The galaxy evolution in the dark matter halo

the physics of clustering

内藤　嘉章
M2
観測的宇宙論(大内研)

Outline

1.Science

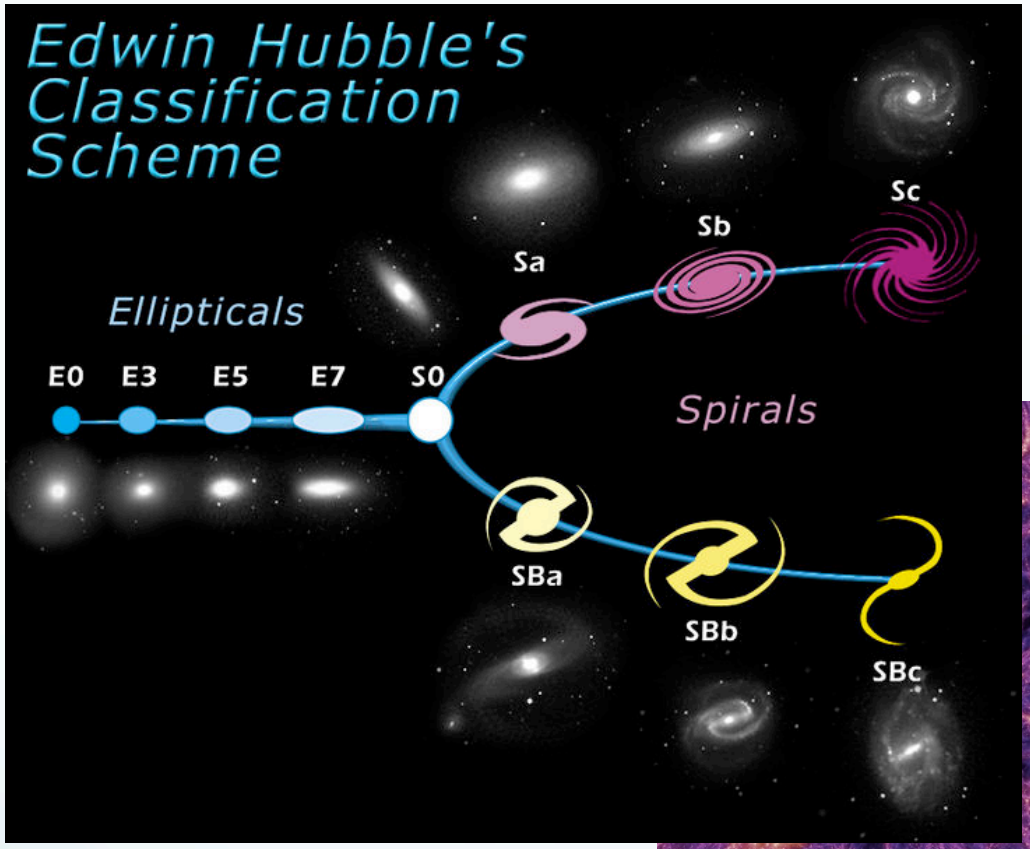
1.1 構造形成、銀河の成長
1.2 角度相関関数-halo質量

2.Data analysis

2.1 strong point
2.2 high-z 銀河検出法(Dropout法)
2.3 星形成銀河 model track
2.4 天体検出、角度相関関数

