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Transient gamma rays from the 2021 outburst of the recurrent nova RS Ophiuchi

RS Ophiuchi is a recurrent nova which explodes on average every 10 or 20 years. These explosions result in nova shocks from which non-thermal particles and radiation are produced. The most recent outburst of RS Ophiuchi in 2021 has been observed by a few different gamma-ray instruments including Fermi-LAT, HESS and MAGIC. Interestingly, TeV gamma rays are only detected about two days after the detection of GeV gamma rays such that there is a delay of about two days between the peaks of GeV and TeV gamma-ray lightcurves. We study the possibility that the delay between the GeV and TeV emissions is due to the effect of gamma-ray absorption from gamma-ray interactions with optical photons emitted also during the outburst. We model particle acceleration in a nova shock to obtain the gamma-ray absorption is then analyzed using the radiative transfer equation. We found that this effect can naturally account for the delay between the peaks of GeV and TeV gamma-ray lightcurves. More precise modeling of the gamma-ray emissions, therefore, requires better knowledge on the optical emissions and a multiwavelength view is essential for gaining more insights into the process of particle acceleration around nova shocks.

Collaboration(s)

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