

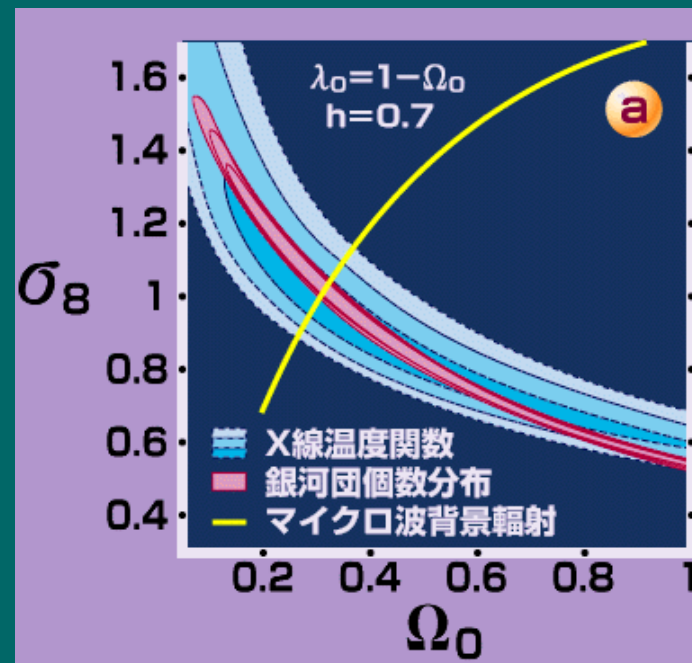
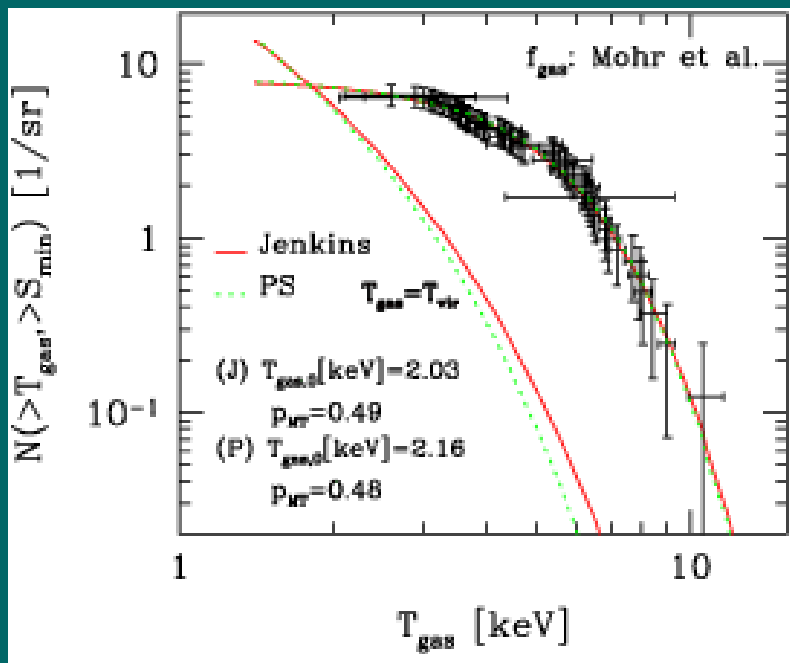
Summary of research activities

Yasushi Suto

**Observational cosmology (in a broad sense)
theory – simulation – observation**

1. Statistical modeling of galaxy clusters
2. Observation of the Sunyaev-Zel'dovich effect
3. Cosmological redshift-space distortion
4. Density profile of dark matter halos
5. **Observational cosmology with SDSS**
6. **Search for cosmic missing baryons with DIOS**
7. **Search for atmospheric signatures of extrasolar planets with Subaru**

Statistical modeling of galaxy clusters



Shimizu, Kitayama, Sasaki & Suto (2003)