3.Future work

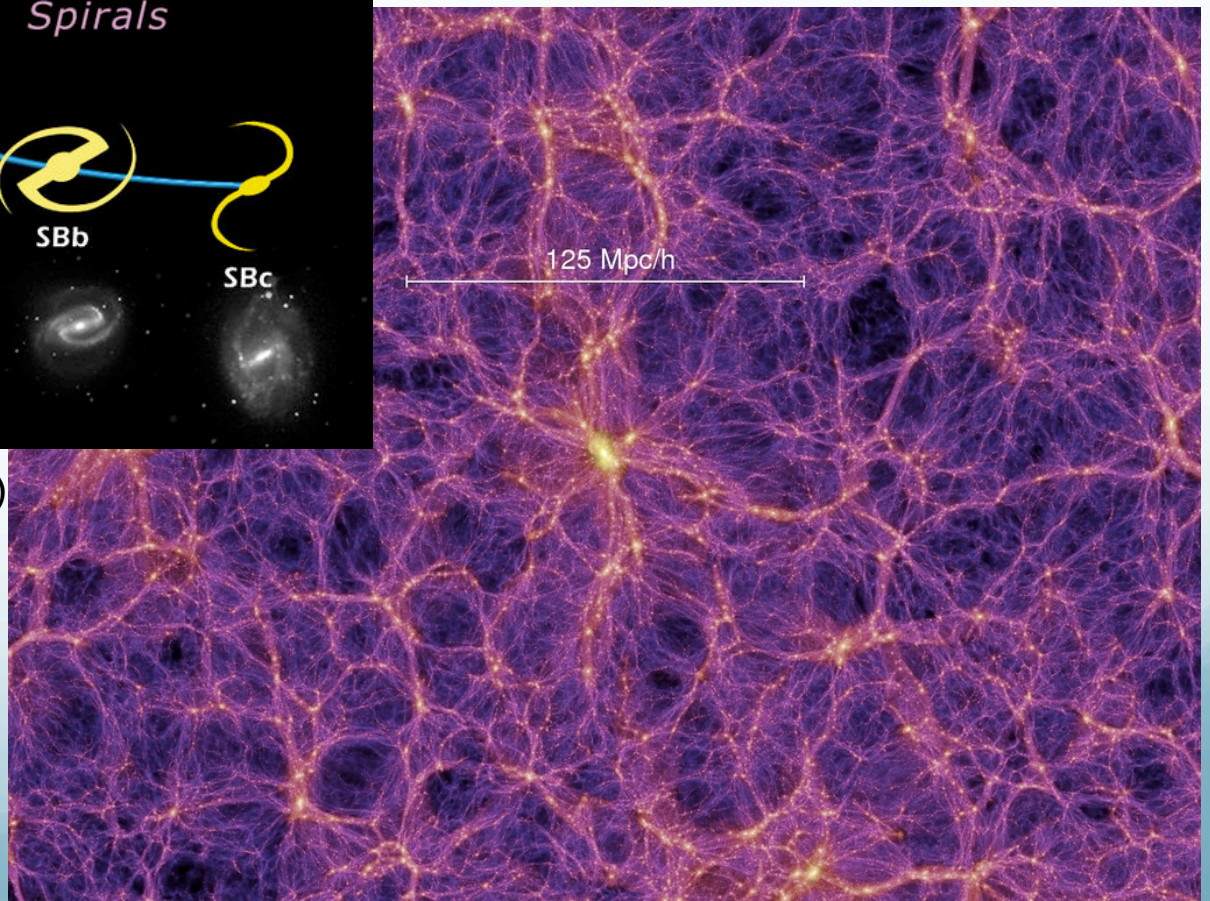
銀河進化、構造形成



wikipedia(Hubble sequence)

→ High-z ex.)LAE(PSFに見える)

