Near Infrared Survey of the Nuclear regions of the Milky Way

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In the recent past there have been several NIR surveys e.g. DENIS, 2MASS etc. Due to poor spatial resolution these surveys suffer from confusion and hence lack depth in the high number density nuclear regions of the Galaxy. Using DENIS data, Schultheis et al., (A&A 1999) prepared a map of the interstellar extinction (fig 1) for the inner Galactic Bulge and reported extinction Av > 25 mag with a clumpy, inhomogeneous nature. However, the J band data in DENIS is incomplete in this region of high extinction. A large number (> 70% in some directions) of K_S sources do not have counterparts in I and J in DENIS (fig 2). The situation has not much improved with the availability of 2MASS data.

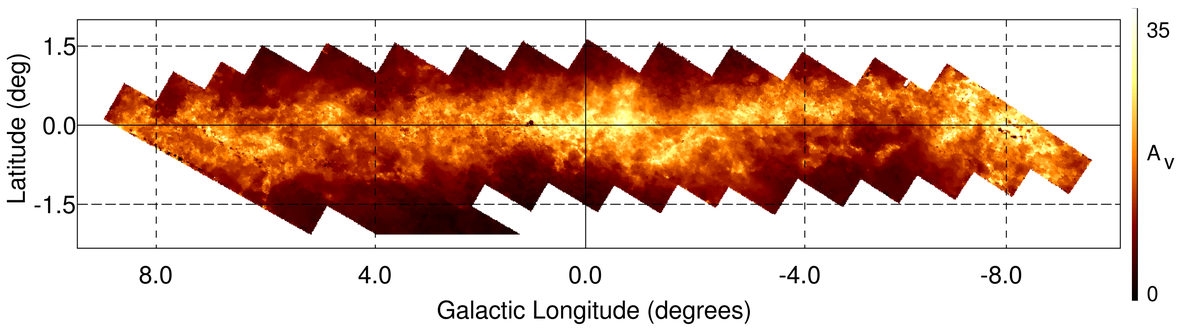


Fig 1. Map of the interstellar extinction towards the inner Galactic Bulge derived from DENIS data.

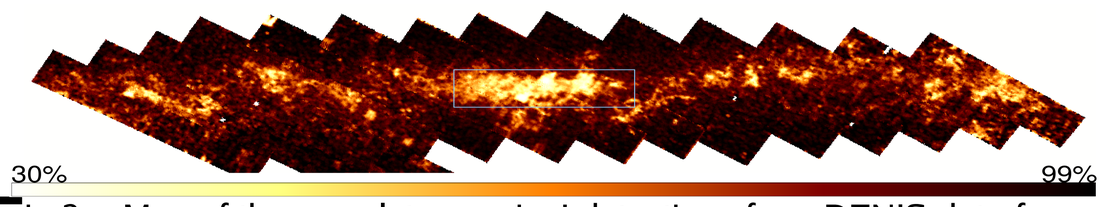


Fig 2. Map of the completeness in J detections from DENIS data for same area as shown in Fig 1.

To overcome these problems, and to gain a better understanding of the distribution of stellar populations in the nuclear bulge region, we carried out a deep imaging survey in J, H and Ks bands with particular emphasis on the fields covered by the ISOGAL survey at 7 and 15 microns. The deep imaging survey in J, H and Ks bands was carried out using the IRSF telescope at SAAO, Sutherland during June-July 2002. This survey is about 2.5 magnitudes deeper compared to DENIS and 2MASS and is able to detect stars of the red clump at a distance of the Galactic Center. The survey covers the inner ~300 pc of the bulge region within |l|~1.5deg and |b| ~0.5 deg plus a few directions at higher galactic latitude on the minor axis.

