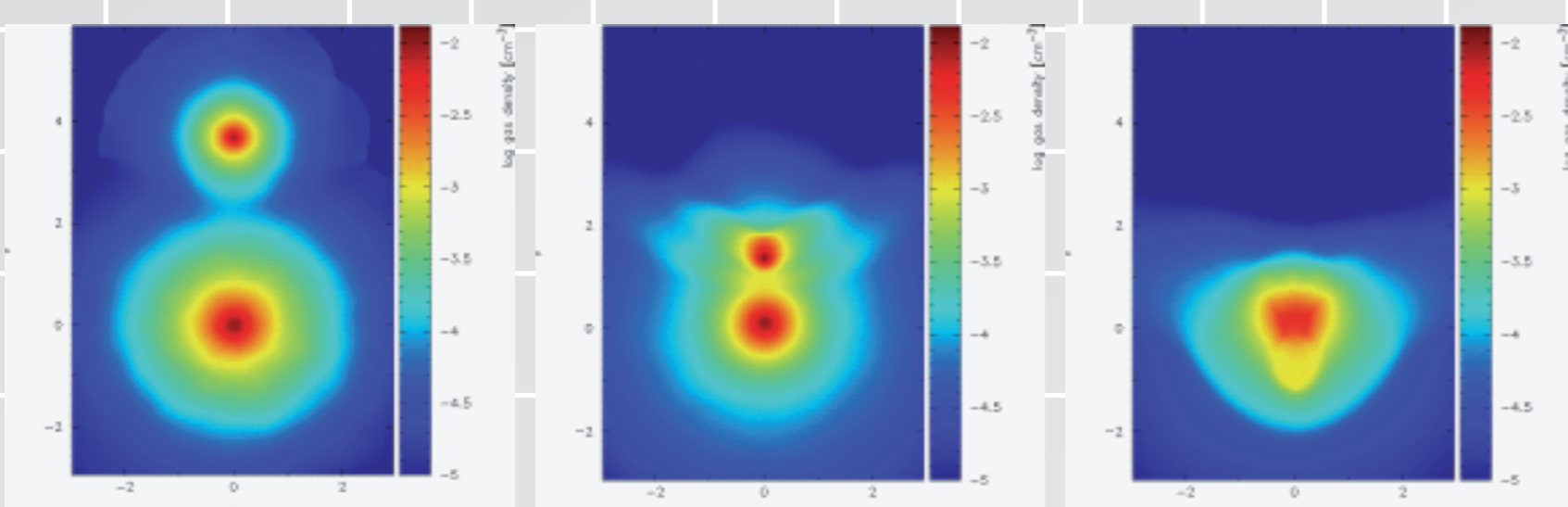


# Simulations with FIRST (2)

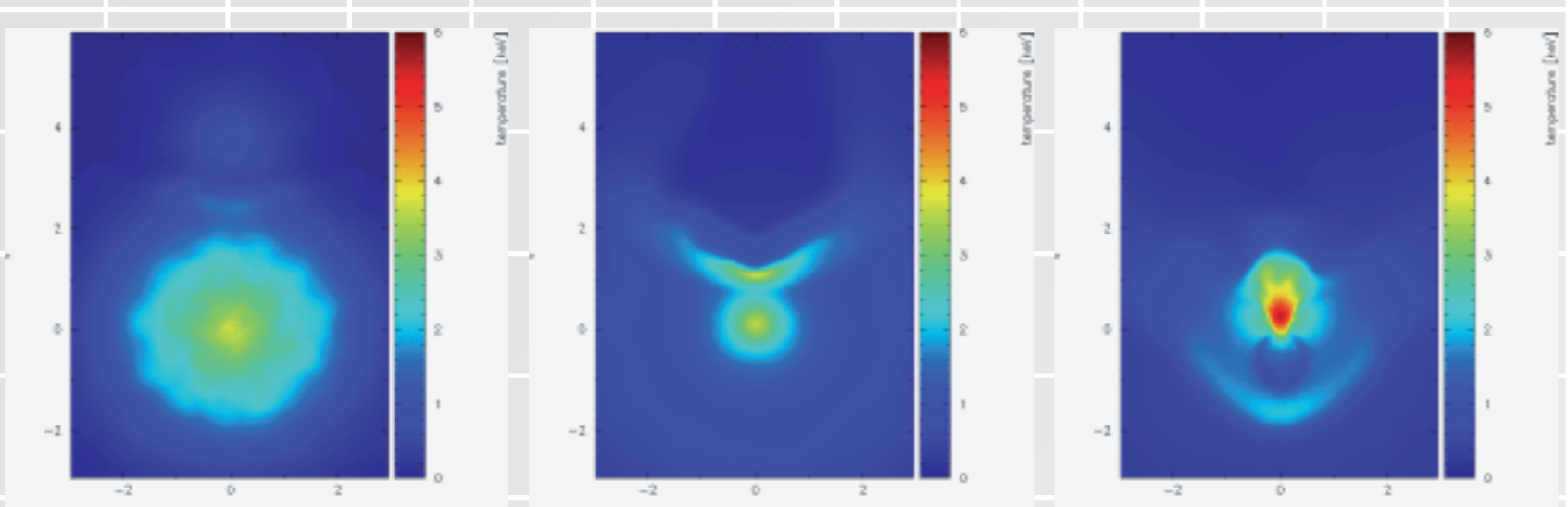
## Merger of galaxy clusters

In the standard cosmological model, it is believed that galaxy clusters have experienced multiple mergers of galaxies and of galaxy groups. Non-equilibrium states of intracluster plasma are good probes for understanding their formation histories. The FIRST simulator enables us to simulate dynamical evolutions of merging clusters, in parallel with calculations for dozens of electron non-equilibrium states of oxygen, iron, and other heavy elements in the plasma.

