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ESA IUE Newsletter

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OBSERVATORY CONTROLLER'S MESSAGE

W. Wamsteker

ESA IUE Observatory

Since the previous Newsletter many things have occurred which are of importance to the IUE Users. Let me first inform you that the ESA's Science Programme Committee has decided to extend the ESA IUE Project for one more year with forward planning for another year. This means that currently ESA will support IUE until December 1995 and a Call for Proposals will be issued later for the 18th year of IUE Observations. In addition to this, it is also with great pleasure that we were informed that our NASA partners have decided to continue funding the IUE Project for the fiscal year 1995. This has the great advantage that we can maintain the important coordination between the ESA and NASA IUE Science observing programmes. It was however decided to continue the preparations for ESA/PPARC - only operations, although with less urgency (PPARC = Particle Physics and Astronomy Research Council the new Agency responsible for IUE in the United Kingdom).

At VILSPA itself of course major changes are taking place with the arrival of the first people and instrumentation associated with the ISO Project. We welcome our colleagues at VILSPA and hope that the scientific nature of the Villafranca Station, through its support of two Observatory missions simultaneously, will be reinforced.

The IUEAC has completed its difficult task and allocated the observing time for the 17th round of IUE Observing. At this moment much IUE time is dedicated (as is at many other observatories, all around the world and in space, to study the effects of the Shoemaker Levy 9/Jupiter encounter). The IUEAC has decided that due to the special nature of the observations of SL9, these will not have any proprietary period associated; in this they are similar to ToO observations. The schedulers have efficiently been able to schedule the programs using their new scheduling support software. From the spacecraft side it appears that the effects of the "streak" associated with the FES Anomaly are becoming less severe (*nobody has been able to confirm that a self-repair mode was originally incorporated in the spacecraft*). It is still too early to be certain that this trend will continue and the situation remains intensely monitored.

The production of the IUEFA is going well but some interruption has been caused by the delay in the delivery schedule of some of the S/W, it is however still expected that we will be able to overcome the delays through increased processing efficiency. Some of you might have wondered why the NEWSIPS output products of the data have not yet been available at VILSPA, while NSSDC already has made some of the NASA data available. The reason for this is in the fact that we felt that we should not present the data to the Users until NEWSIPS had reached the necessary stability to assure that the data available to the Users are inter-comparable and a more complete set could be supplied. This is now the case and therefore visiting Astronomers can retrieve at VILSPA, the ESA SWP images taken before 1990 and we expect to be able to support complete SWP archive support (data taken before 1990) by the end of September. After that IUEFA data sets will be made available as they are completed.

Let me finally express my hope and expectation that you will be pleased with the new internal layout of the ESA IUE Newsletter, which has been homogenized in format by Michael Barylak.

IUE Spacecraft Status

D. Hermoso

INSA/VILSPA

1. GENERAL

The spacecraft continues to support science operations normally and efficiently in its 17th year.

At the end of April 1994 a total of 26.524 images had been collected from 11.157 objects (VILSPA only).

Although the so-called "Baffle Anomaly" is mainly associated with the aging of the spacecraft and is a matter of concern to the project, there are no indications that these will have immediate influence on the importance of the IUE as a scientific mission due to the flexible operation mode of IUE.

2. POWER SUBSYSTEM

IUE's Shadow Season #33 ran from January 11 to February 8, 1994. The longest umbra period of the season was 59.94 minutes, and the maximum depths of discharge were 42.56and #2 respectively.

As far as batteries 1 and 2's performance is concerned, battery #2 dominates and it supplied an average of approx. 2.7than battery #1.

3. ATTITUDE CONTROL SUBSYSTEM

Gyro #5 continues to show 0 amps of motor current since its sudden drop on February 5, 1991. The slope of Gyro 5's drift remains reasonably constant. Gyro 4 continues to perform nominally, maintaining a very stable drift. The normal increase in gyro drift is associated with the degradation of the gyro's condition, while periodic fluctuations are thermally induced. An increase in the drift of Gyros 4 and 5 was seen after the Delta-V maneuver on February 15, 1994. This was an expected effect of the stresses from the Delta-V and transferring the gyros from Hold/Slew to Rate Mode and back.

The hydrazine remaining in the tanks are 17.85 kg. after March 30, 1994. Usage rate is approx. 0.575 kg/year for the purposes of reaction wheel unloading and station keeping maneuvers (Delta-V).

On February 15, 1994 a 13.11 seconds orbit adjustment maneuver was successfully executed.

4. SOLAR ARRAYS

The average yearly degradation continues in approx. 3.1Enough power is supplied by arrays to keep the spacecraft power positive over the range of beta angles between 35 degrees and 103 degrees based on a nominal power requirement of 147.9 watts.

Report of the Novae Target of Opportunity Team

Joachim Krautter

Heidelberg

The ToO team consists of:

J. Krautter, (Heidelberg, Convenor)
Y. Andrillat, (Montpellier)
A. Bianchini, (Padova)
M.F. Bode, (Lancashire)
R. Canal, (Barcelona)
A. Cassatella, (Frascati)
H. Drechsel, (Bamberg)
H. Duerbeck, (Munich)
A. Evans, (Keele)
M. Friedjung, (Paris)
J. Fuensalida, (Canarias)
R. González-Riestra, (Madrid)
D. de Martino, (Madrid)
R. Monier, (Madrid)
L. Rosino, (Padova)
T. Snijders, (Saint Martin d'Heres)
U. Thiele, (Almeria)
M. della Valle, (Garching)

1. Observations with IUE in 1993

During the last year only one nova, N Cas 1993, has been observed as target of opportunity. Four half shifts were spent for this nova on Dec. 24, 1993 and January 2, February 2 and February 10, 1994. This nova which is a moderately fast or slow nova, has been observed in close collaboration with the US ToO team. Cas 93 it is by now still in an optically thick phase which is unusually long. All other novae observed with IUE had become optically thick earlier. Another unusual feature is the strength of the MgII emission. Cas 93 has been extensively observed from ground-based optical observatories too, and, in addition, a ROSAT ToO observation was carried out on January 20 (the results are not known yet).

2. Publications

Main Journals

- González-Riestra, R.: *'The 1990 Outburst of the Recurrent Nova V3890 Sgr Observed with IUE'* Astr. Astrophys. **265**, 71 (1992)
- Shrader, C. and González-Riestra, R.: *'UV Observations of Nova Muscae 1991'* Astr. Astrophys. **276**, 373 (1993)
- Shore, S.N., Sonneborn, G., Starrfield, S., Gonzalez-Riestra, R.: *'The early ultraviolet spectral evolution of Novae Cygni 1992'* Astron.J. **106**, 2408 (1993)

IAU Circulars

- Shore, S.N., Starrfield, S., Sonneborn, G., Ake, T., González-Riestra, R.: *'V1974 Cygni'* IAU Circular 5747 (1993)
- Shore, S.N., Starrfield, S., Hauschildt, P.H., Sonneborn, G., González-Riestra, R.: *'Nova Cassiopeiae 1993'* IAU Circular 5925 (1994)

3. Suggested observations for the next year

The IUE Allocation Committee approved a change of rules governing ToO status for Novae. In future all LMC novae brighter that 12th magnitude will also qualify for ToO status. (This is in addition to the current rule covering all galactic novae brighter than 6th).

4. Scientific Rationale

Novae have been observed with IUE since shortly its launch and these observations have given - in combination with observations in other spectral ranges - totally new insights into the nova phenomenon. The high over-abundance's of the heavy elements CNO, as predicted 8 years before the launch of IUE, could never have been reliably established without IUE. Moreover, on the basis of IUE observations, a totally new class of novae - those on which the outburst occurs on an NeOMg white dwarf - could be discovered. However, we would like to emphasize that the outburst characteristics of each novae observed in the UV have been both qualitatively and quantitatively different, and, hence, further observations of novae are urgently needed.

