Giant X-Ray Loop Hints at Cosmic Particle Accelerator

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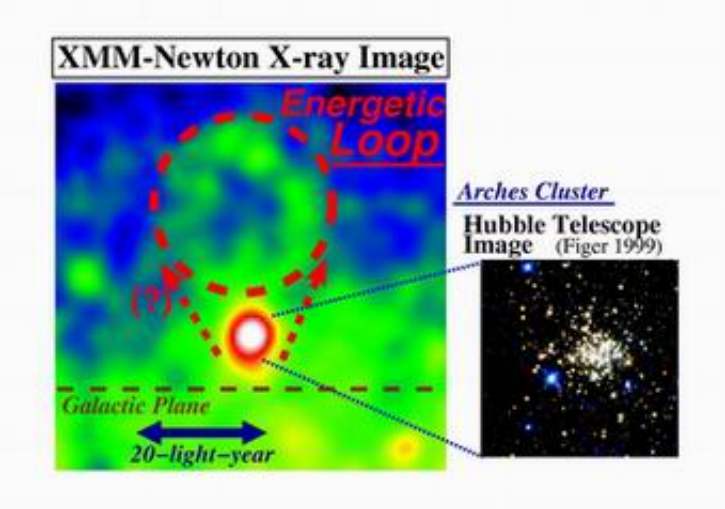

Astronomers have found a vast loop-like structure, 20 light years across, adjacent to the most massive star-forming region known in our galaxy. The loop, which was observed in X-ray wavelengths, is 15 times the size of the Arches Cluster, a star-forming region close to the centre of the Milky Way. This is the first time that such a distinctive and huge loop structure has been observed. Dr Masaaki Sakano, from the University of Leicester, will be presenting the discovery at the RAS National Astronomy Meeting at the University of Birmingham on Friday 8th April.

The team of astronomers, which includes scientists from the University of Leicester, CEA Saclay and the Max Planke Institute for Extraterrestrial Physics, observed the Arches Cluster repeatedly using the European X-ray satellite, XMM-Newton, as a part of the XMM-Newton Galactic Centre Survey. The galactic centre can only be observed at certain wavelengths, such as X-rays, because large amounts of dust lie in our line of sight and this blocks out optical light.

Dr Sakano says, "The X-ray spectrum of the loop is extraordinary. Most diffuse X-ray sources in the Universe have a characteristic temperature because they are the residual radiation from an event, such as a supernova explosion. However in this case the loop is non-thermal and this means that whatever the origin of the structure is, it is not stationary but rather the result of some ongoing process."

The most straightforward interpretation of the observations is that powerful particle-acceleration is occurring on-site, producing high energy particles with an energy of up to a thousand trillion electron volts (a thousand times more energetic than those produced in man-made particle accelerators). Such particles have been detected previously in a few supernova remnants and many pulsar nebulae, where a very powerful central source has created them. However, evidence for high-energy particles has never been observed before in star-forming regions of our galaxy.

At this stage it is not clear whether the loop structure is physically related to the Arches Cluster or just happens to be in our line of sight. However, if future observations show that the Arches Cluster is responsible for the feature, this discovery suggests that star-forming activity plays an important role in the energetic Universe.

Source: University of Leicester

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