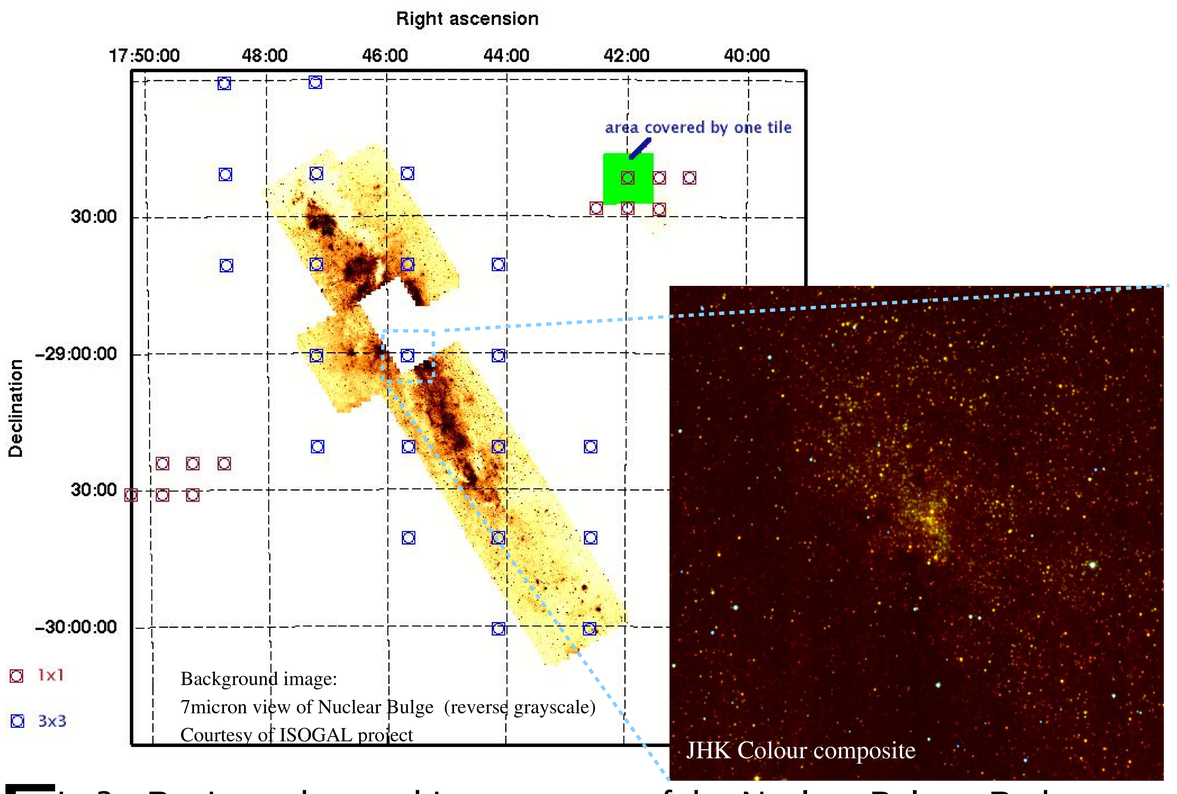


Fig 3. Regions observed in our survey of the Nuclear Bulge. Red squares are single pointings (8'x8'), blue squares are centers of 3x3 pointings. A colour mosaic view of the tile towards the Galactic Center is at bottom right. Note that this is in equatorial coordinate frame while the previous figures were in galactic coordinate scales.

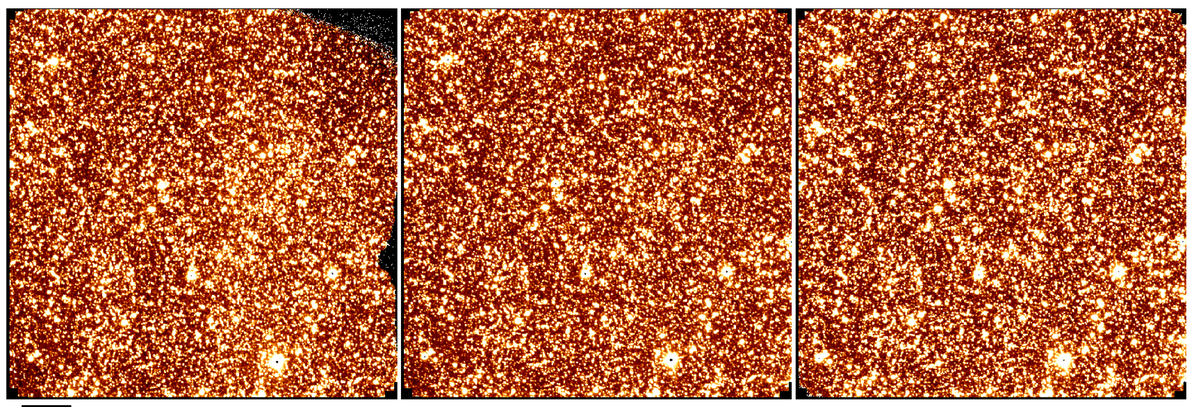
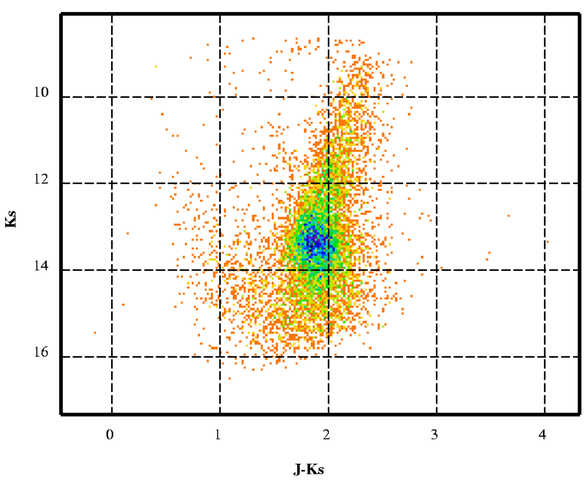


