Researchers offer possible explanation for lack of radiation flash from gas cloud interaction with Milky Way black hole

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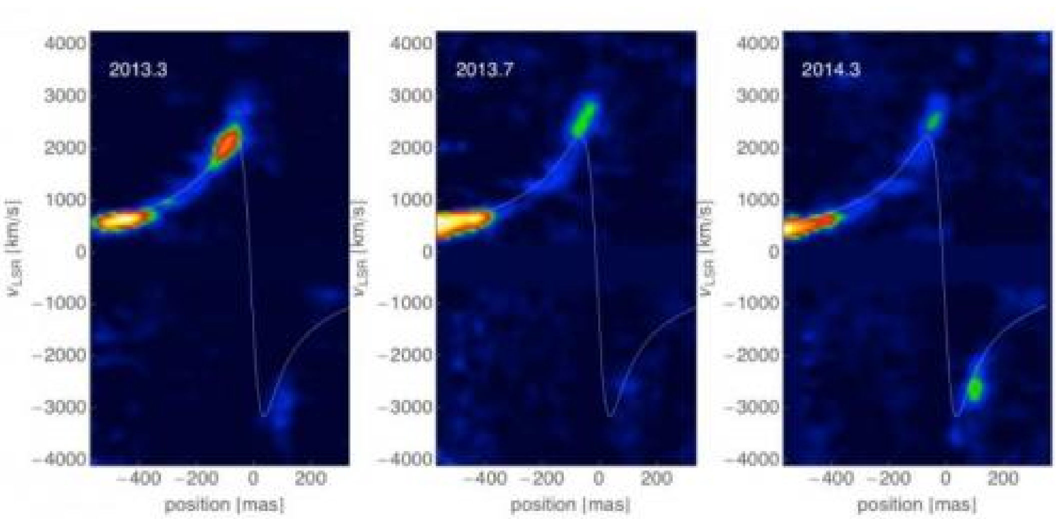

Comparison of the pv-diagrams from spring 2013 (data already presented in Gillessen et al. 2013b), late summer 2013 and spring 2014 (new data). The blue line corresponds to the Brackett-γ based orbit from Gillessen et al. (2013b), along which the pv-diagram is extracted. We have blended out the range between −660 km/s and +240 km/s to avoid emission from the mini-spiral (Paumard et al. 2004) visible at these wavelengths. The scaling is adjusted in each map individually to optimally show the structure of the gaseous emission; the maps cannot be compared photometrically to each other. Credit: arXiv:1407.4354 [astro-ph.GA]

(Phys.org) —A team of researchers at the Max Planck Institute in

Germany has offered a possible explanation for the lack of fireworks during the interaction between a gas cloud and the black hole believed to be at the center of the Milky Way Galaxy. In their paper uploaded to the prepress server *arXiv*, the researchers suggest that the expected fireworks didn't happen because the gas cloud is actually a dense clump that is part of a continuous stream of matter and because of that it only brushed the black hole rather than gushed into it.

The gas cloud, named G2, was first spotted back in 2011, moving towards Sagittarius A*, the super massive black hole believed to exist at the center of our galaxy. Scientists expected a sudden surge in X-rays and radio waves and maybe even a possible brightening of infrared light from the site. Instead, as the gas cloud encountered the black hole, nothing much happened. The cloud simply changed shape a little bit with little to no fanfare, leaving scientists who had trained a lot of telescopes on the Milky Way's center, feeling let down. In their paper, the researchers in Germany offer a possible explanation regarding why so little appeared to happen.

G2, the researchers suggest, is actually part of a continuous stream of material that was ripped from the envelope of a star as recently as just a hundred years ago. They note that G1, another gas cloud spotted over a decade ago, has an identical orbit to G2, and is even in the same plane. They believe both clouds are actually little more than clumps in a much bigger cloud that is essentially a stream of gas that has been traveling towards the center of the Milky Way for a century. And because of that, they suggest, the clumps simply brush Sagittarius A* as they approach and pass by, because of the impact on them exerted by the rest of the stream. If true, it would seem likely that there are other clouds also present in the stream, which are perhaps destined for a rendezvous with Sagittarius A* someday—if so, one of them might produce the fireworks the scientists had been anticipating.

More information: The Galactic Center cloud G2 and its gas streamer, arXiv:1407.4354 [astro-ph.GA] arxiv.org/abs/1407.4354

Abstract
We present new, deep near-infrared SINFONI @ VLT integral field spectroscopy of the gas cloud G2 in the Galactic Center, from late summer 2013 and spring 2014. G2 is visible in recombination line emission. The spatially resolved kinematic data track the ongoing tidal disruption. As expected for an observation near pericenter passage, roughly half of the gas in 2014 is found at the redshifted, pre-pericenter side of the orbit, while the other half is at the post-pericenter, blueshifted side. We also present an orbital solution for the gas cloud G1, which was discovered a decade ago in L'-band images when it was spatially almost coincident with Sgr A*. The orientation of the G1 orbit in the three angles is almost identical to the one of G2, but it has a lower eccentricity and smaller semi-major axis. We show that the observed astrometric positions and radial velocities of G1 are compatible with the G2 orbit, assuming that (i) G1 was originally on the G2 orbit preceding G2 by 13 years and (ii) a simple drag force acted on it during pericenter passage. Taken together with the previously described tail of G2, which we detect in recombination line emission and thermal broadband emission, we propose that G2 may be a bright knot in a much more extensive gas streamer. This matches purely gaseous models for G2, such as a stellar wind clump or the tidal debris from a partial disruption of a star.