Contribution ID: **10** Type: **Talk**

New techniques for studying the real-time evolution of relativistic jets

For decades, high angular resolution VLBI observations of X-ray binary jets have been key to understanding the physics of jet launching. By precisely tracking the motions of transient jets, and thus inferring their ejection date, we can learn about the causal connection between changes in the inner accretion flow and the launching of jets. These efforts are often hindered by the difficulty of analysing observations of jets exhibiting rapid intra-observational motion and variability. We have devised a new modelling approach to study the real-time motion and variability of transient jets within a single observation. We have used this approach to study the jets launched by Swift J1727.8-1613 during its 2023 outburst. Our campaign consisted of 15 observations across North American, European and Australian VLBI arrays throughout the entirety of the outburst, including the reverse transition. In every observation, we detected either an extended self-absorbed ʻcompact'jet, fast-moving transient jet knots, or both. Using our modelling technique, we precisely measure the intra-observational motion, flux density evolution, and expansion of multiple transient jet knots. Some of these are among the most precise measurements of transient jet evolution in an X-ray binary and were constrained from only a single observation. With these new techniques, we were able to show that the ejection of transient jets occurred contemporaneously with drastic changes in the X-ray properties of the accretion inflow. We also studied the properties and evolution of the relativistic jets throughout the various phases of the outburst, including the reverse transition.

Contribution

Oral talk

Affiliation

International Centre for Radio Astronomy Research

E-mail

callan.m.wood@student.curtin.edu.au

Author: WOOD, Callan (ICRAR)

Presenter: WOOD, Callan (ICRAR)

Session Classification: Accretion-ejection (observation, theory, simulations)

Track Classification: Talk