densities are much denser than the model prediction. Several sources of this discrepancy, e.g., missing physical and chemical ingredients in the model such as the multi-phase ISM, non-equilibrium chemistry, and turbulence, will be discussed.

[구 IM-03] Local TIGRESS Simulations of Star Formation in Spiral Galaxies

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Spiral arms greatly affect gas flows and star formation in disk galaxies. We use local 3D simulations of vertically-stratified, self-gravitating, gaseous disks under a stellar spiral potential to study the effects of spiral arms on galactic star formation as well as formation of gaseous spurs/feathers. We adopt the TIGRESS framework to handle radiative heating and cooling, star formation, and ensuing supernova (SN) feedback. We find that more than 90% of star formation takes place inside spiral arms. The global star formation rate (SFR) in models with spiral arms is enhanced by less than a factor of 2 compared to the no-arm counterpart. This supports the picture that spiral arms do not trigger star formation but rather redistribute star-forming regions. Correlated SN feedback produces interarm feathers in both magnetized and unmagnetized models. These feathers live short, have parallel magnetic fields along their length, and are bounded by SN feedback in the lateral direction, in contrast to instability-induced feathers formed in our previous isothermal simulations.

[구 IM-04] Star formation in nuclear rings controlled by bar-driven gas inflow

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Nuclear rings are sites of intense star formation at the center of barred spiral galaxies. A straightforward but unanswered question is what controls star formation rate (SFR) in nuclear rings. To understand how the ring SFR is related to mass inflow rate, gas content, and background gravitational field, we run a series of semi-global hydrodynamic simulations of nuclear rings, adopting the TIGRESS framework to handle radiative heating and cooling as well as star formation and supernova feedback. We find: 1) when the mass inflow rate is constant, star formation proceeds in a remarkably steady fashion, without showing any burst-quench behavior suggested in the literature; 2) the steady state SFR has a simple linear relationship with the inflow rate rather than the ring gas mass; 3) the midplane pressure balances the weight of the overlying gas and the SFR surface density is linearly correlated with the midplane pressure, consistent with the self-regulated star formation theory. We suggest that the ring SFR is controlled by the mass inflow rate in the first place, while the gas mass adjusts to the resulting feedback in the course of achieving the vertical dynamical equilibrium.