The distribution function for a new sample of OH/IR stars

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Abstract. The new IRAS database of OH/IR stars (ages between 5 and 10 Gyr) show clearly different population characteristics from those used by Baud (1981) for his sample of OH/IR stars (ages under 1 Gyr) obtained by means of "blind" surveys. For the IRAS group the velocity dispersions are much higher and the z-scaleheight is larger than for Baud's sample.

Thus OH/IR stars span a range of ages and kinematical properties all the way from the youngest to the oldest stellar galactic population.

Using a quadratic programming method (Dejonghe 1989) we fit a database of Galactic orbits to the observed distribution of radial velocities, longitudes and latitudes of the IRAS sample of OH/IR stars. This sample is complete within a distance of 8 kpc. We distinguish two groups of OH/IR stars, one with high and the other with low expansion velocity of the circumstellar shell (te Lintel Hekkert 1991). The distribution functions for the two groups differ enough to suggest that they represent two different stellar populations.

The velocity dispersions in the solar neighbourhood can be used to estimate the averaged age for each group. We find 10 Gyr and 5 Gyr for each group. The ensuing ZAMS masses from these ages are $1-2$ $M_\odot$ (Iben and Renzini, 1983). Corroborating evidence for such masses is found from the luminosities for AGB stars in the bulge and disc of around 5000 $L_\odot$. The velocity dispersions and z-scaleheights derived for the older group are fairly similar to those found for the so-called thick disc . The younger group fit well within the observed kinematical properties for the so-called old disc . Thus, the IRAS sample of OH/IR stars represents an old, low mass population.

We further find that outside $\varpi \approx 2$ to 3kpc the populations contain only stars rotating in a normal, co–rotating, way around the center, but not on circular orbits. Inside to $\varpi \approx 2$ to 3kpc many more radial and counter rotating orbits occur. Towards the galactic center the older group changes its dynamical properties from a disc to a spheriodal (see also te Lintel Hekkert, 1991, chapter 2). Since, the OH/IR stars in bulge and thick disc are very similar (*e.g.* similar metallicities and luminosities) and the kinematical transition from the thick disc to the Galactic bulge is a very smooth one we conclude that the thick disc and the spheriodal bulge are closely linked and presumably the spheriodal bulge can regarded as the result of the density concentration of the thick disc towards the Galactic centre and not as a seperate dynamical entity.

References

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