Shock-Cloud Interaction in the Young Supernova Remnants

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Abstract

In young supernova remnants (SNRs; _˜2000 yrs old), interaction between the shockwave and interstellar neutral gas is a key element in understanding the origin of cosmic rays and their high-energy radiation. Fukui et al. (2012) demonstrated a good spatial correspondence between the TeV gamma-rays and total interstellar gas in the young SNR RX J1713.7-3946. This gives one of the essential conditions producing the hadronic gamma-rays, and evidence for cosmic ray acceleration. Subsequent studies presented similar results for young SNRs HESS J1731-347 (Fukuda et al. 2014), Vela Jr. (Fukui et al. 2017), and RCW 86 (Sano et al. 2018). As regards cosmic ray electrons, Sano et al. (2010, 2013) revealed that the gas clumps associated with the SNR RX J1713.7-3946 are rim-brightened in synchrotron X-rays, suggesting that the shock-cloud interaction induces the turbulence and magnetic field amplification. Moreover, the strong turbulence also produces cosmic ray electrons with large roll-off energies (Sano et al. 2015). Similar trend is also seen in the Magellanic superbubble 30 Doradus C (Babazaki et al. 2018; Yamane et al. 2018 in prep.). In this talk, we introduce the recent results of shock-cloud interaction toward the young SNRs bright in the TeV gamma-rays and/or synchrotron X-rays.

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