distance was over 4 Astronomical Units.

From earlier apparitions, it is known that the onset of activity is rather abrupt, normally about 60–80 days before perihelion, but at least once (in 1951) up to 100 days before. Since the perihelion would be passed on September 16.7, 1988 this time, it was expected that this turn-on would happen in June, or perhaps already in late May. This means that the cometary nucleus has been heated sufficiently to enable gas and dust to escape, so that a coma and a tail are created.

Observations from Kitt Peak on April 9–15, 1988 by D. Jewitt and J. Luu, still showed an stellar-like image of the comet nucleus. However, as can be seen on the picture, CCD images obtained on May 16 and 17 with the Danish 1.5-m telescope clearly show that the activity has started: the comet is surrounded by a diffuse coma, which extends over 1 arcmin or more. The active phase must therefore have started rather early this time, at least 104 days before perihelion.

The picture, which is a composite of eleven 10-minute exposures through a Johnson V filter on May 17, has a field of $\sim 2.0 \times 2.0$ arcmin^2. North is up and East is to the right. On this date, Tempel 2 was 135 million km from the Earth and the heliocentric distance was 278 million km. The magnitude of the central, bright part was about 17.

In the meantime, as reported by several journals (e.g. *Sky and Telescope,* September 1988, page 236), unfortunately no funding was received for CRAF in fiscal year 1989. This means that the launch will have to be delayed to the fall of 1994 and that therefore another comet will have to be targeted, probably Comet Wild 2. *R. M. WEST*

First Infrared Images with IRAC

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Following its installation and first test in July, a second test of the new infrared array camera has just been completed at the 2.2-m telescope. Having returned after the official deadline we have not had time to prepare a very detailed article for this *Messenger.* We nevertheless wanted to take this opportunity to show a selection of images illustrating the kinds of results being achieved in the various camera modes and also to draw the attention of potential users to a problem with the detector which has developed since the Announcement for period 43 was issued.

As described in the June issue of the *Messenger* (**52,** 50) IRAC provides for infrared imaging in the standard J, H, K, and L filters and offers two novel features compared with existing common user cameras elsewhere – on line selection of four magnifications between 0.3 and 1.6 arcsec. per pixel and the provision of circular variable filters