UV spectra appropriately spaced in time through the nova active period and decline provide measurements of the formation and lifting of the iron curtain, the shift of luminosity into the UV, the absorption and emission line strengths, the kinematics of the ejecta, and are sensitive to dust formation. The UV data will be combined with simultaneous ground based optical, IR, X-ray, and radio observations, to be obtained as part of this project. These data are necessary to determine important physical characteristics of novae such as the energy budget, chemical abundance's of the critical CNONeMg elements, mass ejection rates, line formation mechanisms, and dust condensation processes. Also vital to determine the energetic of a nova is a reliable determination of the reddening and its wavelength dependence. The optical and IR hydrogen lines provide the potential for estimating the reddening independently of the usual method of removing the '2200' interstellar absorption feature in the UV spectrum; furthermore, complementary UV and optical/IR determinations of reddening can point to possible differences between the 'standard' interstellar reddening law and the reddening law for a particular nova, with major implications for the energy budget. Because most of the energy radiated by a nova during its outburst is in the UV and EUV, and because there are emission lines in the UV from ions that do not radiate in the optical, the IUE observations are absolutely necessary for the study of the outburst.

Surveys of the LMC have discovered six bright nova and UV studies of these novae are providing important data on the UV behavior of novae in our Galaxy and the LMC. Our studies of novae in outburst have identified broad classes of behavior both in composition and in energetics. We have also found major differences in the outburst characteristics between classical novae and RN and can show, in fact, that the outburst behavior of a RN depends on its environment. We must now proceed to answer detailed questions about the phenomena that we are observing but do not yet understand. We need more data on novae in outburst and, especially, data very early in the outburst when the expanding shell is still optically thick.

Report of the Supernova IUE ToO Team

C. Fransson

Stockholm

The ToO team for supernovae consists of:

C. Fransson (Stockholm; Convener),
R. Canal (Barcelona),
E. Cappellaro (Padua),
J. Fernley (VILSPA/SERC),
M. Kidger (IAC),
P. Lundqvist (Stockholm),
N. Panagia (STScI),
P.M. Rodriguez-Pascual (VILSPA/ESA),
L. Sanz Fernandez de Cordoba (LAEFF),
M. Turatto (Padua),
W. Wamsteker (VILSPA).

Usually the VILSPA Supernova ToO observations are made in close coordination with the NASA Supernova program. P.I.'s G. Sonneborn (GSFC) and R. Kirshner (CfA).

1. SN 1987A

IUE observation of **SN1987A** have shown a number of high ionization emission lines after ~ 100 days. These grew steadily in time up to ~ 400 days, after which they have decayed (Fransson *et al.,* 1990). The observations have now continued past 2000 days, and represent a unique example of the usefulness of IUE for long term monitoring. The complete set of observations has now been reduced and the results have been presented at several meetings. A paper describing these observations is near completion (Fransson & Sonneborn, 1994; Sonneborn *et al.,* 1994). Light curves of the UV lines are shown in *figure 1.* Imaging ground-based and HST observations revealed that the circumstellar gas was confined to a shell with most of the emission coming from a ring-like structure. High-resolution spectroscopic observations show that the expansion velocity of the ring is $\sim 10^3$ km s^{-1} and that the rest of the shell is expanding faster. Most models explaining the properties of the blue progenitor as due to previous mass loss, predict such a red wind to be present from an earlier evolutionary state.

These observations have been modeled as a result of the ionization in connection with the outbreak of the shock wave in combination with a light echo and recombination. A first modeling based on a spherical shell was discussed in Lundqvist & Fransson (1991). These models showed serious discrepancies with the observed light curves. A new discussion based on a ring geometry, as seen by HST, implying a considerably larger radial thickness has greatly improved the agreement with the data (Lundqvist 1992; Lundqvist, Fransson & Blondin 1994). The new reduction of the observations together with the modeling also confirm the large nitrogen enrichment reported in our first paper. This has proved to be, besides the photometry, the main constraint on progenitor models for **SN1987A.**

The ejecta are expanding with a velocity of ~10,000 km/s. They will therefore collide with the ring in the near future. The most detailed models predict this to occur 2003+/- 3. The models depend, however, on the structure of the circumstellar medium of **SN 1987A,** and the collision may therefore take place earlier than this. A large fraction of the emission will occur in the UV. A brightening of the ring has already occurred in the optical, reported by Wang et al. (IAU Circ. 5927), although the reason is unclear. A continued monitoring is therefore very important.

2. SN 1993J

The recent **SN1993J** in M81 is the most interesting supernova event since **SN1987A.** From its discovery of Feb. 28 1993 it has been observed with all major instruments ranging from radio to X-and gamma rays.

The first observations with IUE took place only 24 hours after discovery (Wamsteker et al. 1993; Sonneborn et al. 1993). These observations are discussed in Fransson and Sonneborn (1994), and a detailed paper is in progress. The initial observation showed a very hot continuum with temperature of ~22,500 K. 24 hours later the temperature had decreased to 14,500 K (*figure 2).* Besides a very hot continuum, the spectrum showed a bright, narrow NV λ124 nm line. High dispersion observations (*figure 4*) showed that the linewidth was less than ~1000 km/s. A puzzling feature was that only the λ124.2 nm component was seen. From the narrow width the NV emission was immediately interpreted as of circumstellar origin. During the next week the NV emission decayed very fast and has in mid-April vitually disappeared (*figure 3*). From the high state of ionization it was obviously the result of ionization and heating of the circumstellar gas by radiation from the supernova. The IUE obserations therefore probe the hot radiation during the first hours after outbreak, long before discovery. Parallel to these observations we have modeled the interaction of the Supernova with its circumsterllar medium, discussing implications of the γ–ray, X Ray, UV and Radio emission observed (Fransson, Lundqvist and Chevalier, 1994). It is found that all observations can be explained self consistenly with radiation emerging from the ~109 K gas behind the SN shock wave and the soft X-Rays in connection with the shock outbreak. The shock is the result of the Supernova ejecta interacting with the stellar wind lost by the progenitor. The mass loss rate is estimated to be 4 10^{-5} $M_{\odot}$ yr^{-1}. In addition to the circumstellar emission, there are several broad features in the continuum, mainly due to FeII resonance lines at λ300 nm.

The rapid response to the discovery allowed IUE high dispersion spectra to be taken to study the interstellar medium in line of sight to M81 (de Boer et al. 1993). These show a number of components from highly ionized species, originating in M81, the halo of our Galaxy and from intergalactic gas surrounding the M81/M82 group.

