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Probing Mass Loss Properties of Supernova Progenitors

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The evolution and death of massive stars and their effect on the surrounding objects is still an open question in astronomy. The type of Supernova that a star will undergo at the end of its life cycle depends on the mass-loss history of the star. Stars with similar initial mass might end up having different types of end evolution phases and die by different types of supernovae (SNe) processes. In particular, Red and Yellow Supergiant stars (RSG & YSG) begin their life with having identical masses but sometime during their evolution phase, their path to endpoint diverges. This project will address the two methods through which the mass-loss rate of massive stars is analyzed and the theoretical models that are used for the analysis. The first method is to analyze the properties of the circumstellar environment of the massive stars and study the dust content using the 2D modeling code HDUST. The second method is to investigate observations of host galaxies of ultralong GRBs (ulGRBs) and long GRBs, from two ground-based telescopes, to characterize star formation rates and investigate YSGs as a ulGRB progenitor. Such an in-depth study of mass-loss from massive stars will significantly improve our understanding of their life cycle, and the various types of supernova processes, in addition to how supernovae enrich nearby environments.

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