planetary stage, through an axi-symmetrical structure reminiscent of bipolar nebulae. Further observations exploiting this still unique opportunity of studying the central star of a type-II OH/IR source are in progress; and, of course, other optical counterparts are actively searched for.

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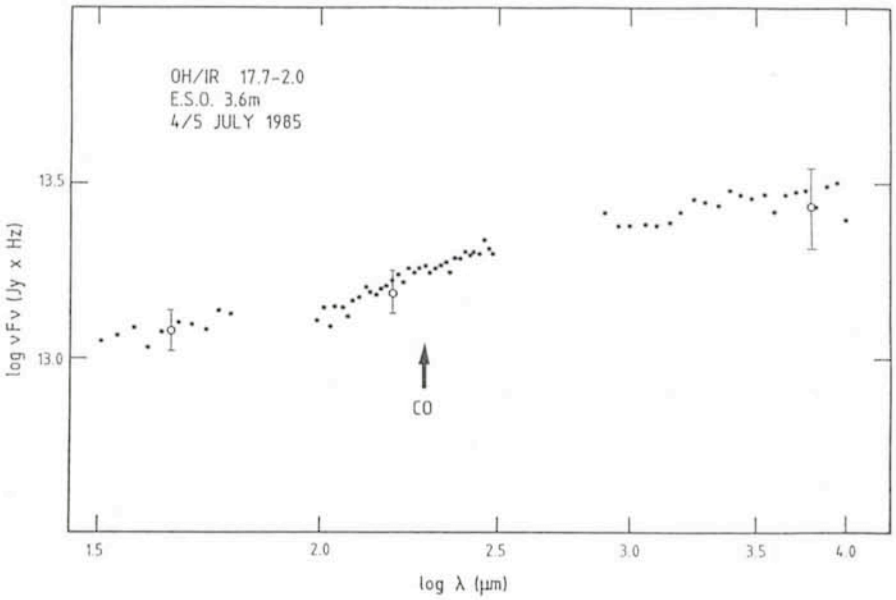

Figure 4: *(1.5–4 μm) CVF spectrum of OH/IR 17.7–2.0. The empty circles (o) correspond to the broad band (H, K, L) data obtained at the 1-m telescope (same as in Figure 3). The arrow indicates the position of the 2.3 μm absorption band produced by CO, and, normally, found in M stars.*

Infrared Observations of Comet Halley Near Perihelion

T. LE BERTRE, P. BOUCHET and A. CHALABAEV, ESO
A.C. DANKS, Michigan State University
T. ENCRENAZ and N. EPCHTEIN, Observatoire de Paris-Meudon

Ground-based observations of periodic Comet Halley near its perihelion passage were important due to the increased activity of its nucleus as it approached the sun and, in this specific case, due to the planned spacecraft fly-bys several weeks later. As with all comets, it naturally reached its maximum brightness at perihelion, but, of course, it was then so close to the sun that it was difficult to see or measure. It is the cometary astronomers misfortune that the best moments to catch a comet at its brightest are just before sunrise, or just after sunset. Few ESO telescopes can be used to observe the comet so close to the sun. Among them, the GPO which can almost be pointed to the horizon, and the 1-m telescope which, when equipped for IR observations, can be used for daytime observing. Our principal interest was to monitor the comet progress and evolution in the IR using both the ESO 3.6-m and 1-m telescopes. As a single group, we had sufficient time spaced around perihelion to monitor the comet fairly well. In addition, we were able to fill some of the remaining holes with the kind cooperation of 1-m observers B. Reipurth, H. Cuypers and G. Hahn, who allowed us to observe 1 or 2 hours each day during their observing runs.

During this time, between December 24, 1985, and March 3, 1986, the 1-m telescope was used for approximately three periods of two weeks each. The orbit of the comet brought it from the northern hemisphere to the southern hemisphere, steadily brightening, and, from February 17 to March 3, the comet was undoubtedly well located ($\delta \sim -14°$) for observations from La Silla. The comet was west of the sun in this period and, consequently, observable in the morning; due to the configuration of the Andes the sunrise was delayed by approximately 15 minutes. These 15 minutes or so were crucial in the period from February 17 to 18 when the comet was at less than 20° from the sun. The 1-m telescope was equipped with an InSb detector for the 1 to 5 μm range or a bolometer for the 8 to 20 μm range. Both instruments employ a focal plane chopper, and chopping was carried out in the east-west direction with a 30 arcseconds amplitude. This naturally means, due to the large angular size of the comet, that with one beam centred on the nucleus, the other beam was somewhere in the coma.

