ALMA turns its eyes to Centaurus A

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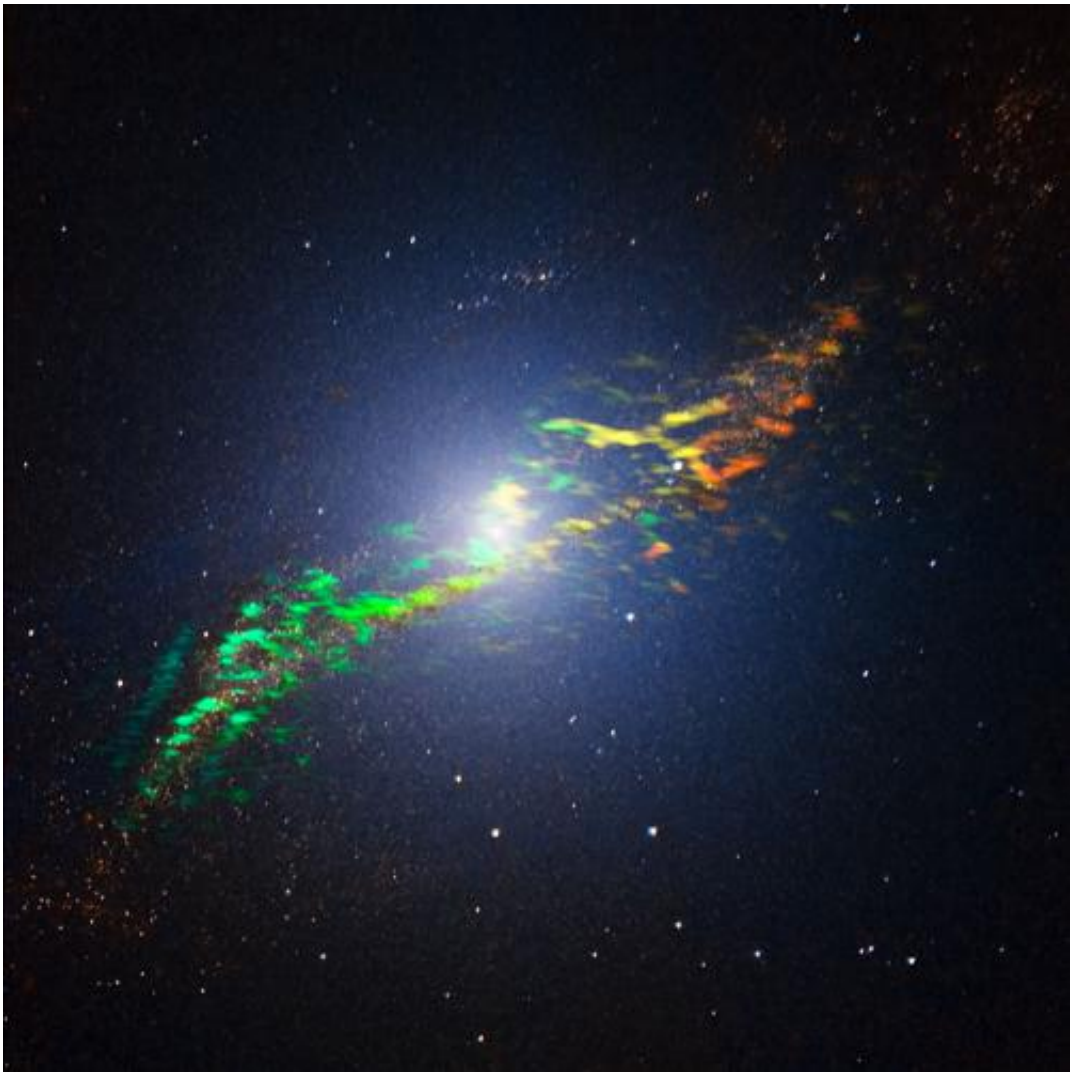

This new image of Centaurus A combines ALMA and near-infrared observations of the massive elliptical radio galaxy. The new ALMA observations, shown in a range of green, yellow and orange colors, reveal the position and motion of the clouds of gas in the galaxy. They are the sharpest and most sensitive such observations ever made. ALMA was tuned to detect signals with a wavelength around 1.3 millimeters, emitted by molecules of carbon monoxide gas. The

motion of the gas in the galaxy causes slight changes to this wavelength, due to the Doppler effect. The motion is shown in this image as changes in color. Greener features trace gas coming towards us while more orange features depict gas moving away. We can see that the gas to the left of the center is moving towards us, while the gas to the right of the center is moving away from us, indicating that the gas is orbiting around the galaxy. The ALMA observations are overlaid on a near-infrared image of Centaurus A obtained with the SOFI instrument attached to the ESO New Technology Telescope (NTT). Credit: ALMA (ESO/NAOJ/NRAO); ESO/Y. Beletsky

(Phys.org) -- A new image of the galaxy Centaurus A, made with the Atacama Large Millimeter/submillimeter Array (ALMA), shows how the observatory allows astronomers to see through the opaque dust lanes that obscure the galaxy's center, with unprecedented quality. ALMA is currently in its Early Science phase of observations and still under construction, but is already the most powerful of its kind. The observatory has just issued the call for proposals for its next cycle of observations.

Centaurus A is a massive elliptical radio galaxy -- a galaxy which emits strong radio waves -- and is the most prominent, as well as by far the nearest, radio galaxy in the sky. Centaurus A has therefore been observed with many different telescopes. Its very luminous centre hosts a supermassive black hole with a mass of about 100 million times that of the Sun.

In visible light, a characteristic feature of the galaxy is the dark band that obscures its centre. This dust lane harbours large amounts of gas, dust and young stars. These features, together with the strong radio emission, are evidence that Centaurus A is the result of a collision between a giant elliptical galaxy, and a smaller spiral galaxy whose remains form the dusty band.

To see through the obscuring dust in the central band, astronomers need to observe using longer wavelengths of light. This new image of Centaurus A combines observations at wavelengths around one millimetre, made with ALMA, and observations in near-infrared light. It thus provides a clear view through the dust towards the galaxy's luminous centre.

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The ALMA observations are overlaid on a near-infrared image of Centaurus A obtained with the SOFI instrument attached to the ESO New Technology Telescope (NTT). The image was processed using an innovative technique that removes the screening effect of the dust (eso0944 - http://www.eso.org/public/news/eso0944/). We see a clear ring of stars and clusters glowing in a golden colour, the tattered remains of the spiral galaxy being ripped apart by the gravitational pull of the giant elliptical galaxy.

The alignment between the ring of stars seen by the NTT in infrared light and the gas seen by ALMA at millimetre wavelengths highlights different aspects of similar structures in the galaxy. This is an example of how observations with other telescopes can complement these new

observations from ALMA.

Construction of ALMA, on the Chajnantor Plateau in northern Chile, will be completed in 2013, when 66 high-precision antennas will be fully operational. Half of the antennas have already been installed. Early scientific observations with a partial array began in 2011, and are already producing outstanding results. The ALMA observations of Centaurus A shown here were taken as part of the Commissioning and Science Verification phase of the telescope.

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Southern Observatory (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.

Provided by ESO