# X-ray observations of distant lensing clusters

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ROSAT and ASCA observations of three distant lensing clusters were analysed: RXJ1347.5-1145 (Schindler et al. 1996), Cl0939+47 (Schindler & Wambsganss 1996), and Cl0500-24 (Schindler & Wambsganss 1997). Although these clusters are the in same redshift range (z = 0.32 - 0.45) and act all as gravitational lenses, i.e. they are massive, they show very different X-ray properties.

RXJ1347.5-1145 is the most luminous X-ray cluster found so far and also in other properties an extreme. It seems to be an old, well relaxed system, with a relaxed morphology, high X-ray luminosity, high temperature, high metallicity and strong cooling flow. The cluster is shown in the left figure: in the overlay of X-ray contours on top of an optical image one can see clearly the relaxed structure of this cluster in X-rays. In the optical image several arcs and arc candidates are visible (marked by letters), which have the largest radius found in a cluster so far.

The other two clusters – Cl0939+47 and Cl0500-24 – show completely different properties. They are optically very rich clusters, but have only low X-ray luminosity. They have the appearance of young, not virialised systems with substructure. The figure to the right is an ROSAT/HRI image of Cl0939+47. It reveals two maxima which shows even some internal structure. Note the different scale of the figures: while the left figure has a size of 1.5x1.5 arcmin$^2$, the right figure's size is 4x4 arcmin$^2$. Furthermore, Cl0939+47 has a low metallicity and also a relatively low temperature. Cl0500-24 consists of two subclusters out of which only one seems to be X-ray luminous. The non-luminous subcluster, however, must be massive as well, because a giant arc is curved towards the non-luminous subcluster.

A comparison with nearby clusters and other distant clusters shows that many X-ray properties – like e.g. the metallicity or the amount of subclustering – show a large scatter and no clear evolutionary trend. This result points to a very early evolution which is completed before a redshift of 0.5 - 1.

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