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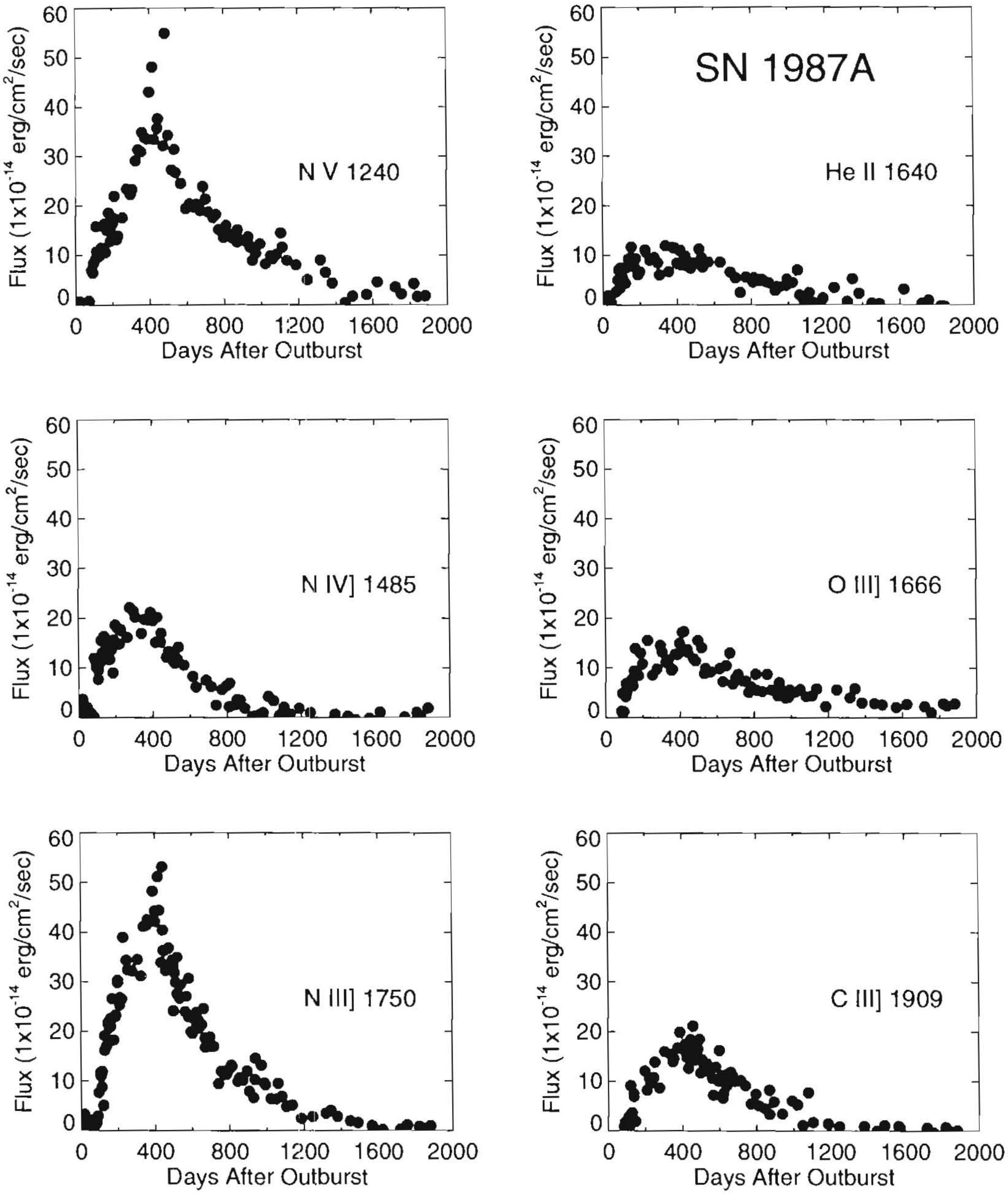

Figure 1: Lightcurves of the UV lines from the circumstellar medium of **SN1987A** as determined from IUE spectra.

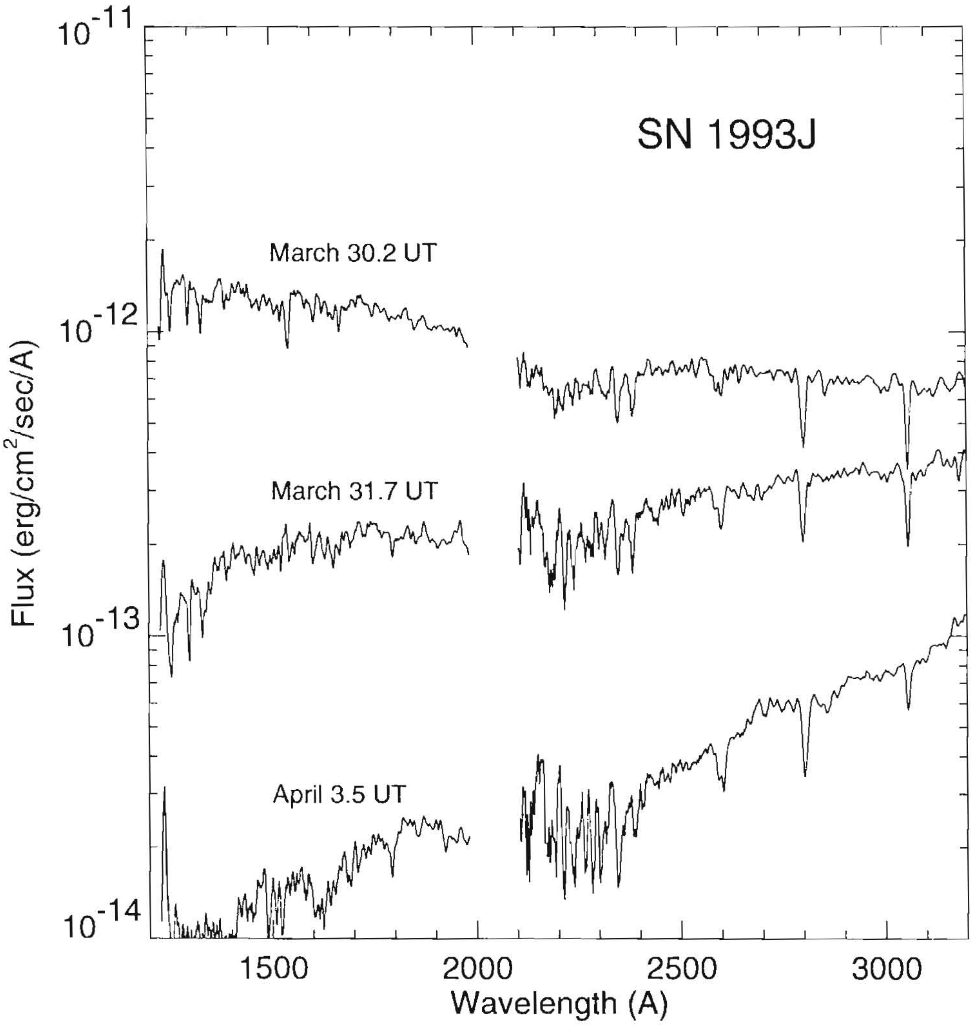

Figure 2: Spectral evolution in the UV of **SN1993J** during the first days after the explosion. The NV λ124 nm emission line is clearly visible; The spectra in the figure were truncated at the short wavelength end to suppress geocoronal Ly-α.

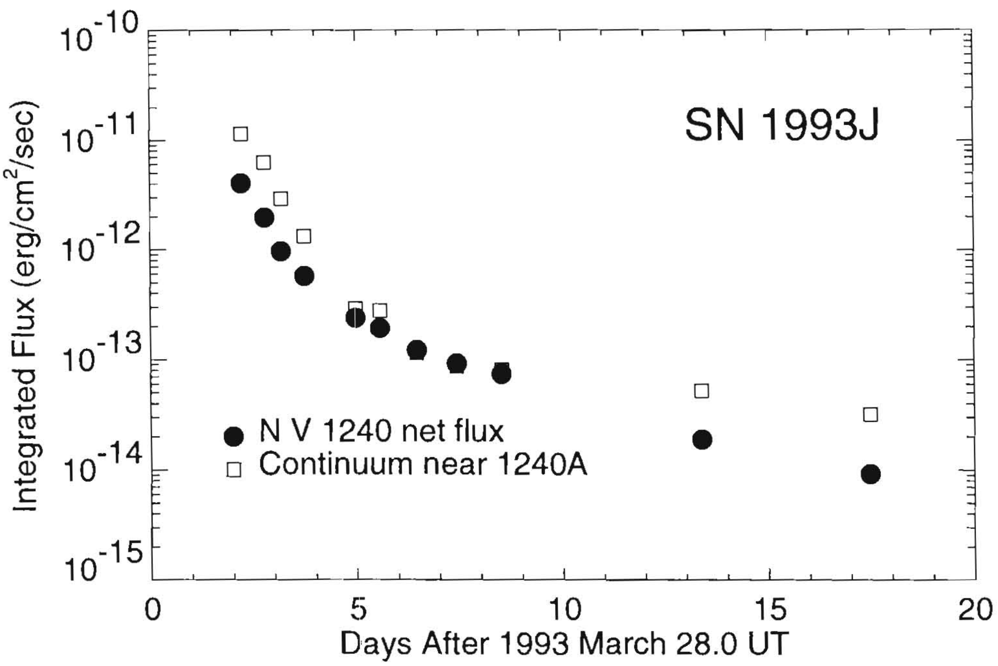

Figure 3: Lightcurves of NV λ124 nm line in **SN1993J.** The solid circles represent the NV flux above the continuum and the open squares the mean continuum level near the line.

