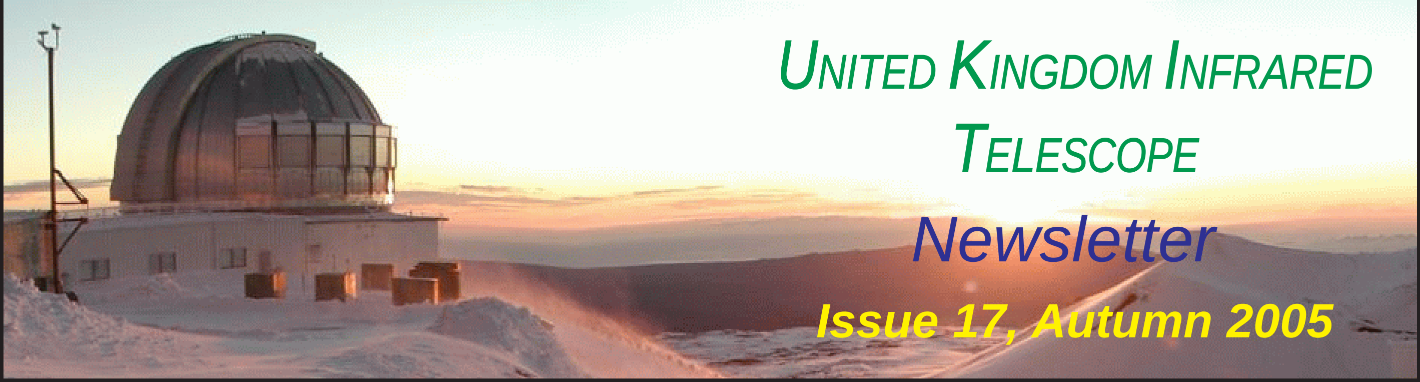


UNITED KINGDOM INFRARED TELESCOPE

Newsletter

Issue 17, Autumn 2005

top end

Deep Impact

Sometimes astronomy throws up an event of such extraordinary excitement that it commands the interest of not just the astronomers directly involved but the whole astronomical community, and also grabs the attention of the general public. In the USA at least, this was very obviously the case with the Deep Impact mission, reported on in this issue. The UCL observing team came extremely well prepared and did a fine job, and Paul Hirst and Tim Carroll can be proud of their support of a once-in-a-lifetime programme under a great degree of pressure to get it right.

WFCAM and UKIDSS

Since the previous newsletter, we have been through one complete cycle of WFCAM operations – carrying out the Feb-March Cassegrain observing block, reinstalling WFCAM on the telescope, recommissioning and undertaking UKIDSS science verification, and then completing the 05A Cassegrain observing before resuming wide-field observing at the end of August. The ETS group have reduced the turnover time between the two modes; it is now settled at three nights of downtime, and the forward-look schedule (which calls for blocks typically of three or four months in duration) should be reasonably efficient. Tilt of the WFCAM focal plane proved to be a significant problem but the most recent iteration has reduced it to a level which can be accommodated with a secondary displacement which will not result in any significant collateral aberrations.

The quality of the data which UKIDSS can expect to be dealing with is apparent in the images seen on the front page and in the UKIDSS SV article in this newsletter. Organizational issues with scheduling the UKIDSS 2-year plan are being worked out with the benefit of experience gained in May and June, and the performance of the camera in conjunction with the telescope has been improving consistently since April; efficient survey operations are anticipated through until the switch back to Cassegrain at the start of 06A in February.

Strategic Review

The strategic review of UKIRT, being carried out by an independent panel of international experts chaired by Richard Ellis, will shortly produce its report. Many of those who have benefited from UKIRT data and contributed to its success over the past decades took part in a community discussion meeting at the NAM in Birmingham. We are grateful to all those who attended and contributed to a compelling discussion, in which a wide range of possible future directions were put forward for consideration. In June, the panel toured the Hilo and Summit facilities and saw in some detail the current state of UKIRT operations; all of this has provided a good deal for the Panel to deliberate over and their efforts are greatly appreciated.

Andy Adamson

Head of UKIRT Operations, Director of Science

stop press !

Deep Impact: UKIRT tells NASA “You hit it!”

On July 4, the *Deep Impact* mission aimed a dustbin-sized block of copper at a nearby comet, known as 9P/Tempel-1. For a couple of anxious minutes around 7:52pm Hawaii Standard Time - 05:52 UT - NASA’s Jet Propulsion Laboratory in Pasadena waited with bated breath for news that they had struck home. That news came from the United Kingdom InfraRed Telescope (UKIRT), on the top of Mauna Kea, Hawaii.The UKIRT observing team (Figure 1), led by Professor Steve Miller, comprised Dr Tom Stallard and Bob Barber, from University College London (UCL), and Dr Paul Hirst and Tim Carroll, from UKIRT. UKIRT had done an amazingly good job at detecting the impact. Impact Time was supposed to have been at 05:52 UT, and sure enough, just a few seconds after this time, the telescope’s fast guider camera detected a flash as the impactor struck home (Figure 2)!

Prof. Miller noted afterwards that there had been a moment’s confusion as someone from another observatory came onto the observing telecommunication network (the “telecom”) and said impact had been delayed. The UKIRT team looked at the guider and saw immediately that this was impossible - the comet had suddenly become so bright.

The team immediately got onto the telecom and reported to NASA and the other observers around the world that impact had occurred, and had occurred on time. The comet had doubled in brightness in the course of just over a minute, and it continued to brighten steadily for the next hour.

The purpose of the Deep Impact mission was to improve our understanding of what comets are made of and how they behave. The impactor was designed to punch a hole through the outermost crust, and create a crater ~100 metres across. The whole process was observed by the cameras onboard the main spacecraft, as well as by telescopes around the world.

