# The UKIDSS Early Data Release

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The first release of data from the UKIRT Infrared Deep Sky Survey (UKIDSS) took place on 10 February 2006. The data are proprietary to astronomers in ESO states, for 18 months, before release to the world. This Early Data Release (EDR) comprises mostly data observed in May and June 2005. Although the EDR represents a very small fraction of the complete UKIDSS 7-year plan, it is already large compared to existing surveys, and will be valuable for science exploitation.

UKIDSS has been covered by two previous articles in The Messenger. The first (Warren 2002) described the goals and the design of the surveys (depths, areas, fields – which have since changed somewhat). The second (Lawrence and Warren 2005) explained how to obtain data that have been released, from the WFCAM Science Archive (WSA) i.e. the registration process. We briefly review this information, and then give an overview of the contents of the EDR.

UKIDSS is an ESO public survey programme, and comprises five large near-infrared surveys, that together will collect about 100 times as many photons as 2MASS, and survey about 20 times the volume. The UKIDSS programme is set out in detail in Lawrence et al. (2006) (see also *http://www.ukidss.org*). The surveys are currently focused on achieving a set of goals to be reached before the end of 2007, the '2-year plan'. The three extragalactic surveys cover complementary combinations of area and depth, running successively deeper from the Large Area Survey (LAS), which is contained within the SDSS footprint, through the Deep Extragalactic Survey (DXS), to the Ultra Deep Survey (UDS). There are two more wide, shallow surveys targeting areas of the Milky Way; the Galactic Plane Survey (GPS) and the Galactic Clusters Survey (GCS). The surveys use the UKIRT Wide Field Camera (WFCAM), the world's most powerful camera-and-telescope combination for near-infrared surveys. Each survey uses some or all of the broadband filter set *ZYJHK*. The photometric system is described by Hewett et al. (2006), who also provide synthetic colours of a wide range of stars, galaxies, and quasars.

UKIDSS data releases are made available at the WSA *http://surveys.roe.ac.uk/wsa*. Any astronomer at an institution in an ESO member state may access the data as soon as it is released. Because ESO astronomers have proprietary access to the data for 18 months, there is a system of registration, which is explained in Lawrence and Warren (2005). Responsibility for the registration process is devolved to volunteers who act as the 'community contact' for an institution. A list of institutions with community contacts is maintained at *http://www.ukidss.org/archive/archive.html*. Astronomers who wish to be registered and who have a community contact should ask their contact to provide a username and password. Those without a contact need to find a volunteer, who should then follow the instructions at the above link.

## The contents of the EDR

Details of the contents of the EDR are provided in Dye et al. (2006), including a summary of the results of the quality control (QC) procedures. The paper also includes relevant background information, sufficient to understand the characteristics of the data, including details about WFCAM, and the data-reduction pipeline, as well as a guide to exploiting the WSA.

A bare summary of the contents of the EDR is provided in Table 1 which lists area covered, and mean depth (5σ, Vega), by filter, for each survey. In good conditions the shallow surveys LAS and GCS, use 40 s integration per band, so the depths are similar, but depend on seeing, sky brightness, and transparency. The GPS uses 40 s in *K* and 80 s in *J* and *H*. We have not attempted to define the depth for the GPS because crowding means that it is difficult to assess, but nominally it is quite similar to that for the LAS and GCS. With the UDS, which covers a single tile (4 WFCAM pointings), 0.8 sq degs, the depth will steadily accumulate, and in any band at any time is defined by a single number (although there are slight variations over the field due to variable q.e. of the detectors). The DXS, on the other hand, is made up of tens of tiles, each accumulating depth at a different rate. A range of depths is therefore quoted for the DXS.

Figure 1 illustrates some of the EDR data. The two plots are the *YJK* and *JHK* two-colour diagrams for all the stellar sources in the LAS, plotting objects detected at S/N > 15. Overplotted is the sequence of synthetic colours of stars from the BPGS atlas, computed by Hewett et al. (2006).

The progress of the surveys, and a comparison against 2MASS, is made in an interesting way in Figure 2. For sky-limited observations in the *K*-band, the time to reach depth *K* is proportional to $10^{(0.8\,K)}$. One can therefore think of the quantity area × $10^{(0.8\,K)}$ as being proportional to the number of photons collected. A related argument, for Euclidian space, leads to the conclusion that the quantity area × $10^{(0.6\,K)}$ is proportional to the volume surveyed. By multiplying by the number of filters, and then normalising to the

| Survey | Area (sq degs) | Filter | Depth | Frac. 2-yr plan |
|---|---|---|---|---|
| LAS | 28.2 | *Y* | 20.2 | 0.014 |
| | | *J* | 19.5 | |
| | | *H* | 18.7 | |
| | | *K* | 18.1 | |
| GPS | 7.2 | *J* | | 0.009 |
| | | *H* | | |
| | | *K* | | |
| GCS | 15.4 | *Z* | 20.3 | 0.043 |
| | | *Y* | 19.9 | |
| | | *J* | 19.4 | |
| | | *H* | 18.8 | |
| | | *K* | 18.1 | |
| DXS | 2.4 | *J* | 20.9–21.7 | 0.072 |
| | | *K* | 20.2–20.6 | |
| UDS | 0.8 | *J* | 22.3 | 0.044 |
| | | *K* | 21.1 | |

**Table 1:** Summary of EDR depths and areas for the five surveys, and fractional completeness of the two-year plan. Depths are not quoted for the GPS, as noted in the text. The EDR includes data with seeing > 1″, whereas most survey-quality (i.e. DR1) data should be better than this. Therefore the depth achieved in DR1 may improve slightly over EDR.