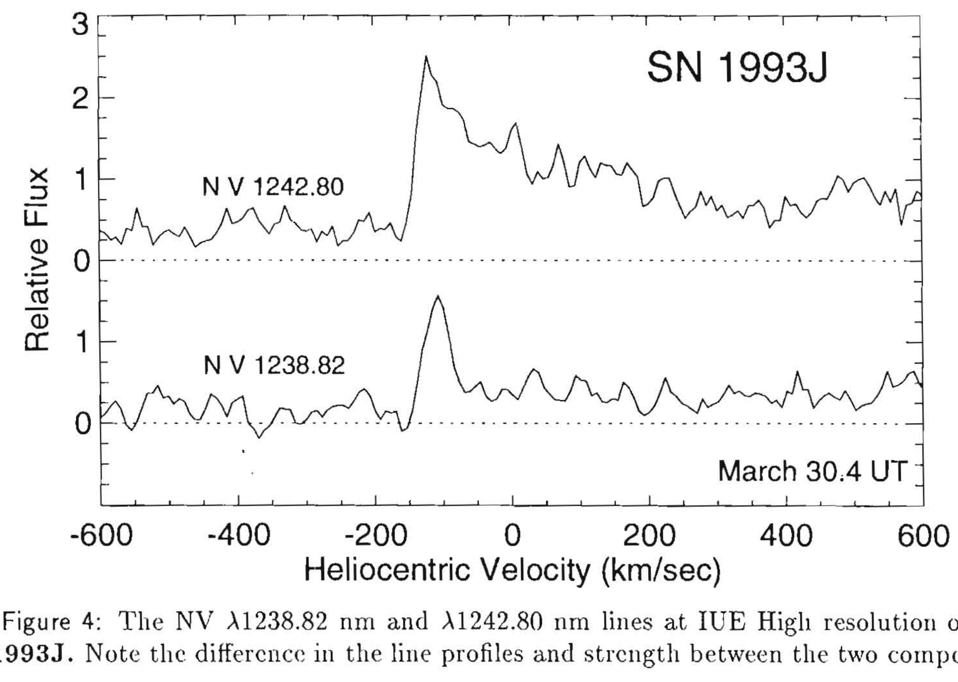

Figure 4: The NV λ1238.82 nm and λ1242.80 nm lines at IUE High resolution on March 30.4, 1993 in **SN1993J.** Note the difference in the line profiles and strength between the two components.

Report of the Comet Target of Opportunity Team

J.C. Zarnecki, Convenor

University of Kent

The observation of comets by IUE has proved to be of great value over the years of IUE's lifetime. In fact, observations held in the IUE cometary database, many of which have been gathered together and published in the form of the ULDA access guide (ESA-SP-1134), represent *the largest homogeneous collection of cometary observations available to astronomers in the world.* Nearly 50 comets have been observed by IUE and are included in this guide. This collection of data continues to be a tool for cometary research and it is confidently expected to be used by cometary scientists for many years to come.

Despite fascinating differences between the various comets observed by IUE, the class taken as a whole seems to be characterised more by their homogeneity than by their diversity. Difference do occur, particularly in the gas to dust ratio for example, but composition, at least of the more abundant elements seems to be comparable. It seems to be felt in the community that what is really needed now is the occurrence of a really bright comet to appear in good observing conditions. This would then allow a different type of observation to what had been done previously. If such a situation were to occur, the goals of the Target of Opportunity team would be:

- To map the spatial distribution of constituents in the coma to yield information on species lifetime and sources.
- To search for new spectral features to give information on the chemical composition of the nucleus, particularly with regard to minor constituents. (These new features will necessarily be weak and will therefore require a bright comet in order to be detected).
- More specifically to observe the OD lines in a comet other than P/Halley in order to make a comparison and determine whether this D/H ratio is typical for comets.

Within the period under consideration, no comet appeared that was sufficiently bright to trigger the Target of Opportunity requirements and make these observations possible. During the period, however the prediction and calculation of the collision of comet Shoemaker-Levy 9 with Jupiter during the week July 16 to 22, 1994 was made. However, as the predictions were made on a timescale that was consistent with the normal time allocation procedure, it was felt, at least initially, that this comet would not fall within the auspices of the Target of Opportunity programme despite the unique nature of the event. Subsequent discussions by the IUEAC may wish to modify this viewpoint however.

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C. Arpigny, University Liege
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Scattered Light from Nearby Bright Stars

J. Fernley

IUE Observatory, Vilspa

Introduction

Previous studies of this subject (A. Cassatella, IUE 3 Agency Meeting June 1986 and references therein) have shown that scattered light from bright stars close to the aperture causes significant "contamination" of IUE spectra. This is illustrated in Fig. 1 where we show the raw image from a 15 minute SWP, Lo-Res exposure on a blank piece of sky 2 arcmins away from α Cru (V=1.6, B0.5IV). These previous studies have concentrated on the scattered light at relatively small distances from the aperture, r < 2 arcmins, mainly because they were interested in removing the scattered light from the central source in observations of, for example, reflection nebulae and interstellar dust. It was found in all these studies that the scattered light, S_λ, followed a power-law relation of the form

$$S_\lambda = A_\lambda * r^{-a_\lambda}$$

Values of A_λ and a_λ are given in Table 1 where it can be seen that whilst A_λ shows a strong variation with wavelength, due to a combination of the camera sensitivity and the spectral type of the "contaminating" star, a_λ is only weakly dependent on wavelength, i.e. the scattering mechanism is almost independent of wavelength.

It can also be seen from Table 1 that the scattered light from even such a bright star as α Cru is expected to fall to zero for r > 20 arcmins. However, on April 3 1994 a 70 minute, Lo-Res, SWP image of the dwarf Novae BI Cru showed measurable contamination. The most likely explanation is scattered light from α Cru even though it is 35 arcmins away ! Examination of previous Lo-Res SWP images of BI Cru taken on March 26 and November 30, 1981 also showed a similar level of contamination.

Analysis

In order to investigate the behaviour of the scattered light at larger distances from the aperture we have made some new observations near α Cru as well as using archival material. The full list of spectra used are listed in Table 2 and plotted in Fig. 2 where it can be seen that out to distances of 20 arcmins the fall-off of the contamination is relatively steep but it then flattens out and there is a slower fall-off with very weak comtamination present even at distances as great as one degree. Based on a limited number of spectra taken at the same distance but at a different position with respect to the aperture, there appears to be no obvious position angle dependence.

Conclusions

Observers with lo-res spectra of targets close to bright stars of appropriate spectral type clearly need to be concerned about the presence, or not, of scattered light. In this context the words "close", "bright" and "appropriate spectral type" are difficult to quantify. For instance, for SWP spectra only stars of O,B or A spectral types will cause contamination whereas for LWP spectra F and G spectral types must also be considered. Similarly 1st and 2nd magnitude stars within a degree can be a source of contamination, depending on exposure time, whereas 4th or 5th magnitude stars are only likely to be a problem if they are within 10 arcmins again, of course, depending on exposure time. Firstly using the values of A from Table 1, and scaling with the appropriate spectral type and magnitude of the contaminating star, and secondly using the radial behaviour shown in Fig. 2 it should be possible to make a rough estimate as to whether a particular target and observation are likely to be affected.

If it is thought there may be a problem then the raw image should be inspected. If the raw image shows "contamination" then the IUESIPS extracted spectrum will be wrong because the background will not have been removed correctly. A preliminary search of the database, i.e. looking for targets within one degree of a sample of bright early-type stars, suggests few spectra are affected in this way. However if you have a spectrum that is affected and you require advice on how to deal with it you can contact the author (`jaf@vilspa.esa.es` or `vilspa::jaf`).

Table 1. Coefficients of Equation (1).

Lambda	A	a
1400	195	-2.27
1600	75	-2.29
1800	70	-2.34
2400	40	-2.56
2600	60	-2.54
2800	40	-2.57

Notes:
1. Values of a are from Cassatella (1986)
2. Values of A are in DN/HR and are measured at a distance of 2 arcmins from alpha Cru.

Table 2. Spectra used in the Analysis.

SWP	Distance
13583	35
15595	35
50452	35
50748	2
50751	10
50761	20
50976	1
50977	2
50978	5
50979	60

Notes:
1. Distances, in arcmins, are the distance of alpha Cru from the aperture.

