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The location of BNS mergers through short GRB hosts and NGC 4993

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The concurrent detection of GW 170817 and GRB 170817A secured the connection between binary neutron star (BNS) mergers and at least some short-duration gamma-ray bursts (sGRBs), allowing us to link several aspects of the two phenomena. Among the links opened by this connection, one is between the host galaxies of sGRBs and the environment of BNS mergers. From the study of sGRB hosts we can gather information about their stellar progenitors, the redshift distribution, and their dynamics, which can then be used to inform the physics underlying the production of BNS systems. Here I present a sample of sGRBs host galaxies including the host of GW 170817 (i.e. NGC 4993), and discuss the implications for the systemic velocities of BNSs and their merger times. For each host, I reproduce the galactic potential from observations and seed synthetic binary stars in it, to then evolve their orbits and record the location of BNS mergers. This allows me to compare the actual locations of sGRBs with those expected from population synthesis, and test the requirements on natal kicks to explain the observed sGRB population. While for the whole sample the galactic potentials are parametrized through scaling relations, for NGC 4993 alone a second method is presented. For this galaxy, I use also a MUSE observation to infer rotation and velocity dispersion, which allows us to infer the galactic potential directly from kinematics and to compare it with the results from the scaling relations.

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