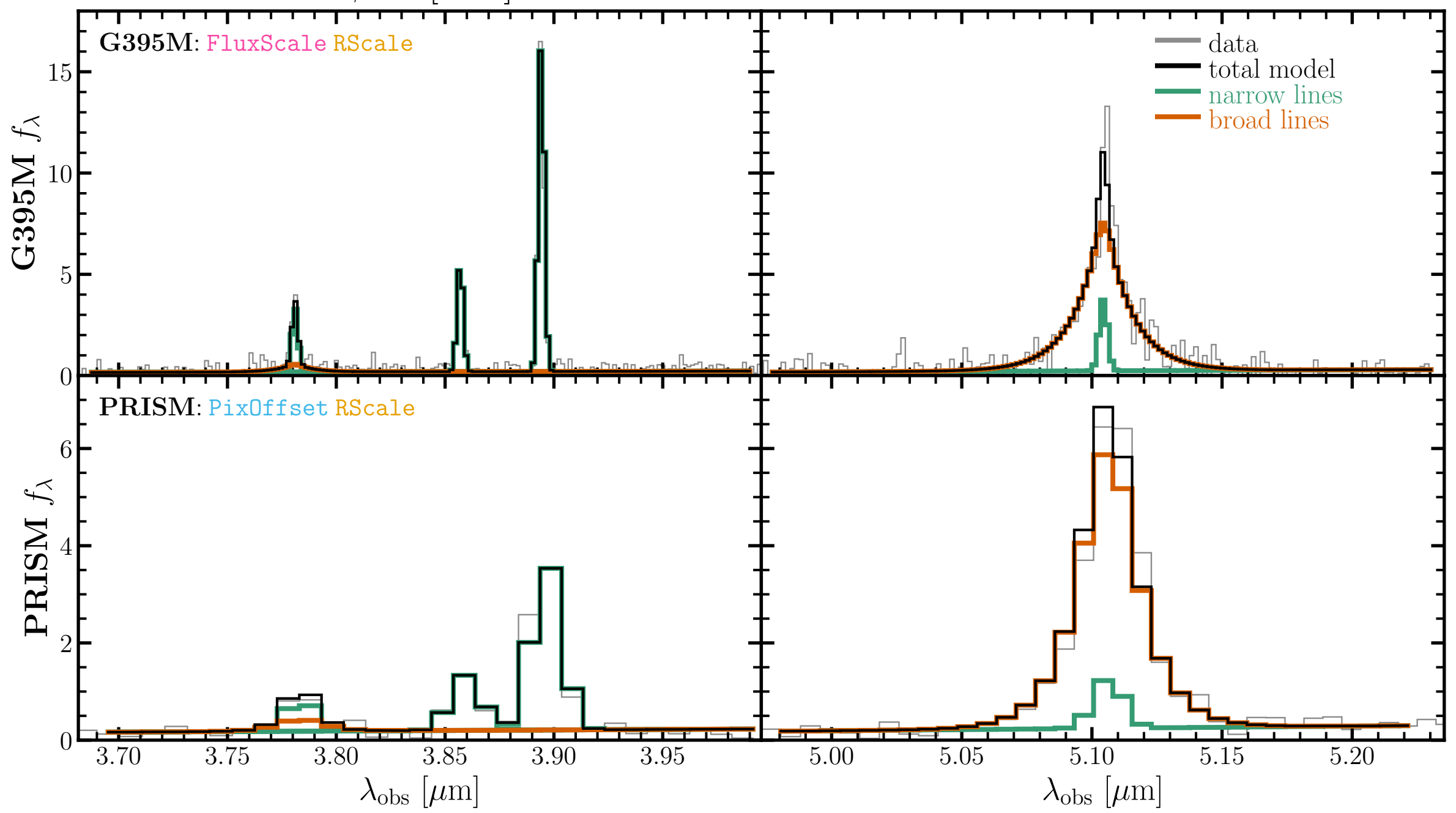
unite: One Model, Many Spectra



Shared and dependent priors

$z \sim \mathcal{U}(-0.005,\, 0.005)$ $\quad$ $\mathrm{FWHM_n} \sim \mathcal{U}(100,\, 500)$ $\quad$ $\mathrm{FWHM_b} \sim \mathcal{U}(\,\mathrm{FWHM_n}\, +150,\, 5000)$

$\mathrm{FWHM_b}$ depends on $\mathrm{FWHM_n}$ (broad lines are always broader), z is shared by every line

Correlated fluxes

$F_{5008} = 3\,F_{4960} = 3\;F_{\rm [OIII]}$ $\quad$ the [OIII] doublet is one parameter with a fixed 1:3 ratio

Calibration offsets between spectra

`RScale` inflates the LSF to absorb slit and morphology uncertainty, shared by both spectra

`FluxScale` absorbs the flux mismatch between G395M and the PRISM reference

`PixOffset` absorbs sub-pixel wavelength shifts in the PRISM spectrum

each has its own prior, e.g. $\mathcal{N}_{[0.6,1.2]}(0.9,\, 0.1)$ for the G395M flux scale

This is only a fraction of what `unite` can do

JAX-powered and JIT-compiled · GPU-accelerated · any NumPyro sampler (NUTS, nested sampling, SVI)
tau-parametrized absorbers · a library of line profiles and continuum forms · human-readable, shareable configs