Talk at Splinter Meeting

Splinter I

3D Hydrodynamic Simulations of the Galactic Supernova Remnant CTB 109

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Feedback processes from massive stars play an important role for the dynamical and chemical evolution of the interstellar medium (ISM). The explosive end point of the life of a massive star as supernova (SN) is a major driver of the interstellar turbulence. The turbulence is an inherently mixing process and can yield the formation of dense structures. Consequently, the SN-driven turbulence is shaping the entire ISM. The numerical simulation of observations of SNe and its remnants can help to gain insight into the physical processes there.

We present detailed 3D hydrodynamic simulations of the Galactic supernova remnant (SNR) CTB 109, which is well-known for its half-shell morphology both in radio and in X-rays and a bright diffuse X-ray emission feature inside the SNR, called the "Lobe".

The Lobe may be the result of the interaction of the SNR shock with the inhomogeneous ambient medium. Therefore, we used as initial density structure ^{12}CO emission data, which is supplemented by an additional dense cloud, causing the Lobe, when it is shocked. For the conversion of the ^{12}CO data into a density structure *XMM-Newton* and *Chandra* data, respectively, was used.

The performed hydrodynamic simulations can reproduce the morphology and the observed size of the SNR CTB 109 remarkably well. Moreover, the simulations show that it is very plausible that the bright X-ray emission inside the SNR is the result of a shocked elliptical dense cloud. We show that numerical simulations using observational data for an initial model can produce meaningful results.