Fig 4. J (left), H(center) and Ks(right) frames from the SIRIUS camera towards (l=0,b=1; marked by green square in Fig 3). Over 15000 sources detected in ~8x8' with 5 sec integrations!

Fig 5. Colour Magnitude diagram (J-Ks vs Ks) constructed from the stars detected in the images of figure 4. This CMD is colour coded for number density of sources in colour and magnitude bins. With 5 sec integrations we reach a level of completeness of Ks fainter than 15 mag towards this region. The extinction is relatively uniform (Av~6) over the entire field as can be seen by the well defined red giant sequence. Also prominent is the red clump at Ks~13.



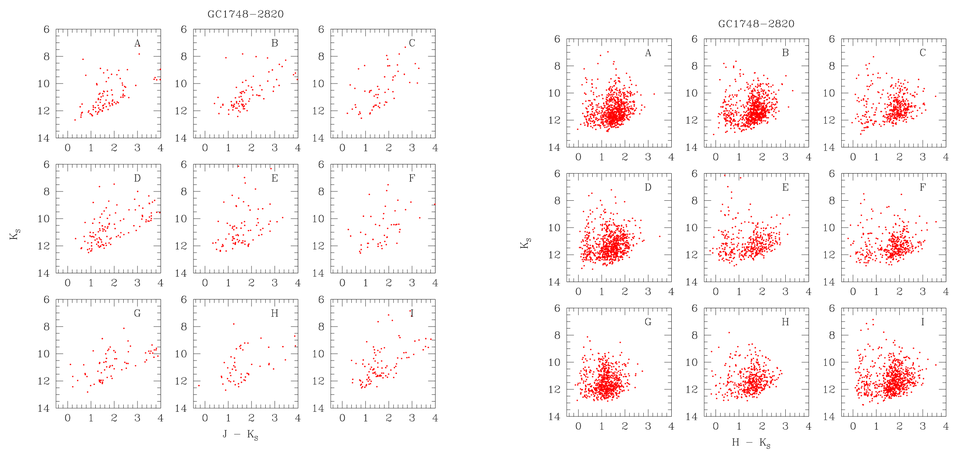
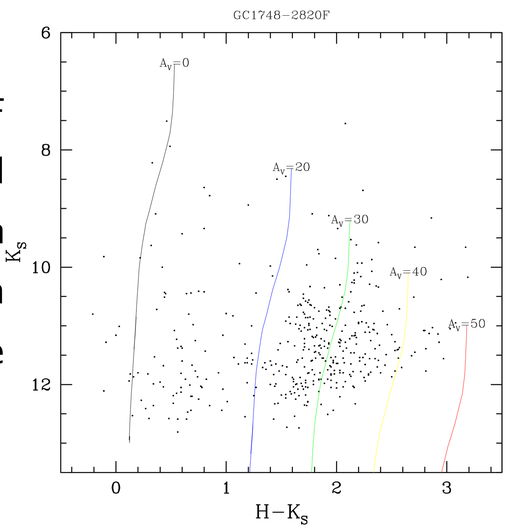


Fig 6. Colour magnitude diagrams J-Ks vs Ks (left) and H-Ks vs Ks (right) for 9 locations around (RA=17:48, DEC=-28:20). Note the much larger number of sources detected in both H and Ks than those detected also at J. These CMDs are from 0.1sec integrations and already provide results comparable to those from DENIS: towards this region we derive extinction values of Av in the range 15 to 20 mag from J-Ks vs Ks as compared to DENIS' value of Av~20mag.

Fig 7. H-Ks vs Ks for GC1748-2820F where we have over plotted the red giant isochrones at different Av ranging from 30 to 50 mag. With the longer integration data we estimate to accurately quantify the extinction to much deeper values.



Final products to be published shortly : 1. Catalog of ~ 3 million sources with extinction and stellar population identification. 2. Extinction map towards the Nuclear Bulge.

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