

Title

Origin of density structures --- Reveal filamentary hubs in Very High-Velocity Cloud

Abstract

The origin of hierarchical density structures of the interstellar medium is still a mystery. Recently, we observed the HI emission towards a very high-velocity cloud ($|V_{\text{LSR}} > 200|$ km/s), G165 VHVC, using the FAST with a resolution of ~ 3.5 arcmin. For the first time, such a VHVC is clearly revealed to be a supersonic system of warm neutral medium (WNM) consisting of a network of velocity-coherent HI filaments. The FAST observation, along with our MHD simulation, suggests that hierarchical filaments can be established by shocks in low-density WNM, where gravity is negligible, offering a viable pathway to structure formation in the earliest evolutionary phases of interstellar medium. Guided by the FAST data, it is very likely that we can further see filamentary hubs, a special kind of filaments that are commonly seen in gravity-bounded molecular clumps, in the high-Galactic-latitude gravity-unbounded WNM under a better resolution. We want to know (1) whether the filamentary structures of VHVC maintain in pc scale in the form of filamentary hubs; (2) and whether the shock is still responsible for the hierarchical density in such scale. Inspired by these motivations, we propose to resolve the HI emission of G165 VHVC in a sub-arcmin resolution using the MeerKAT.