### Density

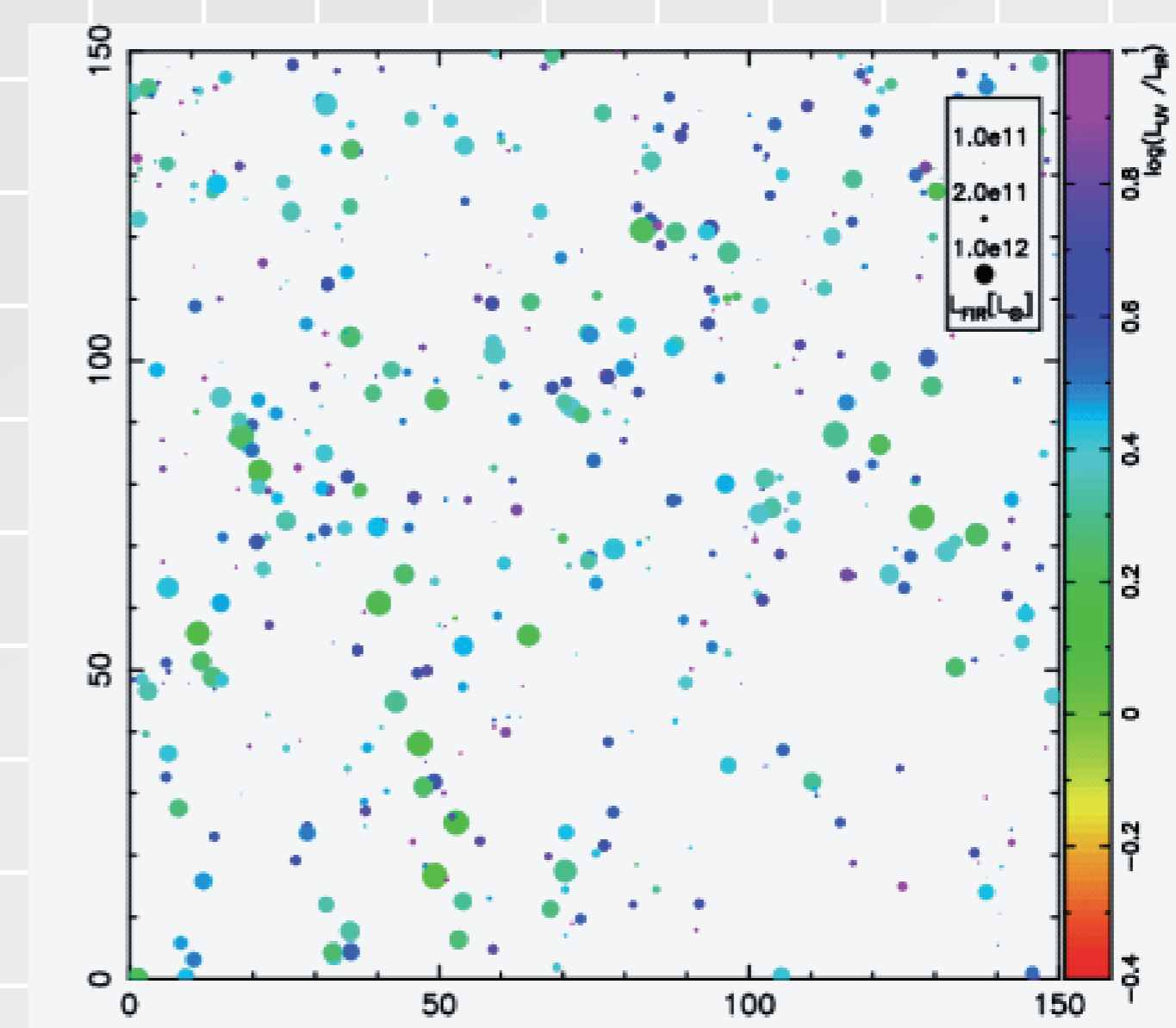


### Temperature



## Large-scale distribution of infrared-luminous galaxies

Infrared-luminous galaxies are one of the most luminous species in the Universe. Our simulation of large-scale distribution of infrared-luminous galaxies in the Universe has predicted that this species of galaxies exist in an early Universe when its age is as young as several millions of years. Infrared-luminous galaxies in the early Universe are strongly related to the first star formation and the first metal-enrichment in the Universe.



## Interaction between Andromeda galaxy and a satellite

Using parallel N-body simulations with 40 million particles, we have studied the interaction between the Andromeda galaxy and its satellite. The simulation nicely reproduces the giant stellar stream discovered at the southern part of the Andromeda galaxy. Moreover, the results show that several of the observed faint features in the Andromeda galaxy can be explained as the forward continuation of the giant stellar stream.

