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Superradiant clouds in binaries

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Bosonic particles within a suitable mass range may form clouds around rotating black holes through the black hole superradiance process. For black holes in binary black hole systems, it has been suggested that these clouds are mostly depleted at large binary separations because of a resonant level mixing effect, and hence may not be dynamically relevant for black hole and neutron star binaries that enter the LIGO and LISA detection frequency band. In this talk, we discuss the possibility that the common envelope process during a compact binary evolution may protect the clouds from the depletion. When the binary separation further decreases due to gravitational wave radiation, we discuss the impact of non-resonant level mixing for cloud depletion, as well as possible cloud mass transfer between the binary objects. We also comment on the state of the cloud after the binary enters the frequency band of ground-based detectors.

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