Unprecedented X-Ray Outburst from Blazar PKS 2005-489

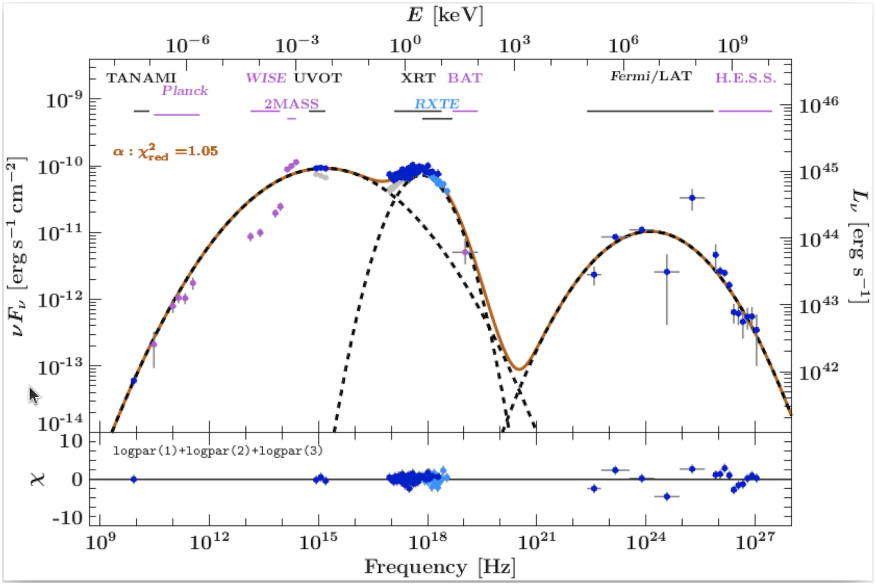
Wilder Mae Harwood, 2024

Under my Student Faculty Research Grant, I worked with Professor Fe McBride investigating and modeling a particular black hole system, PKS 2005-489, which displayed strange and inexplicable X-Ray radiation over a period of observation between 2008 and 2009.

An Active Galactic Nucleus (AGN) is a powerful black hole at the center of a galaxy. When an AGN has a jet that is pointed almost toward the Earth, that AGN is classified as a Blazar. Because of the Blazar's emission direction, we are able to measure the pulses of radiation from this kind of black hole more easily than other types of AGN. Over several decades, the output from PKS 2005-489 was recorded by several different telescopes, including NASA space telescopes Swift and NuStar.

In a previous analysis, Professor McBride noticed an unexpected concentration of X-Ray radiation on the usually standard "camel plot" used to describe these types of AGN. Camel plot refers to the two-peaked radiation produced from a black hole, where the first peak is caused by radiation from photons that are emitted from the jet, and the second peak is caused by interaction between these new photons and other particles in the jet. However, in this analysis of PKS 2005-489, an unprecedented third peak was found off the first.

I spent the summer analyzing Swift's data to see if the analysis needed stricter parameters, extracting satellite data from Swift and NuStar's multiple instruments, using the program ISIS to analyze this data, and learning how to fit complex multi-wave data with a three parabola mathematical model to create a new camel plot confirming the anomaly. I then began to learn new software called BHJet, to develop a more complex model of the system that could help determine the causes of the X-Ray irregularity. This is a project I will continue to work on as an Independent Study throughout next year.



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