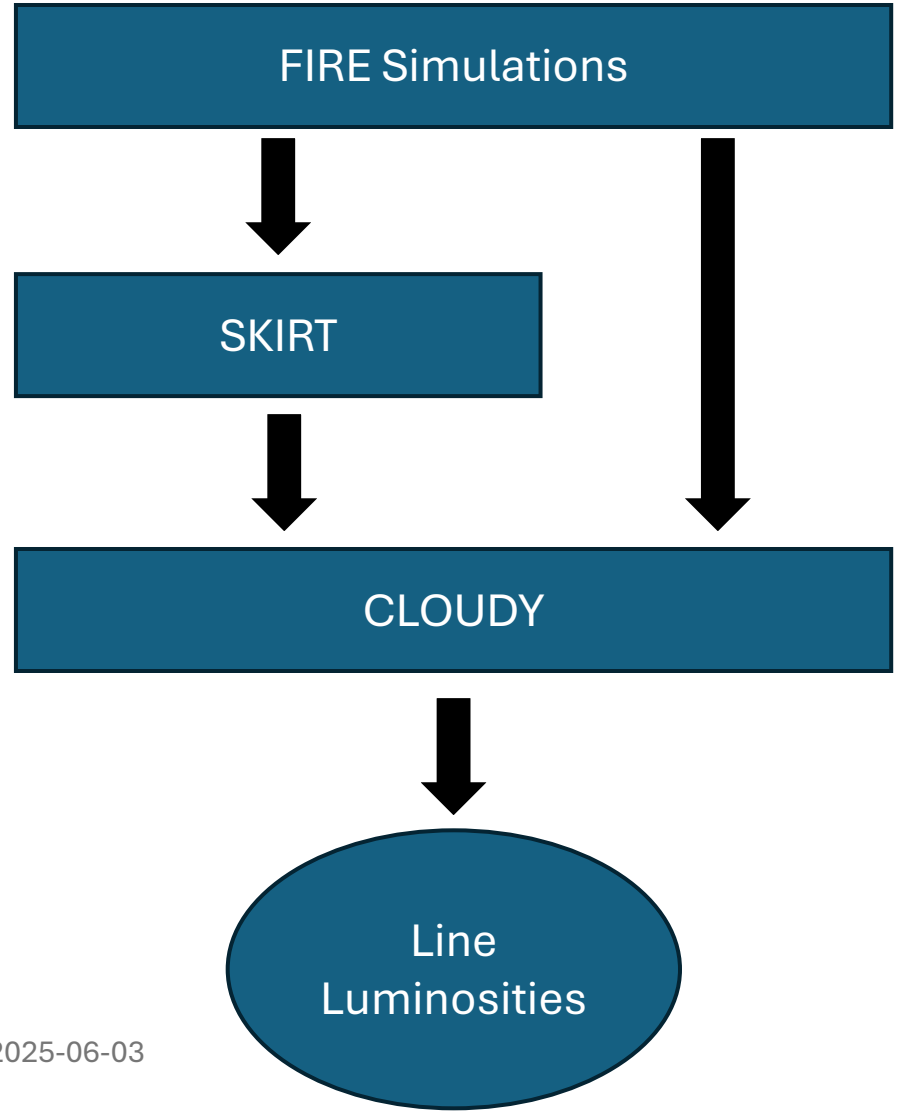
Post-processing Chain

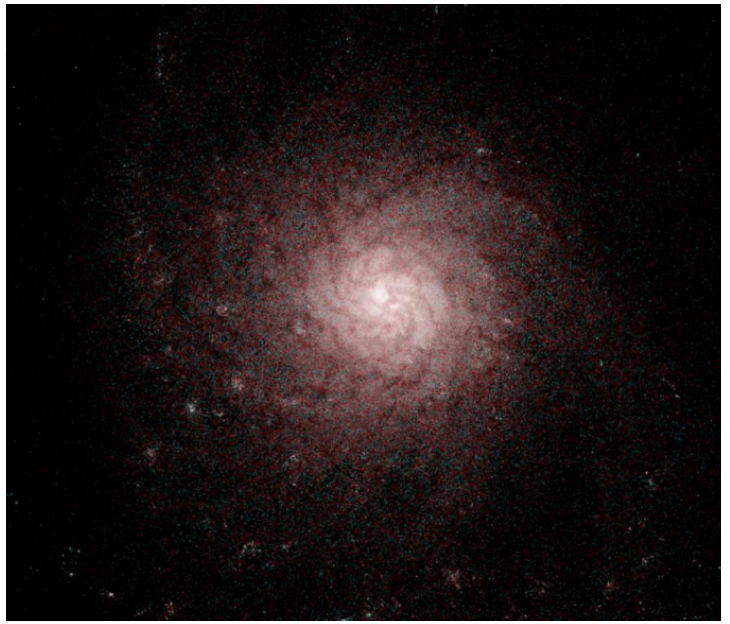


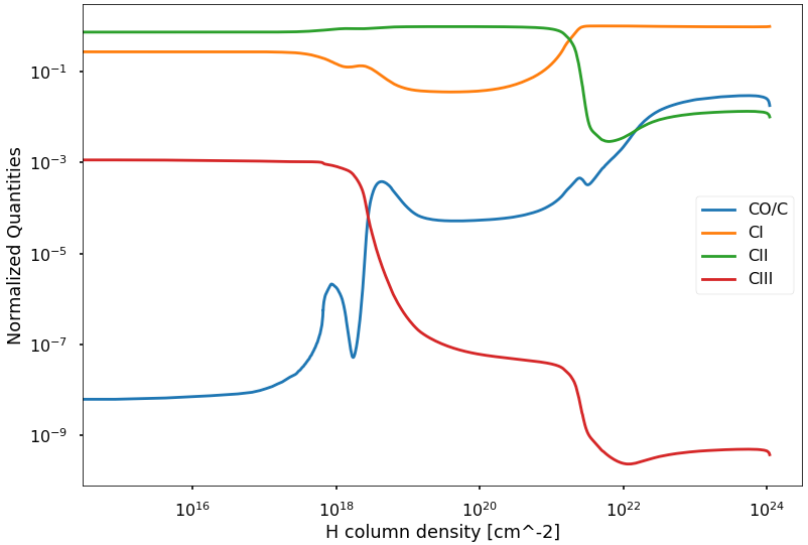




Post-processing Chain







Ranking Variables based on Fit