Contribution ID: **175** Type: **Poster**

Relativistic Fluid Modeling of the Gamma-Ray Binary LS5039

Tuesday, April 13, 2021 6:30 PM (5 minutes)

LS 5039 is one of the best-observed gamma-ray binaries with non-thermal emission ranging from soft X-rays to VHE gamma-ray. Explaining the observed anti-correlation between the X-ray/VHE and the HE gamma-ray bands, while accounting for its complex spectral features, has become a challenge for current modelling efforts.
We investigate this system in a wind-driven context, where non-thermal leptons are thought to be accelerated in the interaction of the stellar and pulsar wind. Numerical simulations have shown that neither the shock structure nor the downstream flow are stationary but depend on the orbital phase. They are subject to the combined effects of orbital motion and dynamical turbulence arising in the wind collision. This has an impact on the system's radiative output that was largely neglected or simplified in previous models.
We investigate this dynamical behavior with a recently developed relativistic extension to the CRONOS code. The transport of accelerated leptons is thereby solved simultaneously alongside a three-dimensional, relativistic hydrodynamic simulation of the wind-interaction. This consistent treatment allows us to fully capture the effects of fluid dynamics on the particle evolution and the subsequent phase-dependent emission of gamma-rays. Relativistic boosting and gamma-gamma absorption can be included consistently for the extended emission region.
Our model successfully reproduces the main spectral features of the LS 5039 system, further supporting the applicability of wind-driven models for LS 5039. Furthermore, we provide first insights into the impact of fluid dynamics on the radiative output of gamma-ray binaries.

Primary author: HUBER, David

Presenter: HUBER, David

Session Classification: Binaries/Galactic/Pulsars/SNR/Solar-1

Track Classification: Binaries