2MASS values, we can compare the size of the EDR against 2MASS in terms of photons and volume. The results are plotted in the figure. Summing over the surveys we see that the EDR is about as large as 2MASS in terms of photons collected. Also shown are the two-year goals, i.e. where UKIDSS aims to be by the end of 2007. The final column in Table 1 shows the fractional completion of the two-year plan in terms of photons, by survey.

Within UKIDSS we consider the EDR to be a small prototype sample, provided to the community as a stepping stone towards the goal of prompt release of survey quality data. The data have passed a set of QC procedures. Some details of the pipeline (including treatment of artefacts) and QC procedures are still being refined, in preparation for the first large release of survey-quality data in the summer of 2006, called Data Release 1 (DR1, we have copied the SDSS nomenclature). We would expect most, but not all, of the EDR to satisfy our final survey QC procedures.

As explained in Dye et al. (2006) the EDR release includes all fields observed, that pass QC, and where the full filter complement exists. There is an additional database included in the release, but in the background, called EDR+. This contains fields that pass QC, but where the filter complement is incomplete. The paper contains an explanation of how to access the EDR+ database as well.

The DR1 release is scheduled to take place this summer, and will be an order of magnitude larger. We will provide a similar paper, and Messenger article, to accompany the release.

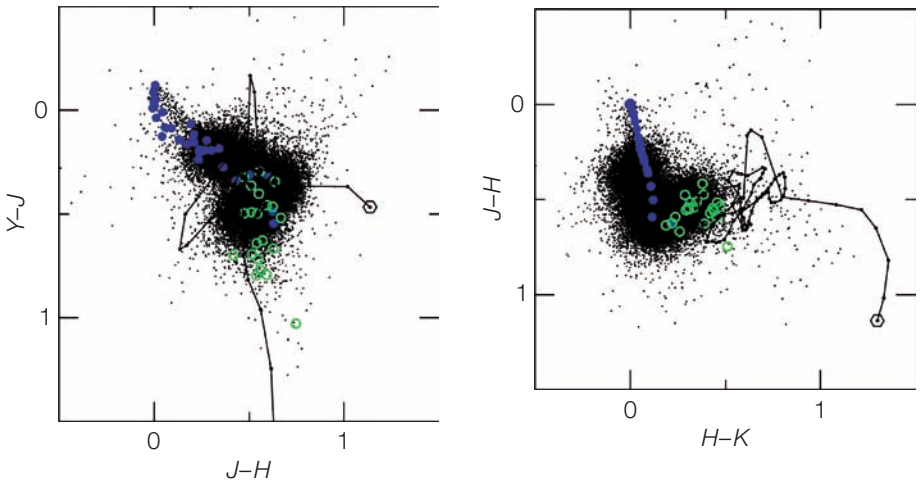


Figure 1: Two-colour diagrams for stellar sources, with colour errors on each axis < 0.1 in the LAS portion of the EDR. The large blue symbols show the synthetic colours computed from the BPGS atlas by Hewett et al. (2006), the large green symbols mark the computed colours of M stars, and the black track shows the predicted colours of quasars $0 < z < 8$, at intervals of $z$ of 0.1, with $z = 0$ marked by the hexagon. There are some 80 000 points in each plot. The nature of the small fraction of outliers has not been checked yet in detail, and many may be spurious.

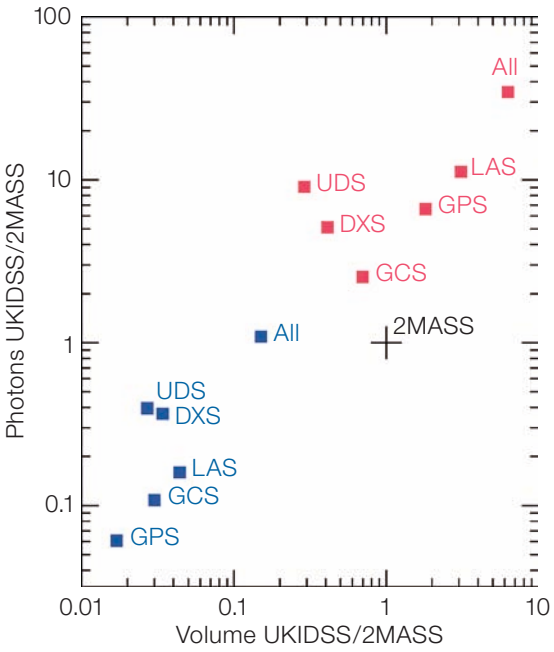


Figure 2: Comparison of the UKIDSS EDR (blue symbols) and two-year plan (cerise symbols) against 2MASS, in terms of number of photons detected, and volume surveyed, computed as described in the text.

## References

Dye S. et al. 2006, MNRAS, submitted
Hewett P. C. et al. 2006, MNRAS, in press
Lawrence A., Warren S. J., Almaini O. 2006, MNRAS, submitted
Lawrence A., Warren S. J. 2005, The Messenger 119, 56
Warren S. J. 2002, The Messenger 108, 31