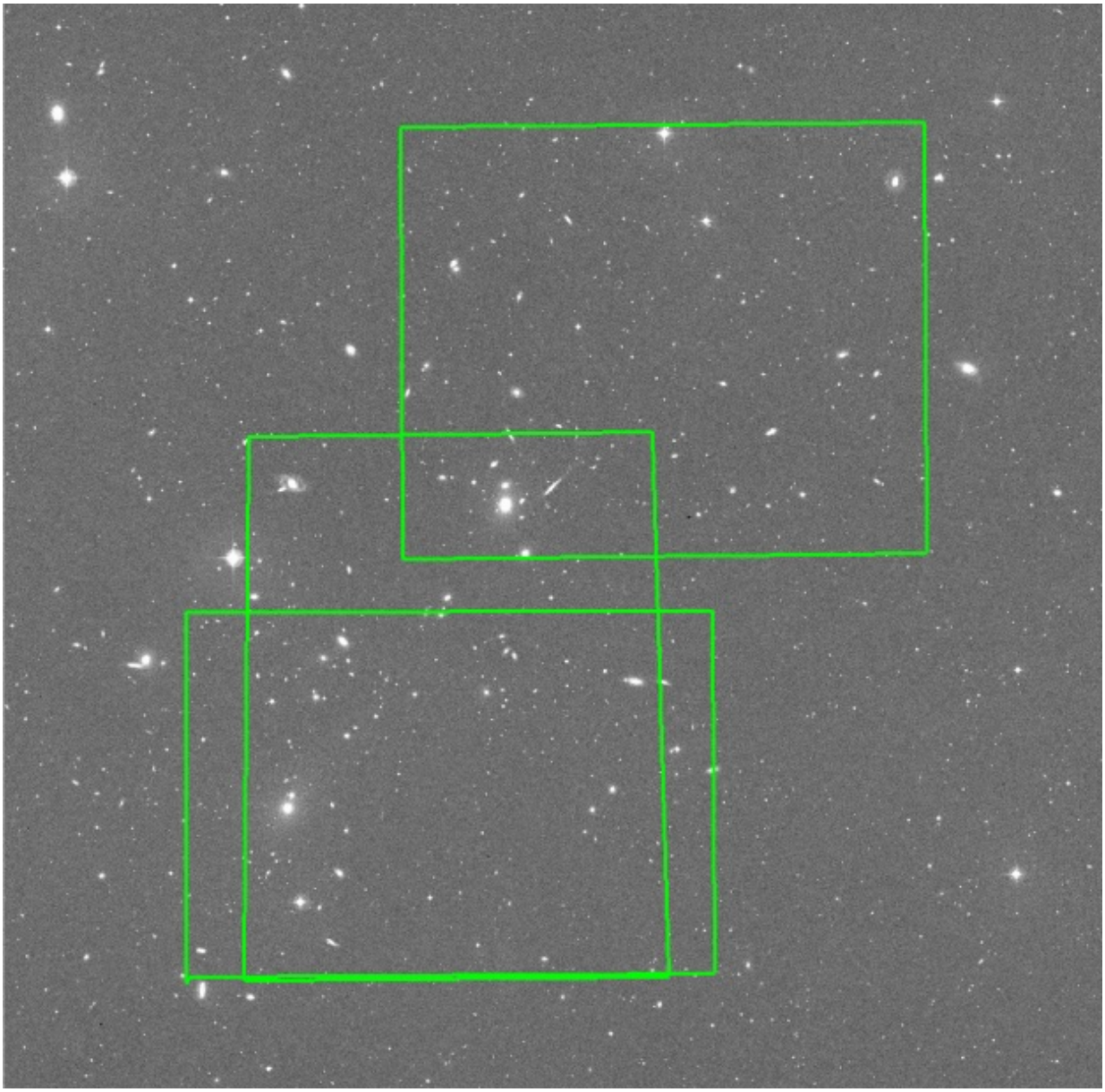
New extended ionized gas clouds detected in Abell 1367 cluster

April 5 2017, by Tomasz Nowakowski



Abell 1367 cluster. The background image is R-band of Palomar Digitized Sky Survey 2 (DSS2). The size of the image is 75 arcmin square. The solid boxes represent the observed regions in this study. Credit: Yagi et al., 2017.

