Contribution ID: **26** Type: **Poster**

Wind nebulae and supernova remnants of very massive stars

Tuesday 20 July 2021 13:12 (12 minutes)

A very small fraction of (runaway) massive stars have masses exceeding 60-70 $\mathrm{M}_{\odot}$ and are predicted to evolve as Luminous-Blue-Variable and Wolf-Rayet stars before ending their lives as core-collapse supernovae. Our 2D axisymmetric hydrodynamical simulations explore how a fast wind ($2000\,\mathrm{km\,s^{-1}}$) and high mass-loss rate ($10^{-5}\,\mathrm{M}_{\odot}\,\mathrm{yr}^{-1}$) can impact the morphology of the circumstellar medium. It is shaped as 100 pc-scale wind nebula which can be pierced by the driving star when it supersonically moves with velocity 20-40 $\mathrm{km\,s^{-1}}$ through the interstellar medium (ISM) in the Galactic plane. The bow shock nebulae of such runaway stars have large ($5-10\,\mathrm{pc}$) termination shocks which may be substantial cosmic-ray accelerators prior to the supernova explosion. The motion of such runaway stars displaces the position of the supernova explosion out of their bow shock nebula, imposing asymmetries to the eventual shock wave expansion and engendering Cygnus-loop-like supernova remnants.

We conclude that the size (up to more than $200\,\mathrm{pc}$) of the filamentary wind cavity in which the chemically enriched supernova ejecta expand, mixing efficiently the wind and ISM materials by at least 10% in number density, can be used as a tracer of the runaway nature of the very massive progenitors of such $0.1\,\mathrm{Myr}$ old remnants. Our results motivate further observational campaigns devoted to the bow shock of the very massive stars BD+43 3654 and to the close surroundings of the synchrotron-emitting Wolf-Rayet shell G2.4+1.4.

Keywords

Collaboration

other Collaboration

Subcategory

Theoretical Results

Primary authors: MEYER, Dominique (University of Potsdam); Mr PETROV, Mykola (Max Planck Institute); POHL, Martin (Z_THAT (Theoretische Astroteilchenphysik))

Presenter: MEYER, Dominique (University of Potsdam)

Session Classification: Discussion

Track Classification: Scientific Field: MM | Multi-Messenger