keep the satellites perfectly centred in the diaphragms for several hours.

According to the impact time predictions, only 3 events occurred during night time at La Silla (fragments B, F, V). Two additional fragments (L, U), which impacted during dawn, required of course clear skies for optical photometry. After the spectacular A impact observed in the IR from La Silla in the afternoon of July 16, we were optimistic to detect a flash signature during the impact of fragment B which was much brighter than A in images of the comet train. Half an hour before the predicted time we started to measure the surface brightness of Europa and Callisto every second. The individual data were displayed on-line on a graphic monitor to watch for any sudden brightness increase exceeding the photon noise level. Unfortunately, the observations were strongly affected by clouds which prevented on-line detection of any possible flash echo. Preliminary data reduction immediately thereafter did not reveal any significant peak in the light curves either.

The second event observable from La Silla during night time was the impact of fragment F. This time we set the fibers on Ganymede, Callisto and the sky, respectively. Though the post-impact plume caused by this SL-9 fragment was clearly detected by ESO observers in the IR, fast-moving clouds which partly reduced the visual transparency to only a few per cent, once again prevented on-line searching for an impact light echo.

As an example for the provisional data reduction performed immediately after observation, the raw I-band light curves of Ganymede(A) and Callisto(B) are displayed in Figure 2. They were increasingly affected by thick clouds during the predicted impact time interval. The reduced light curve of Ganymede(C) is plotted below. No flash signatures significantly exceeding the noise of the mean relative brightness (1 s $\sim$ 1 %) could be detected so far.

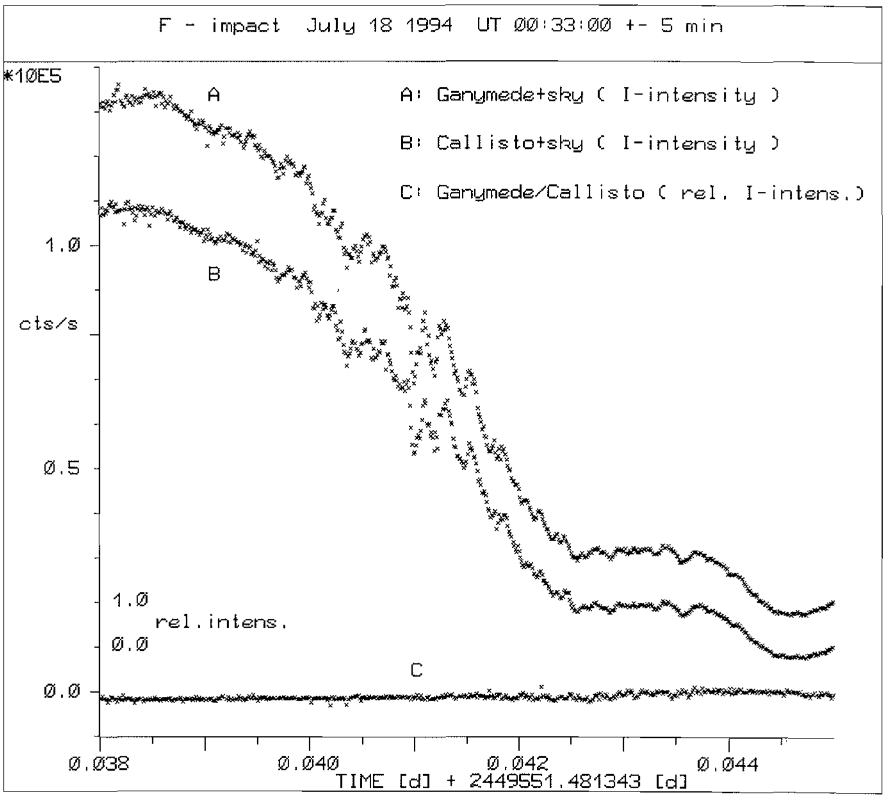

Figure 2: *Example of the standard reduction procedure: the relative brightness of Ganymede during the impact of fragment F.*

The remaining impact events observable from La Silla were much less favourable for a search for visual light-echo effects due to the low S/N during dawn and due to the fact that only the comparatively distant satellite Callisto could have been used as flash reflector. These photometric observations however failed because of unfavourable weather conditions.

