The IMF of open star clusters with Tycho–2

Jörg Sanner, Michael Geffert
(Sternwarte der Universität Bonn, Auf dem Hügel 71, 53121 Bonn, Germany)

We present the stellar initial mass function (IMF) of several nearby open star clusters derived on the basis of the Tycho–2 catalogue (Høg et al., 2000, A&A 355, L27). Tycho–2, computed from the original Tycho catalogue (ESA, 1997, SP–1200) and ground based first epoch data, provides positions, stellar proper motions, and B_T and V_T photometric data.

With the help of the proper motions, we distinguished between the members and non-members of the clusters; from the stellar magnitudes we derived the initial stellar masses.

Since the catalogue becomes incomplete around $V_T = 11$ mag, we were restricted to a small magnitude (and hence mass) interval, so that we chose to study nearby ($(m-M)_0 \leq 7.5$ mag) open star clusters with — according to Robichon et al. (1999, A&A 345, 471) — a clear separation of field and cluster proper motions, restricting our sample to 8 objects.

The IMF computed from $m \approx 1M_\odot$ up to the main sequence turn off point could be well represented by power laws with exponents from $\Gamma = -0.85$ to $\Gamma = -2.36$ (when Salpeter's (1955, ApJ 121, 161) value is $\Gamma = -1.35$). Within the errors (which are comparably high for some of the objects due to their low numbers of members), this is in good agreement with the range of IMF slopes as given, e.g., by Scalo (1998, ASP Conf. Series 142, 201).

Regarding upcoming missions of astrometry satellites (FAME, DIVA, GAIA), this kind of IMF study based on a uniform all-sky data sample will play a more important role in the future: The limiting magnitudes of these instruments will be fainter, proper motions will be available for all detected objects (in contrary to, e.g., the HIPPARCOS catalogue, the proper motions of which were determined for the stars of an input catalogue only) and will become independent of ground based observations, so that their quality will be higher.