ISAAC Sees First Light at the VLT

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ESO, Garching and Paranal

ISAAC, the cryogenic infrared spectrometer and array camera developed by the Instrumentation Division at ESO (http://www.eso.org/instruments/isaac/) saw first light on the VLT on the night of 16/17 November 1998. Figure 1 shows the instrument mounted on the Nasmyth B focus of Unit Telescope 1. Visible are the 1.6-m diameter vacuum vessel surrounding the 350-kg cooled optical assembly and the co-rotator system which carries the electrical cables and closed-cycle cooler hoses to the instrument and rotates with the telescope adapter as the telescope tracks objects on the sky. ISAAC has 0.9–2.5 µm (SW) and 2–5 µm (LW) 'arms' providing imaging and spectroscopic capabilities over a maximum field of 2.5′ with a variety of pixel scales and resolving powers.

The moment of first light was preceded by intense activity by the ISAAC team from Garching, assisted by their Paranal colleagues, to install this complex in-

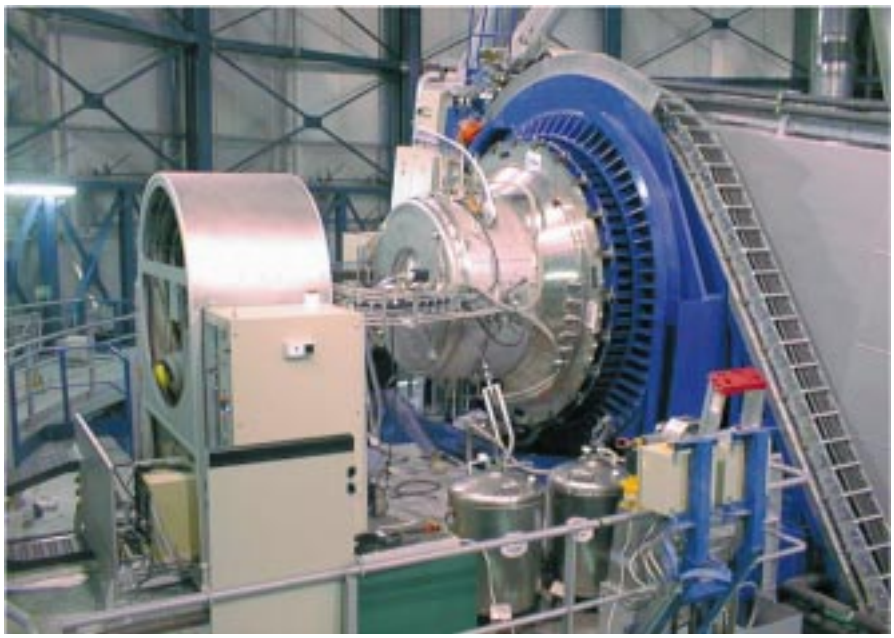

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Figure 1: ISAAC as it is now mounted on the UT1 Nasmyth B adapter-rotator. The 1.6-m-diameter vacuum tank houses the 350-kg cryogenic optical assembly which is cooled by means of two closed-cycle coolers. Various gas and liquid hoses plus all the electrical cables are carried by the co-rotator system visible on the left which rotates with the adapter as objects are tracked on the sky.