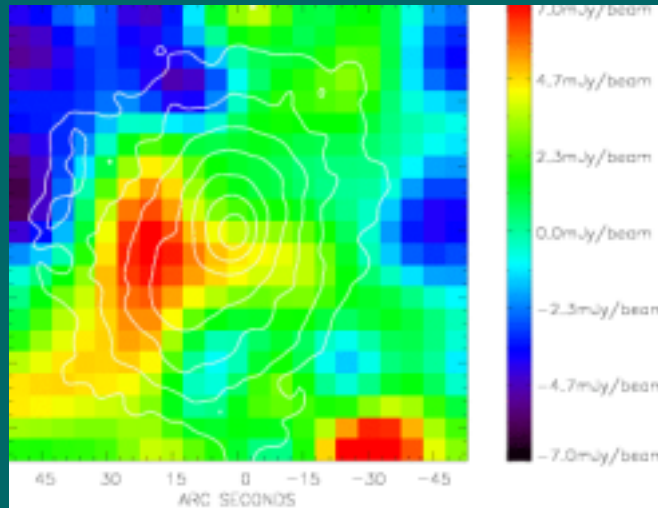
Kitayama & Suto (1997)

- established a statistical methodology of cosmological parameter estimation using X-ray cluster abundances (Kitayama & Suto 1996)
- derived a set of the best-fit parameters from a combined analysis of clusters and CMB: $\Omega_{\Lambda} = 0.7$, $\Omega_m = 0.3$, $\sigma_8 = 1.0$ (Kitayama & Suto 1997)

Observation of the Sunyaev-Zel'dovich effect

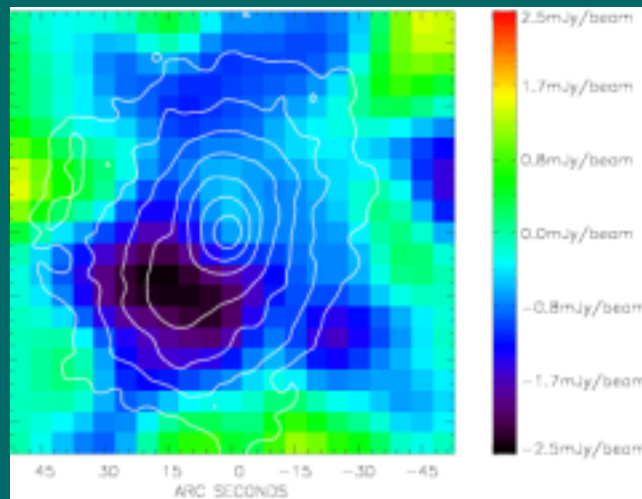
the most luminous X-ray cluster: RX J1347.5-1145

The *first submm* SZ map with SCUBA, JCMT



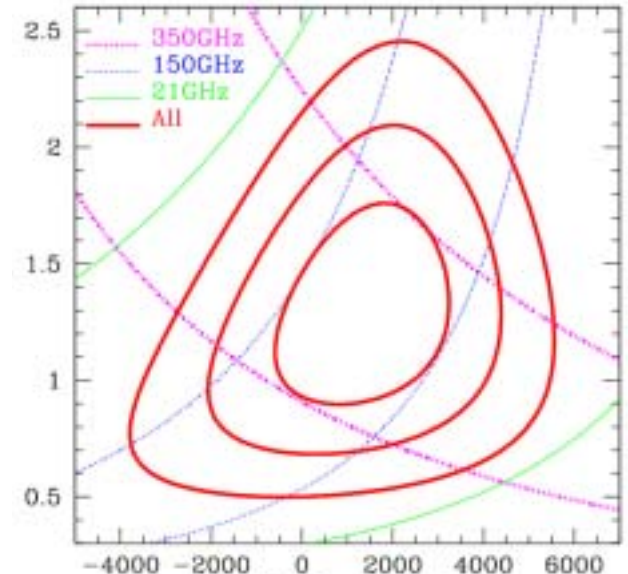
submm SZ map

The *highest angular resolution* ($\sigma_{\text{FWHM}} = 13''$) mm SZ map with NOBA, Nobeyama



mm SZ map: discovery of substructure

elongation along the line of sight



cluster peculiar velocity [km/s]

Komatsu et al.