UKIRT’s camera picked up the initial explosive flash of impact, plus a jet of hot gas which streamed back out of the hole punched by the impactor for about 70 seconds. Then the rock, ice and dust created by the actual cratering process itself took over, as sunlight was reflected back off the newly created debris. The UKIRT observations showed that material from the crater flew away from the comet into space at around 300 metres per second.

Figure 1: *Photo of the project team; Steve Miller, Tom Stallard and Bob Barber, with UKIRT Telescope System Specialist Tim Carroll in the background. (Paul Hirst is behind the camera!)*

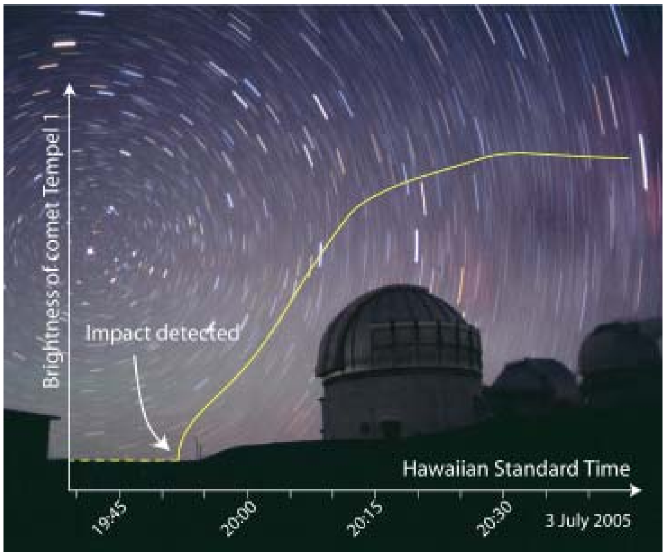
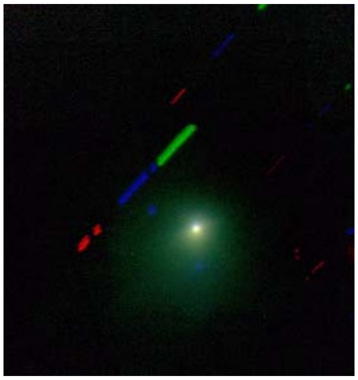


Figure 2: *The light-curve obtained from the UKIRT fastguider, showing the sudden brightening of the comet at impact, followed by the gradual increase in intensity of the comet as the plume of ejected material spreads out into space from the impact site. The graph has been superimposed onto a time-lapse photograph of UKIRT showing the background stars circling the pole star as the earth rotates (image coutesy of Douglas Pierce-Price and Nik Szymanek).*

UKIRT also took several spectra of the gases formed after the impact using the CGS4 spectrometer. These are currently being analysed at UCL, but almost certainly show that water vapour was formed from the ice melted by impact. Information from the spacecraft and ground-based observatories around the world are being combined to maximise the scientific return from the missions. Prof. Miller and his team agreed that there’s still an awful lot more for us to get out of this exciting event.

Information, images and videos from the Deep Impact mission can be found at:http://deepimpact.jpl.nasa.gov/home/index.html



As part of UKIRT’s preparations for Deep Impact, staff members Chris Davis, Tom Kerr and Thor Wold took a quick look at the comet a week or so before impact. This UFTI image comprises short exposures taken in J, H and K-band filters. (See the on-line version of the Newsletter for a colour representation.)

FRONT COVER ILLUSTRATION: One of the first Images from the UKIDSS Science Verification observations of Spring 2005. This JHK composite image of M51 - The Whirlpool Galaxy represents data from just one of WFCAM’s four arrays. Data processing by Mike Irwin, Cambridge Astronomical Survey Unit.

science news

UIST: Leading the way with IFU observations of Submillimetre Galaxies

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The study of submm-luminous galaxies (SMGs), first discovered using SCUBA on the JCMT (Smail, Ivison & Blain 1997), has progressed rapidly in the last two years with the combination of deep optical imaging from HST (Chapman et al. 2003a; Smail et al. 2004), deep X-ray imaging and spectra (Alexander et al. 2005), UV and near-IR spectroscopy from 10-m telescopes (Chapman et al. 2003b, 2005; Swinbank et al. 2004), and the subsequent follow-up in rotational CO emission lines to probe the state of the molecular gas (Neri et al. 2003; Greve et al. 2005). From these observations, we are beginning to understand the processes which trigger the immense bolometric luminosity output in these galaxies, allowing us to address their true contribution to the star-formation rate history of the Universe.

To probe the dynamical structures of these frequently complex systems requires a reliable separation of the spatial and spectral information. The UIST IFU is an ideal tool to accomplish this task. 2-D spectroscopic maps from UIST allow us to trace the dynamical and structural properties of SMGs on scales of a few kpc, pin-point the sites of active star formation and identify non-thermal emission from active galactic nuclei (AGN). These observations allow us to directly understand the rapid evolution of SMGs, testing the claims that far-infrared luminous galaxies comprise merging systems which are likely to be the progenitors of local massive ellipticals, or whether instead they are simply high-luminosity episodes in the history of less massive galaxies.

