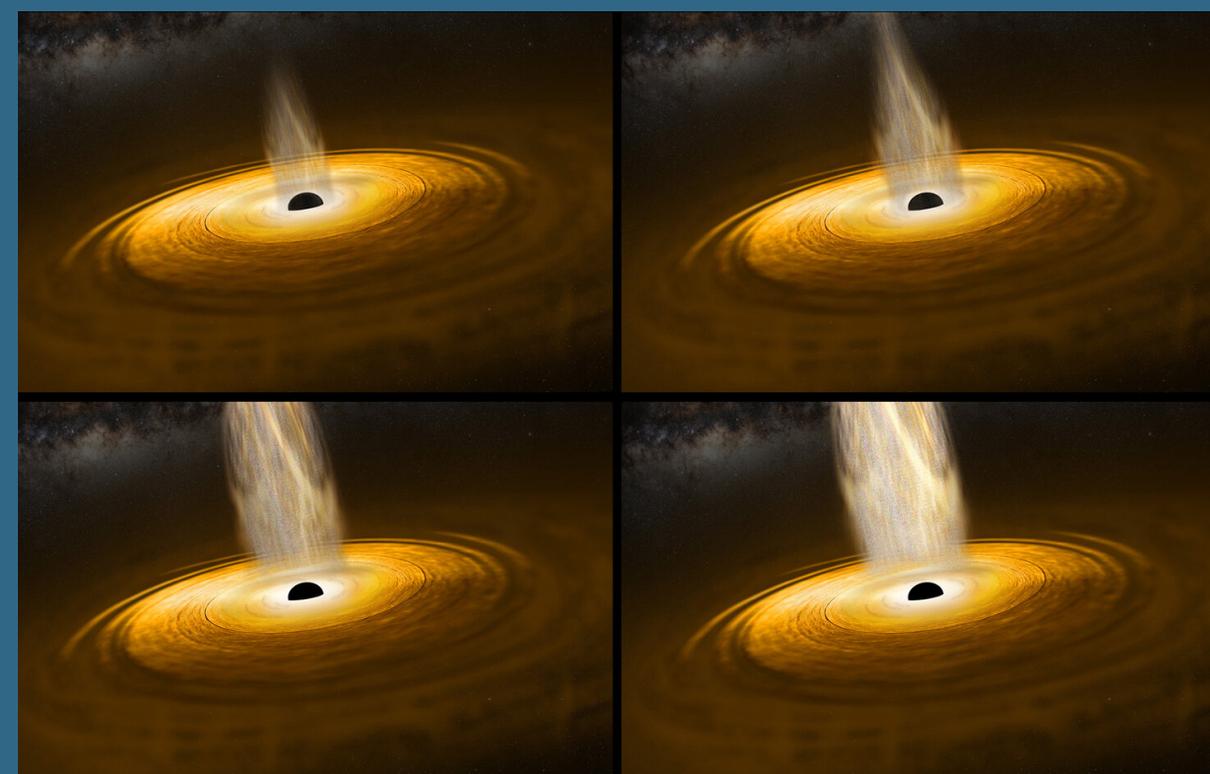


Measuring black hole properties by mapping their surroundings via X-ray light echoes



CREDIT: W. ALSTON (UNIV. OF CAMBRIDGE) / ESA

[ESA's press release](#)

[National Geographic's press release](#)

Most black holes are too small on the sky for us to resolve their immediate environment, but we can still explore these mysterious objects by watching how matter behaves as it nears, and falls into, them. As material spirals towards a black hole, it is heated up and emits X-rays that, in turn, echo and reverberate as they interact with nearby gas. These regions of space are highly distorted and warped due to the extreme nature and crushingly strong gravity of the black hole.

We have used [XMM-Newton](#) to track these light echoes and map the surroundings of the black hole at the core of the active Galaxy IRAS 13224–3809, one of the most variable X-ray sources in the sky.

As the emitting region size changes (see Figure on the left where the X-ray emitting region is depicted as a changing extended vertical region), so does the light echo. By tracking the light echoes, we were able to track this changing region and – what's even more exciting – get much better values for the black hole's mass and rotation (spin) than we could have determined if the X-ray source wasn't dynamically variable.