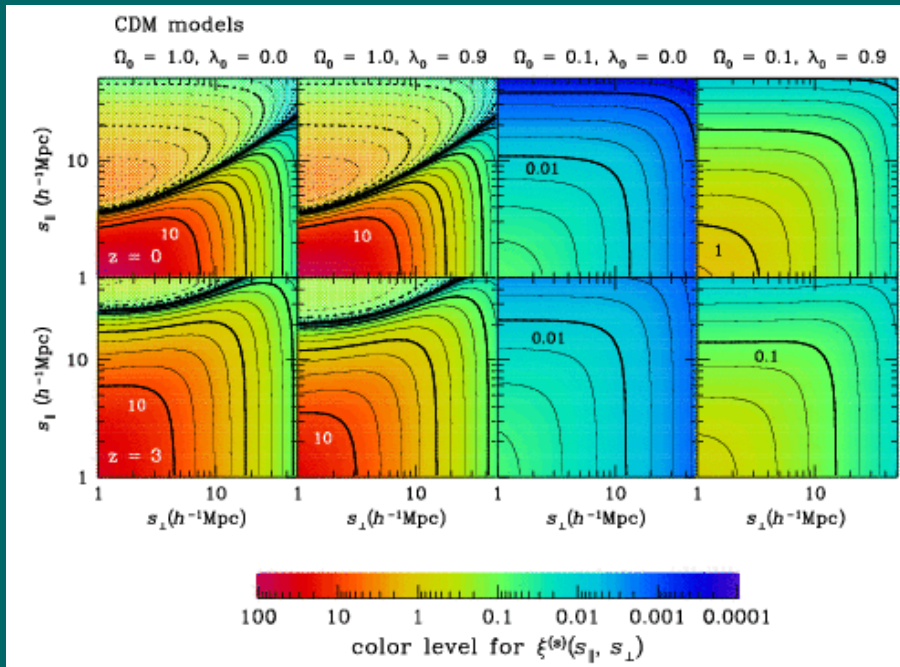
ApJ 516 (1998) L1

PASJ 53 (2001) 57

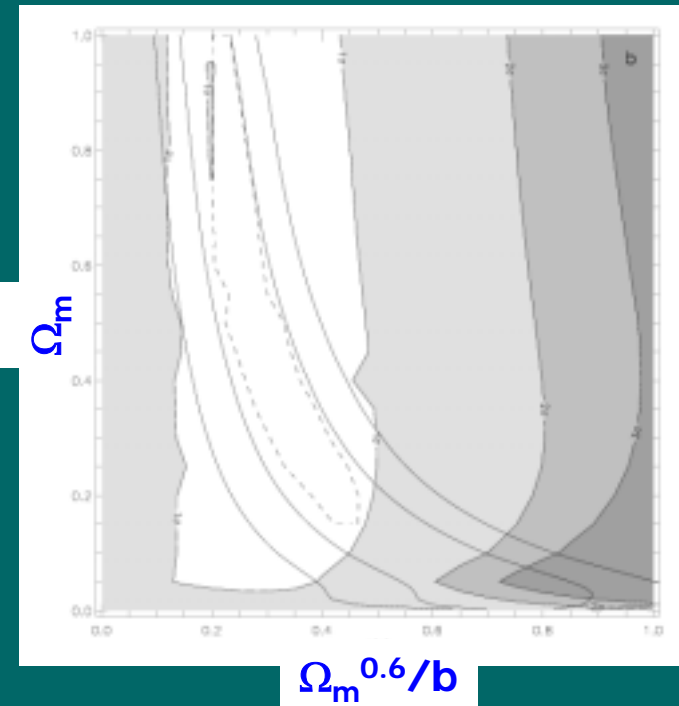
Kitayama et al.

