Massive galaxy cluster ClG-J104803.7+313843 investigated in X-rays

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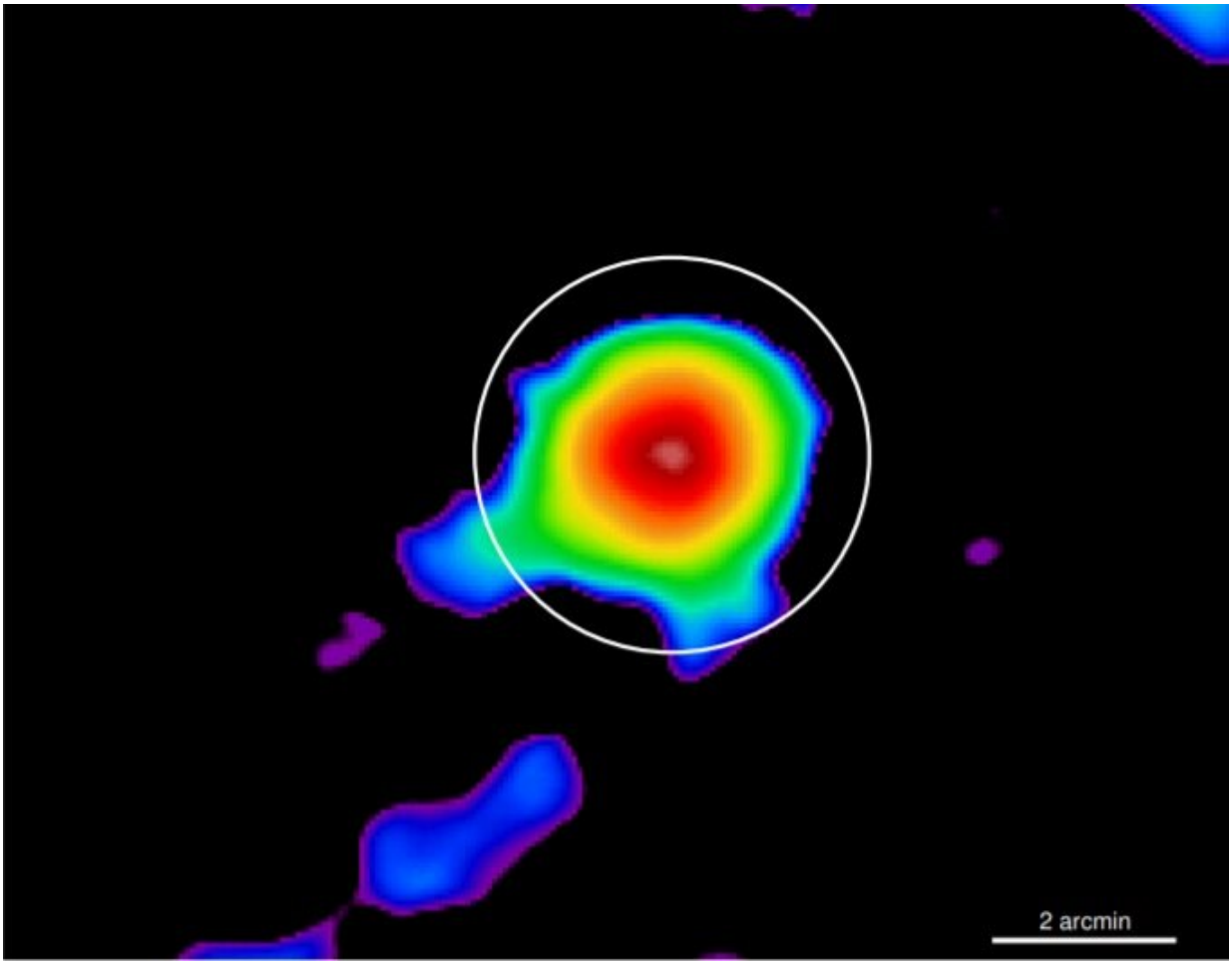

Wavelet filtered image of ClG-J104803.7+313843 in the [0.5 – 2.5] keV band. Credit: Bartalucci et al., 2021.

Italian astronomers have performed X-ray observations of the massive galaxy cluster ClG-J104803.7+313843, using ESA's XMM-Newton spacecraft. Results of the observational campaign, presented November 26 on arXiv.org, shed more light on the properties of this cluster.

Galaxy clusters contain up to thousands of galaxies bound together by gravity. They are the largest known gravitationally bound structures in the universe, and could serve as excellent laboratories for studying galaxy evolution and cosmology.

At a redshift of approximately 0.76, ClG-J104803.7+313843 is a galaxy cluster that has not been comprehensively studied yet. With a mass estimated to be about 980 trillion solar masses, ClG-J104803.7+313843 is one of the most massive galaxy clusters known to date.

A team of astronomers led by Iacopo Bartalucci of the Institute of Space Astrophysics and Cosmic Physics of Milano in Italy, has recently carried out X-ray observations of ClG-J104803.7+313843 using XMM-Newton's European Photon Imaging Camera (EPIC). Data from EPIC allowed them to take a closer look at the cluster's morphology, which delivered more hints into the nature of this object.

"We present the X-ray analysis of the cluster ClG-J104803.7+313843. This object is part of a sample of 44 candidate clusters presented in Buddendiek et al. (2015) which have been confirmed by an optical follow-up using the William Herschel Telescope (WHT) and the Large Binocular Telescope (LBT)," the researchers wrote in the paper.

The team inspected the morphology of ClG-J104803.7+313843 and found signs of merging activities in the outskirts and a flat core. However, it was noted that the lack of significant merger features could be due to the low statistics combined with low angular resolution of the collected data.

According to the study, the inner part of the cluster within about 1.5 arcmins appears to be quite regular, showing a roundish shape with a moderately bright core. The morphology appears to be more irregular at large scales, with the shape being ellipsoidal and elongated along the northwest-southeast direction. Two faint substructures were identified in the south and southeast sectors.

The observations confirmed that ClG-J104803.7+313843 is at a redshift of about 0.76 and found that its mass is approximately 564 trillion solar masses. Therefore, the cluster turned out to be less massive than previously estimated.

"ClG-J104803.7+313843 has been initially detected as a $\sim 10^{15}$ solar masses object while our work shows that it is still massive but has a smaller mass with a reduction on the relative error of the order of ~ 3 times. This result shows the importance of X-ray characterisation," the astronomers explained.

The researchers added that X-ray observations like the one presented in their research, together with ancillary multi-wavelength studies are needed in order to improve our understanding of massive clusters such as ClG-J104803.7+313843, but also similar objects at higher redshifts.

More information: I. Bartalucci et al, X-ray characterisation of the massive galaxy clusterClG-J104803.7+313843 at z=0.76 with XMM-Newton. arXiv:2111.13543v1 [astro-ph.CO], arxiv.org/abs/2111.13543