Plenary Talk PV XIV Fri 8:30 V53.01

Dynamical and thermal evolution of turbulent interstellar plasmas — •Dieter Breitschwerdt — Zentrum für Astronomie und Astrophysik, TU Berlin, Hardenbergstr. 36, 10623 Berlin

The evolution of most spiral and irregular galaxies is driven by star formation, and therefore depends sensitively on the physical and chemical state of the interstellar medium (ISM). Stars are formed from molecular clouds, representing a gigantic and well-controlled fusion reactor during most of their lifetime. Massive stars end their lives, however, in a catastrophic core collapse supernova event, expelling chemically enriched material into the ISM, and depositing about 10^{44} J in hydrodynamic energy. As a result, the structure of the ISM is thoroughly changed, thereby closing a feedback loop between star formation and the ISM, called the galactic matter cycle. We will show, that the ISM, despite assertions in previous decades, is distributed not into separate phases, but covers a large range of densities and temperatures. As it turns out, high Reynolds number turbulence profoundly affects the ISM state and structure. It will further be shown that the ionization structure is in general out of equilibrium, leading to a spatially and temporally varying cooling function and to emission spectra, sometimes characterized by so-called delayed recombination, which manifests itself by X-ray emission from gas with temperatures as low as 10^4 K. It is argued, that turbulence is the key to our understanding of the ISM plasma in general, and to star formation in particular, and may thus help us to solve one of the long standing problems in astrophysics.