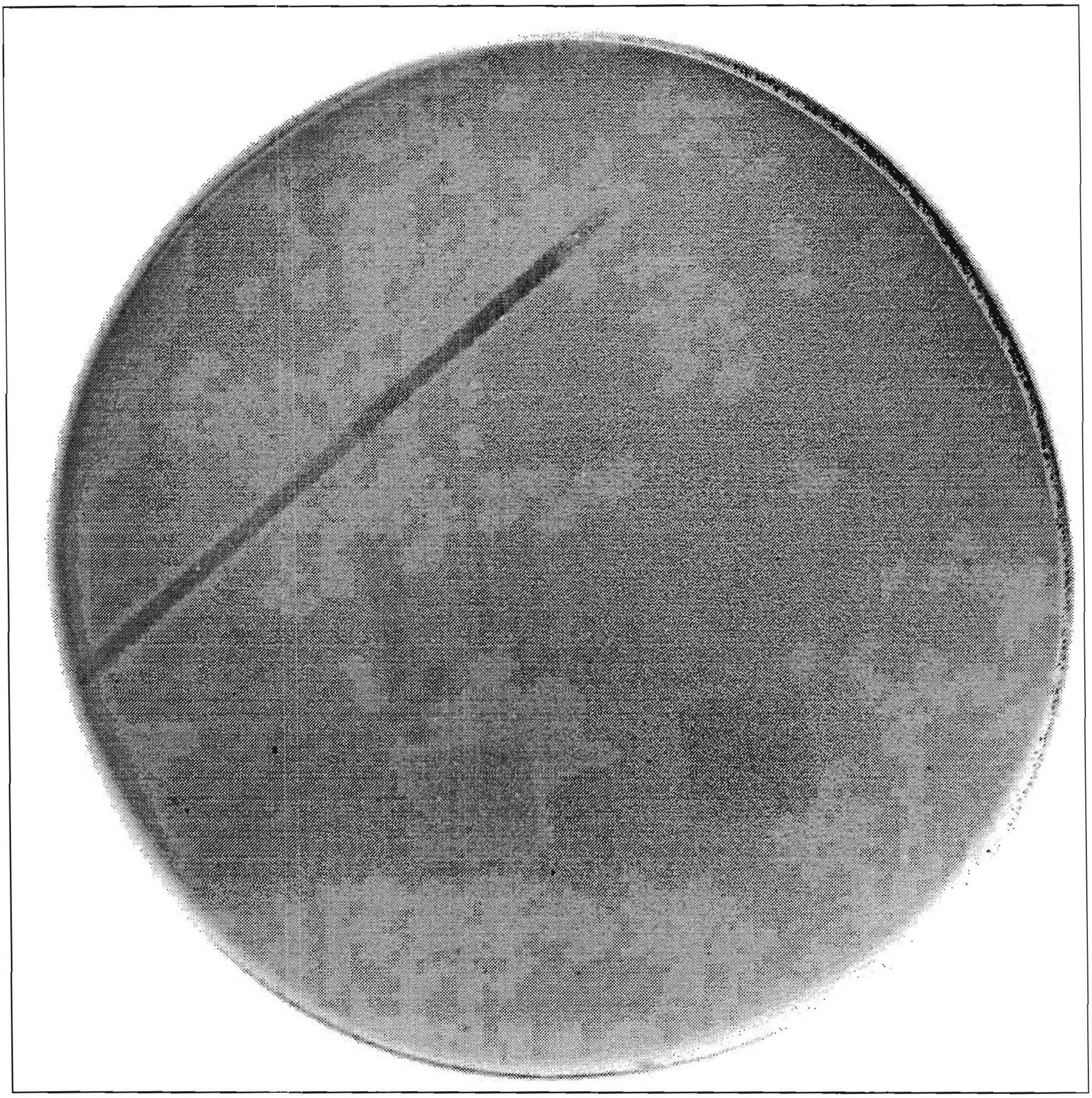

Fig.1 The raw image of SWP50748 which was a 15 minute, Lo-Res, SWP exposure on a blank piece of sky 2 arcmins away from α Cru (V=1.6, B0.5IV).

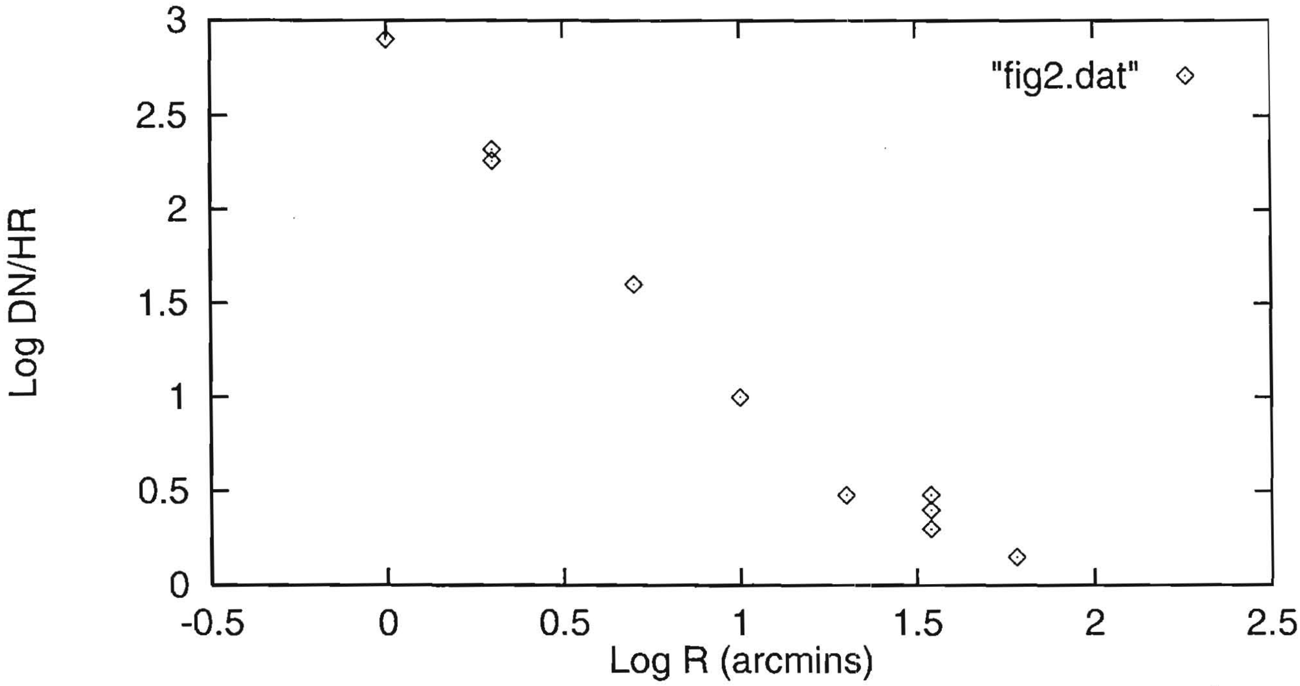

Fig.2 The variation of the intensity of the scattered light from α Cru, measured in DN/HR at 1400 Å, as a function of distance R, in arcmins, from the aperture.

The IUE Final Archive - V

A. Talavera, J.D. Ponz

VILSPA

Archive Production Status

In the previous article of this series (ESA IUE Newsletter No. 43, December 1993) it was announced the starting of the reprocessing of SWP low resolution images for the IUE Final Archive. At the time of writing this article, Vilspa has processed nearly 6000 low resolution SWP images corresponding to the first set, defined as the images obtained before 1990. The output files in FITS format have been written into 4 mm DAT tapes and from there they will be copied to optical disks, the media in which the Final Archive will be based.

The Quality Control procedures (see ESA IUE Newsletter No. 43, December 1993) set up in the processing system (NEWSIPS) have proved to be very efficient, confirming the correctness and high stability of NEWSIPS. Only less than 4% of the images have failed at some stage of the processing, most of them due to the lack of some processing parameter or to corrupted raw data.