In Figure 1, the broad band flux distribution is shown plotted against wavelength. Although the dust grains expelled from the nucleus constitute, in mass, only a minor fraction of the material, they are the dominant element responsible for the observed broad-band IR spectrum. The flux distribution can be seen to consist of two different regimes: from 1 to ~ 3 μm, the spectrum is dominated by dust-scattered sunlight, whereas at wavelengths longer than 3 μm, thermal emission from the dust is dominating, and described well by a 400°K blackbody (no wavelength dependence of emissivity has been taken into account). The spectrum is qualitatively similar to that found in comets Bennett, Kohoutek and Bradfield (see e.g., Ney, E.P.: 1974, *Icarus* **23,** 551).

In Figure 2, the evolution of individual bands and colours is shown with time, over the period between February 17 and March 3, 1986. One measurement a day was made at approximately 10 hours UT, and the observations were, therefore, carried out during day time, centring the comet by maximizing the detector signal. This procedure worked well as there was found to be no wavelength dependence with this

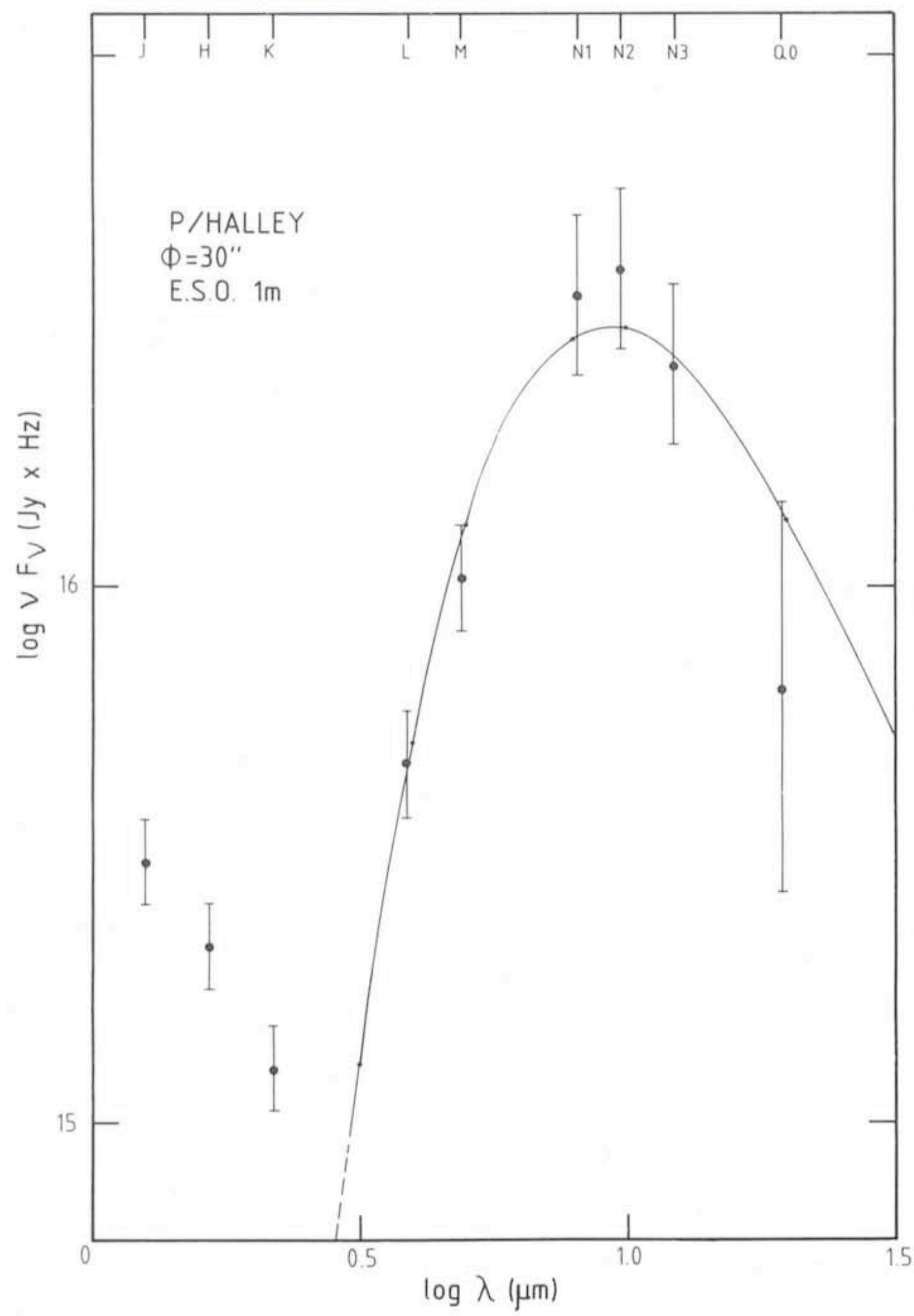

Figure 1: *Broad band spectral energy distribution of the central part of comet P/Halley (∅ = 30") obtained in January 1986 with the 1-m telescope. The labels in the upper part of the frame indicate the positions of the broad band filters that have been used.*

technique; also we had checked, before, that the IR centre corresponded to visual centring to within 2 to 3 arcseconds. Throughout, we used the IHW ephemeris to locate the comet, and we also took the cometary motions from there to set the telescope tracking rate; both proved extremely accurate. Figure 2 shows that strong fluctuations in individual bands were seen from day to day superimposed on a monotonic variation. In some cases, fluctuations of up to 1.5 magnitudes are seen within 24 hours (i.e. a factor of 4 in flux). These fluctuations were present in all filters and appear to be well correlated (to help visualize this correlation, linear regression lines are also shown). This means that these fluctuations are almost identical in the emitted and in the scattered fluxes, and, consequently, that they are mainly due to variations in the mass-loss rate ("outbursts"). Of course, it is well known that comets exhibit both a gas tail and a dust tail, and it is therefore not surprising that we have noted a correlation between these outbursts and the apparition of tail features. The origin of these rapid variations in the