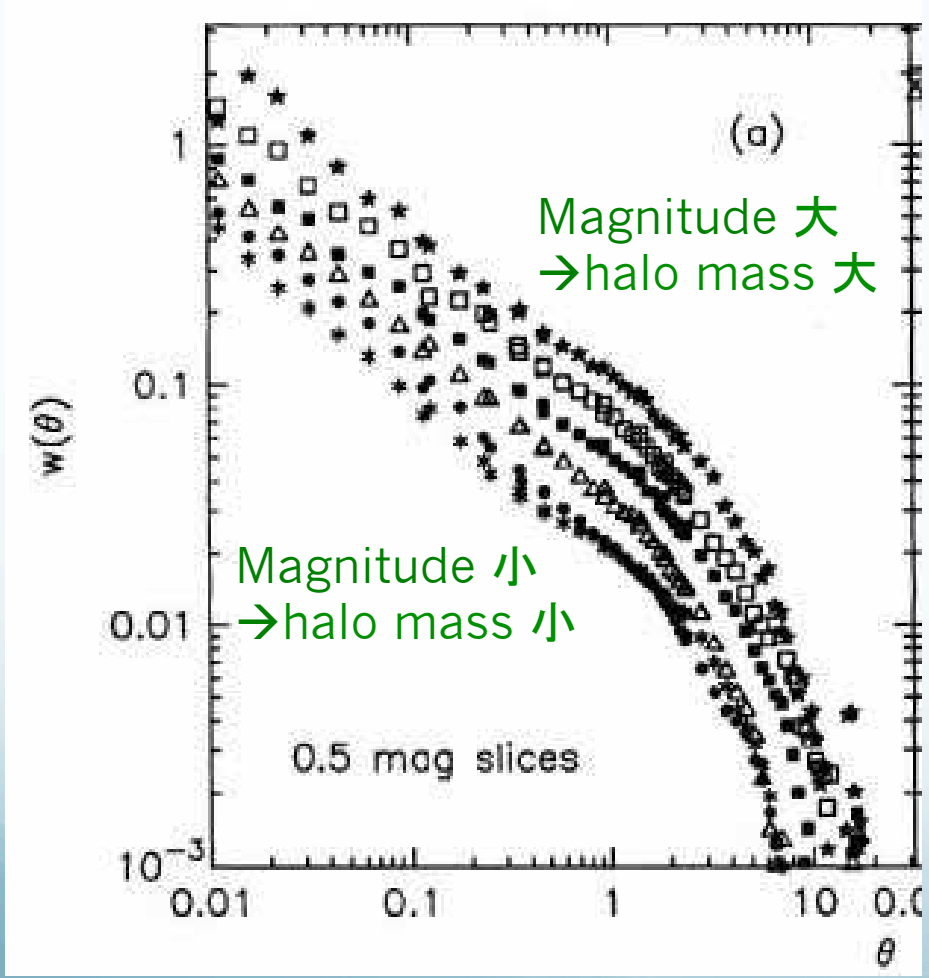
進化の過程？
進化の速さ？



Springel et al. 2005

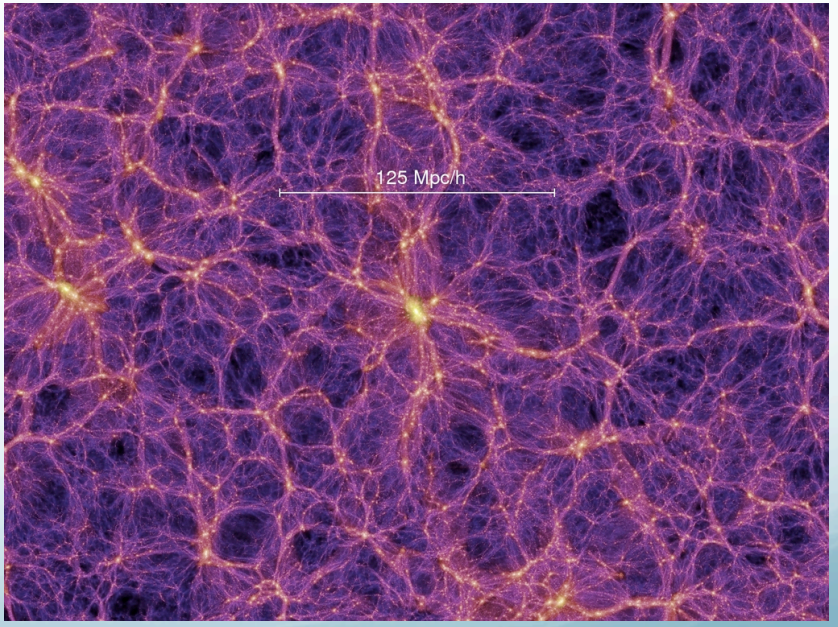
Clustering(相関関数)