Similar photometric programmes have also been performed by two other groups at La Silla using CCD cameras (PIs: K. Horne, B. Sicardy) and also by many other observers around the world. When their photometric data become available, a concerted effort will be made to search for probably very faint, coincident flash signals, which might still be hidden in individual light curves behind features that were otherwise thought to be artefacts of the different reduction procedures.

The faintness (or even absence?) of light echoes in optical light is nevertheless an important result from our observing campaign. Together with other data obtained world-wide during the SL-9 impacts, both from Jupiter itself and its satellites, it will certainly help to better understand the physics involved in such high-energy processes.

Near-Infrared Imaging of Comet SL-9 and Jupiter's Atmosphere

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The Max-Planck-Institut für Astronomie in Heidelberg kindly granted observing time at the ESO 2.2-m telescope during "German" time from July 16 to 24. During this run, Jupiter was observed with ESO's IRAC 2B near-infrared camera in the K band through interference filters and a tunable Fabry-Perot-interferometer (FPI) with resolution approximately 1000. This programme aimed at studying the interaction of the cometary fragments with Jupiter's atmosphere.

Regrettably, no impacts were observed. Apart from some wide-band im-

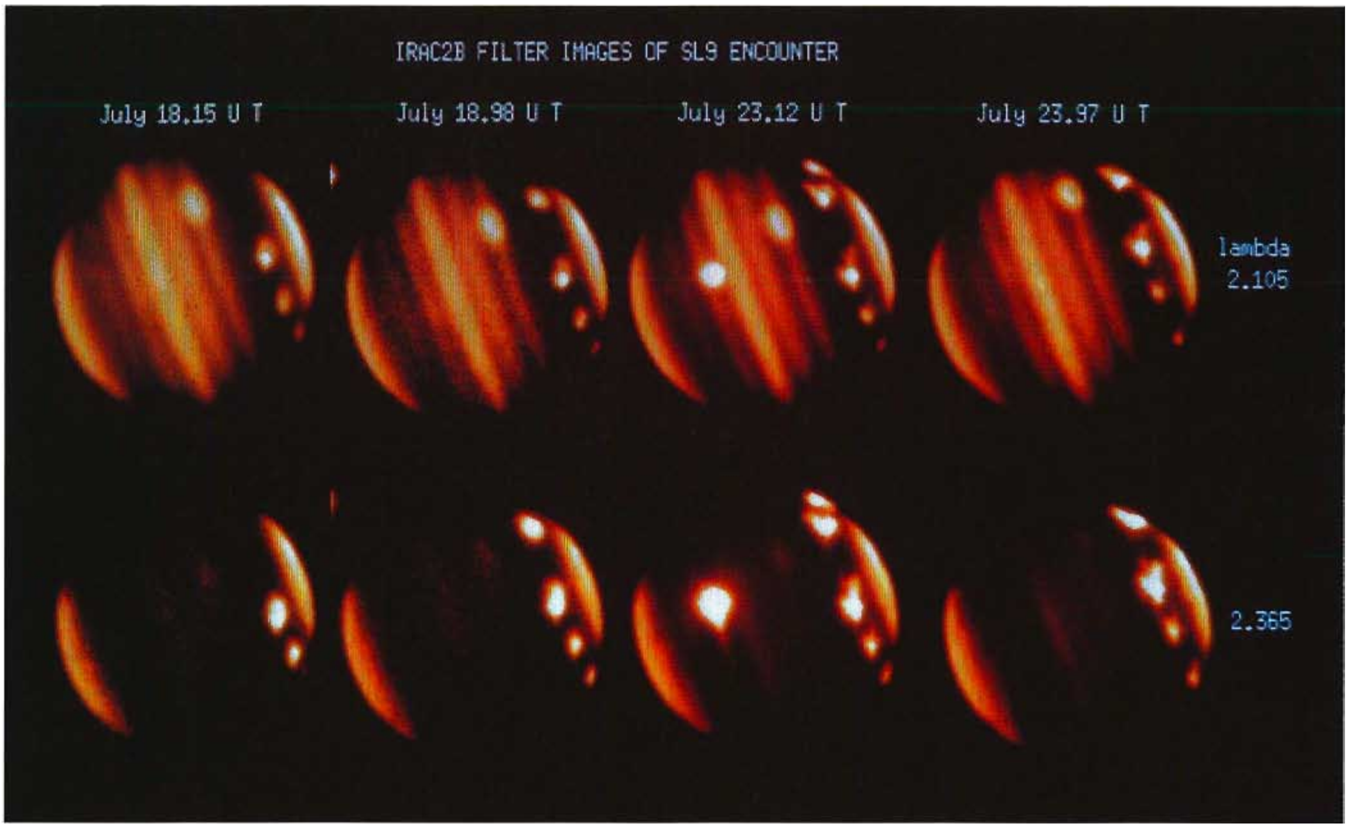

Figure 1.

ages taken through the K and Kp filters, mainly during the time of impact B (which did not produce any observable effects), most filter images are taken through the interference filters BP4 and BP11 (central wavelengths 2.105 and 2.365 μm, and FWHM 0.037 and 0.088 μm, respectively). These wavelengths are located in the wing and in the centre of a deep methane absorption band.

While at 2.105 μm some of the Jovian clouds are still visible, Jupiter's disk is practically black at 2.365 μm, and even the Great Red Spot, which extends to great height, is barely visible at this wavelength. Figure 1 shows several frames taken at different Jovian rotations at similar aspects of Jupiter's disk. The well-known feature of the Jovian polar haze is visible in both wavelengths