## [IM11] Galactic Spiral Shocks with Thermal Instability

Chang-Goo Kim[1], Woong-Tae Kim[1], Eve C. Ostriker[2]
*[1]Seoul National University, [2]University of Maryland*

Using one-dimensional numerical simulations, we investigate nonlinear evolution of gas flows across galactic spiral shocks subject to interstellar cooling and heating. We model the gaseous medium as a non-self-gravitating, unmagnetized fluid, and solve its interaction with a stellar spiral potential in a local frame comoving with the spiral pattern. The initially uniform gas rapidly turns into warm and cold phases as a result of thermal instability, and forms a quasi-steady spiral shock when the spiral potential achieves its full strength. Despite abundant transient structures, the time-averaged shock profile is remarkably similar to that of an isothermal shock with temperature of 20K. The warm and cold clouds in rough pressure equilibrium in the interarm regions become even denser cold clouds immediate behind the spiral shock. Cold clouds inside the spiral arm become subsequently less dense due to post-shock expansion and enter the thermally unstable regime as they exit the arm regions. This in turn supplies warm and cold clouds to the interarm regions, and the cycle repeats. We find that the mass fraction of cold, warm, and unstable gas is roughly 0.6, 0.2, 0.2 at a given instant. The fractional times the gas spends during its galactic orbit as cold clouds inside spiral arm, thermally unstable gas in between the arm and interam regions, and two-phase clouds in the interarm regions, are 0.2, 0.2, 0.6, respectively.