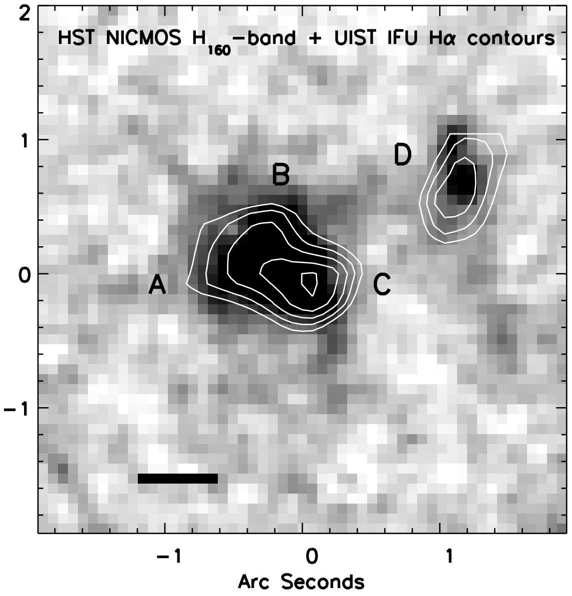

Figure 1: *An HST image with UIST IFU contours overlaid showing the distribution of Hα emission in ELAIS N2.850.7*

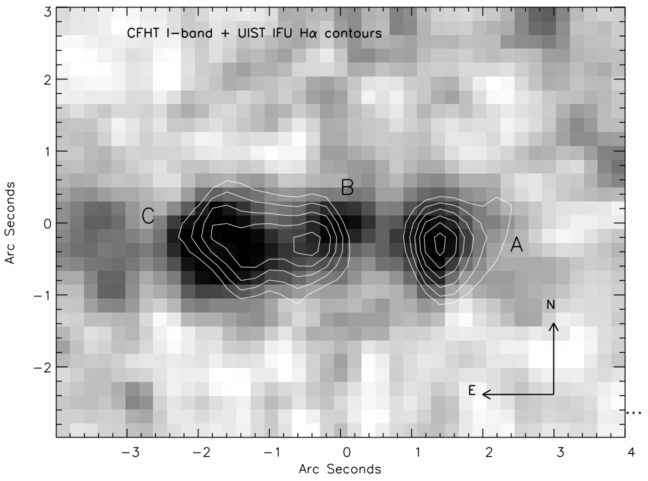

Figure 2: *A comparison of the Hα emission from the UIST IFU with CFHT I-band imaging of SA22-96.*

Seven SMGs were identified as bright submm/mm sources from various survey fields, with radio counterparts (Chapman et al. 2002; Ivison et al. 2002; Greve et al. 2004) providing precise positions which enabled spectroscopic redshifts to be procured from Keck LRIS and NIRSPEC observations (Chapman et al. 2005; Swinbank et al. 2004). In addition, three sources selected at 24 microns with the Spitzer Space Telescope were followed up as galaxies with potentially comparable bolometric luminosity to the SMGs, from the surveys of Yan et al. (2005) and Borys et al. (2005). All ten of these targets were observed with the UIST spectrograph using the HK grism and exposure times of 2-8 hours each. All targeted sources yielded detections in the Hα (and sometimes [OIII] 5007) emission line, at the targeted radio position and in most (7/10 cases) additional components were identified offset spatially from the radio/submm position (Swinbank et al. 2005, 2006). *The observations represent a triumph of efficiency for the UIST spectrograph, given that all spectroscopic studies to date of these galaxies have been conducted with 10m-class telescopes.*

Deconvolving the exact contributions from the star formation and AGN activity within these galaxies is difficult using just the UV slit spectroscopy from Chapman et al. (2005). Ideally we need to use the well-developed spectral indicators based on rest-frame optical emission lines (Veilleux & Osterbrock 1987) falling in the near-IR for these high-redshift galaxies. Coupling the spatial coverage from the UIST IFU with coverage around the rest-frame optical emission lines allows us to locate and isolate the components hosting the AGN in these systems, determine dynamical masses, and search for extended halos and/or companions.

The UIST observations have enabled the remarkable discovery that many, potentially the majority, of the SMGs reveal additional kinematic components and extensions. These companions exhibit luminous Hα emission, indicative of star formation in excess of 100 M$_o$/yr, in structures up to ~20 kpc from the submm burst. Figures 1-3 illustrate several examples of SMGs surveyed in our UKIRT/UIST program (from Swinbank et al. 2005, 2006), all exhibiting multiple and extended structures on the scale of the UIST field of view (~5 arcsec, ~40 kpc). With typical component velocity separations of ~300 km/s, our estimates for the dynamical masses of the systems (assuming the components are in a state of merging free-fall) are of order 5x10^{11} M$_o$.

These observations provide clear support for the proposal that SMGs represent merging/interacting systems with high instantaneous star formation rates and actively fueled AGN. The multi-component nature of these galaxies indicates that they may be analogous (but scaled up) versions of local Ultra-Luminous

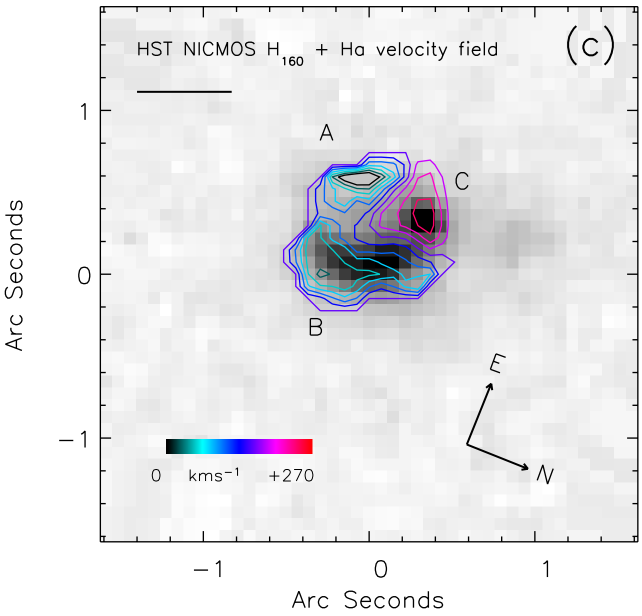

***Figure 3:** An HST image with UIST IFU data overlaid as contours, illustrating the Hα velocity field across ELAIS N2.850.4 (Swinbank et al. 2005).*

infrared galaxies. Furthermore, the velocity offsets and line widths from the resolved components in these galaxies are consistent with those seen in local luminous ellipticals, furthering the case that these sources represent the most active formation phase in massive galaxies.

Acknowledgments: We thank Andy Adamson, Thor Wold and Tim Carroll for their superb support with this program.

