## [구GC-10] Spiral Structure and Mass Inflows in Barred-Spiral Galaxies

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We use high-resolution hydrodynamic simulations to study nonlinear gas responses to imposed non-axisymmetric stellar potentials in barred-spiral galaxies. The gas is assumed to be infinitesimally thin, isothermal, and unmagnetized. We consider various spiral-arm models with differing strength and pattern speed, while fixing the bar parameters. We find that the extent and shapes of spiral shocks as well as the related mass drift depend rather sensitively on the pattern speed. In models where the arm pattern is rotating more slowly than the bar, the gaseous arms extend from the bar ends all the way to the outer boundary, with a pitch angle slightly smaller than that of the stellar counterpart. The arms drive mass inflows at a rate of ~0.5-2.5M☉/yr to the bar region to which the shock dissipation, external torque, and self-gravitational torque contribute about 50%, 40%, and 10%, respectively. About 85% of the inflowing mass is added to bar substructures such as an inner ring, dust lanes, and a nuclear ring. while the remaining 15% encircles the bar region. On the other hand, models where the arms corotate with the bar exhibit mass outflows, rather than inflows, over most of the arm region. In these models, spiral shocks are much more tightly wound than the stellar arms and cease to exist in the region where $M_\perp/\sin p_* \gtrsim 25-40$, where $M_\perp$ denotes the Mach number of a rotating gas perpendicular to the arms with pitch angle $p_*$. We demonstrate that the distributions of line-of-sight velocities and densities can be a useful diagnostic tool to distinguish if the arms and bar corotate or not.

## [구GC-11] Star Formation in Nuclear Rings of Barred-Spiral Galaxies?

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We use grid-based hydrodynamic simulations to study star formation history in nuclear rings of barred-spiral galaxies. In our previous study, we concentrated on bar-only galaxies without spirals, finding that the star formation rate (SFR) in a nuclear ring exhibits a strong primary burst at early time before decreasing to below 1 $M_\odot$/yr at late time. The rapid decline is caused by the paucity of the gas in the bar region, due to early massive gas inflows to the nuclear ring. Since star formation in nuclear rings is observed to be sustained for about 1-2 Gyr, this requires mechanisms to supply the gas to the bar regions. In this work, we study the effect of spiral arms on the radial gas inflows and related star formation in the nuclear rings. We show that spiral arms are efficient to remove angular momentum of the gas to cause significant gas inflows to the bar region, provided the patten speed of the arms is much smaller than that of the bar. The inflowing gas is added to a nuclear ring, making the ring SFR episodic over a long period of time. The time interval of multiple bursts of star formation is a few tens to hundred million years, with the mean peak SFR of ~5$M_\odot$/yr, consistent with observations of M100.