質量密度揺らぎの情報
2点相関関数(角度相関関数)→halo mass



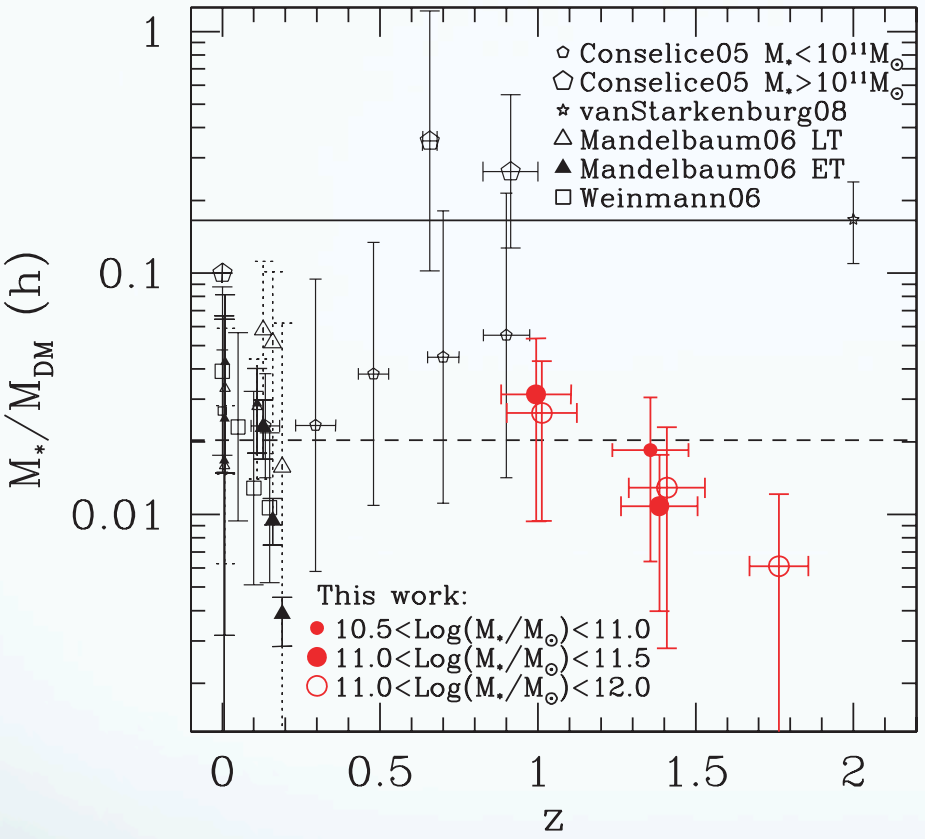
Maddox et al. 1990

ある星形成率(or 星質量)をもつ天体
が所属するhalo 質量がわかる
+N体シミュレーションからHalo の成長を計算
→銀河-halo のz進化



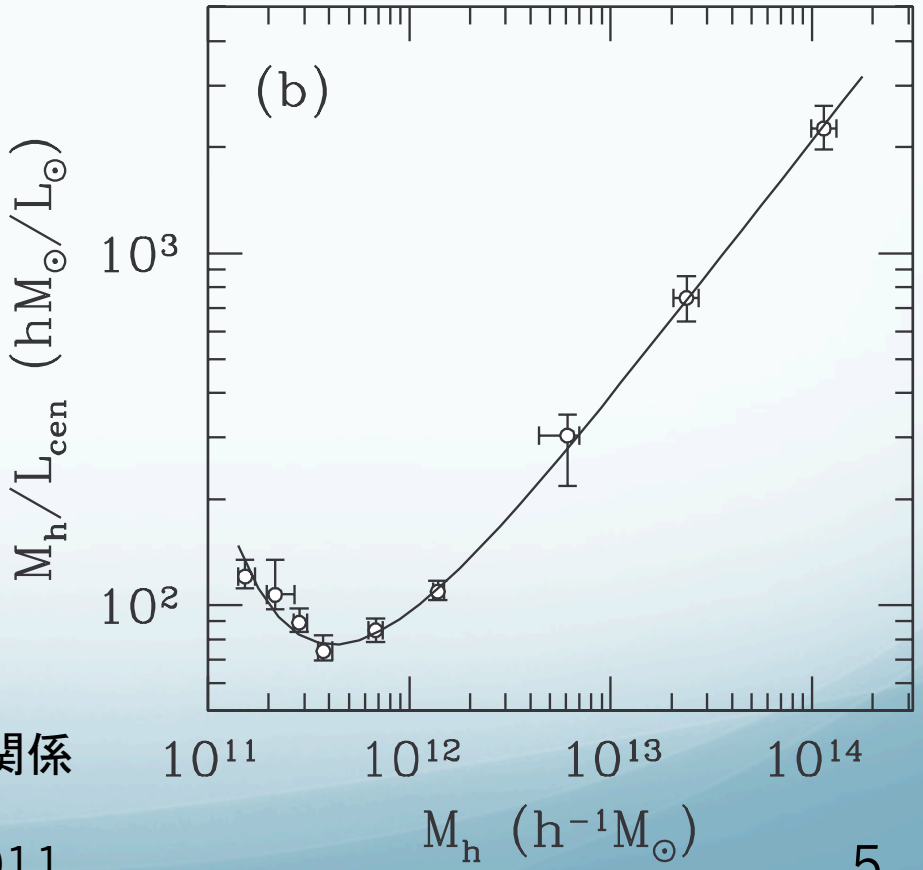
Springel et al. 2005

Science