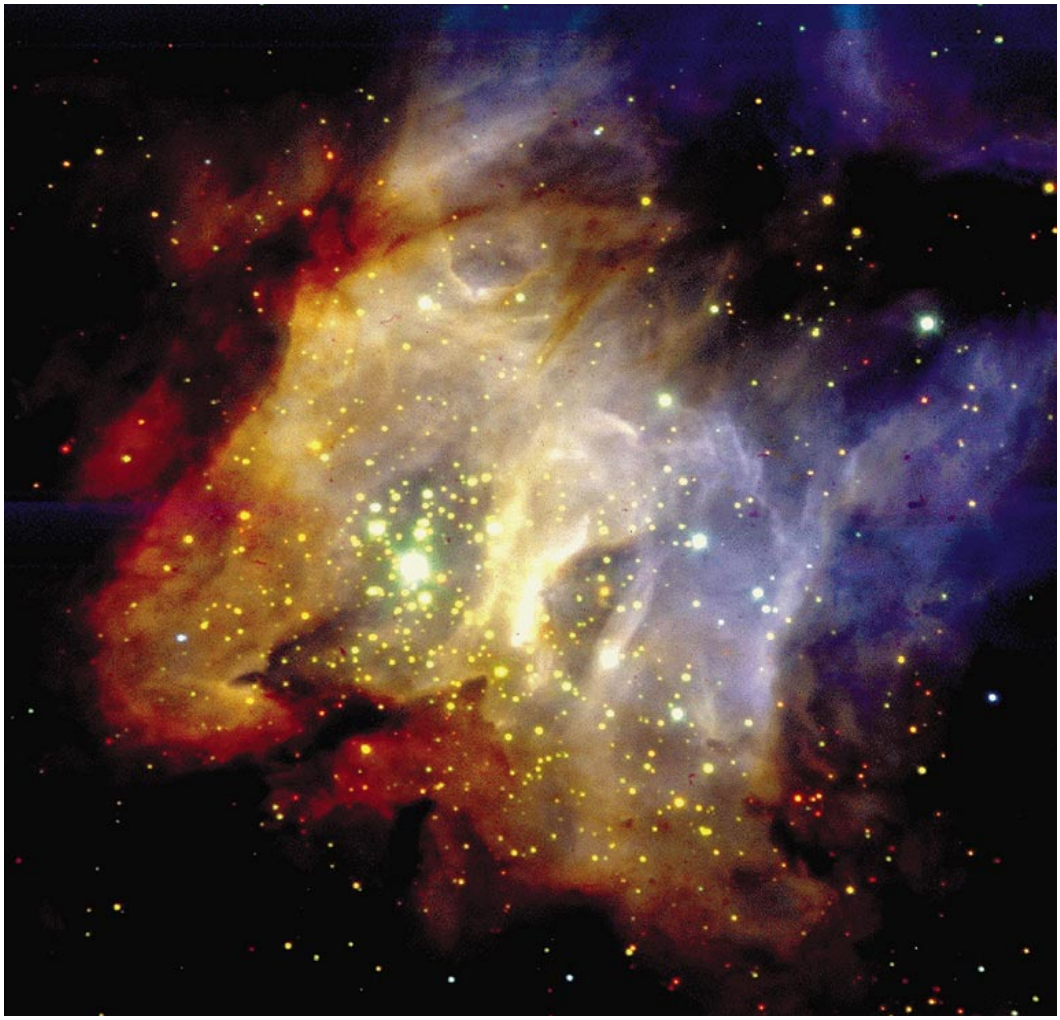

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Figure 2: Colour composite image of the RCW38 star-forming complex obtained by combining short Z(0.9 µm), H(1.65 µm) and Ks(2.16 µm) exposures. Stars which have recently formed in clouds of gas and dust in this region about 5000 light-years away are still heavily obscured and cannot be seen at optical wavelengths but become visible at infrared wavelengths where the obscuration is substantially lower. The diffuse radiation is a mixture of starlight scattered by the dust and atomic and molecular hydrogen line emission. The field of view is 2.5× 2.5′ with North at the top and East to the left and the image quality is set by the FWHM seeing of 0.4″.

Figure 3: A Ks (2.16 µm) image centred on the distant radio galaxy MRC0316-257 (z = 3.14) obtained primarily to locate other distant galaxies for future spectroscopic observations with ISAAC. This image was obtained by combining 45 1-min exposures, taken with the telescope randomly offset by small amounts in between ("jittering") to allow subtraction of the bright sky emission. The field measures 2.5 × 2.5 arcmin with North at the top and East to the left. The seeing was 0.5 arcsec and the limiting magnitude is Ks ∼ 22. ▶