REFERENCES:

Alexander, D., et al. 2005, Nature, 434, 738
Borys, C., et al., 2005, ApJ, in press
Chapman, S., et al., 2002, ApJ, 570, 557
Chapman, S., et al., 2003a, ApJ, 599, 92
Chapman, S., et al., 2003b, Nature, 422, 695
Chapman, S., et al., 2005, ApJ, 622, 772
Greve, T., et al., 2004, MNRAS, 354, 779
Greve, T., et al., 2005, MNRAS, 359, 1165
Ivison, R., et al., 2002, MNRAS, 337, 1
Neri, R., et al., 2003, ApJL, 597, 113
Smail, I., Ivison, R., Blain, A., 1997, ApJ, 490, L5
Smail, I., et al., 2004, ApJ, 616, 71
Swinbank, M., et al., 2004, ApJ, 617, 64
Swinbank, M., et al., 2005, MNRAS, 359, 401
Swinbank, M., et al., 2006, MNRAS, submitted
Veilleux, S., Osterbrock, D., 1987, ApJS, 63, 295
Yan, L., et al., 2005, ApJ, in press

What I did in my summer holidays: Using UFTI calibrations fields for Adaptive Optics surveys

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High-angular resolution studies of the rest-frame optical morphologies and kinematics of faint high-redshift galaxies may provide a wealth of information about the formation and evolution of galaxies. However, they necessitate the use of an Adaptive Optics(AO) system to track and correct the effects of the atmosphere on the view of the distant galaxy and such systems require that the galaxies are typically within 25" of V<15 stars. This has restricted the impact of AO for such studies and has forced researchers to undertake surveys for galaxies around bright stars. Larkin & Glassman (1999, PASP, 111,1410) used 4 nights on Keck to identify roughly 15 galaxies within 25" of 5 bright stars, while Baker et al. (2003, A&A, 406, 593) took 6 nights on the NTT to identify 350 galaxies, brighter than K~19.5, within 25" of 42 stars. There are, however, opportunities for obtaining comparably deep data *for free* from archival calibration observations.

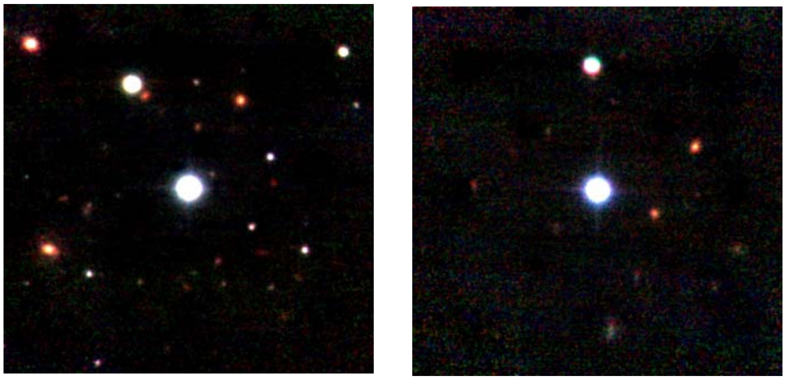

***Figure 1:** 60x60 arcsec true-colour images of FS27 and FS29. Each panel is centred on the FS with North up and East left. The reddest galaxies in both fields, with (J-K) > 2, are likely to be at z~2.*

Undertaken as a 3 week summer-student project, our study (Christopher & Smail 2005, MN, submitted) exploited the UKIRT archive and the integrated ORAC-DR reduction pipeline to efficiently create a catalogue of faint galaxies around 16 bright stars. UKIRT is particularly well-suited for this purpose since the bulk of the photometric calibration relies on a small number of standard stars - the UKIRT Faint Standards (FS) from Hawarden et al. (2001, MN, 325, 563). There are approximately 140 hrs of observations of FS stars in the JHK filters with UFTI in the archive, so the cumulative integrations can reach the depth needed to study the morphologies of z>1 galaxies, i.e. K~20. Moreover, UFTI calibrations typically jitter the star around one 46"-square quadrant of the HAWAII-1 detector - well matched to the isoplanatic patch.

Our first task was to query the archive for all the UFTI observations of FS stars in the JHK-bands with more than 2.5 ksec integration in K, as of August 1st 2005. We removed any FS with V>15 and those with extinction of A_k>0.02. From the initial 83 faint standards this leaves us with 16 fields. These data were then retrieved and reduced using the ORAC-DR pipeline. Due to changes in the file headers, slightly different incantations were needed for data taken on different dates. Nevertheless, the basic steps taken by the pipeline were identical: subtracting suitable dark frames, creating (using the data themselves) and applying a flatfield and aligning the frames, before co-adding them to create a final image. For the most part the pipeline reduces the observations with no intervention using the reduction recipes given in the frame headers. The co-added frames from each of the jitter sets were then combined using CCDPACK routines. In total, data were retrieved for the 16 FS stars from over 360 nights from 1999 to 2004, with around 10,000 individual frames (10Gb) retrieved and processed in about a week. Calibration of these fields

