A PanRadio view of the most powerful cosmic explosions

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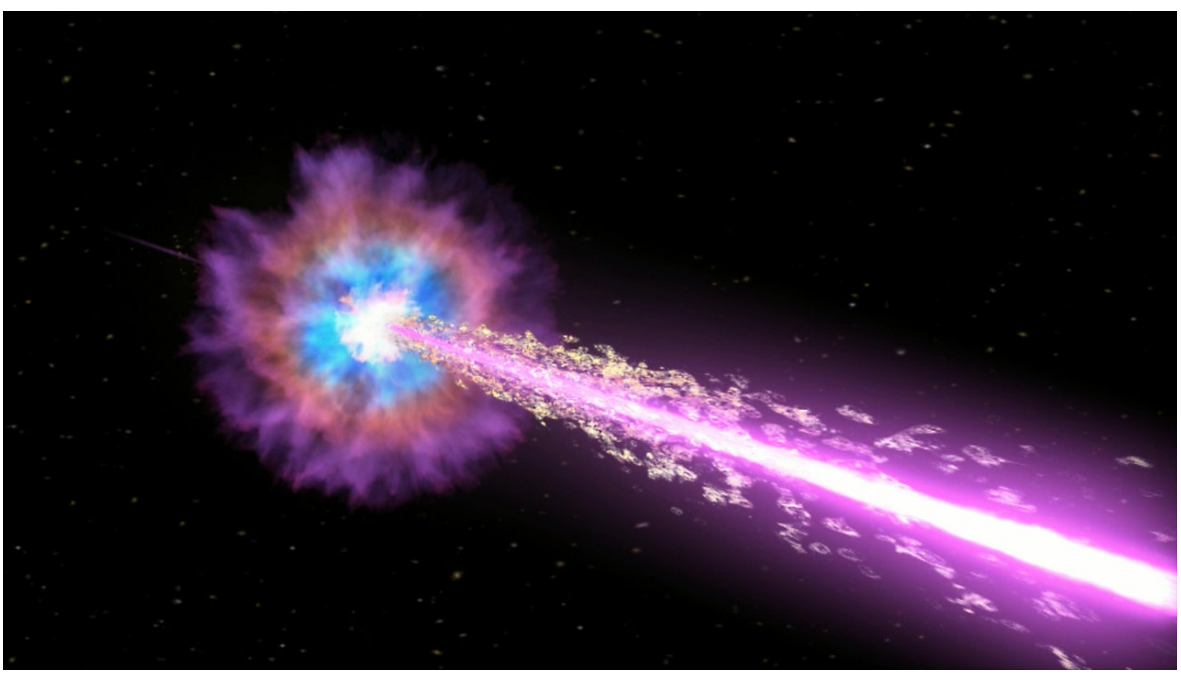
Description: Gamma-ray bursts (GRBs) are the most powerful explosions in the Universe. The bright flash of gamma-ray light is caused by the death of a massive star that forms a black hole, launching material at near the speed of light in the form of a jet. This outflow gathers up all the surrounding gas and dust, giving rise to shocks that produce an "afterglow" that is detectable from radio to very high-energy gamma rays. While GRB afterglows have been well studied from optical to gamma-ray wavelengths, only a few have comprehensive and early-time radio coverage. However, radio observations of the afterglow are crucial for understanding the physics of the jet and the lifecycle of the progenitor star. Additionally, the most interesting physics often occurs within minutes to hours of the explosion but few radio telescopes are capable of being on target fast enough to capture the earliest radio light that GRBs emit. Luckily, our International team led by the primary supervisor of this project has been awarded over 500 hours of observing time on the Australia Telescope Compact Array (ATCA) to perform radio follow-up observations of all GRBs discovered in the Southern Hemisphere skies. This is the first of a 3 year observing program called "PanRadio GRB".

The PhD candidate will have the opportunity to observe with ATCA and collect exciting radio datasets on multiple GRBs in order to explore jet physics and untangle the early-time radio properties of these powerful events as part of the three year PanRadio GRB program. They will make use of the newly upgraded "rapid-response observing mode" on ATCA to perform automated and rapid radio follow-up of all new GRBs detected with the *Swift* Burst Alert Telescope, a satellite dedicated to detecting new GRBs. On receiving an alert from *Swift*, ATCA will repoint and begin observing the GRB within minutes of its discovery, allowing us to catch the earliest radio light emitted by these powerful events. The student will help to develop data processing pipelines that will ensure the rapid dissemination of radio afterglow detections to the wider team, who have linked telescope proposals that will provide follow-up across the electromagnetic spectrum. Such a program will connect the student with International astronomers with the possibility of co-supervision through the Square Kilometre Array Office (SKAO), which will allow them to grow their own collaborations.



The black hole formed by the GRB drives powerful jets of particles traveling near the speed of light (NASA/Swift/Cruz deWilde)