STELLAR KINEMATICS IN STAR-FORMING REGIONS

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High-precision radial-velocity studies of four star-forming regions: λ Orionis, NGC 2264, the Trapezium cluster and Taurus-Auriga, are completed or in process (in collaboration with Latham, Marschall and Hartmann). Single-order ($\sim$ 50 Å, central wavelength 5200 Å) echelle spectra have been obtained for late-type pre-main sequence stars. Measurement errors of 0.7 - 1.5 km/sec are typical, although some stars do not permit any radial-velocity measurement due to stellar rotation or spectral peculiarities.

The global velocity dispersion of late-type stars in the λ Orionis association is 1.9±0.3 km/sec. However, the velocity field has a structure very similar to that seen in the molecular clouds and the local velocity dispersions are smaller. Indirect arguments are made that the internal motions of the OB-association itself are also of the order of 1 km/sec. The escape velocity from the region is 0.2 km/sec; clearly the stellar population of the region is unbound and will disassociate.

In the NGC 2264 region we find a velocity dispersion of 2-2.5 km/sec, depending on the sample of stars considered as members of the system. This dispersion is similar to that of the molecular gas; interesting however the stellar velocity field does not agree with the molecular gas velocity field in detail. The stellar internal motions of NGC 2264 are large when compared to older open clusters; the stellar system certainly is not in virial equilibrium and is quite possibly unbound.

The Trapezium cluster is a star-forming region with a stellar mass density of at least 3000 $M_\odot/pc^3$ (Herbig and Terndrup, preprint), as compared to 1-10 $M_\odot/pc^3$ in NGC 2264. The velocity dispersion is very similar to that in NGC 2264, with a preliminary measurement of 2.3±0.4 km/sec. In this region, however, the stellar density is sufficiently high that the stellar mass is marginally sufficient to bind itself even after the gas is dispersed.

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