PASJ 56 (2004) 17

Cosmological redshift-space distortion



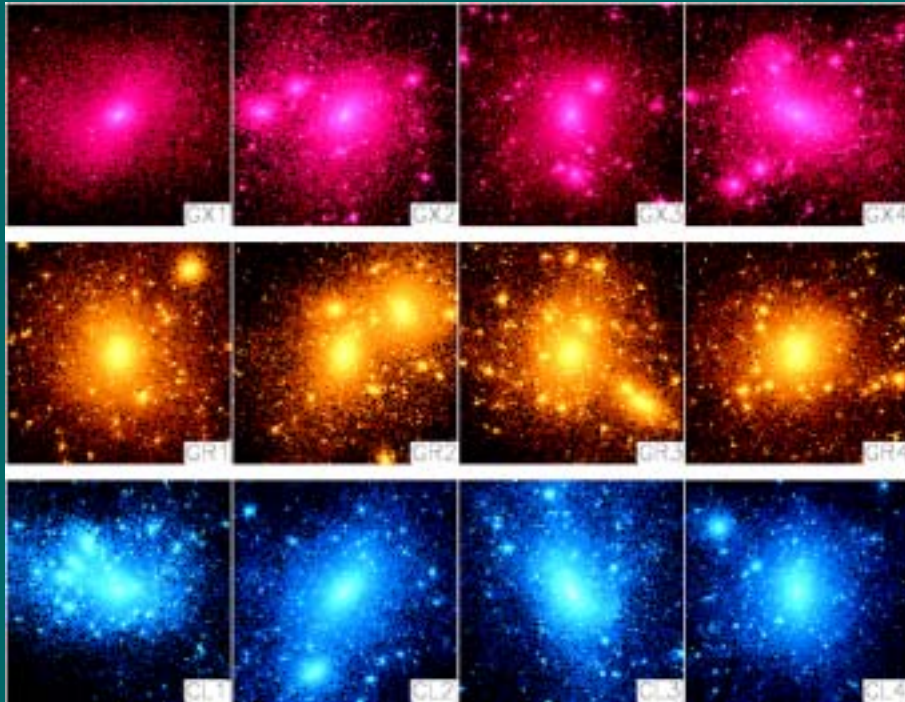
Matsubara & Suto (1996)



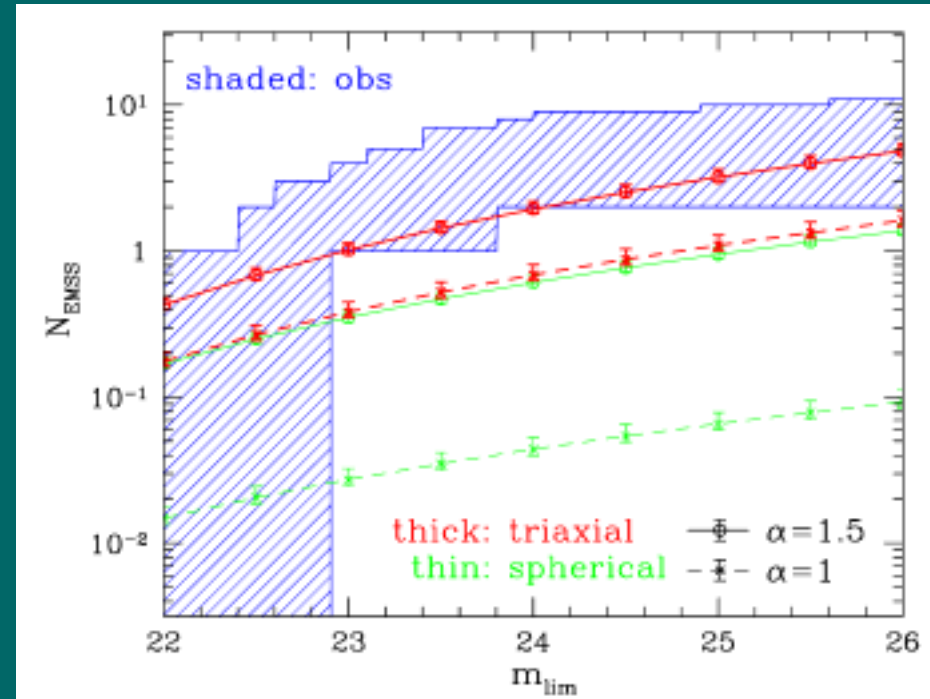
Hoyle et al. MNRAS 332(2002)311

- predicted the general-relativistic distortion in the clustering pattern of high-redshift objects to constrain the cosmological constant (Matsubara & Suto 1996)
- already applied to 2dF QSO data (Hoyle et al. 2002)
- application to SDSS QSO data in progress (Yahata et al. 2005)

