Contribution ID: **79** Type: **Flash-talk**

Are jets from stellar mass black holes as fast as those from supermassive black holes?

Jets from stellar mass black holes in X-ray binaries (XRBs) and supermassive black holes in blazars provide distinct opportunities to study the jets of black holes across two different mass regimes. They also represent samples with very different selection effects. Historically, the apparent speeds of XRB jets have been observed to be lower than those of blazars, leading to the assumption that this reflects the underlying distributions of Lorentz factors, i.e. stellar mass BHs produce slower jets. In this talk, I will present our detailed modelling of the parent population for large-scale BHXRB jets, which accounts for the selection effects present in the observed sample. Using nested sampling, we determined that the Lorentz factors of the parent population of BHXRBs are best described by a power law with a slope of $b = -2.63^{+0.87}_{-1.18}$ where $N(\Gamma) \propto \Gamma^b$, the same model which has been historically applied to blazar jets. We can reject several other potential Lorentz factor distributions using Bayes factors. When comparing our findings to the parent distributions of Blazar jets documented in the literature, it is notable that we cannot rule out the possibility that both BHXRBs and Blazar jets share the same parent population Lorentz factor distribution. While other astrophysical considerations, beyond kinematics, may lead to constraints on the maximum Lorentz factor, we find no constraints on the upper limit, $\Gamma_{\rm max}$. In other words, based on kinematics alone, jets from stellar mass black holes are broadly consistent with being just as relativistic as those from supermassive black holes.

Contribution

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Session Classification: Flash-talk

Track Classification: Flash-talk