Measuring galaxy black hole masses

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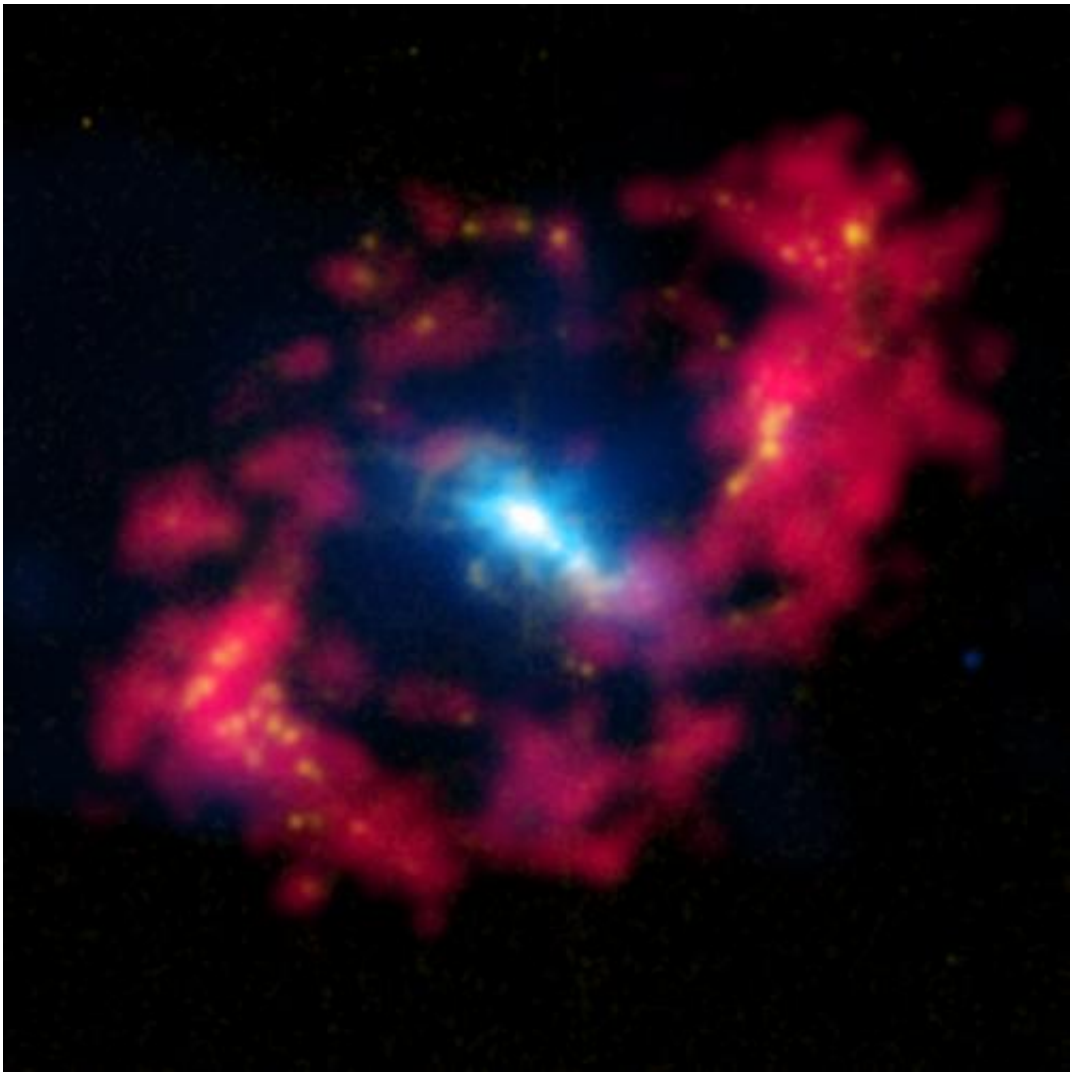

The galaxy NGC 4151 seen in a multi-color composite. The size of the massive black hole in its nucleus has been measured using a new infrared technique. Credit: X-ray (blue): NASA/CXC/CfA/J.Wang et al.; Optical (yellow): Isaac Newton Group of Telescopes, La Palma/Jacobus Kapteyn Telescope; Radio (red): NSF/NRAO/VLA

(PhysOrg.com) -- Black holes, one of the most amazing and bizarre predictions of Einstein's theory of gravity, are irresistible sinks for matter and energy. They are so dense that not even light can escape from their gravitational clutches.

Massive black holes, containing millions to billions of solar masses of material, reside at the centers of most galaxies including our own Milky Way.

Although black holes are dark, their masses can be measured quite precisely from their gravitational influence on stars and other matter.

Astronomers have done just that over the past few decades by looking at the way gas around a nucleus moves under the influence of the massive black hole.

The results on dozens of galaxies so far have shown that black hole sizes can be reliably estimated with this technique.

It is not always easy, however, to separate the light around the nuclear region from the rest of a galaxy's starlight in order to measure this moving gas.

SAO astronomers Martin Elvis and Margarita Karovska, together with five colleagues, have devised a new technique that takes advantage of the fact that the infrared luminosity of the gas also depends on its motion, and so also provides a measure of the black hole mass.

They find from a sample of fourteen previously measured galaxies that the infrared observations give very good agreement with other techniques.

Since infrared observations can in many situations be easier to obtain,

the new technique will allow black hole measurements to be extended to many other galaxies.

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