Overview

Goal
Constrain the high mass $(\log(M_*/M_\odot) \gtrsim 11.5)$ satellite fraction (f_{sat}) in Hyper Suprime-Cam (HSC) observations.

How

- In an N-body simulation, map some halo property (*e.g.* $M_{\mathrm{halo,peak}}$, $V_{\mathrm{max}}@M_{\mathrm{peak}}$) to M_*, with some scatter.
- Optimize this mapping in to fit some HSC observations (*e.g.* SMF, clustering).
- Measure f_{sat} in the best fitting mock.

See also
Reddick 2013 did this for SDSS

Observations + Simulation data

Hyper Suprime Cam

- $\sim$ 4500, 30
  $\log(M_*/M_\odot) > 11.5,\ 12$
- $z \sim 0.3$ (check)

MDPL

- $1000\ \mathrm{Mpc\,h^{-1}}$
- Snapshot at $z \sim 0.37$

Fitting choices

Halo Parameter

$M_*= f(\text{halo property})$. We build models with $V_{\max}@M_{\text{peak}}$ and $M_{\text{halo,peak}}$.

Functional form

We use Behroozi $+$ halo mass dependent scatter (linear). Other options were an HOD, abundance matching.
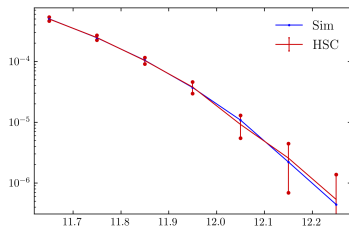
Fitting Data

► The SMF

► Counts in cylinders: $\xi(r_p, r_\pi)$ in a single r ($< 1\text{Mpc}$) and π ($< 10\text{Mpc}$) bin. HSC doesn't have enough data for a more detailed measurement of clustering. This is a cross correlation between galaxies $\log(M_*/M_\odot) > M$ and $M - 0.1 < \log(M_*/M_\odot) < M$ for a couple of M.
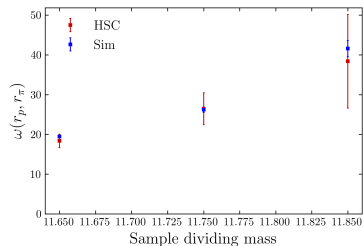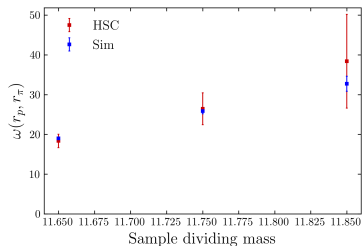
Bestfit Models 1: SMF

$V_{\max}@M_{\mathrm{peak}}$
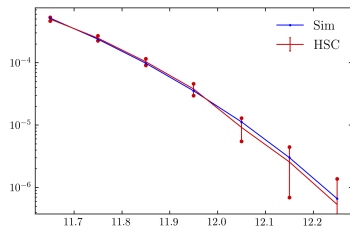
$M_{\mathrm{halo,peak}}$

Bestfit Models 2: Clustering

$V_{\max}@M_{\mathrm{peak}}$

$M_{\mathrm{halo,peak}}$
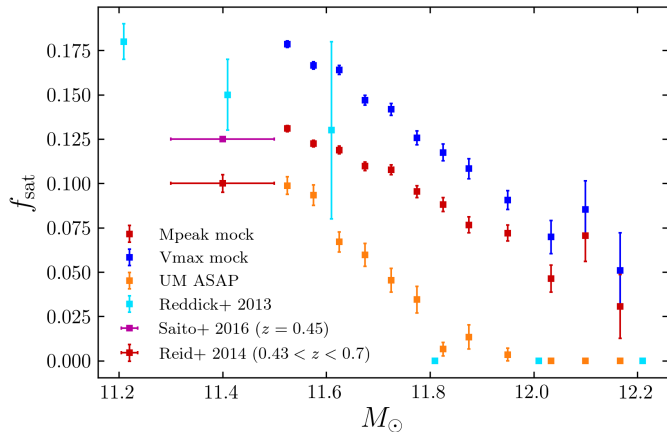
Results 1: $f_{\rm sat}$

Figure: Error bars show only the statistical error in all cases except Reddick+ 2013.

Questions

- I don't use any covariances in my best fit. This is certainly wrong though unclear how important?
- Auto vs cross correlation in the counts in cells stage?
- We assumed all have specz in the model. In HSC 5% photoz.