Giant, magnetized outflows from our galactic center

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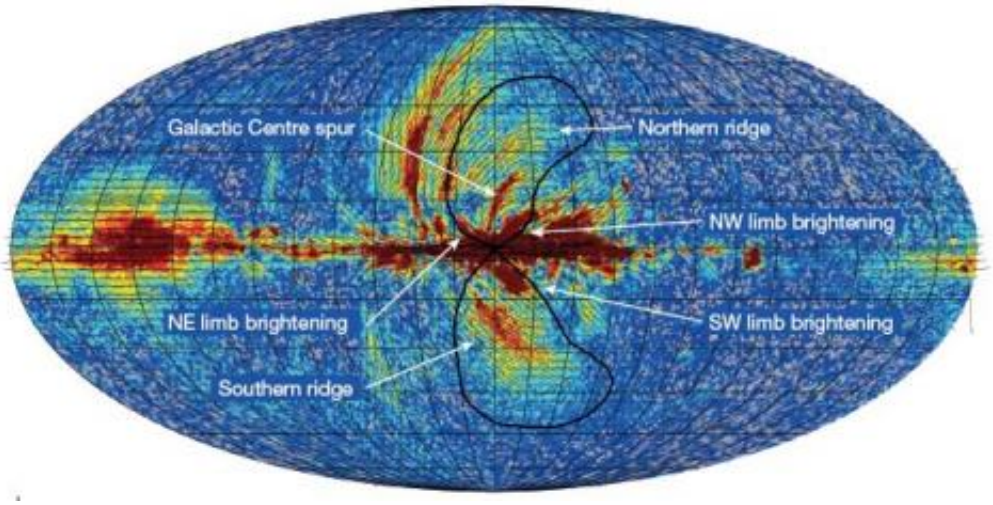

A false-color image of our Milky Way as seen in a projection that shows the galactic center at the center of the image, the plane of the galaxy stretching across the central band, and the two arc-shaped radio lobes of emission seen extending north and south of the plane. Several of the newly discovered magnetic structures are labeled. Credit: Carretti et al., and Nature

(Phys.org)—Two years ago, CfA astronomers reported the discovery of giant, twin lobes of gamma-ray emission protruding about 50,000 light-years above and below the plane of our Milky Way galaxy, and centered on the supermassive black hole at our galaxy's core. The scientists argued then that the bubbles were produced either by an eruption from the black hole sometime in the past, or else by a burst of star formation in that vicinity.

It now appears that these giant bubbles of hot gas can be seen at radio wavelengths as well. Writing in the new issue of the journal *Nature*, CfA astronomer Gianni Bernardi and eight of his colleagues describe finding humongous lobes of radio emission emanating from the Galactic Center. Moreover, the emission is polarized, a general property that electromagnetic radiation can have; some sunglasses take advantage of the fact that reflected sunlight becomes polarized. In the case of radio wavelengths, the explanation for polarization is the presence of strong magnetic fields.

The scientists calculate that the radio lobes, which closely match the gamma-ray lobes in overall dimensions but which contain three ridge-like substructures, are probably polarized by the presence of strong magnetic fields that extend out of the galactic plane in both directions for tens of thousands of light-years, and which contain an energy roughly equivalent to the total current output of the Sun for a time equal to the lifetime of the universe. They argue that the activity is driven by star-formation activity, rather than black-hole activity, and that it originates in a region around the Galactic Center about 650 light-years in size. Not least, the scientists argue that the ridges seen in the magnetically-shaped outflow are the result of several episodes of star-formation that constitute a phonograph-like record of star formation in this region over at least the past ten million years.

Provided by Harvard-Smithsonian Center for Astrophysics

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