mass-loss rate may be multiple. It could be in part due to the elongated shape of the nucleus; depending on the orientation of the nucleus with respect to the sun, the surface area exposed to the sun's radiation, and hence solar heating, would be different, consequently varying the amount of heat absorbed, and therefore the amount of matter released. Such a geometrical effect could alone account for a factor 4 in the variation of mass loss, only if the nucleus is highly prolate (4:1). In fact, recent pictures obtained by Giotto suggest that the nucleus is of the order of 12 by 5 kms (i.e. ~ 2:1). Another source of the outbursts could be inhomogeneities in the composition of the nucleus. Present models suggest that the cometary nuclei are made of snows or ices, with a clathrate or porous like structure in which the dust particles are held. Solar heating results in sublimation of these snows with the consequent release of gases and dust. Furthermore, varying composition or crystallization of the ices would result in varying specific heats and hence varying production rates. In both cases, the rotation of the nucleus should be reflected in the light-curve by some sort of periodicity. If this periodicity were due solely to geometrical effects, the observed period would be twice as high as that produced from a rotating active region. More likely, both effects are present, with several active regions, to produce a more complex variation.

The monotonic variations are most probably due to changes in the distances between the comet, sun and earth. Part of them are almost certainly observational effects. As the chopping throw used was fixed at 30 arcseconds, it follows then that, as the earth-comet distance changes, we effectively compare the nuclear region to physically different parts of the coma. The coma itself, being fed by mass loss from the nucleus will also be varying in brightness.

Variations of colour with time are also seen; although the effect is small in comparison with the individual magnitude, it is real and was especially apparent around March 1. The rapid colour fluctuations could be indicative of an evolution in the scattering and emitting properties of the dust as ist moves outwards from the nucleus. The monotonic variations in K-J most probably are due to changes in the scattering angle, whereas the L-M index would more probably reflect the decrease in dust temperature as the comet recedes from the sun. Finally, time variations study of the observed fluxes from different diaphragms is also possible due to the high quality of the detector beam profiles,

