Contribution ID: **111** Type: **Oral Presentation**

The Physics of Core-Collapse Supernovae

Tuesday, 5 July 2022 12:15 (15 minutes)

The core-collapse supernovae(CCSN) can be described as an explosion that occurs when a massive star ($\sim 8 \times M_{\odot}$) dies, where $M_{\odot}$ is the astronomical symbol representing solar mass. The later supernovae(SN) explosion yields to a shock wave distribution. In this study, the computations specifically looking at the shock wave (or simply shock) distribution were performed. Hence, the Taylor Sedov solution was used together with physics related assumptions involved in simplifying the equations. This so-called Sedov solution is used to calculate the energy released in a SN explosion, the typical radius and velocity of the propagating shock. For Crab Nebula SN remnant, the energy released was found to be $\sim 1.236 \times 10^{61}\ eV$. In general, this means that the shock is approximately $10^{30}\ eV$ more powerful than a lightning bolt (that is, $6.242 \times 10^{27} eV$). Thus, the shock radius was found to be $\sim 9.556 \times 10^{16}\ m$, the meaning behind this is that the radius of the blastwave is $10^{10}\ m$ times longer than the $R_{\odot}$ (radius of the Earth). Lastly, the velocity of the propagating shock wave was found to be roughly $1.349 \times 10^{6}\ m/s$. This generally means that the shock travels with a speed close to the speed of light ($c = 3 \times 10^{8}\ m/s$).

keywords: Core-Collapse Supernovae, Taylor Sedov Solution, Supernova remnant, Blastwave, Shock wave

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary authors: Mr MKHWANAZI, Njabulo (University of Zululand); Ms MBUYISA, Busisiwe (University of Venda); Ms NZUZA, Wandile (University of Witwatersrand)

Presenter: Ms NZUZA, Wandile (University of Witwatersrand)

Session Classification: Theoretical and Computational Physics

Track Classification: Track G - Theoretical and Computational Physics