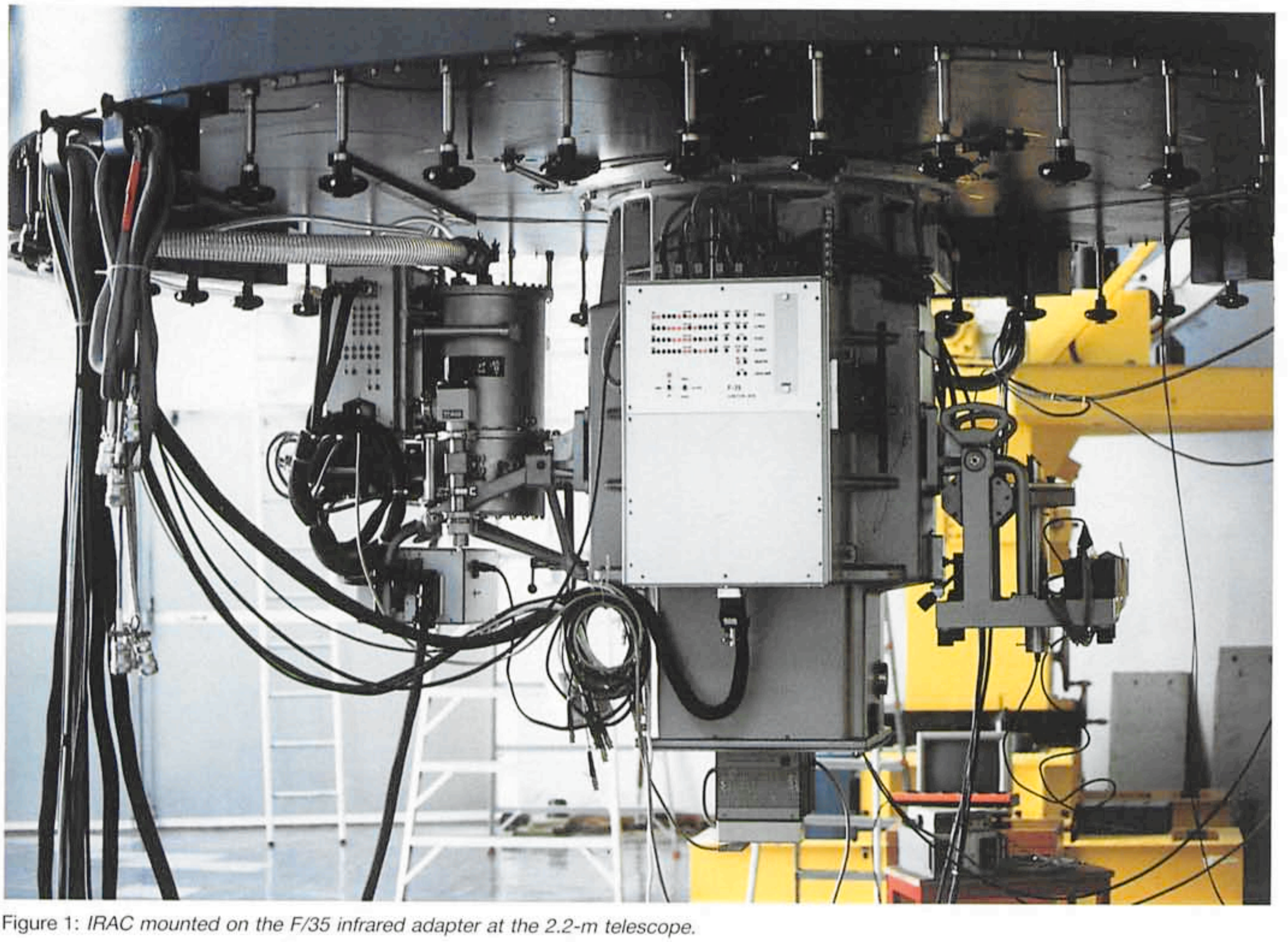

Figure 1: *IRAC mounted on the F/35 infrared adapter at the 2.2-m telescope.*

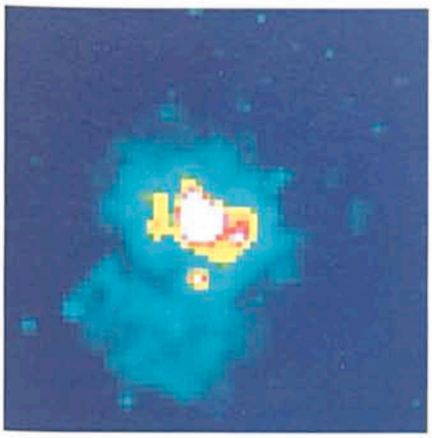

Figure 2: *The HII region G 333.6-0.2. K (2.2 μm) band; 0.8 arcsec/pixel; average of 10 40-s exposures; sky subtracted; median filtered.*

(CVF) for narrow band imaging at R ~ 50. No real problems with the camera itself or its associated electronics and software have been experienced so far. The detector used in July was a 64 × 64 pixel Hg : Cd : Te/CCD array (Philips Components) with a long wavelength cutoff around 4.7 μm, very good read noise (~ 400 e) and average dark current (~ 1000 e/s at 47 K) characteristics and a large well capacity ($7 \cdot 10^6$ e). Unfortunately, about 10 % of the pixels scattered over the array exhibit excess dark current and saturate after relatively short integration times spoiling the appearance of the raw images. They are rather easy to remove during image processing, however, either by median filtering or by combining two images shifted by a few pixels. This latter is quite straightforward using the lens wheel in IRAC which provides a more accurate (0.1 pixel) means of displacing the image than moving the telescope. With on-chip integrations of 10 minutes and equal numbers of alternate source and sky exposures the actual 3 σ detection limits achieved in 1 hour of observing time were J ~ 20.5, H ~ 20, K ~ 19.5 mag per pixel and the faintest sources actually measured were the components of the double quasar Q 1548+114 A, B at K ~ 17 and 17.5 mag (~ 1 % of the sky). As expected, the well capacity also proved sufficient for broad band imaging at L (3.8 μm) and even M (4.7 μm).

