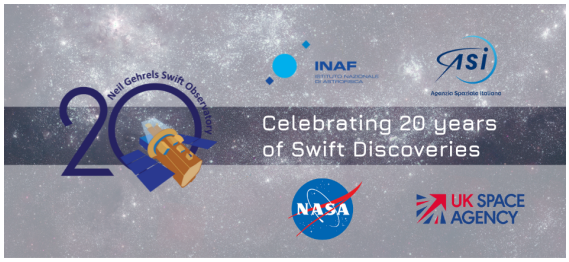

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Exploring pathways for long-duration gamma-ray bursts from compact object mergers

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In the decades following the discovery of gamma-ray bursts (GRBs) in the 1960s, an understanding emerged that there are two classes of progenitor. The short duration (<2s) bursts arise from binary neutron star mergers (confirmed by the coincident LIGO/VIRGO gravitational wave detection of GRB170817A), and the long bursts (>2s) arise from the core-collapse of massive stars. However, the recent GRBs 211211A and 230307A spectacularly defied this convention. These bursts were unambiguously long, but far away from star-formation and without supernovae. They instead showed kilonovae - explosions powered by the radioactive decay of newly produced r-process elements in an extremely neutron-rich environment, and the tell-tale sign of a compact binary merger. White dwarf - neutron star/black hole mergers have been suggested as possible channel for these long-duration merger GRBs. In this work, we combine modelling of the host galaxies of GRBs 211211A and 230307A with binary population synthesis predictions to test whether the observed locations of these GRBs are consistent with a merger involving a white dwarf, and compare predictions for the cosmological rates of binary compact object mergers with the rates of short and long GRBs.

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