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Neutron stars as the progenitors & central engines of GRBs

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It has now been shown that many short GRBs also have plateau phases which are comparable to those observed in long GRBs. However, this challenges the typical short GRB progenitor model (the merger of two neutron stars or a neutron star and a black hole) as all significant accretion onto the black hole is expected to occur during the prompt emission phase. The recent discovery of massive neutron stars lends support to an alternative central engine model, a magnetar formed via the merger of 2 neutron stars. In this scenario, a plateau phase followed by a shallow decay phase is predicted due dipole radiation from the magnetar. In some cases the magnetar may be unstable and collapses to form a black hole within a few hundred seconds, giving a characteristic steep decay phase as the energy injection rapidly turns off. Additionally, magnetars can be formed via the collapse of a massive star and, therefore, could also be the central engines of many long GRBs explaining the plateaus observed in both populations.

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