Fourcaud et al. 2010

Stellar mass – halo mass の関係

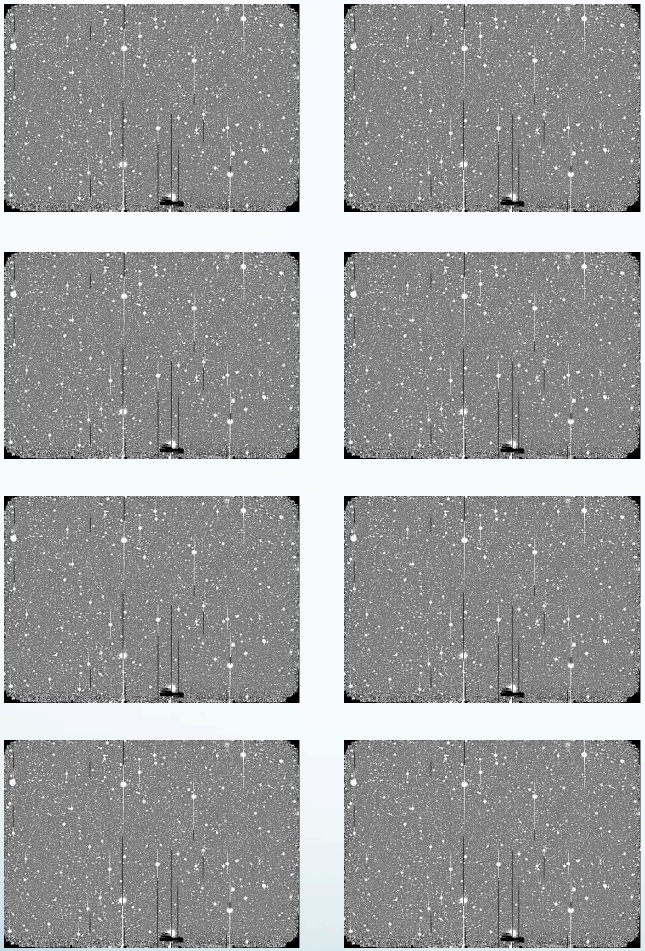


SFR – halo mass の関係

Zehavi et al. 2011

Data

データ解析



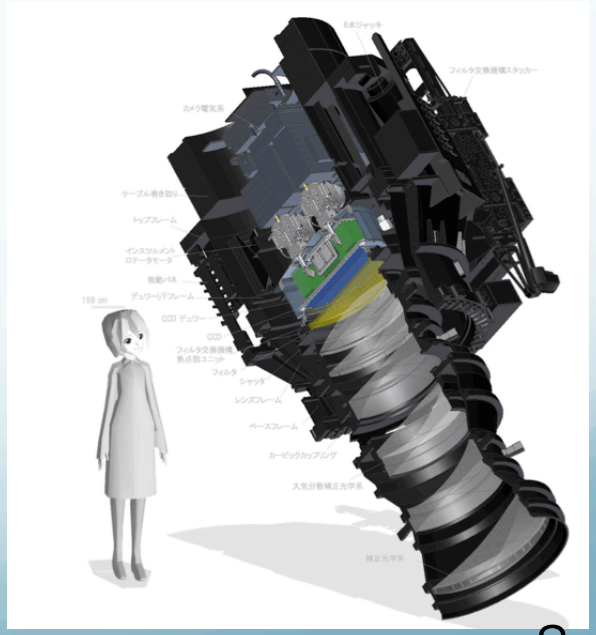
すばる望遠鏡

Suprime-Cam

今回のデータ解析の視野

将来(Hyper SuprimeCam)