The processing of LWP low resolution images will start within the next month, and we are working at both sites, VILSPA and GSFC, in the preparation of the second set of data, covering from 1990 till now, aiming at start processing of this set at the beginning of 1995. If you wonder what will happen to the LWR camera, not in standard use since 1984 but containing a very substantial part of the archive, do not worry: we shall process it as soon as the wavelength and flux calibrations have been derived for this camera.

The team at GSFC has made substantial progress in the development of the algorithms for high resolution pipeline; according with the current plan processing of high resolution data could start by the end of the year.

Data Distribution

Our main concern, now that archive production with NEWSIPS has became almost routine, is the distribution of the data to the astronomical community. The estimated information volume of the complete master archive is 1000 Gbytes, equivalent to more than 150 optical disks (12" WORM ODs) with files written in FITS format.

The distribution system is currently being defined in a phased approach that incorporates the experience with ULDA/USSP, using modern technologies in networking and user interface. The definition of the system will be done in collaboration with ULDA host managers, in such a way that experience and ideas from the users community are incorporated at an early stage of the design.

In summary, the main design aspect is to structure the system in three levels, corresponding to the Master node, several National Host nodes and unlimited End User nodes (very similar to the ULDA distribution architecture). End Users will access National Hosts via high level Internet services to query the catalog and request data available either at the National Host or provided by the Master node. Details of the design will be discussed during the next ULDA Host Manager meeting (June 1994). A prototype of the system, required for production Quality Control, is available at Villafranca to access Final Archive data.

LIST OF IUE ALLOCATION COMMITTEE MEMBERS

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Accepted Proposals

IUE 17th Year (1994 - 1995)

TITLE	APPLICANTS	INSTITUTION	PROG. ID
Pulsating atmospheres: V473 Lyr	N. Evans G. Burki D. Gillet B. Nicolet D. Bersier D. Sasselov	Ontario, Canada Geneve, Switzerland Haute Provence, France Geneve, Switzerland Geneve, Switzerland Harvard, USA	RC 001
Composite spectrum binaries	D.J. Stickland R.F. Griffin D.L. Harmer	RAL, UK IOA, UK KPNO, USA	RC 002
Massive eclipsing binaries	D.J. Stickland C. Lloyd R.H. Koch	RAL, UK RAL, UK Pennsylvania, USA	RA 003
Wind variability in hot, massive stars: the rotation connection	A.J. Willis R.K. Prinja L. Kaper D. Massa A.W. Fullerton + 28 co-applicants	UCL, London, UK UCL, London, UK Amsterdam, Holland USA USA	RA 004 **LV**
Inclination effects in the bright quasar sample	R. Walter H.H. Fink	Geneva, Switzerland MPE, Germany	RQ 005
The disappearing broad absorption lines in NGC 3516	P.T. O'Brien I. Wanders M. Crenshaw A. Koratkar	Oxford, UK Uppsala, Sweden USA USA	RQ 007
UV spectrophotometry of the planetary nebula K 1-27 and its very hot central star	T. Rauch J. Koeppen K. Werner	Kiel, Germany Kiel, Germany Kiel, Germany	RA 008
High resolution spectroscopy of a new PG 1159 type central star	K. Werner T. Rauch	Kiel, Germany Kiel, Germany	RA 009

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
A search for hot companions to post-AGB stars with nebular emission lines	L. Sanz Fdz de Cordoba P. Garcia Lario M. Parthasarathy	LAEFF, Madrid, Spain INSA, Madrid, Spain Bangalore, India	RC 010
The UV Albedo of Chiron	N. Brosch	Tel Aviv, Israel	RS 012
The cooling flow galaxy Hydra A	L. Hansen H.E. Jorgensen H.U. Norgaard-Nielsen	Copenhagen, Denmark Copenhagen, Denmark Copenhagen,Denmark	RE 013
Envelope contraction episodes of Luminous Blue Variables	B. Wolf O. Stahl F.J. Zickgraf T. Szeifert	Heidelberg, Germany Heidelberg, Germany Heidelberg, Germany Heidelberg, Germany	RA 014
Symbiotic stars in the Magellanic Clouds	M. Vogel H. Nussbaumer H. Schild	Zurich, Switzerland Zurich, Switzerland Zurich, Switzerland	RI 015
A flux-limited survey of RS CVn systems	M. Rodono I. Pagano P.B. Byrne K. Strassmeier J.L. Linsky T. Ayres A. Brown J. Neff F. Walter	Catania, Italy Catania, Italy Armagh, N. Ireland Wien, Austria USA USA USA USA USA	RC 016
Sixth epoch Doppler imaging observations of the active RS CVn binary AR Lacertae	M. Rodono I. Pagano G. Cutispoto F.M. Walter J.E. Neff	Catania, Italy Catania, Italy Catania, Italy USA USA	RC 017
The eclipse of SY Mus and other symbiotic systems	H. Nussbaumer M. Vogel	Zurich, Switzerland Zurich, Switzerland	RI 018
Interstellar gas in the field of globular clusters	B. Bates S.N. Kemp	Belfast, UK Belfast, UK	RM 019

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
Coordinated HST-EUVE-IUE observations of YZ Cmi	J.G. Doyle P.B. Byrne M. Mathioudakis R.D. Robinson	Armagh, N. Ireland Armagh, N. Ireland USA USA	RC 020
Lambda Boo stars in OB Associations	M. Gerbaldi R. Faraggiana	IAP, Paris, France Trieste, Italy	RA 021
Dynamics and physical properties of accretion regions in Algols	M.T. Richards G.A. Albright P. Koubsky E.F. Guinan	USA USA Czech Republic USA	RI 023
The evolutionary status of blue stragglers in young galactic clusters	P.L. Dufton T.R. Kendall D.J. Lennon R.P. Kudritzki	Belfast, UK Belfast, UK Muenchen, Germany Muenchen, Germany	RA 024
Monitoring of the spectral variations in the circumstellar disk of Beta Pictoris	M. Deleuil	Marseille, France	RM 025
Z And: Returning to the quiescence state	T. Fernandez-Castro R. Gonzalez-Riestra A. Cassatella	Madrid, Spain VILSPA, Madrid, Spain Frascati, Italy	RI 027
UV monitoring of the unidentified spectral feature of GD 229	H.J. Lamers V. Zheleznyakov A. Serber	SRON Utrecht, Holland Russia Russia	RA 028
Multi-wavelength observations of the Oe/X-ray binary X Per	D. de Martino L. Kaper L.B.F.M. Waters P. Roche F. Haberl	VILSPA, Madrid, Spain Amsterdam, Holland Groningen, Hollan Southampton, UK Muenchen, Germany	RI 029
Study of UV orbital variability in the intermediate polar AO Psc/H2252-035	D. de Martino M. Mouchet K. Mukai D. Buckley	VILSPA, Madrid, Spain Meudon, France USA Cape Town,S. Africa	RI 031

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
On the origin of the UV excess from pre-main sequence stars	A.I. Gomez de Castro M. Fernandez A. Talavera	VILSPA, Madrid, Spain Mexico VILSPA, Madrid, Spain	RC 032
IUE Observations of Beryllium in Lithium-rich giant stars	A. Lebre D. Medeiros	Montpellier, France Brasil	RC 034
UV study of the underlying white dwarf in AM Her stars	C. la Dous D. de Martino	VILSPA, Madrid, Spain VILSPA, Madrid, Spain	RI 035
The nearby blue horizontal branch stars	C. Cacciari A. Bragaglia T.D. Kinman	Bologna, Italy Bologna, Italy USA	RA 037
Mass loss rates and intrinsic parameters of B-supergiants	D.J. Lennon R.P. Kudritzki S. Haser P.L. Dufton A. Fitzsimmons	Muenchen, Germany Muenchen, Germany Muenchen, Germany Belfast, UK Belfast, UK	RA 038
A possible link between starbursts and Seyfert galaxies?	J.M. Mas Hesse P. Rodriguez-Pascual M. Cervino T. Boller	LAEFF, Madrid, Spain VILSPA, Madrid, Spain LAEFF, Madrid, Spain MPE, Germany	RQ 040
The nature of newly discovered extragalactic objects at low galactic latitude	L. Buson E. Capellaro M. Turatto	Padova, Italy Padova, Italy Padova, Italy	RE 041
The multiracial stellar population of local group dwarf ellipticals	L. Buson	Padova, Italy	RE 042
Lyman alpha observations for determination of accretion in pre-main sequence stars	H.R.E. Tjin A Djie P.F.C. Blondel A. Talavera A.I. Gomez de Castro P.S. The M.R. Perez C.A. Grady	Amsterdam, Holland Amsterdam, Holland VILSPA, Madrid, Spain VILSPA, Madrid, Spain Amsterdam, Holland USA USA	RA 043