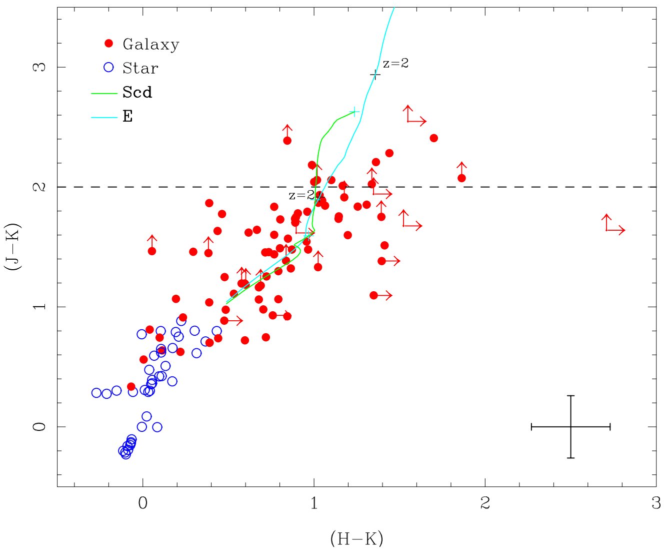

Figure 2: *The (J-K) and (H-K) colours for galaxies and stars in our catalogue. The stars show a tight locus and are generally bluer than the galaxies, which have a broader colour distribution. We plot two model redshift tracks for galaxies with SEDs comparable to present-day ellipticals or Scd galaxies. These start off blue at z=0 and become redder at higher redshifts; we mark z=2 on both tracks.The distribution of galaxy colours broadly spans that expected for passive or star-forming galaxies at z~0-2. The dividing line at (J-K)=2 roughly corresponds to galaxies at z~2. We show the median errors for the colours at bottom-right.*

is of course trivial due to the presence of the FS.

The mean exposure times for the 16 fields are 3.2 ksec, 1.7 ksec and 3.7 ksec in the J-, H- and K-bands respectively. This is sufficient to reach 5-sigma point-source limits of J~21.4, H~20.3 and K~20.3 - adequate to detect L* galaxies at z~1 and beyond (Figure 1). The seeing is 0.70", 0.67" and 0.57" in the J-, H- and K-bands. As these are measured from the co-added images from observations spread over 5 years, *they can be taken to represent firm upper limits on the typical seeing achieved by UFTI+UKIRT*.

Catalogues were constructed from the K-band frames using SExtractor within GAIA. In total we detect 24 stars (excluding the FS stars) and 87 galaxies within a 25" radius of the FS and brighter than the 5-sigma limits, K=19.7-20.7, over a surveyed area of 8.7 sq. arcmin.

In Figure 2 we show the (J-K)-(H-K) diagram for the stars and galaxies. We plot model tracks for the colour of galaxies as a function of redshift which show that those with the reddest (J-K) colours are likely to lie at z~2. Focusing on the 12 (J-K)>2.0 galaxies, we find that they are all well-resolved with FWHM (corrected for seeing) of ~1.4" (~10kpc at z~2) and have a median magnitude of K=19.0.These galaxies are well-situated for AO-assisted studies with a median separation from the FS star of 13.0".

Acknowledgments: We thank Malcolm Currie, Brad Cavanagh, Peter Draper, Jim Lewis, Nigel Metcalfe and Mark Swinbank for help. NMC acknowledges support from a Summer Studentship at Durham University. IRS acknowledges support from the Royal Society.

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ukirt news

UKIDSS Science Verification

Steve Warren

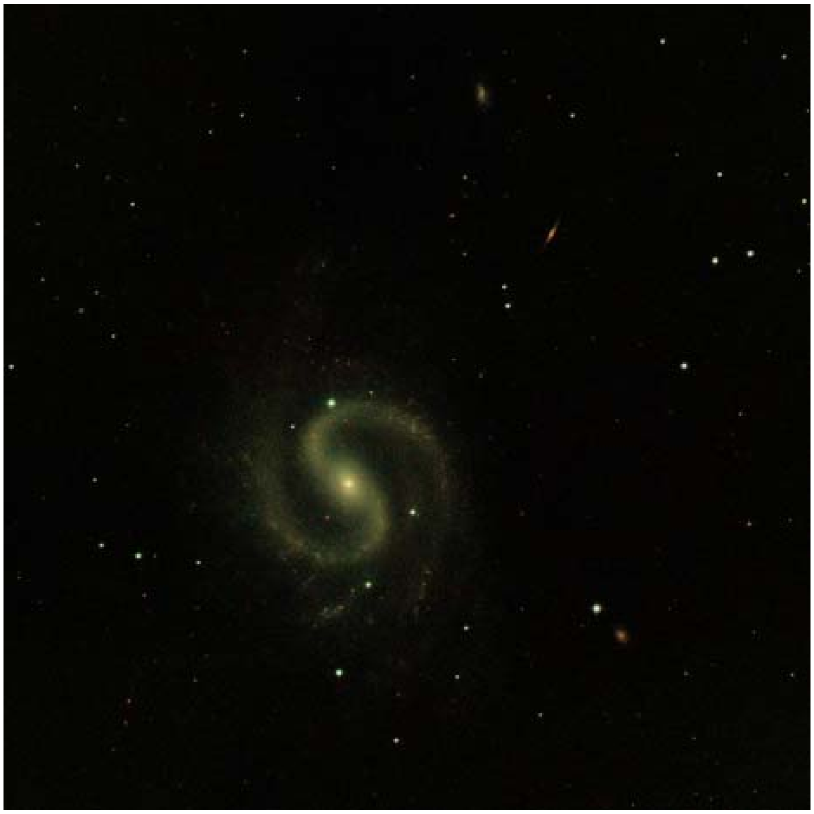
Imperial College London, U.K.

UKIDSS began full survey operations on May 13, 2005, and the data taken in the observing block up to the end of June when the instrument came off again represents about 2% of the planned 7-year survey. Particular fields were targeted before the start of the survey for science verification purposes. These data have been pipelined and archived. A group of UKIDSS consortium astronomers are analysing this small dataset, and feeding back findings to the wide-field survey groups, the CASU (pipeline) and WFAU (archive), as a contribution to the shake-down of the system.

Broadly speaking we are impressed with the results, even at this early stage. We expect the science verification phase to be complete by the end of October, and the first data release of the May/June block to take place before the end of the year.

One of the science verification fields was a strip crossing part of the Virgo galaxy cluster. The colour image at right is a composite of 40 second exposures in the Y, J and K bands of the barred-spiral galaxy NGC 4535. The field is 1400x1400 pixels in size, with a pixel scale of 0.4 arcsec. North is up, East is to the left.