超大規模サンプル
7.5倍の精度

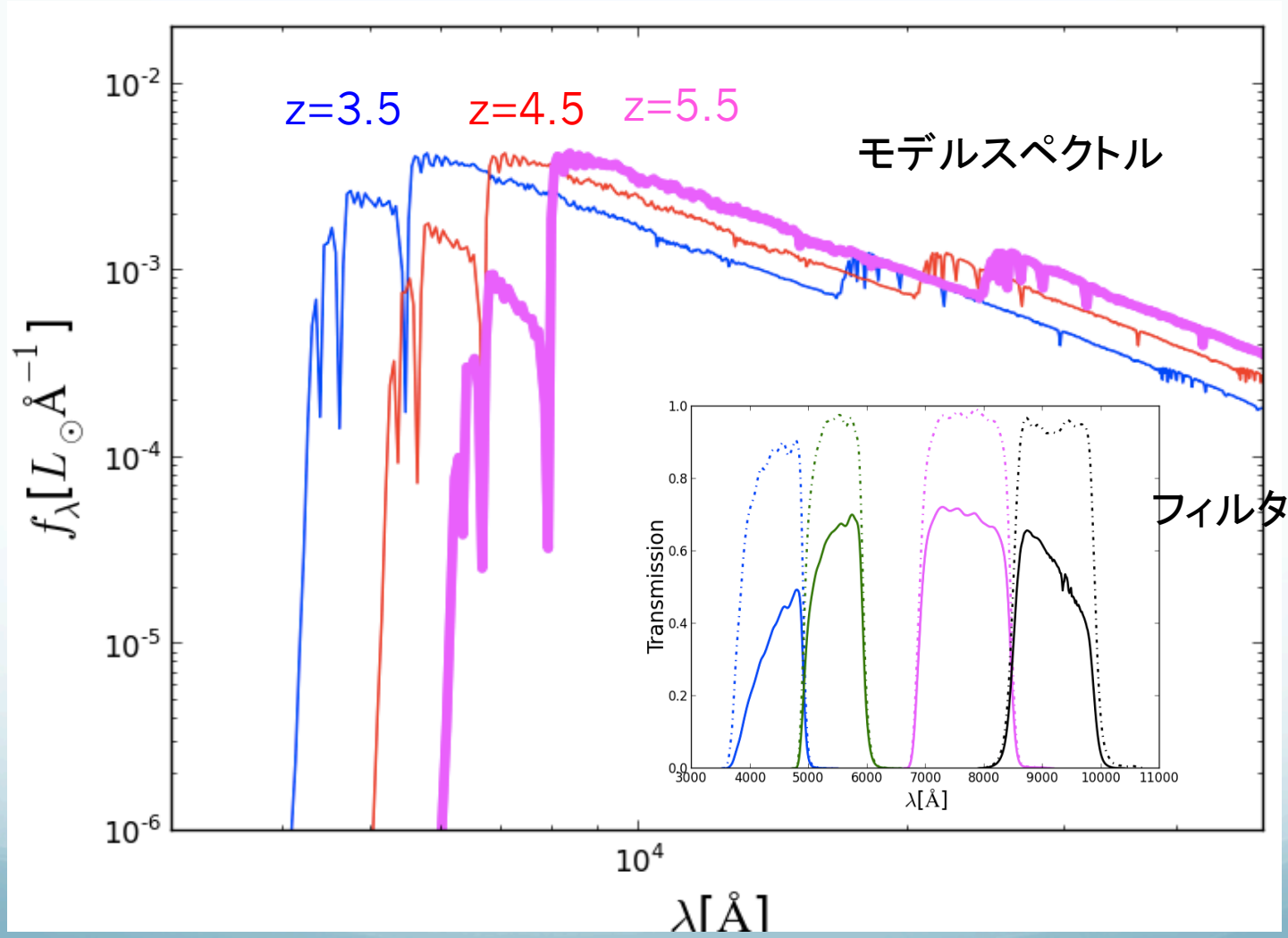


Hyper SuprimeCam

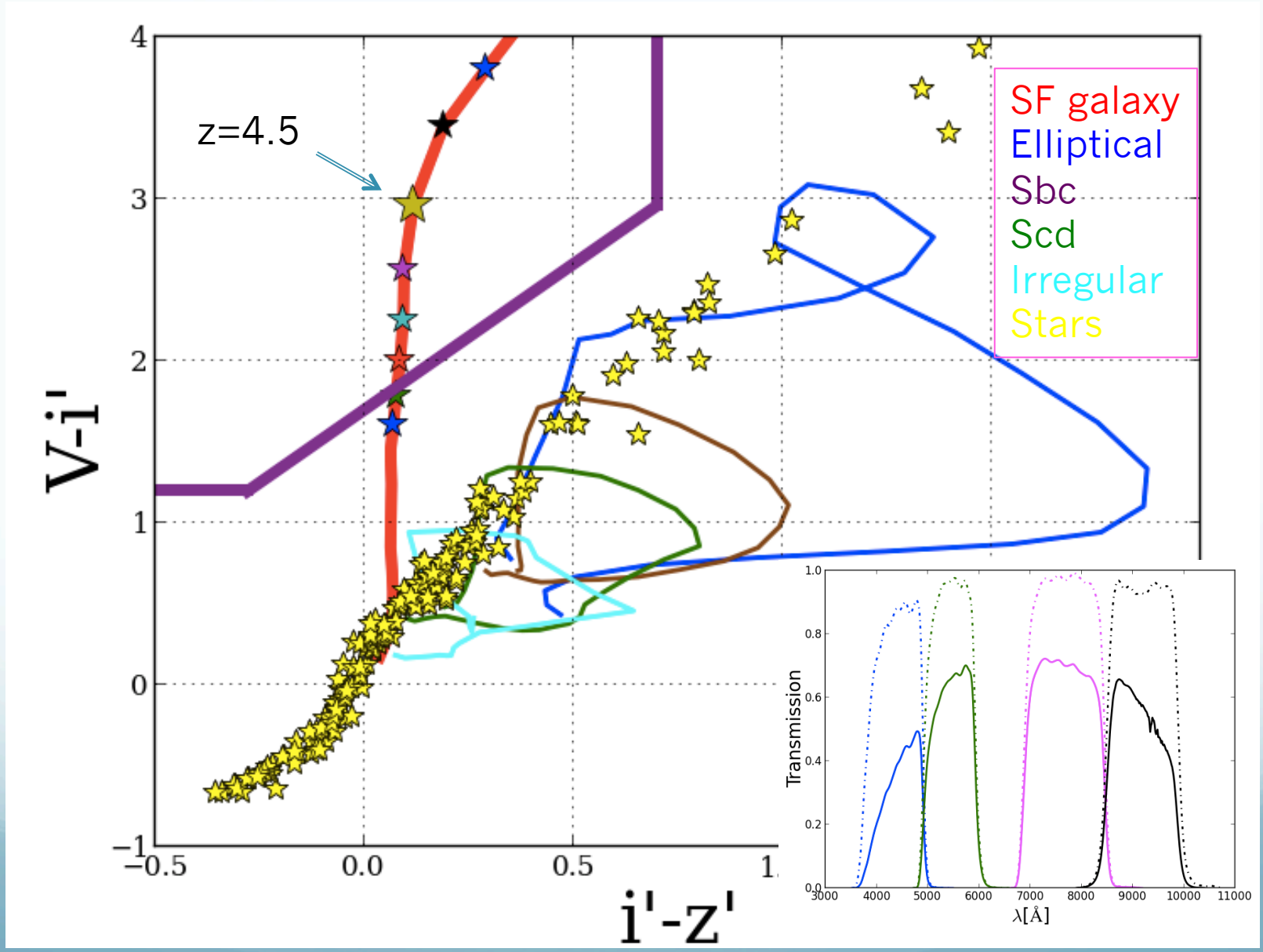
High-z galaxy 選択

Dropout法(High-z star forming銀河の見つけ方)