Density profile of dark matter halos



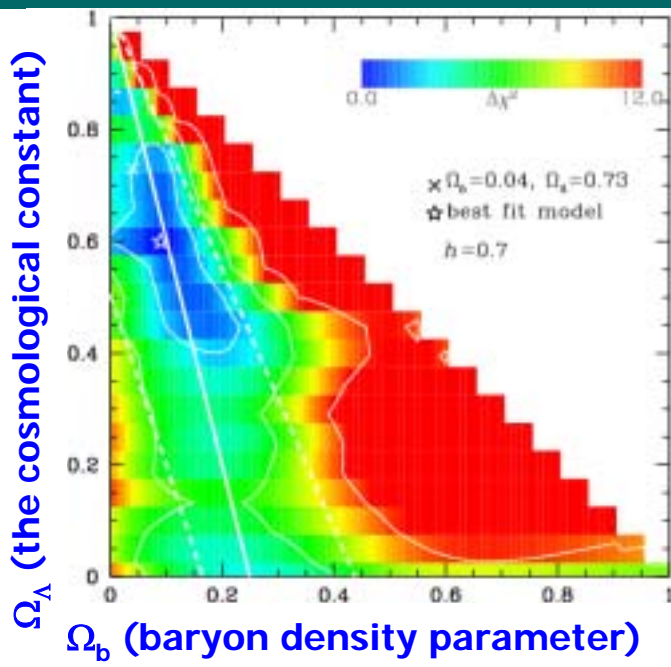
Jing & Suto (2000)



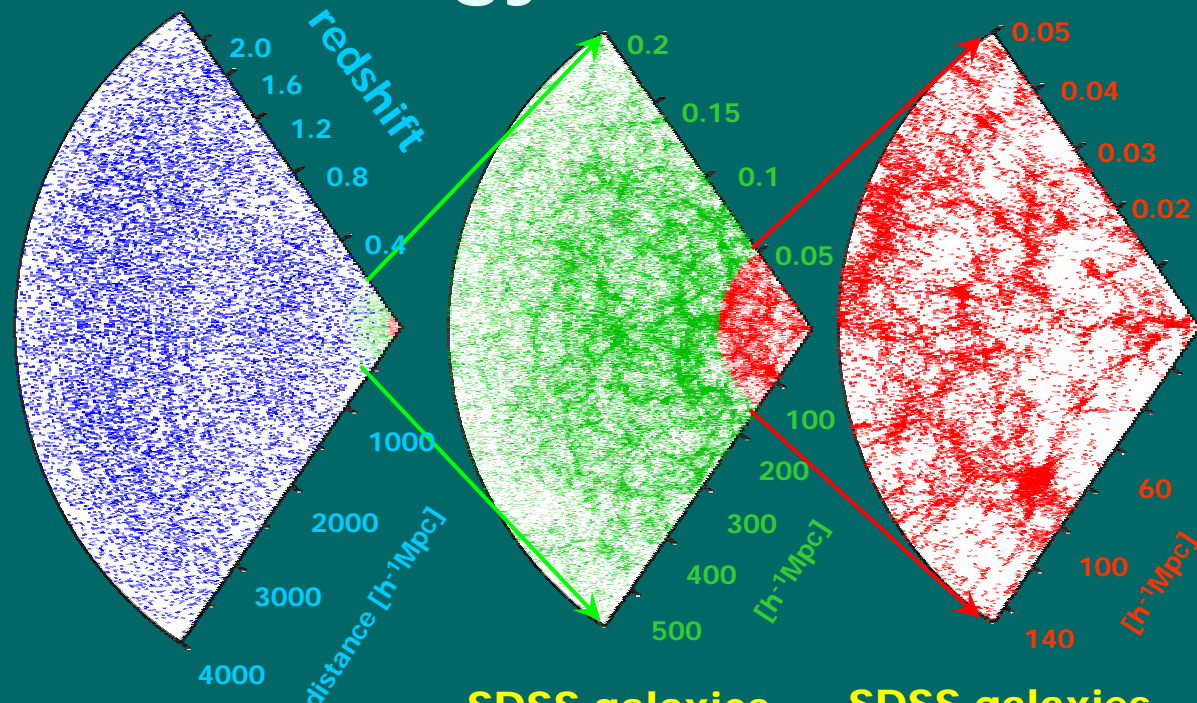
Oguri, Lee & Suto (2003)

