THE K-BAND LUMINOSITY FUNCTION

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Investigations of broad band energy distributions of specific classes of sources requires homogeneous samples of a sufficiently large number of objects. Deep and homogeneous surveys in those energy ranges which are accessible to satellites only are rare. One such a field in the north ecliptic pole (NEP). The ROSAT and IRAS whole sky surveys and deep additional observations by other satellites make the NEP the region of the deepest mid-IR and X-ray observations. We performed complete surveys in three optical/IR colors at 460 nm, 700 nm, and 2.1 μm (B, R, and K') within a one square degree field around the NEP. Limiting magnitudes in the three bands are 23, 24, and 19, respectively. The optical bands are observed with sufficient spatial sampling to classify extended and point sources. Down to levels which still correspond to high completeness limits we detect 80.000, 240.000 and 25.000 sources in B, R, and K', respectively.

From these surveys we derive the luminosity function and color luminosity relation in the near-IR regime from a sample of sources which is much larger than those used previously. In addition we also study the spatial correlation function of near-IR bright sources. Image classification is carried out with the optical frames down to 22nd magnitude.

We compare our K' band LF to that of Gardner et al. (ApJ 415, L9, 1993), who derived a LF over 12 magnitudes from several surveys of different depths and field sizes, which were, however, taken at different galactic latitudes. They clearly demonstrate that the LF displays a break at K'=16.8 where the average B-K colors are largest. From our survey we find that the break of the LF and its slope at the bright side depends crucially on the separation of point sources. In the brighter part the point sources are exclusively stars. The fraction of point sources increases for redder objects (B-K>5). This indicates, that the shape of the K' LF should not be derived from ensembles of data taken at different galactic latitude unless a clear separation of stars and galaxies is possible.

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