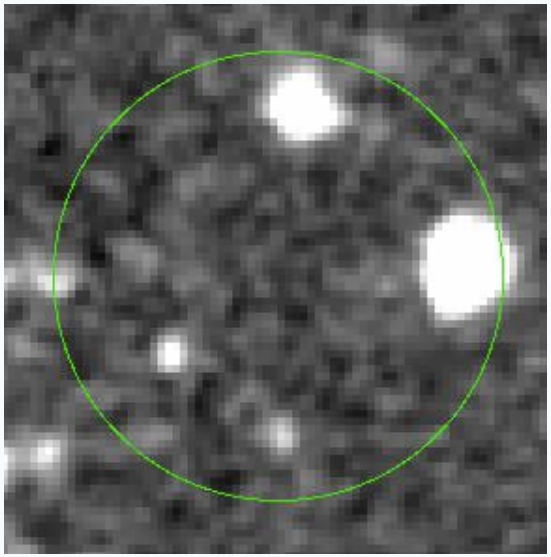
赤方偏移ごとにスペクトルが赤方偏移+銀河間空間の中性水素によって吸収



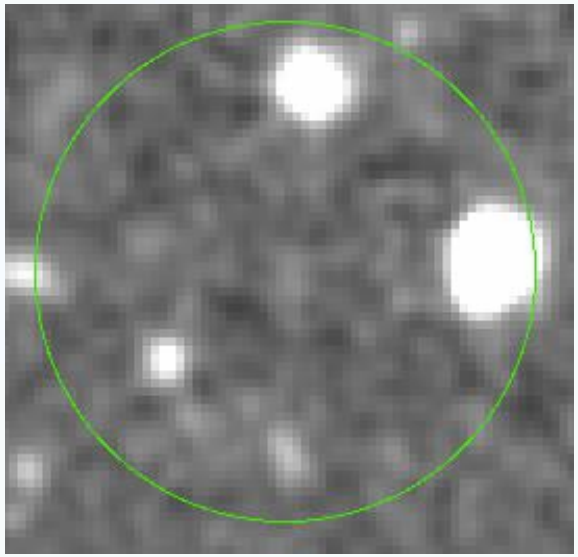
星形成銀河のmodel track



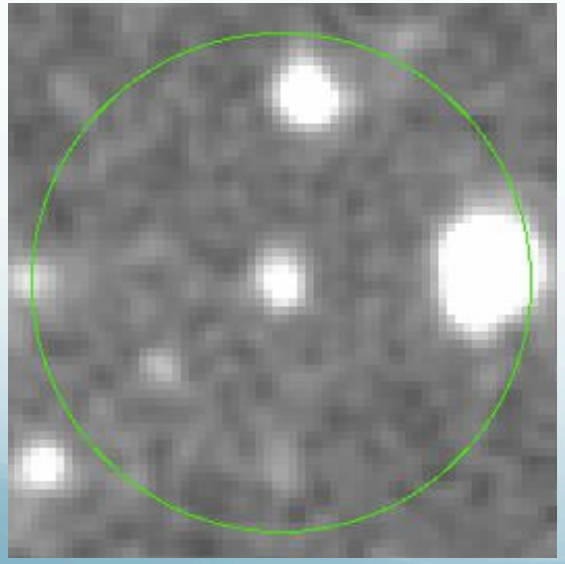
候補天体(例)