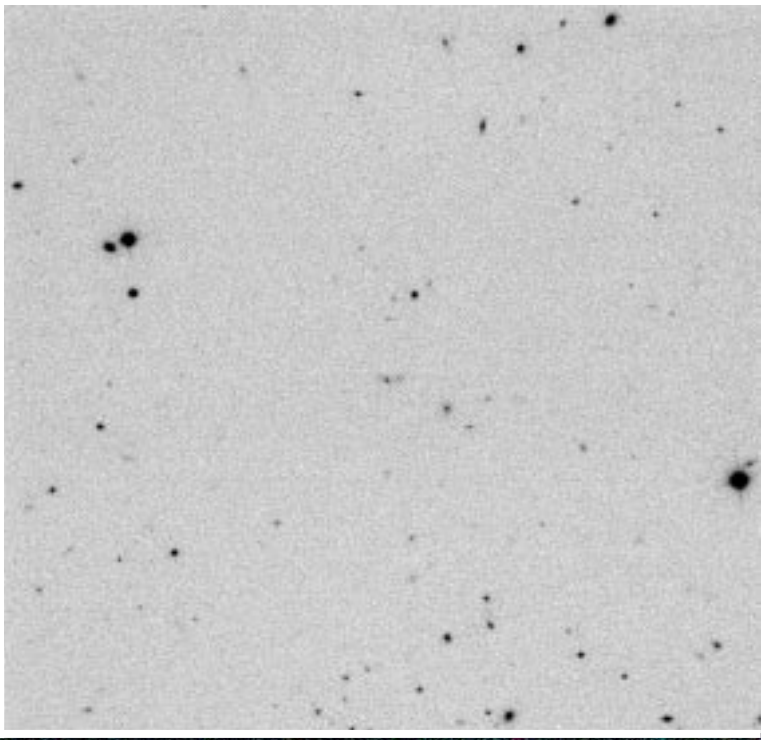
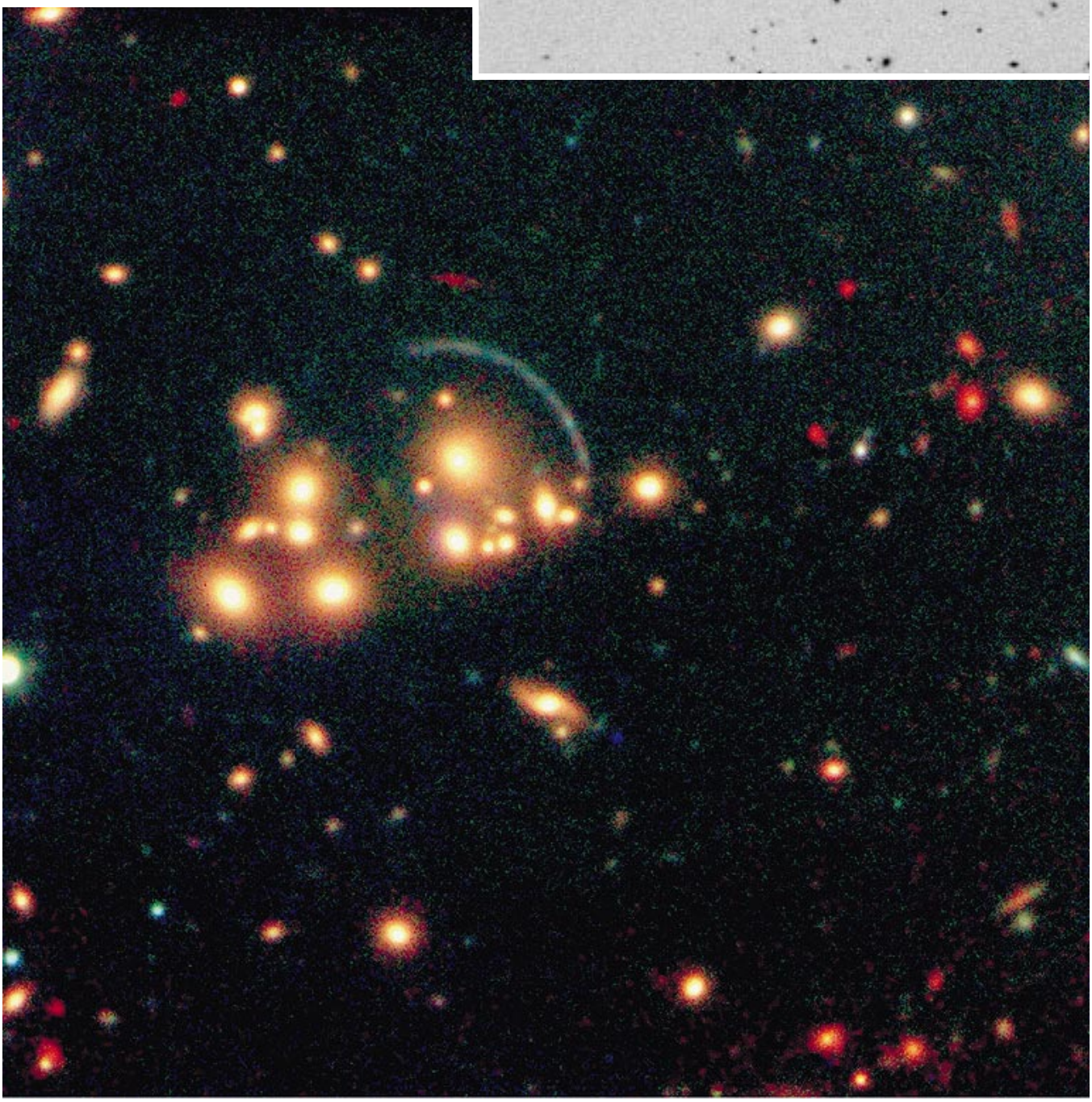