at nearly the same brightness, while the Jovian atmospheric clouds appear only at 2.15 μm. On July 23.1, Jupiter's satellite Io is seen to cross the disk. The impact clouds appear bright in front of the disk. As time goes on, more impacts occur, and more of these clouds appear. They are remarkably stable, but in the course of a few days they are getting sheared by Jupiter's velocity field.

From comparison of the images in the two wavelength ranges, it is obvious that the clouds must be located in atmospheric heights that are unaffected by methane absorption. Outside of wavelengths of strong methane absorption the impact clouds appear dark in front of the bright Jovian disk. This, and the observed high stability of the clouds, makes it likely that they consist of solid material, either remains of the comet, or material from deeper layers of Jupiter's atmosphere brought into the Jovian stratosphere during or shortly after the impacts. Spectra in the infrared and visual range, as obtained by other ESO projects, are needed to investigate the nature of the cloud material.

With the Fabry-Perot interferometer the line of H_3^+ at 2.093 μm and the H_2 quadrupole line at 2.121 μm were observed. Both lines are sensitive to temperature enhancement in the outer layers of the Jovian atmosphere. The fundamental vibration band of H_3^+ at 3–4 μm can always be observed in Jupiter's aurora, where it is excited by heating Jupiter's ionosphere through electron precipitation caused by magnetospheric phenomena. The H_3^+ lines in the "hot" overtone band at 2 μm can be observed only when the auroral heating is particularly strong.

Because of Jupiter's rapid rotation, line images and continuum images at a wavelength of 2.108 μm were taken alternately. So far only single pairs of line and continuum images have been processed. They show that at both wavelengths the line and continuum images, apart from a factor, seem to be exactly identical. Consequently, despite the positive results obtained with the IRSPEC instrument, the FPI images so far do not show any evidence for line emission. Most likely the signal/noise ratio of individual pairs of images is not sufficient to show the line emission. To increase the signal/noise ratio many pairs of interferograms must be averaged.