

# 7衝突銀河団の質量・バリオン分布

## Subaru Weak Lensing of Seven Merging Clusters: Distributions of Mass and Baryons

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# 1: Motivation – X-ray Clusters

Chandra and XMM-Newton revealed complicated ICM structures which are expected to be associated with cluster mergers.

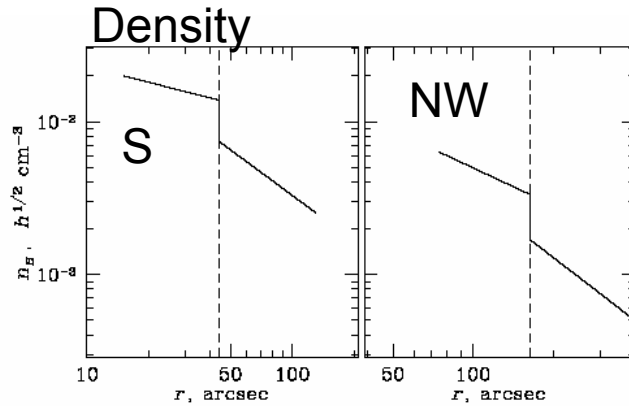
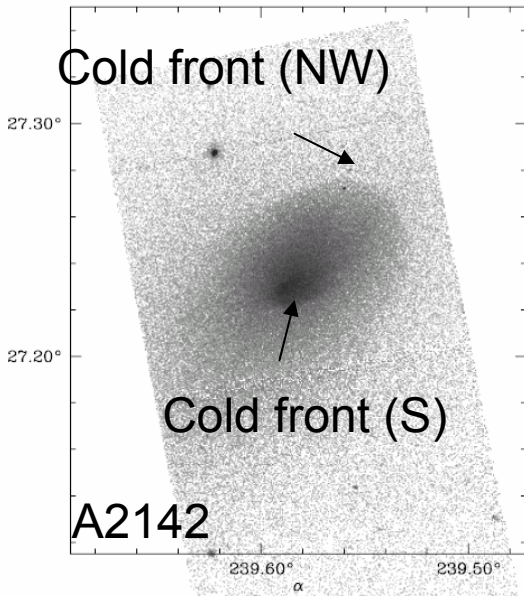


FIG. 4d

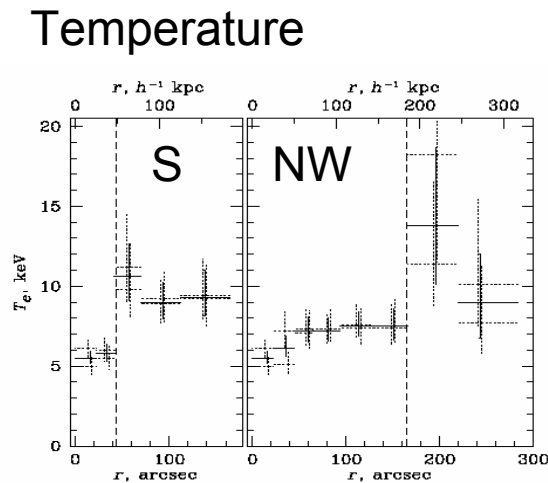
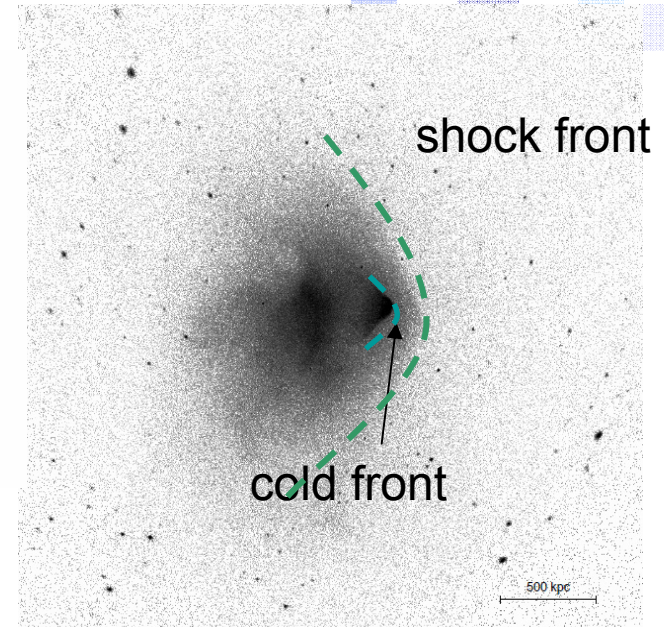


FIG. 4b



1E0657-56  
(exposure time=500ksec)

# Motivation

- (1) ICM is dynamically controlled by dark matter.
- (2) Understanding the ICM phenomena requires to know the dark matter (mass) distribution.
- (3) Mass distributions deduced from X-ray results are ill constrained because the ICM is not in hydrostatic equilibrium.

