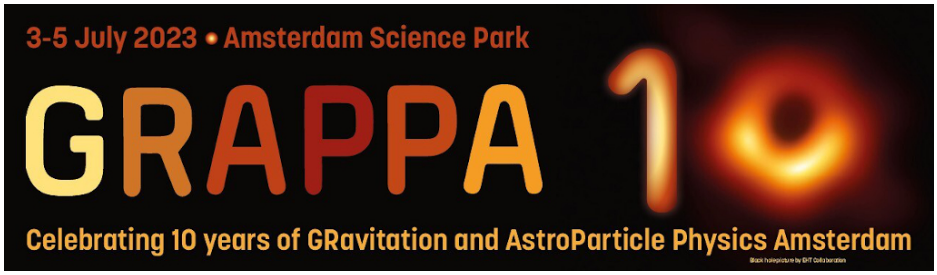

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The colliding wind binary Eta Carinae as a cosmic ray factory

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The binary stellar system Eta Carinae is one of very few established astrophysical hadron accelerators and one of only two colliding wind binary systems detected in the gamma-ray regime. At the shocks in the wind collision region, particles are accelerated beyond TeV energies. It seems likely that at least some fraction of the accelerated particles escape from the system. Copious target material for hadronic interactions and associated gamma-ray emission exists on a wide range of spatial scales outside the binary system. This material creates a unique opportunity to trace the propagation of particles into the interstellar medium. Here we analyse gamma-ray data from Fermi-LAT of Eta Carinae and surrounding molecular clouds and investigate the many different scales on which escaping particles may interact and produce gamma rays. We find that interactions of escaping cosmic rays from Eta Carinae in the wind region and the Homunculus Nebula could produce a significant contribution to the gamma-ray emission associated with the system. Furthermore, we detect excess emission from the surrounding molecular clouds. The derived radial cosmic-ray excess profile is consistent with a steady injection of cosmic rays by a central source. However, this would require a higher flux of escaping cosmic rays from Eta Carinae than provided by our model. Therefore it is likely that additional cosmic ray sources contribute to the emission from the clouds.

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