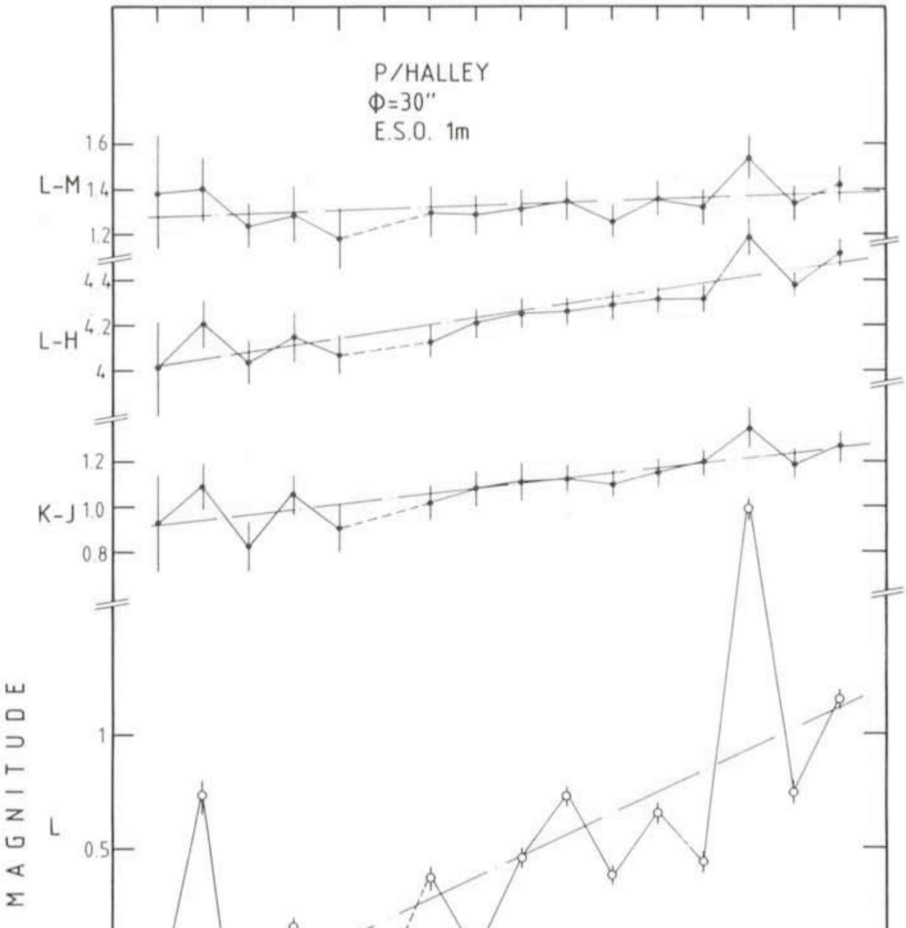

Figure 2: *Infrared light-curves of comet Halley between February 17 and March 3 are shown. Observations were made with a diaphragm of 30". Filled circles (●): H-curve (scattered flux); empty circles (○): L-curve (emitted flux); small dots (•): colours (K-J, L-M and L-H) -curves. There was no observation on February 21.*

and initial results indicate the outward dust propagation from the nucleus.

An impressive amount of IR data has already been collected at ESO and is being analysed. The first data on Halley were obtained with the 1-m telescope in September 1985, and we plan to pursue, with it, our monitoring further on, at least till July 1986.

We are thankful to R. Vega who always, even after a long observing night, helped us with enthusiasm and skillfulness.

ESO Exhibition at the Amateur Astronomy Fair at Laupheim

Soon after the ESO exhibition at the Reuschel Bank in Munich closed on 30 April, it was transported to the city of Laupheim, about 150 km west of Munich. Here it was one of the highlights during the 3-day Amateur Astronomy Fair on May 17–19, 1986. The fair which was organized by Volkssternwarte Laupheim for the fifth time attracted more than 5,000 amateur astronomers from all over Germany and was a great success.

The photo on page 24 of this issue shows a model of the ESO New Technology Telescope (scale 1 : 20) which joined models of La Silla, the ESO 3.6-m and the future ESO VLT 16-m telescope in Laupheim. The ESO exhibition which also includes large colour pictures of the most beautiful objects in the southern sky, is available for similar occasions. Societies, institutions, etc. who are interested in borrowing (part of) the exhibition should contact the ESO Information and Photographic Service.

ESO Press Releases

The following material has been published since the last issue of the *Messenger*. It has been sent to about 350 addresses in the ESO member countries and beyond. The distribution is limited for practical reasons, but members of the press are welcome to apply for inclusion to the ESO Information and Photographic Service (address on last page).

PR s/n: The ESO 16-m Optical Telescope (VLT) – a Colour Brochure (20 March).

PR 07/86: Big Radio Galaxy Is Nearer Than Previously Thought (13 May; with photo of NGG 5128 = Cen A).

Note also that an ESO Halley Slide Set has now become available, see the announcement on page 17 in this issue of the *Messenger*.

ESO Book to Appear in 1987

It has been decided that the ESO Book "An Outlook to the Southern Sky", cf. the *Messenger* 43, p. 25 (March 1986), shall now be published in 1987, on the occasion of ESO's 25-year anniversary. A publishing contract with a major European publishing house is in the final stages of negociation.