SIMULATION OF MASS TRANSPORT IN DISK GALAXIES

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The large-scale dynamics and evolution of disk galaxies is controlled by the angular-momentum transport provided by non-axisymmetric perturbances through their gravity torques. To continuously maintain such gravitational instabilities, the presence of the gas component and its dissipative character are essential.

By using 2D N-body simulations of a self-gravitating disk, composed of stars and gas, we investigate quantitatively the efficiency of the mass and angular-momentum transport and its relevance for a large-scale mass accretion rate in disk galaxies. Clouds are simulated by spheres of constant density and they have masses between 10^4 und 10^7 $M_\odot$. The hydrodynamics is based on the cloud-cloud collision model of Combes & Gerin (1985, *A&A*, **150**, 327-338) and Casoli & Combes (1982, *A&A*, **110**, 287-294)

We verify this theoretical considerations with observations. We present as an example NGC 7331. Using optical and radio observations we compare and discuss the secular redistribution of matter in the disk of this galaxy. The CO observations show an extended, torus-like accumulation of molecular gas at a radius of 4-8 kpc. The central 4 kpc of the galaxy is partly depleated from molecular gas. The position-velocity cuts along the major axis hints at the presence of an inner disk/ring structure. The optical I-band image shows deformation of the isophotes in the inner 10 arcsec which may be due to a stellar bar.

The simulation reproduce a small nuclear bar as well as the locations of the ring-like enhancement of molecular material around the turnover points. We are able to describe a possible development of the stellar and molecular disk.

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