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
Investigation of the UV spectrum of the VV Cep binary KQ Puppis	R. Viotti G.B. Baratta M. Friedjung C. Rossi	Frascati, Italy Roma, Italy IAP Paris, France Roma, Italy	RC 044
Stellar winds in A-type supergiants	E. Verdugo A. Talavera A.I. Gomez de Castro	VILSPA, Madrid, Spain VILSPA, Madrid, Spain VILSPA, Madrid, Spain	RA 046
Probing the disks and near-stellar environments of PMS proto-planetary disk systems	A. Talavera A.I. Gomez de Castro C.A. Grady M. Perez	VILSPA, Madrid, Spain VILSPA, Madrid, Spain USA USA	RM 048
The evolution of proto-planetary disks	C. Waelkens L. Waters H. Plets	Belgium Groningen, Holland Belgium	RM 050
Temperature of white dwarfs in cataclysmic variables	C. la Dous B. Hassall	VILSPA, Madrid, Spain Lancashire, UK	RI 051
The Big Blue/UV Bump in soft X-ray selected ROSAT AGN	D. Grupe K. Beuermann K. Reinsch H.C. Thomas D. de Martino	Gottingen, Germany Gottingen, Germany Gottingen, Germany MPA Garching, Germany VILSPA, Madrid, Spain	RQ 052
New supersoft X-ray sources	K. Reinsch K. Beuermann H.C. Thomas D. de Martino	Gottingen, Germany Gottingen, Germany MPA Garching, Germany VILSPA, Madrid, Spain	RI 053
UV observations of 3C 279 and other Gamma-Ray emitting blazars coordinated with GRO.	L. Maraschi P. Grandi R.C. Hartmann J.E. Pesce E. Pian A. Treves C.M. Urry	Genova, Italy STECF, Garching, Germany NASA, Greenbelt, USA STSCI, Baltimore, USA SISSA-ISAS, Italy SISSA-ISAS, Italy STSCI, Baltimore, USA	RQ 054

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
On the evolutionary link between the PG 1159 stars and the DO white dwarfs	S. Dreizler U. Heber S. Haas S. Jordan D. Koester K. Werner	Bamberg, Germany Bamberg, Germany Bamberg, Germany Kiel, Germany Kiel, Germany Kiel, Germany	RA 055
Early-type stars in the extreme Wolf-Rayet galaxy HE 1203-2644	L. Wisotzki T. Kohler D. Reimers	Hamburg, Germany Hamburg, Germany Hamburg, Germany	RE 056
A search for more transparent lines of sight to bright high-redshift QSOs	D. Reimers L. Wisotzki H.J. Hagen P. Rodriguez W. Wamsteker	Hamburg, Germany Hamburg, Germany Hamburg, Germany VILSPA, Madrid, Spain VILSPA, Madrid, Spain	RQ 057 **LV**
ROSAT X-ray population of the Magellanic Clouds	M. Pakull L. Bianchi W. Pietsch	Strasbourg, France STSCI, Baltimore, USA MPE Garching, Germany	RI 058
X-ray reprocessing and the origin of the 'blue bump' in AGN	A. Celotti P. Nandra A.C. Fabian	Cambridge, UK Cambridge, UK Cambridge, UK	RQ 059
The UV extinction curve of cirrus clouds	M.L. Prevot F. Boulanger C. Joblin R. Monier	Marseille, France IAS Paris, France NASA, USA VILSPA, Madrid, Spain	RM 061
Nature of the outburst stages in symbiotic stars	A. Skopal M.F. Bode A. Evans A. Ivison	Lomnica, Slovakia Liverpool, UK Keele, UK Toronto, Canada	RI 062
Observations of the Seyfert 1 nucleus of NGC 4151	M.H. Ulrich G. Perola P. Rodriguez-Pascual M.A.J. Snijders J. Clavel	ESO, Germany Rome, Italy VILSPA, Madrid, Spain Tubingen, Germany ESTEC, Holland	RQ 065
IUE spectra of quasars observed with ASCA and EUV	M.H. Ulrich S. Molendi	ESO, Germany MPE/ESO, Germany	RQ066

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
A very high magnetic field white dwarf candidate	S. Jordan D. Koester D. Reimers U. Heber S. Dreizler	Kiel, Germany Kiel, Germany Hamburg, Germany Bamberg, Germany Bamberg, Germany	RA 067
UV observations of elliptical galaxies in compact groups	M. Capaccioli D. de Martino G. Longo T.K., Menon	Capodimonte, Italy VILSPA, Madrid, Spain Capodimonte, Italy Vancouver, Canada	RE 068
IUE survey of X-ray selected late-type stars	L. Bianchi A. Maggio F. Favata	STSCI, Baltimore, USA Palermo, Italy ESTEC, Holland	RC 069
UV + Optical spectroscopy of Planetary Nebulae nuclei	L. Bianchi B. Balick A. Manchado-Torres G. de Francesco P. Glauda	STSCI, Baltimore USA Seattle, USA IAC, Canarias, Spain Torino, Italy Torino, Italy	RA 070
Reflection nebulae as probes of dust extinction in starburst galaxies	D. Calzetti L. Bianchi R.C. Bohlin A.L. Kinney	STSCI, Baltimore, USA STSCI, Baltimore, USA STSCI, Baltimore, USA STSCI, Baltimore, USA	RM 071
The super lithium rich K giant stars	R. de la Reza L. da Silva	Sao Cristovao, Brasil Sao Cristovao, Brasil	RC 072
A new interacting binary white dwarf system	J.E. Solheim D.O'Donoghue R. Stobie D. Kilkenny	Tronso, Norway Cape Town, S. Africa Cape Town, S. Africa SAAO, S. Africa	RI 073
An analysis of the manganese star 74 Aqr	S. Hubrig G. Mathys M. Hunsch	Postdam, Germany ESO, Chile Hamburg, Germany	RA 074
Analysis of hot subdwarf stars in binary systems	A. Theissen K.S. de Boer	Bonn, Germany Bonn, Germany	RA 076

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
Circumstellar material in the RS CVn system SZ Psc	J.G. Doyle P.B. Byrne C.K. Mitrou	Armagh, N. Ireland Armagh, N. Ireland Athens, Greece	RC 077
Ultraviolet spectroscopy of the DA + dM binary Feige 24 near inferior conjunction: evidence for external plasma	J.G. Doyle P.B. Byrne M. Mathioudakis S. Vennes	Armagh, N. Ireland Armagh, N.Ireland USA USA	RC 078
International AGN watch: variability of the broad-line radiogalaxy 3C 390.3	P.T. O'Brien M. Malkan W. Wamsteker	Oxford, UK UCLA, USA VILSPA, Madrid (International AGN Watch)	RQ 079
Properties of the Riegel and Crutcher cold cloud	B. Bates A. Montgomery S. Kemp R. Davies	Belfast, UK Belfast, UK Belfast, UK Jodrell Bank, UK	RM 080
An optical-ultraviolet spectrophotometric atlas of RV Tauri variables	A. Evans R. Monier M. Shenton	Keele, UK VILSPA, Madrid, Spain Keele, UK	RC 082
The disk and wind structure of U Gem in outburst	T. Naylor	Keele, UK	RI 083
A continued search for hot white dwarf companions to normal stars	M.A. Barstow M.C. Marsh M.R. Burleigh J.B. Holberg T.A. Fleming	Leicester, UK Leicester, UK Leicester, UK Tucson, USA Tucson, USA	RA 085
High signal-to-noise echelle spectra of key white dwarfs	M.A. Barstow M.C. Marsh M.R.Burleigh J.B. Holberg E.M. Sion	Leicester, UK Leicester, UK Leicester, UK Tucson, USA Villanova, USA	RA 086 **LV**
Baade masses for extreme helium stars	C.S. Jeffery	St. Andrews, UK	RA 087
Probing the structure of Wolf-Rayet winds	C. Lloyd D.J. Stickland	RAL, Didcot, UK RAL, Didcot, UK	RA 088

