DEVELOPMENT OF NEW ANALYSIS METHOD FOR MAPPING OBSERVATIONS OF CLUSTERS OF GALAXIES

K. KIKUCHI, T. OHASHI
Department of Physics, Tokyo Metropolitan University
H. EZAWA, M. HIRAYAMA
Department of Physics, University of Tokyo
AND
H. HONDA, R. SHIBATA
Institute of Space and Astronautical Science

1. Introduction

Mapping observations of nearby large-extended clusters of galaxies (Coma, Perseus, Virgo, etc.) are being performed with ASCA. Such clusters allow us to map physical parameters of hot gas in the clusters, such as temperature, metal abundance, and X-ray surface brightness. To determine such parameters at each part of a cluster, one should take careful care of X-ray contamination from outside of a pointed field, which is mainly due to "stray-light" X-rays (Honda et al. 1997). For this reason, the only way to obtain the distribution of hot gas parameter is to process the whole cluster data in a self-consistent way. For this purpose, we are developing the new analysis system called TERRA.

2. The TERRA System

The new analysis system TERRA (TEchnique of Reproducing the Response for ASCA) is characterized by following three points.

- Response calculation by Monte Calro simulation
- Simultaneous fit to spectra from multi-pointing observations
- Database to store the response simulated

The stray light contamination is evaluated correctly utilizing Monte Carlo simulation with a ray-tracing code. In addition, the system is adapted to multi-pointing observations and performing a simultaneous fit to multiple

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spectra. Furthermore, the simulated ASCA response is accumulated in the form of a database, so that users do not have to run the same ray-tracing code for each analysis. This brings us a considerable save of time compared with the existing analysis method in which the response has to be calculated by the ray-tracing simulation for every analysis of each observation.

To verify performance of the TERRA system, we fit simulated pulse-height spectra of a cluster placed at various offset angles referred to a pointing direction. Pointing directions were taken to be similar to those of the Coma cluster observations with ASCA (Honda et al. 1997). We fit these simulated spectra jointly with the TERRA system, with kT and normalization factor set free and others fixed at each region. The best-fit values are obtained with $\chi^2 = 1478$ for 1344 degrees of freedom and consistent with the simulated ones. This suggest that the TERRA is able to derive meaningful parameters even when the stray light creates severe contaminations. Also, the plots for large offset simulations indicate that the system predicts the stray light contamination very well.

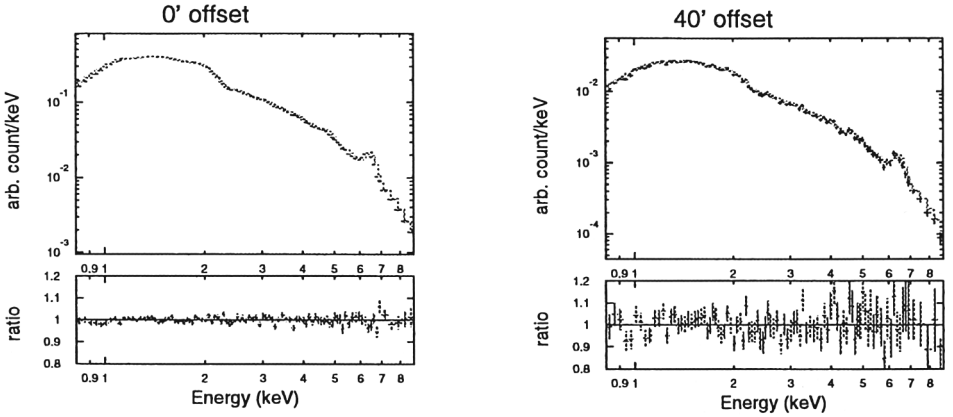

Figure 1. Fitting result by TERRA. Lower panel shows the ratio of simulated data and fitted model.

References

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