Supermassive breakthrough

2013-12-04 16:20:07 by Southern

Scientists now know how fast a black hole spins

Russia Today/

NASA/JPL-Caltech

For the first time ever, scientists have been able to measure the precise spin rate of a 'supermassive black hole'. The findings will provide some clue as to how some of the most mysterious objects in our universe began to form.

The black hole is located in the NGC 1365 galaxy, located 56 million light years away from us, and two million times the mass of the Sun.

By its very nature, a black hole is an object so dense that its gravity is strong enough to absorb the space around it. But in the process, as the incoming objects create friction and heat up, it emits x-rays.

It is these x-rays that astronomers measured, using the Nuclear Spectroscopic Telescope Array (NuSTAR), launched by NASA last year, and the European Space Agency's XMM-Newton.

"We can trace matter as it swirls into a black hole using X-rays emitted from regions very close to the black hole," said the co-author of the new study just published in Nature magazine, Fiona Harrison of the California Institute of Technology in Pasadena.

"The radiation we see is warped and distorted by the motions of particles and the black hole's incredibly strong gravity."

It turns out the supermassive black hole is rotating at approximately 84 percent of the speed allowed by the Theory of Relativity – close to the speed of light.

But the data has thrown up even more interesting discoveries.

"The black hole's spin is a memory, a record, of the past history of the galaxy as a whole," said the study's lead author, Guido Risaliti of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and the Italian National Institute for Astrophysics.

Confirming that black holes move at such speed allows us to discover just how they were formed, from their original small size to giant status over billions of years.

If they had been produced by randomly pulling objects around them, it would not be able to develop such a fast, smooth rate of spin. So scientists are now sure that black holes expand evenly, through a process known as "ordered accretion", as gas and stars are gradually sucked into the hole.

The data will now be applied to other black holes, whose spin had tentatively been measured, but which was previously explained by alternative theories.

And since mass and spin are the only information an outsider can make about a black hole (since objects only travel one way into it) astronomers are coming close to understanding the phenomena, and can use them to study the Theory of Relativity (of which they are a perfect example) more closely.

"This is hugely important to the field of black hole science," summed up Lou Kaluzienski, a NuSTAR program scientist at NASA Headquarters.

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