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
Wind variability and atmospheric properties of central stars of Planetary Nebulae	P. Patriarchi M. Perinotto	Firenze, Italy Firenze, Italy	RA 090
Superdips - the ultraviolet counterpart to optical super humps in Dwarf Nova super outbursts	I.M. Billington T.R. Marsh	Oxford, UK Oxford, UK	RI 092
Transition region line strengths of X-ray selected low activity late type giants	M. Hunsch D. Reimers	Hamburg, Germany Hamburg, Germany	RC 093
IUE Observations of post AGB stars which show spectrum variation	M. Parthasarathy S.R. Pottasch D. de Martino P. Garcia Lario L. Sanz Fdz de Cordoba	Bangalore, India Groningen, Holland VILSPA, Madrid VILSPA, Madrid LAEFF, Madrid, Spain	RA 094
IUE Observations of high-velocity clouds in the direction of the LMC	P. Molaro G. Vladilo S. Monai M. Centurion	Trieste, Italy Trieste, Italy Trieste, Italy Canarias, Spain	RM 097
Interaction of Comet Shoemaker-Levy 9 with the magnetosphere and the upper atmosphere of Jupiter	R. Prange L. Ben Jaffel J.P. Bibring C. Emerich W. Ip S. Miller D. Rego D. Southwood M. Dougherty G. Ballester J. Clarke W. Harris	Orsay, France IAP, Paris, France Orsay, France Orsay, France Lindau, Germany UCL London, UK Orsay, France Imp. College, London, UK Imp. College, London, UK Michigan, USA Michigan, USA Michigan, USA	RS 098 **LV**
The massive star content of the superbuble N44 in the Large Magellanic Cloud	J.M. Will D.J. Bomans	Bonn, Germany Bonn, Germany	RA 099
Dynamics of hot gas in the core of 30 Dor	D.J. Bomans K.S. de Boer U.H. Chu M.M. Mac Low	Bonn, Germany Bonn, Germany Illinois, USA Chicago, USA	RM 100
Hot gas in front of the LMC bar	D.J. Bomans K.S. de Boer	Bonn, Germany Bonn, Germany	RM 101

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
The galactic bulge reddening law	N.A. Walton R.E.S. Clegg M.J. Barlow	RGO, Canarias RGO, UK UCL, UK	RM 104
Discrete absorption components and the Be-star phenomenon	H.F. Henrichs L, Kaper J. Telting, B. Scheers J. Nichols	Amsterdam, Holland Amsterdam, Holland Amsterdam, Holland Amsterdam, Holland Lanham, MD, USA	RA 106
Wind modulation in β Cep stars	H.F. Henrichs L. Kaper G. Hill J. Nichols J. Landstreet	Amsterdam, Holland Amsterdam, Holland Montreal, Canada Lanham, MD, USA Ontario, Canada	RA 107
Wind variability in the radial pulsator BW Vul	H.F. Henrichs D. Massa J. Nichols M. Smith	Amsterdam, Holland Landover, MD, USA Lanham, MD, USA Lanham, MD, USA	RA 108
Central star formation in the Merger Remnant NGC 7252	K.J. Fricke V. Fritze U. Alvensleben P. Papaderos F. Schweizer	Gottingen, Germany Gottingen, Germany Gottingen, Germany Gottingen, Germany Washington, USA	RE 109
Phase-resolved spectroscopy of the stellar wind variability of the peculiar O star φ1 Ori C	O. Stahl B. Wolf A. Kaufer M. Pakull	Heidelberg, Germany Heidelberg, Germany Heidelberg, Germany Strasbourg, France	RA 110
Have blue HB stars a mass incompatible with theory ?	K.S. de Boer J.H. Schmidt	Bonn, Germany Bonn, Germany	RA 111
The gas production curves of comets P/Borrelly and P/d'Arrest	M.C. Festou G.P. Tozzi	Toulouse, France Firenze, Italy	RS 112
Search for species formed after the injection in the jovian magnetosphere of dust and gases released by comet P/Shoemaker-Levy 9	M.C. Festou D.E. Shemansky P. Matheson	Toulouse, France Los Angeles, USA Los Angeles, USA	RS 114

TITLE	APPLICANTS	INSTITUTION	PROGR. ID
Ultraviolet spectroscopy of Vega-Excess stars	C.J. Skinner M.J. Barlow R.J. Sylvester	Livermore, USA UCL, London UCL London	RC 115
IUE Observations of new, bright EUVE sources	P.B. Byrne J.G. Doyle M. Mathioudakis J. Drake	Armagh, N. Ireland Armagh, N. Ireland USA USA	RC 116

List of IUE Publications in Journals

compiled by GSFC

1/1/1993 – 31/12/1993

1. Adelman, S.J., Cowley, C.R., Leckrone, D.S., Roby, S.W., Wahlgren, G.M. 1993, APJ, 419, 276.
   The abundances of the elements in sharp-lined early-type stars from IUE high-dispersion spectrograms. I. Cr, Mn, Fe, Ni, and Co

2. Albert, C.E., Blades, J.C., Morton, D.C., Lockman, F.J., Proulx, M., Ferrarese, L. 1993, APJS, 88, 81.
   A high-resolution optical and radio study of Milky Way halo gas

3. Altner, B., Matilsky, T.A. 1993, APJ, 410, 116.
   Ultraviolet properties of individual hot stars in globular cluster cores. I. NGC 1904 (M 79)

4. Arnaboldi, M., Capaccioli, M., Barbaro, G., Buson, L., Longo, G. 1993, A&A, 268, 103.
   Studies of narrow polar rings around E galaxies. II. The UV spectrum of AM 2020-504

5. Arquilla, R. 1993, PASP, 105, 603.
   Periodicities in the IUE particle radiation data

6. Aufdenberg, J.P. 1993, APJS, 87, 337.
   IUE short-wavelength high-dispersion line list for the symbiotic nova RR Telescopii

7. Ayres, T.R., Brown, A., Gayley, K.G., Linsky, J.L. 1993, APJ, 402, 710.
   The hydrogen Lyman-alpha emission of Capella

8. Ayres, T.R. 1993, PASP, 105, 538.
   Signal-to-noise ratios in IUE low-dispersion spectra. II. Photometrically corrected images

9. Bahcall, J.N., Bergeron, J., Boksenberg, A., Hartig, G.F., Jannuzi, B.T., Kirhakos, S., Sargent, W.L.W., Savage, B.D., Schneider, D.P., Turnshek, D.A., Weymann, R.J., Wolfe, A.M. 1993, APJS, 87, 1.
   The Hubble Space Telescope Quasar Absorption Line Key Project. I. First observational results, including Lyman-alpha and Lyman-limit systems

10. Barvainis, R. 1993, APJ, 412, 513.
    Free-free emission and the big blue bump in active galactic nuclei

11. Bergeron, P., Wesemael, F., Lamontagne, R., Chayer, P. 1993, APJ, 407,

L85.
Metal-line blanketing and the peculiar H-beta line profile in the DAO star Feige 55

12. Bertola, F., Burstein, D., Buson, L.M. 1993, APJ, 403, 573.
NGC 5018: A metal-poor giant elliptical

13. Bertola, F., Burstein, D., Buson, L.M., Renzini, A. 1993, APJ, 403, 577.
An IUE search for star formation in ellipticals with gaseous disks

14. Beust, H., Tagger, M. 1993, ICARUS, 106, 42.
A hydrodynamical model for infalling evaporating bodies in the Beta Pictoris circumstellar disk

15. Bhatia, A.K., Kastner, S.O. 1993, APJ, 408, 744.
The optically thin C III spectrum: Line and multiplet intensities

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