- the first non-spherical modeling of simulated dark matter halos (Jing & Suto 2000, 2002)
- solved the problem of gravitationally lensed arc statistics (Oguri, Lee & Suto 2003)

Observational cosmology with SDSS



Yahata et al. (2005)



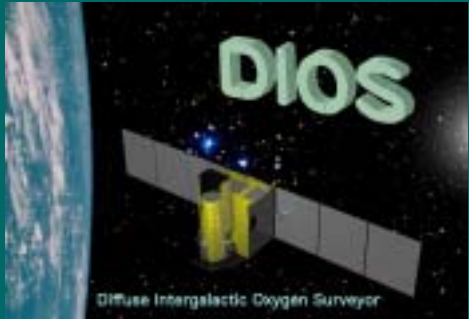
SDSS QSOs

SDSS galaxies

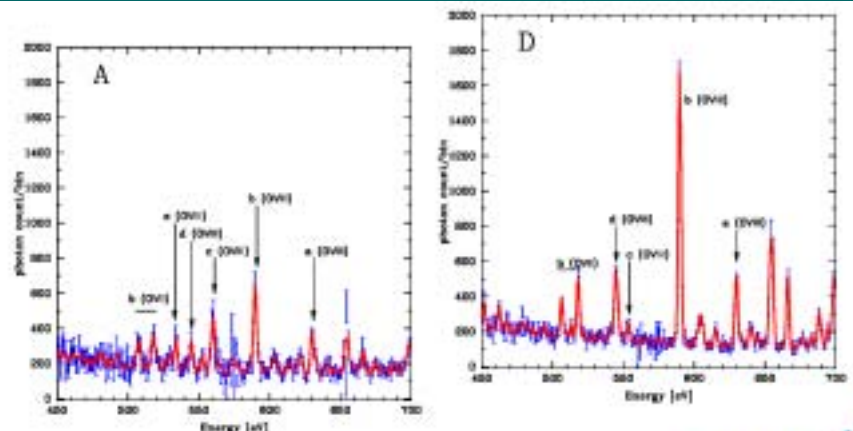
SDSS galaxies

- Higher-order clustering statistics from SDSS galaxies (Kayo et al. 2004)
- Topology of SDSS galaxy distribution (Hikage et al. 2002, 2003; Park et al. 2005)
- Baryonic signature from SDSS quasar clustering (Yahata et al. 2005)
- Galactic/cosmological dust map from SDSS galaxies and quasars

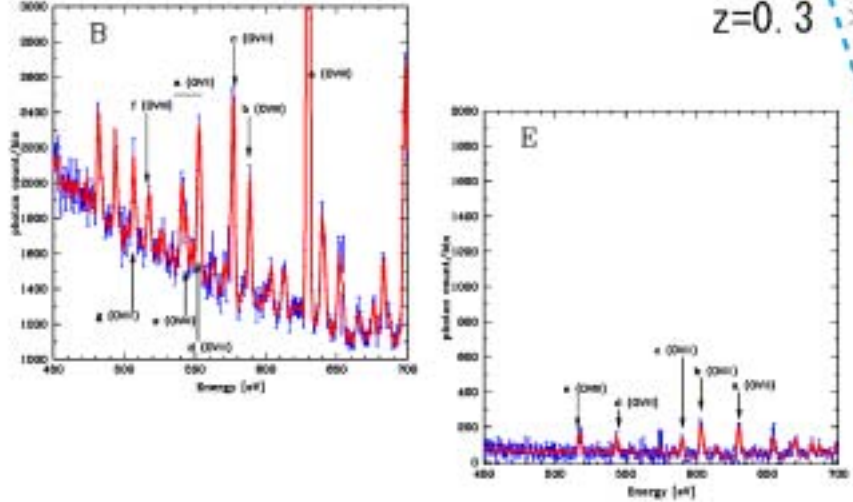
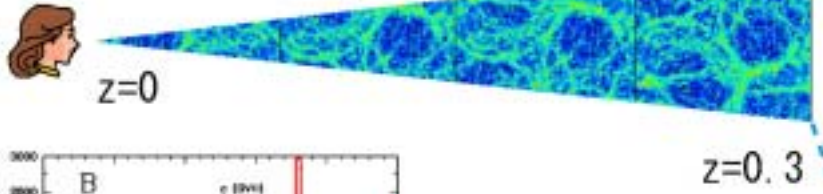
Searching for cosmic missing baryons with DIOS (Diffuse Intergalactic Oxygen Surveyor)