FIGURE (below): One of the “lost galaxies” of Virgo. Data extracted from just one of the four WFCAM arrays. This (and all other figures) available in the on-line version of this newsletter, at www.jach.hawaii.edu/UKIRT



WFCAM synthetic photometry: First UKIDSS paper submitted

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As alluded to in the previous section, the first observing season for UKIDSS has been completed, and the first data release will occur before the end of the year. A series of five baseline papers, which will provide the reference technical documentation for UKIDSS, is in preparation. These are:

- ***Lawrence et al. (2006)*** describing the scope, layout, and broad science goals of the five surveys that make up UKIDSS
- ***Casali et al. (2006)*** describing the Wide Field Camera, WFCAM
- ***Hewett et al. (2005)*** characterising the photometric system of the survey
- ***Irwin et al. (2006)*** providing the details of the pipeline, and
- ***Hambly et al. (2006)*** describing theWFCAM Science Archive that will provide access to the images and object catalogues.

The photometry paper has just been submitted, and so will be the first UKIDSS paper. The contents are summarised here.

The aims of the photometry paper are similar to those of the paper by Fukugita et al. (1996) for SDSS, i.e. to characterise as closely as possible the photometric system, and to synthesise colours of astronomical sources, as an aid to interpretation of the data. WFCAM has 5 broadband filters, ZYJHK. The JHK filters have been manufactured to the MKO specification (Simons and Tokunaga, 2002), and so are expected to have negligible colour terms compared to the MKO standards. The Z and Y bands cover the wavelength ranges 0.83-0.925 micron and 0.97-1.07 micron respectively. This whole wavelength range is relatively little explored, with the notable exception of the Sloan Digital Sky Survey z band. This latter passband has an extended red tail, which includes significant atmospheric absorption near 0.95 micron. The WFCAM Z filter has a similar effective wavelength to the SDSS z filter, but a rectangular profile, while the new Y band aims to open up the region between Z and J. Passband response functions have been computed by taking into consideration all wavelength dependent quantities, including atmospheric absorption, mirror reflectivity, filter transmission, and array quantum efficiency. Wavelength independent quantities are irrelevant for synthesising colours, but have been included by normalising the computed curves to the measured system throughput. The estimated final system throughput as a function of wavelength is shown in Fig. 1. We have used these transmission curves together with the spectrum of Vega of Bohlin and Gilliland (2004) to compute colours, offsets to the AB system, and colour equations for conversion between WFCAM bands and the SDSS z band, and the 2MASS JHK bands.

We have synthesised, and tabulate in the paper, colours of a wide range of astronomical sources as listed below: (1) stars, using the Bruzual, Persson, Gunn, and Stryker atlas, and additional published spectra of cool M stars; (2) a large number of L (30) and T (22) brown dwarfs; (3) model very-cool brown dwarfs, cooler than T. It is expected that a new spectral class will appear at cool temperatures, possibly 600-400K (the coolest brown dwarf known has an effective temperature of about 700K). One of the goals of UKIDSS is to discover and characterise this population, termed Y dwarfs; (4) cool H and He atmosphere white dwarfs; (5) galaxies of a range of spectral types, and over a wide redshift range, using template spectra of the hyperz library (Bolzonella et al., 2000), and the atlas of Manucci et al. (2001); (6) model quasar spectra over the entire redshift range $0 < z < 8.5$.

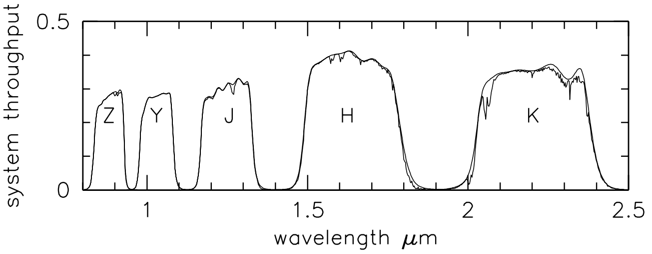


FIGURE 1: *System response curves for the WFCAM ZYJHK filter set. Two curves are shown for each band. The lower curve is the total throughput of the system from above atmosphere to detector. The upper curve omits the effect of the atmosphere.*

As an illustration of the results we show in Fig. 2 the YJH two-colour diagram for stars and quasars, that illustrates the potential of the Y band for detecting cool brown dwarfs. T dwarfs become blue in J-H and track up the stellar sequence in a JHK diagram. The Y-J colour pulls the T dwarfs (open triangles in the figure) down below the stars so they may be identified. Y dwarfs, shown as filled and open squares in the figure, for two different models, are expected to be blue in J-H,and possibly redder than T dwarfs in Y-J.

All the relevant tables from the paper, including response curves and synthetic colours are available from the UKIDSS web site: www.ukidss.org. The photometry paper itself is also available at www.ukidss.org/technical/technical.html.

REFERENCES:

Bohlin, R., Gilliland, R., 2004, AJ, 127, 3508
Bolzonella, M., Miralles, J.-M., Pello, R., 2000, A&A, 363, 476
Fukugita, M, et al., 1996, 1996, AJ, 111, 1748
Mannucci, F., 2001, MNRAS, 326, 745
Simons, D., Tokunaga, A., 2002, PASP, 114, 169