Unfortunately, by October this array was found to have mysteriously developed a new fault in the form of several lines of saturated pixels on alternate columns starting at one side and extending over about a quarter of the array. The rest was still useable but, as planned already in advance, this array was exchanged after a few nights for another with a 2.3 μm cutoff which it was of interest to test for future applications. This array exhibits a factor of 10 lower dark current and relatively few saturated pixels but is only 32 × 32 and cannot, of course, be used longward of the K band. The cause of the degradation of our 64 × 64 array is still not known although some type of surface contamination is a possibility, in which case its performance can probably be restored by a special cleaning technique.

As only very few of the October data have been reduced, the images shown here were all obtained with the 64 × 64 array in July except for Jupiter, observed with this array in October, and NGC 1097 (32 × 32). The only "cleaning" applied has been the application of

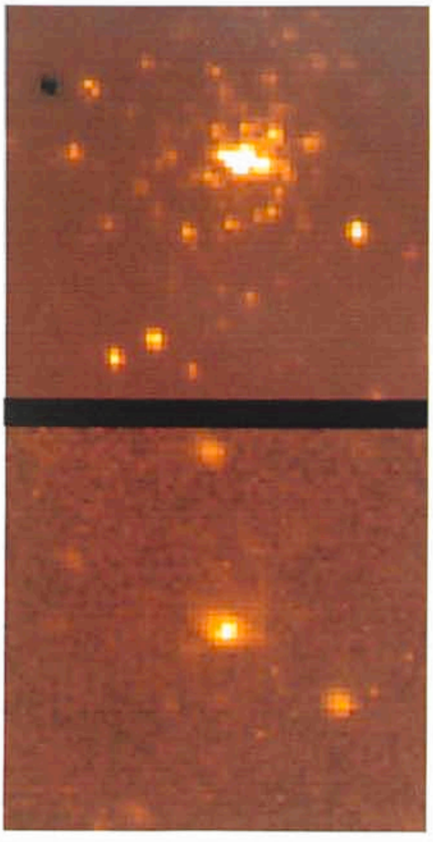

Figure 3: *The HII region NGC 3603. Upper panel – K band; 0.8 arcsec/pixel; average of 8 40-s exposures; sky subtracted; median filtered. N.B. the black spot is due to a star in the sky reference field. Lower panel – L (3.8 μm) band; 0.8 arcsec/pixel; average of 60 1-s exposures made with sky chopping at the F/35 secondary mirror.*