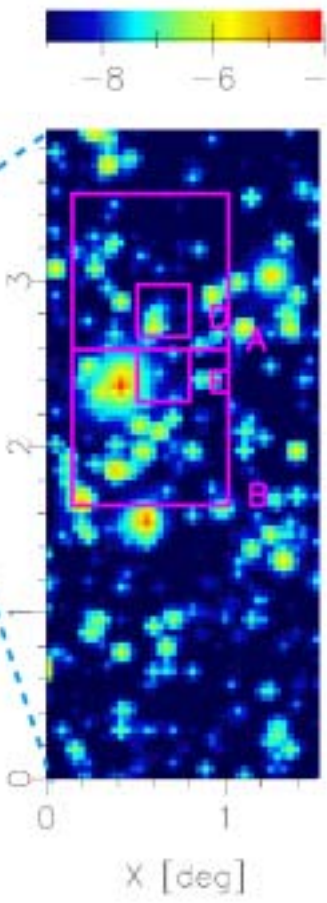
PASJ 55 (2003) 879
PASJ 56 (2004) 939



Mock simulations



Log S_x [erg/s/cm²]



Tokyo Metropolitan Univ.:

T. Ohashi

JAXA/ISAS:

N. Yamasaki

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Nagoya Univ.:

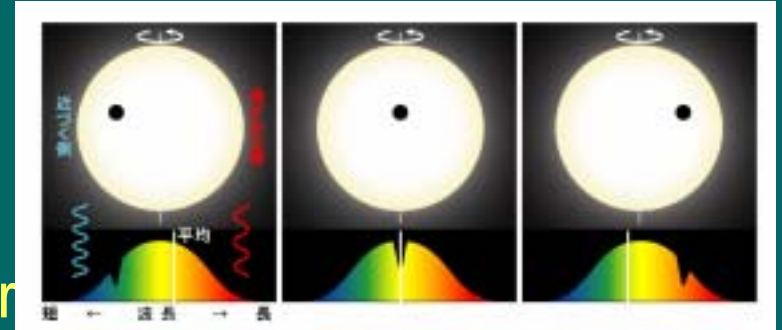
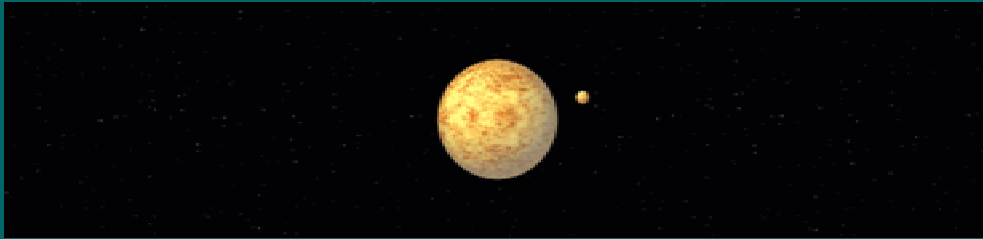
Y. Tawara

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Search for atmospheric signatures of extrasolar planets with Subaru



- Transmission spectroscopy of extrasolar planets
 - H₂ absorption upper limit $\sim 0.1\%$ (Hoshi Navi, 2005 Feb issue)
(Winn et al. 2004, PASJ 56, 655)
 - Analysis of other lines (Narita et al. 2005)
- Constraining the stellar spin and the planetary orbital axes from the Rossiter-McLaughlin effect
 - the first analytic formulae + Subaru proposal
(Ohta, Taruya & Suto 2005; ApJ April 10 issue)
- Search for reflected light from extrasolar planets
 - on-going collaboration with a group at St. Andrews University (A. Cameron, C. Leigh, ...)