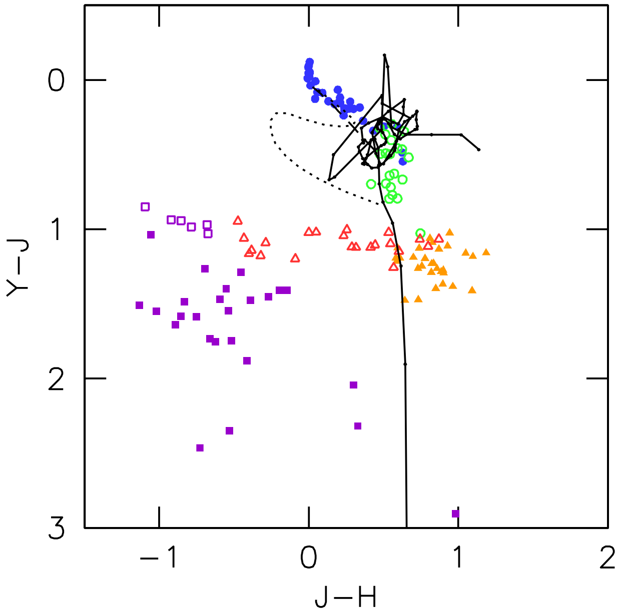


FIGURE 2: *YJH 2-colour diagram illustrating how Y dwarfs might be selected. Key: BPGS O-K dwarfs filled circles; M dwarfs open circles; L dwarfs filled triangles;T dwarfs open triangles;model Y dwarfs filled and open squares; quasars $0 < z < 8.5$ (in steps of 0.1) solid line; H cool white dwarfs dotted line; He cool white dwarfs dashed line.*

Polarimetry at UKIRT

Chris Davis - JAC

UKIRT has a long tradition of dual-beam polarimetry with its facility instruments and the IRPOL unit, which was originally supplied by the University of Hertfordshire. This tradition continues, most recently with the expansion of spectro-polarimetry options for UIST.

In early 2005 a second Wollaston prism was purchased and installed in UIST's second grism wheel. With a prism in both wheels, spectro-polarimetry is now available with all installed grisms; at low spectral resolution (R~1000) over a broad wavelength range with the IJ, JH, HK, KL and M grisms, and at higher resolution (R~3000) with the short- and long- grisms in the J, H, K, and L bands.

Our goal has also been to provide automated and yet reliable pipeline software for the reduction and assessment of polarimetry data in real time at the telescope. While stationed in Hilo, Malcolm Currie developed a suite of ORAC-DR recipes to reduce imaging polarimetry data. Images reduced with these recipes are bad-pixel masked, dark subtracted and flat-fielded before e- and o-beam sub-images are extracted and processed to produce images in the Stokes I, Q, and U vectors, the percentage polarisation P and position angle theta (TH), as well as FITS binary-table catalogues of the binned and culled polarisation data. The DR ultimately displays an image with vectors overlayed showing the percentage polarisation and position angle across the image. Additionally, with the polarimetry toolbox in GAIA, observers are able to bin, rotate, and selectively display vectors over a carefully-scaled image. The data in Figure 1 were reduced with ORAC-DR, and displayed in GAIA using this toolbox.

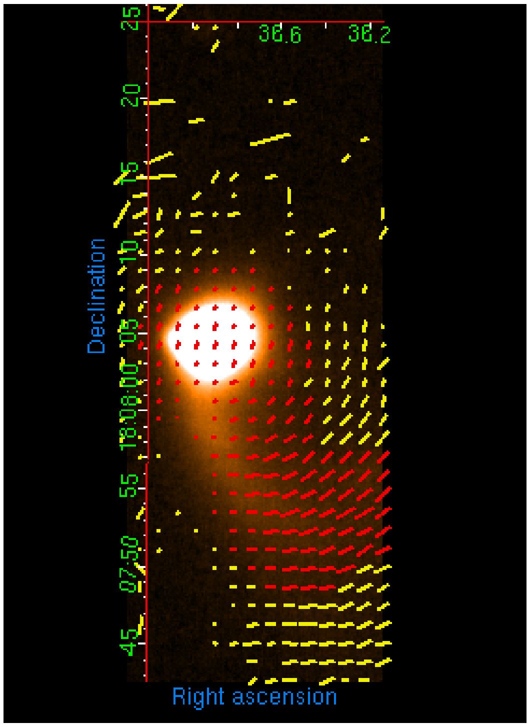


Figure 1: An image of the young star L1551-IRS5 with polarisation vectors overlayed.Data obtained with UIST, reduced with ORAC-DR, and displayed with the Polarimetry Toolbox in GAIA.

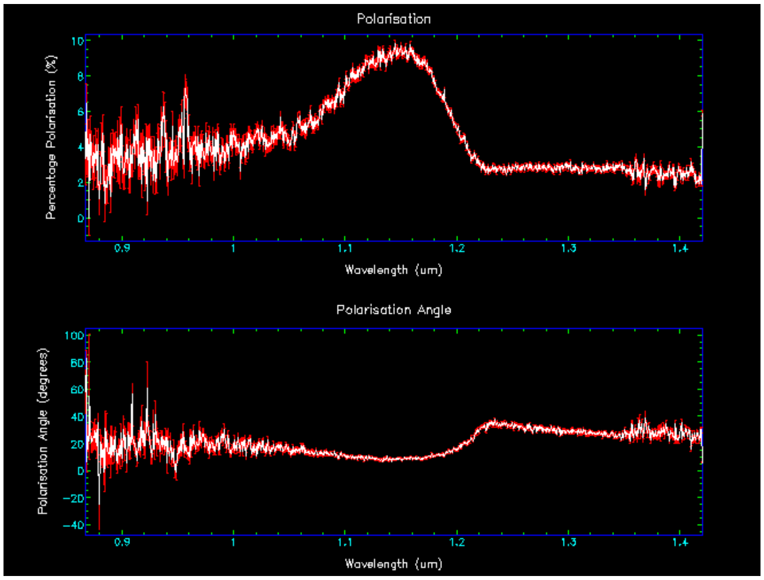


Figure 2: Spectro-polarimetry in the IJ bands obtained with UIST and reduced with ORAC-DR.

