Abstract

Cluster of galaxies is the largest gravitationally bound system in astronomical objects, hence it is one of the most suitable objects to study the formation of structure in the universe. Since a cluster of galaxies is filled with an X-ray emitting hot plasma, X-ray observations of clusters of galaxies have given us valuable informations for investigation of the structure, evolution and origin of the intra-cluster medium (ICM).

The X-ray spectra of clusters of galaxies are rich in K-lines and L-lines from highly ionized heavy metal elements, in which iron-Kα lines seen around 6.7 keV are the most prominent. The existence of the line emissions means that the gas is comprised of not only the primordial gas but also the processed gas in the stellar interior. The metal abundance of ICM is derived from spatially-sorted spectra by the spectral fitting of plasma emission model. The measurements of abundance distribution are of great importance because they can be used to measure the precise amount of metals in the ICM and to constrain the origin of metals spatially and in terms of the contribution of different types of SNe, which are equivalent to investigate the metal enrichment processes in the ICM.

We analyzed the *ASCA* data of two bright near-by clusters, 2A 0335+096 ($z = 0.035$) and the Centaurus cluster ($z = 0.0104$). Both clusters exhibit some common profiles, the possession of cool gas of $kT \sim 3$ keV, relatively spherically symmetric surface brightness, a strong peak in the surface brightness at the cluster center, the existence of the giant elliptical galaxy located at the center and the increase of temperature with increasing radius. So far, the metal abundance profiles of both clusters have been studied in radial direction, and the central concentrations of the metal abundance have been reported by some authors, who suggest that the concentrations are attributed to the giant elliptical galaxy located at the cluster center. However, it has to be noted that the metal distribution in azimuthal direction has not been investigated in detail.

In this thesis, we investigated the iron abundance distribution in detail by making a two-dimensional iron-line equivalent width map. For both clusters, we found that there is a non-uniformity of the abundance distribution, which have a 100 kpc-scale variation. By extracting spectra from high equivalent width regions and fitting the spectra with

the plasma emission model, we found that the abundance at these regions is $\sim$0.8 solar against its surroundings average of $\sim$0.5 solar for 2A 0335+096, and $\sim$1 solar against its surroundings average of $\sim$0.4 solar for the Centaurus cluster. These results suggest that the metal-rich gas has been supplied from, e.g., galaxy, or groups of galaxies falling to the cluster, to metal-poor gas which had already existed during the early phase of cluster formation. But we could not identify any galaxies with the high abundance regions, thus, the deep optical observations of these regions are encouraged. And we also found that the cluster 2A 0335+096 does not have the steep gradient of metallicity as reported before, in contrast to the metallicity profile of the Centaurus cluster. This result indicates that the radial abundance distribution cannot be accounted for only by considering the contribution of the central dominant elliptical galaxy.