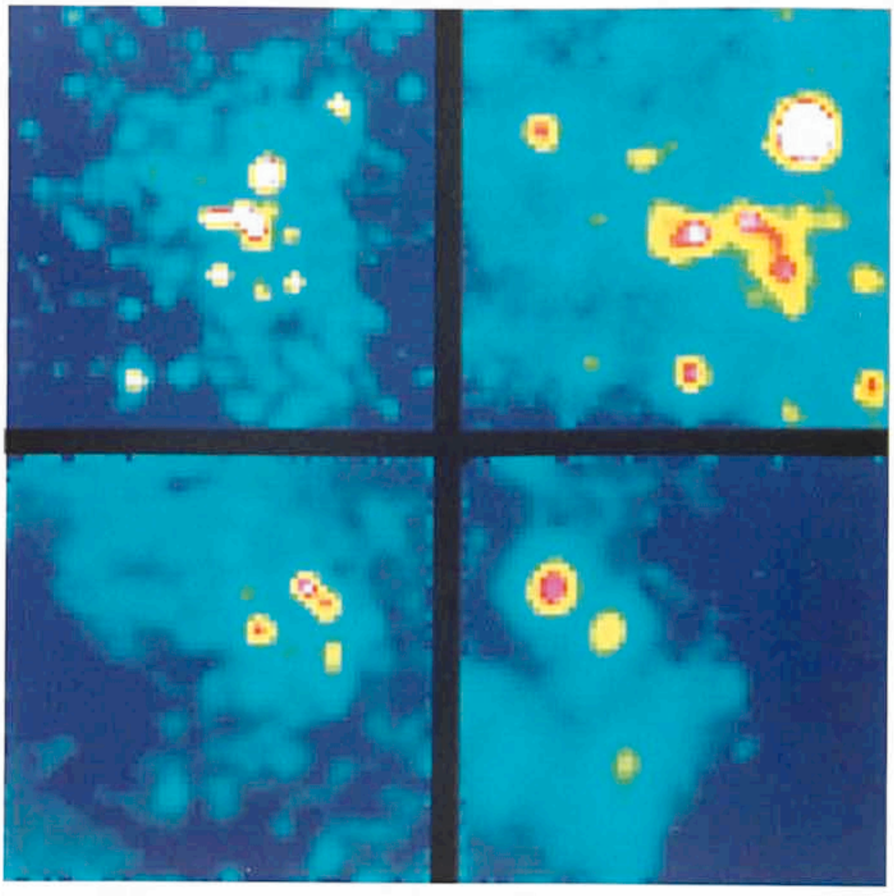

Figure 4: *The Galactic Centre. Upper panels – K band; 0.8 arcsec/pixel (left) and 0.3 arcsec/pixel (right) to show effect of zooming; combination of two 300-s exposures shifted by 3 pixels (see text); divided by sky. Lower panels – L band; same scales as upper panels but slightly displaced due to lack of co-centring between the differently coated lenses used at K and L. This can be avoided by using the same lens with a slight loss of efficiency in one of the bands; average of 125 1-s exposures without sky chopping; divided by sky.*