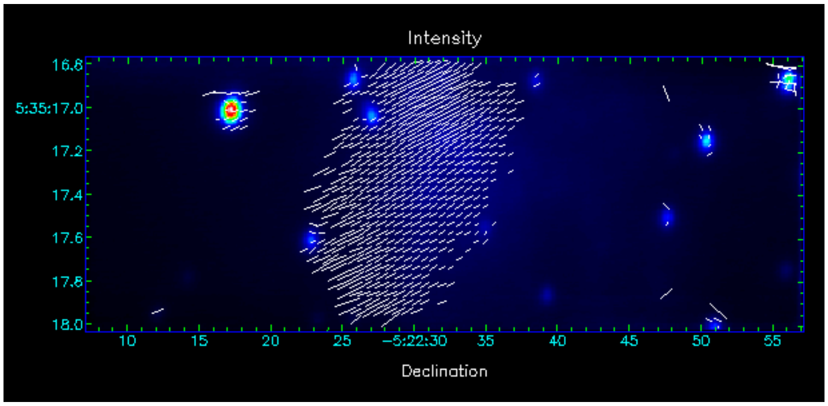
More recently, Malcolm and Brad Cavanagh (of the JAC) have developed a recipe for spectro-polarimetry. After flat-fielding and sky-subtraction, the recipe extracts the dual-beam e and o spectra from the data taken at each waveplate angle. These data are processed with David Berry's polarimetry package POLPACK, before spectra in I, Q, U, P and TH are produced, the last two data products being displayed in a kapview window (see Figure 2).

With the flexibility offered by UFTI and UIST, combined with the development of these ORAC-DR recipes, the GAIA Polarimetry Toolbox and POLPACK, polarimetry has never been easier at UKIRT!

Finally, earlier this year Tim Gledhill of the University of Hertfordshire commissioned Circular Polarimetry with UIST (Figure 3). Circular polarimetry with UIST *and* UFTI is available to all UKIRT users. Proposals are welcomed. However, the quarterwave plate and additional hardware needed for circular polarimetry are owned by the University of Hertfordshire, so collaboration with U. Herts is requested.

Full details of linear imaging and spectro-polarimetry, circular polarimetry, and the software described above, are available from the UKIRT web pages:http://www.jach.hawaii.edu/UKIRT/instruments/irpol/irpol.html. Potential users are also welcome to contact Chris Davis at c.davis@jach.hawaii.edu.

Figure 3 (below): Circular-polarimetry observations of BN in Orion. The vectors show the orientation of the quaterwave plate fast axis. The lengths of the vectors indicate V/I; 17% near the top/east of the image decreasing to 10% towards the bottom.



view from the top

Another semester draws to a close, and now we come to "The WFCAM Semester" - 05b shall be the semester totally devoted to just one instrument for the first time in the history of UKIRT, as we strive to push forward with the UKIDSS surveys, particularly the UDS.

We three TSSs had enough fits trying to once again remember how to run the three cassegrain instruments after the 13 weeks of this last WFCAM shakedown period. It shall be most interesting when we have to encounter this once again - but this time after a continuous period of six months! We have banded together to create documentation to help us remember all the nuances, but please remember to bear with us a bit as we come out on the other side of the current span of WFCAM time.

Federal funding of $50 million for half of the realignment of Saddle Road has been passed by the US Congress in a new six-year Federal Highway Bill. This, in fact, is more than one-third of the total Federal spending allocated for the whole state of Hawai'i and is the largest project of them all in terms of money. This shows the determination to finally join the east and west sides of the island with a road that will better allow travel and commerce than the belt road.

In the meantime, the first section that bypasses the military base at Pohakuloa has been finished to grade and only now awaits paving. While there has not been any public discussion of how the new monies will be spent, if things continue according to the plans in place previously, this will mean that the road will be realigned on the east side first, so that travel from Hilo up to Hale Pohaku will be made even easier and safer.

The new Mauna Kea Education Center (maunakea.hawaii.edu) at the University Park is rapidly nearing completion and is still on schedule. The world-class planetarium ought to be fully completed by early next year, while the rest of the building and contents ought to be done by the end of this year. (They were nice enough to give me a certificate for four people to go to the planetarium in appreciation for my volunteering to participate in a video interactive display). The center just got a new director, someone who has had extensive experience with a tech museum in San Diego.

Up at your beloved Vacation Resort Hale Pohaku, things have been mercifully quiet the past several months. Some renovation of new offices for Subaru and Gemini (next to the JAC office) are nearing completion. The work on replacing the siding on the outside of Building B has come to a halt, after the south wall was completed. Nothing has happened now since late last year. This is the most requested dorm building, so finding a way to get the work done without disturbing people's sleep is near impossible. MKSS is sort of waiting for a bit for a lull in the occupancy rate, but this is really unlikely anytime soon, so one wonders what they will end up doing. The logical idea might be to hire a contractor to hammer this out in a matter of days, but this still does not seem to be the plan.

Other than this, nothing has changed of late (alas)...food and accomodations the same. While they appear to have gotten a few substantial pillows, we still have the not-quite-big-enough fitted sheets that still manage to pop loose. So far this summer, we have managed to avoid having any honeybee infestations. And the HP Hot Flashes in the shower are still there, but much more muted.

Now that we are into "The WFCAM Semester", we will probably be seeing fewer of you than normal. That said, we do look forward to getting back to the cassegrain instruments in February, and seeing more of our old friends coming back through again.

In the meantime...

Aloha!—

Thor Wold, UKIRT/JAC

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Spot your favourite astronomy support person! *The above photo was taken in August 2005 on the steps of the Subaru building in Hilo. It shows many of Hilo's astronomers and support staff, from the JAC, Subaru, Gemini, Univ. of Hawaii, SMA, and CSO. Of course, not everyone could make it to the shoot (including this newsletter's editor, who was grabbing some shut-eye after a night of "unravelling the mysteries of the Universe" at UKIRT), although photos were also taken in Waimea and at the summit. This photo courtesy of* ***Gary Fujihara, IfA.***