

# Overview

## Goal

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

## How

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

- ▶  $1000 \text{ Mpc } h^{-1}$
- ▶ Snapshot at  $z \sim 0.37$

# Fitting choices

## Halo Parameter

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

## Functional form

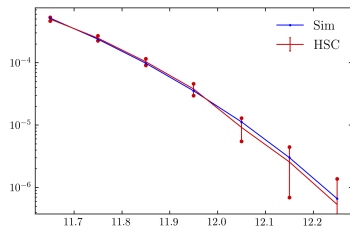
We use Behroozi + halo mass dependent scatter (linear). Other options were an HOD, abundance matching.

## Fitting Data

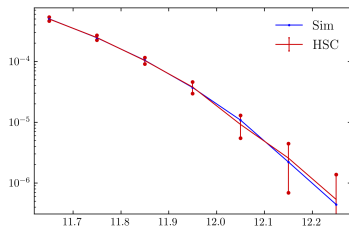
- ▶ The SMF
- ▶ Counts in cylinders:  $\xi(r_p, r_\pi)$  in a single  $r$  ( $< 1\text{Mpc}$ ) and  $\pi$  ( $< 10\text{Mpc}$ ) bin. HSC doesn't have enough data for a more detailed measurement of clustering. This is a cross correlation between galaxies  $\log(M_*/M_\odot) > M$  and  $M - 0.1 < \log(M_*/M_\odot)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

# Bestfit Models 1: SMF

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



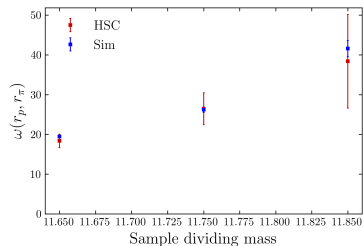
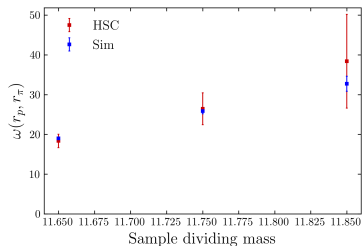
$M_{\text{halo,peak}}$



# Bestfit Models 2: Clustering

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

$M_{\text{halo,peak}}$



## Results 1: $f_{\text{sat}}$

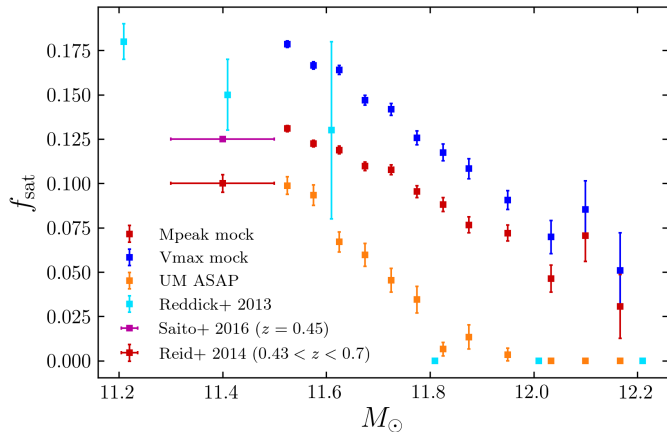


Figure: Error bars show only the statistical error in all cases except Reddick+ 2013.

# 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?