Poster Abstract

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Most massive stars, if not all, are in binary configuration or higher multiples. These massive stars undergo supernova explosions and end their lives as either black holes or neutron stars. Recent observations have suggested that neutron stars and perhaps even black holes receive large velocity kicks at birth. Such natal kicks and the sudden mass-loss can significantly alter the orbital configuration of the system. Here we derive general analytical expressions that describe the effects of natal kicks in binaries on hierarchical triple systems. We explore several proof-of-concept applications such as black hole and neutron stars binaries and X-ray binaries with either stellar or Supermassive Black Hole (SMBH) companions on a wide orbit. Kicks can disrupt the hierarchical configuration, although it is harder to escape the potential well of an SMBH. Some binary systems do escape the SMBH system resulting in hypervelocity binary system. Furthermore, kicks can result in increasing or decreasing the orbital separations. Decreasing the orbital separation may have significant consequences in these astrophysical systems. For example, shrinking the separation post-supernova kick can lead to the shrinking of an inner compact binary that then may merge via gravitational wave (GW) emission. This process yields a supernova that is shortly followed by a possible GW-LIGO event. Interestingly, we find that the natal kick can result in shrinking the outer orbit, and the binary may cross the tertiary Roche limit, breaking up the inner binary. Thus, in the case of SMBH companion, this process can lead to either a tidal disruption event or a GW-LISA detection event (Extreme Mass ratio inspiral, EMRI) with a supernova precursor.