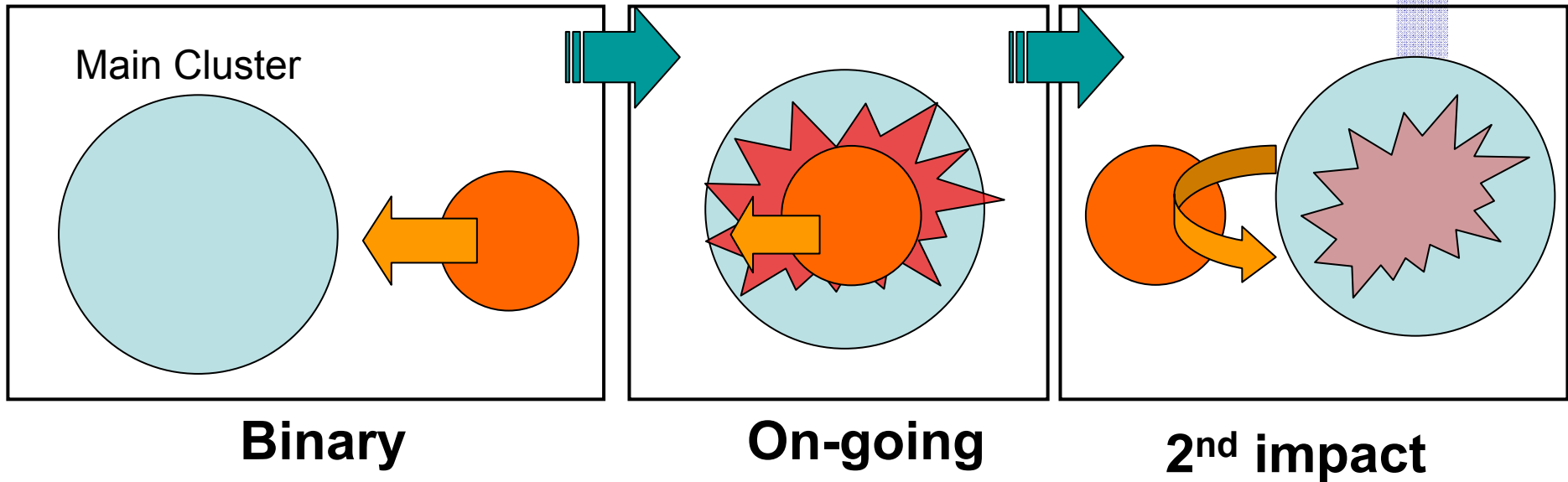
$$\frac{1}{\mu m_p n_g(r)} \frac{dP_g}{dr} = - \frac{d\Phi}{dr}$$

The only method to **directly** reveal mass distribution without the assumption of dynamical states and mass distributions is to use **a weak gravitational lensing effect.**

# 2: Cluster Targets

1: We have not yet known mass distributions in **almost all** merging clusters!!!

\* Various Merging Stages



2: We have not yet known the relationship between dark matter and baryons (ICM and member galaxies) during merger process.

# Cluster Targets

**Suprime-CAM**

Table 2. Cluster X-ray Features

Cluster	$z$	Type	1 arcmin (kpc/ $h_{70}$ )	Components	$T_{\text{ave}}$ (keV)
(1)	(2)	(3)	(4)	(5)	(6)
A754	0.0542	On-going	63.1		$10.0 \pm 0.3^a$
A1750	0.0860	Binary	96.7	A1750C	$3.87 \pm 0.10^b$
				A1750N	$2.84 \pm 0.12^b$
A1758	0.2790	Binary	254.0	A1758N	$8.2 \pm 0.4^c$
				A1758S	$6.4^{+0.3}_{-0.4}^c$
A1914	0.1712	On-going	174.9		$10.9 \pm 0.7^a$
A2034	0.1130	Cold Front	123.2		$7.9 \pm 0.4^d$
A2142	0.0909	Cold Front	101.7		$8.1 \pm 0.4^e$
A520	0.1990	On-going	197.2		$7.1 \pm 0.9^a$

**S05A-159,  
PI: Okabe**

**Archive** ←

**(SMOKA)**

**This talk focuses on distributions of mass and baryons in Merging Clusters.**

# 3: Summary

1 :

Weak Lensing analysis is **a new observational method** to understand galaxy clusters.

- **Complementary** to X-ray / Optical Analyses.

2 :

Subaru + Suprime-CAM is **the most powerful** instrument of weak lensing analysis.

- Subaru/Suprime-CAM can carry out WL analysis on **almost ALL** X-ray clusters

### 3 : Distributions of Mass, ICM, and member galaxies.

**Initial Stage** : Mass ~ Galaxies ~ ICM A1750 & A1758

**On-Going/Cold front** : Mass ~ Galaxies  $\neq$  ICM

peak

Mass in front of X-ray core : A1758N & 1E0657-56 (Clowe et al 2004)

Mass behind X-ray core : A754

No significant offset within smoothing scale : A520, A1914 & A1758S

Mass in front of Cold front : A2034, A2142 & 1E0657-56 (Clowe et al. 2004)

### 4 : Combined Study ( Subaru UM 2005 )

Lx-T relation, M-T relation,  $f_{\text{gas}}$  & M/L...

Compare with Temperature, Pressure and Entropy Maps of ICM

Constrain merger geometry & energy input into ICM...

# Locuss

## (Local Cluster Substructure Survey)

Flux limited Sample:  $L_x > 5 \times 10^{44}$  erg/s

Redshift :  $0.15 < z < 0.30$

**Subaru/Suprime-CAM** : Goal ~40 clusters

Currently ~15 clusters (S05B & S06A , PI: Futamase)

**Reduction finished!**. and observation (S07A)

(Okabe, Takada, Umetsu & Futamase, PASJ, in prep)

**HST/ACS**: 143 Targets (100 clusters) **Smith & Kneib**

**NOW OBSERVING ( until the end of 2007)**

**Chandra/XMM-Newton/Suzaku**: **Mazzotta, Ponman, Finogonov & Okabe**

Archival DATA (Chandra/XMM)+ Suzaku ( Low X-ray background )

**SZE**: SZA **Carlstrom & Church**

**Combined Studies : WL+ SL, WL+X-ray, WL+SZE**