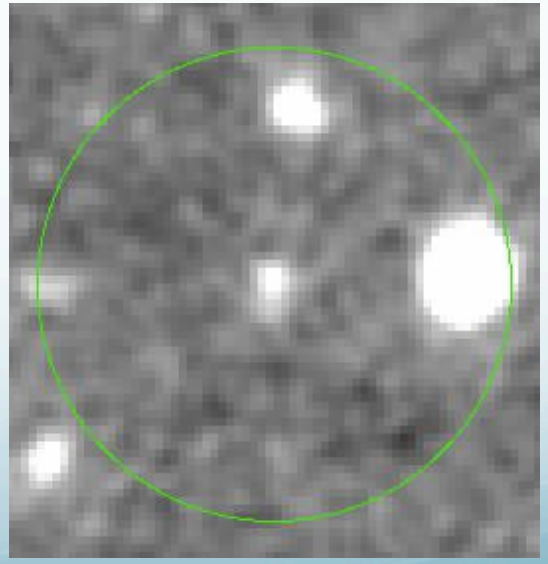
B band ~4500Å



V band ~5500Å



i band ~7600Å



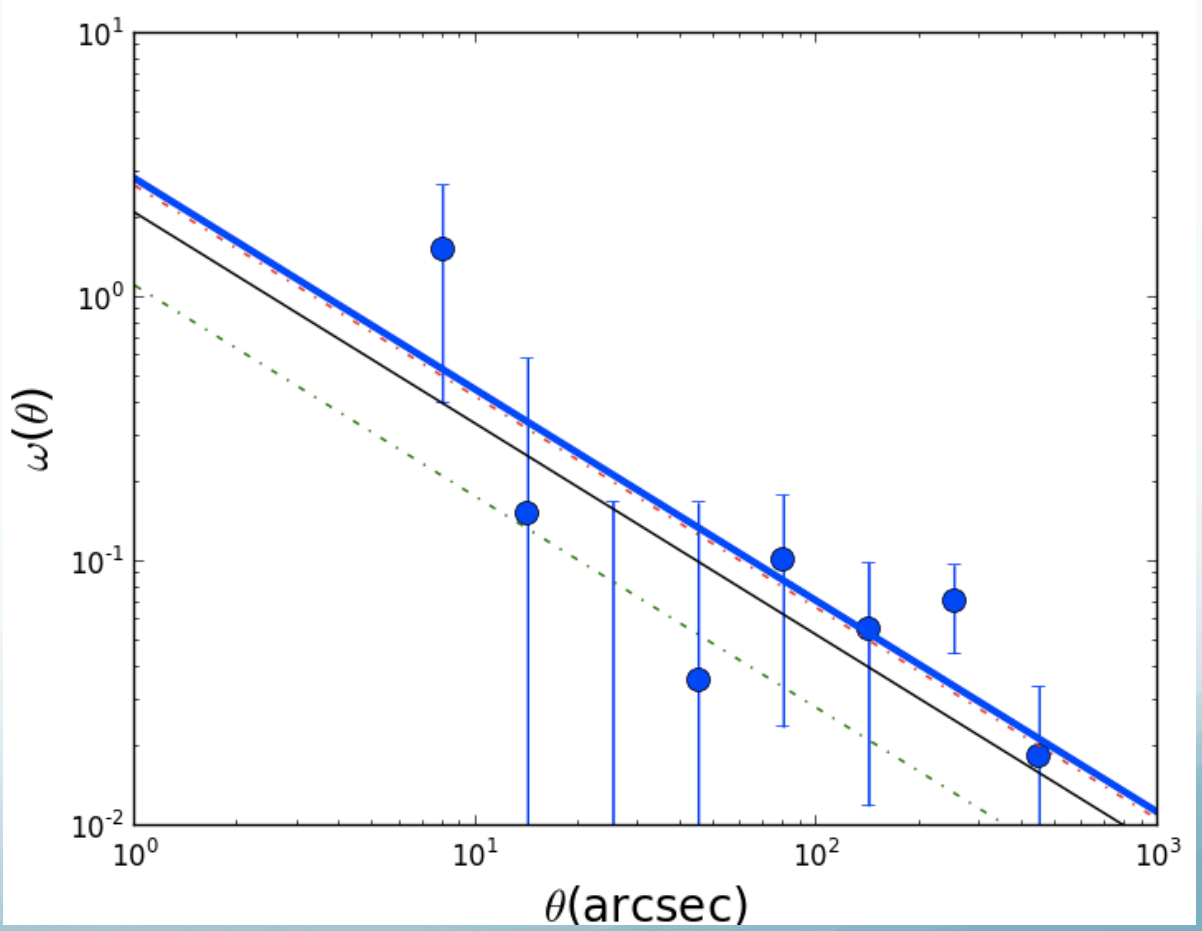
z band ~9300Å

Angular correlation function

$$\omega_{\rm obs}(\theta) = [DD(\theta) - 2DR(\theta) + RR(\theta)]/RR(\theta),$$

$\sigma_\omega = (1+\omega(\theta))/\sqrt{DD}$
Poisson noise
$\sigma_\omega^2 = \Sigma\,(d\omega/dx_i)^2\,\sigma_{xi}^2$

$\omega(\theta) = A\,\theta^{-0.8}$
A=
2.82±0.92
2.1±0.9(Ouchi et al.2004)

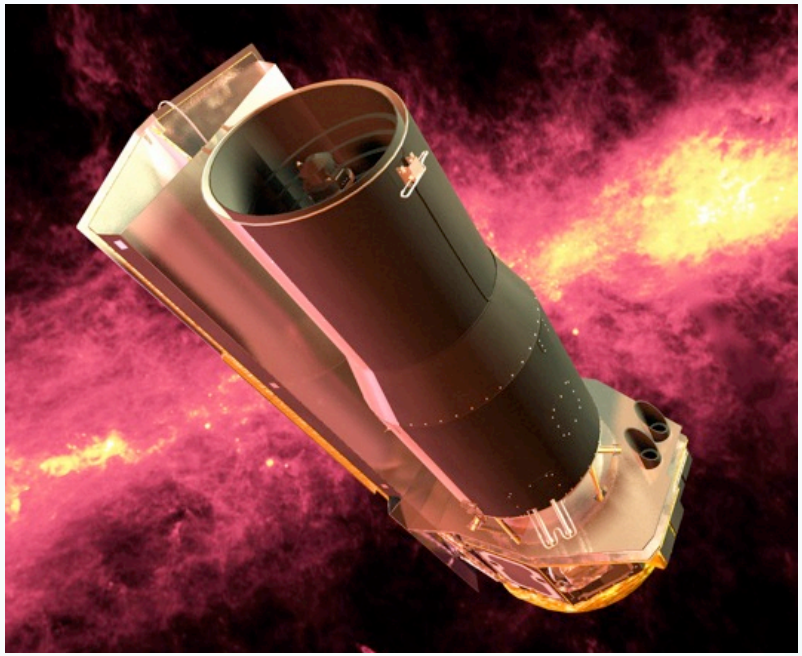


今後の課題

・Halo mass の計算
・Luminosity のbinごとに天体をStacking
→Spitzer/IRACも利用してstellar mass を計算

stellar mass – halo mass
SFR – halo mass

・ よりhigh-z(z~6)に対して同様のことを行う



Spitzer