(Phys.org)—Astronomers have found six new extended ionized gas clouds (EIGs) in the galaxy cluster Abell 1367 (also known as the Leo Cluster). The discovery expands the current list of the cluster's known EIGs to 11 and provides new clues about the evolution of this group of galaxies. The researchers detailed their findings in a paper published Mar. 30 on arXiv.org.

Located some 330 million light years away in the constellation Leo, Abell 1367 is a young cluster containing at least 70 major galaxies. The cluster is best known for its high fraction of spiral galaxies, low central galaxy density and the irregular shape of hot gas distribution. Moreover, Abell 1367 is one of the best-studied nearby clusters in H-alpha (Hα) spectral line. To date, numerous Hα observations of this cluster have been conducted with the aim of detecting the presence of ionized gas.

Such studies are of high importance for astronomers due to the fact that gas around a galaxy in a cluster is an indicator of a recent or ongoing gas-loss event of the parent galaxy. Therefore, finding new EIGs is crucial for detecting gas loss from star-forming galaxies, which could result in better understanding of galaxy evolution processes.

The new research paper authored by Masafumi Yagi of the National Astronomical Observatory of Japan (NAOJ) and his team reveals the presence of new EIGs in Abell 1367 and provides more details on the nature of this cluster. In this paper, the researchers described their observations of the central region of Abell 1367 using the Subaru Telescope in Hawaii.

"We surveyed a central 0.6 deg^2 region of Abell 1367 cluster for extended ionized gas clouds using the Subaru prime-focus camera (Suprime-Cam) with a narrow-band filter that covers Hα," the paper reads.

The observational campaign was carried out in April and May 2014 and resulted in the discovery of six new EIGs in Abell 1367 in addition to five such clouds known before. Furthermore, the data provided by the Subaru Telescope allowed the researchers to find that the Hα tail from the blue infalling group (BIG) is extended to about 1.08 million light years in projected distance, which is about two times longer than previously thought.

"The deep Hα image also revealed that the Hα tails are extended in fainter surface brightness much longer than previously known," the scientists wrote.

Given the fact that Abell 1367 together with Abell 1656 (Coma Cluster) make up the SCl 117 supercluster (also known as the Coma Supercluster), the team compared this two clusters taking the new results into account. In general, they found that the properties of the EIG parent galaxies in Abell 1367 basically resemble those in Abell 1656.

"The comparison of the parent galaxies of EIGs in Abell 1367 and in the Coma Cluster showed that the properties of the parents are basically similar," the researchers wrote in the paper.

However, one meaningful difference was found by Yagi's team. They revealed that the length of EIGs is longer and more often connected to star-forming parents in Abell 1367. This indicates that the EIGs and parents in Abell 1367 are, on average, younger than those in Abell 1656. It also means that gas removal from the parent and heating of EIG is slower in Abell 1367.

More information: Extended ionized gas clouds in the Abell 1367 cluster, arXiv:1703.10301 [astro-ph.GA] arxiv.org/abs/1703.10301

Abstract

We surveyed a central 0.6 deg^2 region of Abell 1367 cluster for extended ionized gas clouds (EIGs) using the Subaru prime-focus camera (Suprime-Cam) with a narrow-band filter that covers Halpha. We discovered six new EIGs in addition to five known EIGs. We also found that the Halpha tail from the blue infalling group (BIG) is extended to about 330 kpc in projected distance, which is about twice longer than previously reported. Candidates of star-forming blobs in the tail are detected. The properties of the EIG parent galaxies in Abell 1367 basically resemble those in the Coma cluster. A noticeable difference is that the number of detached EIGs is significantly fewer in Abell 1367, while the fraction of blue member galaxies is higher. The results suggest a difference in the evolutionary stage of the clusters; Abell 1367 is at an earlier stage than the Coma cluster.