Figure 4: Colour composite image of the galaxy cluster CL2244-02 (z = 0.33) obtained by combining a 20-min jittered ISAAC Ks (2.16 µm) exposure with 15-min V and R exposures made with the VLT Test Camera at the UT1 Nasmyth focus. In addition to the prominent blue arc, produced by gravitational lensing of a galaxy at redshift z = 2.24, there are also notable, very red arcs, both closer to the centre and further out which were only detected in the infrared image indicating that these lensed galaxies are either not forming stars or are much more distant. The field size is about 1.5 × 1.5 arcmin with North at the top left and East at the lower left corner. The average seeing was around 0.5 arcsec. ▼



strument on the telescope and start the evacuation and cool-down procedure. Despite its large mass, cooling is actually achieved in only 24 hours by using a liquid-nitrogen pre-cooling circuit in addition to the closed-cycle coolers. Once operational and after focussing and aligning the instrument and telescope pupils, short exposures in the 1–2.5 µm filters quickly demonstrated the excellent combination of Paranal seeing and telescope plus instrument optical quality by delivering images with around 0.3″ FWHM across the 2.5′ field. During the next several nights, test images and spectra of a variety of astronomical targets were made to exercise and establish the performance of the various SW instrument modes. Due to a few technical problems encountered in this period, it was then necessary to dismount and open the instrument which, although unfortunate, was a possibility for which contingency had already been foreseen in the planning of this first test. Four days later, testing of the long-wavelength arm started and is continuing as this short report is being written in the control room on Paranal.

A first impression of the capabilities and performance offered by this new instrument is provided by Figures 2, 3, 4 and 5, which show a small selection of the images obtained so far. More images plus the first spectra obtained can be viewed at http://www.eso.org/outreach/press-rel/pr-1998/pr-19-98.html

Figure 5: Combination of 15-min Ks (2.16 µm) and L(3.8 µm) band images of the central region of the galaxy NGC1365 made with the Long Wavelength arm plus chopping at the telescope secondary mirror. The field is 16 × 16″ with North at the top and East to the left and shows the prominent Seyfert nucleus plus a rich complex of star forming regions extending over a region about 1 kpc across and including one almost at the nucleus to the East.

News from VLT Science Verification

The data from the UT1 Science Verifications (SV) have been released to the ESO community on October 2, 1998, with the data relative to the Hubble Deep Field South being available worldwide. The SV data can be retrieved either from the ESO Web server at http://www.eso.org/paranal/sv or ask the library of your institution for the CD-ROM set containing the combined and the raw data. These CD-ROM sets where mailed in October to all astronomical institutes within ESO member states (addressed to the institute's library). Since some sets are still available, interested people may get one by contacting ESO through the above Web page.

A widely publicised editorial of the Board of Directors of *Astronomy and Astrophysics* has called for papers based on the UT1 SV data, with those submitted by November 30, 1998, and passing the peer referee process, being published in a special issue of *A&A* Letters on March 1, 1999.

With the successful installation and commissioning of FORS-1 at UT1 and the forthcoming commissioning of ISAAC, the plans for the SV observations with these instruments are in an advanced stage of preparation. The FORS-1 SV Team has been formed (based largely on a new set of astronomers compared to UT1 SV Team), and the ISAAC SV Team is being assembled. The target selection for SV will reflect the expectations of the community, with an attempt being made to cover as far as possible the large variety of astronomical areas in which ESO astronomers are currently active.

FORS-1 SV observations will take place during the dark time in January (14–21 January, 1999), while ISAAC SV observations are planned for 18–25 February, 1999. The astronomical targets of SV will be advertised through the above SV Web in advance of the observations. The two SV data sets should be released about one month after they were obtained, as it was done for the UT1 SV data obtained with the Test Camera. The SV Teams will make every effort to provide combined and flatfielded data. Along with the SV data, also science grade data obtained during instrument commissioning may be released. Keep watching the Science Verification Web pages for any news.

The instrument SV observations will include some of the observations for which the VLT was specifically built. With FORS, the optical spectroscopy of faint objects – especially in multi-object mode – as well as the deep imaging on a respectable field of view will demonstrate the capabilities of the VLT to a much larger degree than could be achieved by the Test Camera images.

With ISAAC, the start of near-infrared observations with a large telescope in many ways will open up completely new capabilities. By having prompt access to FORS and ISAAC science grade data astronomers in the community will have yet another, even more exciting opportunity of using and familiarising with VLT data, specifically of the kind that will be provided by UT1 to the community of successful investigators in ESO observing Period 63.