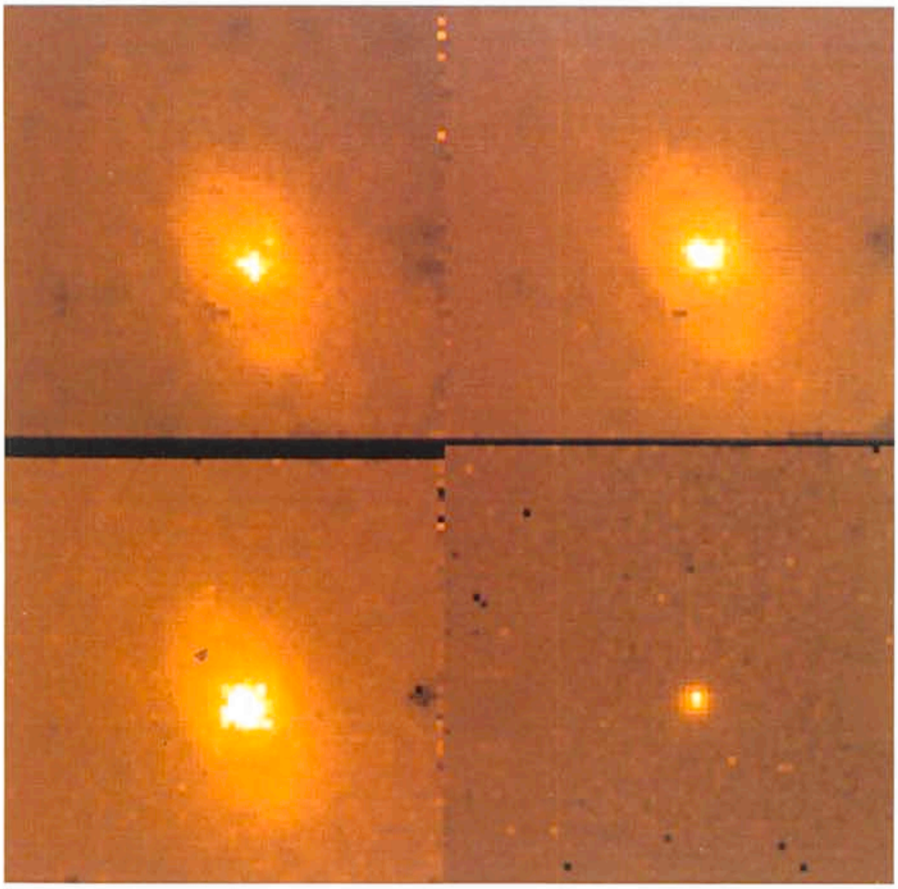

Figure 5: *The galaxy A 1409–65. J (1.25 μm) (upper left), H (1.65 μm) (upper right), K (2.2 μm) lower left); 0.8 arcsec/pixel; average of 4 40-s exposures; combination of images shifted by 3 pixels; sky subtracted. L band (lower right); 0.5 arcsec/pixel; average of 140 1-s exposures with sky chopping at the telescope secondary mirror. Note the point-like nucleus at L whose size has been estimated at 0.3 arcsec using 1 D speckle techniques at the 3.6-m telescope (Moorwood, Véron-Cetty and Perrier, in preparation).*

Figure 6: *Jupiter (Oct. 88). 0.8 arcsec/pixel; sky subtracted; median filtered with high threshold. Upper panel – K band. Middle panel – CVF at 2.07 μm. Lower panel – CVF at 2.12 μm showing effect of pressure induced absorption by molecular hydrogen in the planetary atmosphere. Note the appearance of a moon on the right side in the CVF images which were taken later than that in K.*

a median filter or the replacement of bad pixels using two images displaced by 3 pixels as described above. Some of the images have been flat fielded by ratioing with the sky while in others the sky has only been subtracted. The actual observing parameters and reduction procedure used in each case are specified in the figure captions.

Having offered IRAC in period 43 on the basis of the July test results we are now in the unfortunate position of not knowing exactly which array will be available at that time. The 64 × 64 array has to be returned to the manufacturers who have promised to do their best either to restore its performance by surface cleaning or to replace it with a detector of comparable performance. An improved array is also not excluded, depending on the results of a new Hg : Cd : Te production technique developed specifically to improve the uniformity and reduce the fraction of bad pixels.

At the moment therefore we remain confident of being able to offer our first Visiting Astronomers at least the performance as advertized and illustrated here.

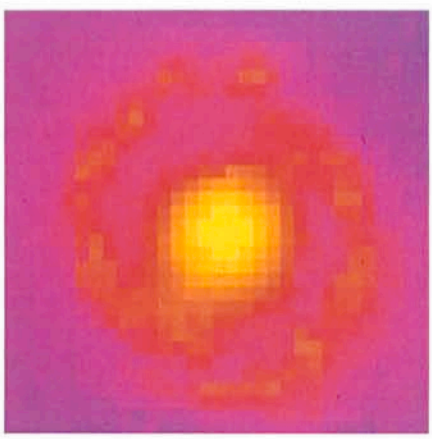

Figure 7: *Nuclear region of the galaxy NGC 1097. 32 × 32 array; K band; 0.8 arcsec/pixel; average of 5 60-s exposures; median filtered (but almost identical to raw image); divided by sky. Note that the "spiral arms" are composed of star forming regions within about 10 arcsec of the active nucleus.*

MIDAS Memo

1. Application Developments

The astrometric package is currently being developed. Coordinate transformations as well as usual coordinate projections can be performed on tabular format. The plotting package has been extended with commands to draw coordinate grids in different geometric projections. Also, some basic commands have been added to increase the flexibility of the package. For the same pur-