

IUE NEWS

Special Edition September 10, 1987 Greenbelt, Maryland

Looking Forward to the Tenth Anniversary

IUE is looking forward to its tenth birthday on January 26, 1988. The past and present IUE staff members and friends celebrate IUE's birthday every year, but this time a special celebration is planned to commemorate a decade of IUE.

In addition, the tenth year IUE symposium will be a gala affair. Goddard will host the international symposium on April 12 through 15, 1988. An evening event befitting the occasion is being planned. Stay tuned for further developments!

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IUE and the Supernova

By now every astronomer on the Earth is aware that a supernova went off in the Large Magellanic Cloud in late February. Thanks to a quick phone call from former Resident Astronomer Nancy Evans (now working at the University of Toronto), IUE was observing the supernova within 14 hours of its discovery. At that time, the visual brightness was just peaking but the ultraviolet flux had already started to fall.

Thanks to the cooperation of many IUE Guest Observers, an extensive program of IUE observations under the direction of Bob Kirshner has been carried out. The supernova's propitious location in the LMC has made it

possible for IUE to observe it continuously. The satellite has obtained probably the most complete set of observations of SN 1987a because of this - no clouds, no daylight, no beta restrictions, no Earth occultation, no Moon occultation! A total of 260 spectra have been obtained so far.

Several significant results have already arisen from the IUE observations. Probably the most notable result is the demonstration that the blue supergiant Sanduleak -69 202 is not present in the ultraviolet spectra obtained of the supernova. The spectra of Sk -69 202's two blue stellar neighbors are seen by IUE. The obvious interpretation is that Sk -69 202 was the progenitor of the supernova. The bright supernova also provided an excellent "light bulb" for illuminating the interstellar absorption lines. High quality, high resolution spectra were obtained on February 24, while the ultraviolet flux was high. The spectra show 7 to 9 components of many of the absorption lines, some from the Milky Way's halo and some from the LMC. These results and others are described in numerous IAU Circulars (*4317, 4320, 4324, 4327, 4330, 4333, 4348, 4366, 4377, 4399, 4410, 4435) and in papers currently in press (Kirshner et al., 1987, Ap. J. ; Sonneborn et al., 1987, Ap. J. Letters; Dupree et al., 1987, Ap. J.; Bruhweiler, 1987, Ap. J., and others).

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The One-Gyro/FSS Mode

The one-gyro plus Fine Sun Sensor (FSS) mode is being developed as a backup attitude control mode, in the event that IUE loses another gyro. Currently both remaining gyros are performing well, so it is hoped that the new backup mode will not be needed for some time.

Significant progress on the development and testing of the backup attitude control mode has been made. The new control mode is similar to the current two-gyro/FSS mode. Insufficient information is available from the remaining operational gyros to control pointing in three axes, so the FSS data are used to fill in the needed information. The sun sensors provide information in two directions, pitch (along the beta line) and roll. On the one-gyro/FSS system, large slews between stars will be performed much the way such slews are now performed on the two-gyro/FSS system.

A new capability, which has been developed for the one-gyro/FSS system, uses the Fine Error Sensor (FES) tracking information to move a star around within the FES field of view. This new technique should allow the satellite to simultaneously track on a star, move it to the center of the field, and move it to an offset guiding position.

The one-gyro/FSS backup mode will impose some additional constraints on IUE science observations. All exposures will require guide stars. Blind offsets must be done from a star within the field of view of the FES (within 6 or 7 arcmin). The latter requirement will mean that Guest Observers may need to measure accurate relative coordinates for their targets and guide stars.

The new control mode is now undergoing testing on a simulator. Some necessary software changes are being made in the ground-system computer programs. In addition, tests of the one-gyro/FSS mode with the satellite are expected to take place sometime next year. Because of the similarity of the one-gyro mode to the current two-gyro mode, these tests can be conducted with no impact to the satellite. The primary change necessary will be to ignore the data from second gyro and use only one gyro's data in controlling the spacecraft pointing. (We would certainly NOT turn off a gyro!)

Although all these tests are not yet completed, the backup control mode is now fairly well developed. If a gyro failure were to occur in the near future, it could be used to protect and control the spacecraft. The remaining software changes and tests would then be accelerated so that normal operations could be resumed as quickly as possible.

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The Zero-Gyro Mode?

The attitude control specialists at Goddard Space Flight Center are, believe it or not, looking into the possible design for a zero-gyro attitude control mode. The mode would use information from the Fine Sun Sensors plus spacecraft angular momentum information from the reaction wheels that are used to slew the spacecraft. At this time, some design ideas have been explored and some very basic simulations have been successful. The

zero-gyro mode may be considered a long shot, yet there may come a time when we might want to play that longshot!

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Trying Out FES No. 1

The IUE Observatory has been considering the possible use of FES No. 1 in conjunction with the one-gyro/FSS control mode. It is thought that by using both FES No. 2 (currently in use) and FES No. 1, it would be possible to track on a star with one FES while taking an FES image with the other. However, FES No. 1 had not been used since shortly after launch.

In July FES No. 1 was turned on. Its various tracking and image collection modes were tried out and found to be fully functional. As had been determined in 1978, FES No. 1 is less sensitive than FES No. 2 by about 1 mag.

It is expected that the FESs will be heavily used for pointing and tracking with the one-gyro/FSS control mode. Blind offsets will be performed by placing an offset star at an accurately determined position in the FES field of view. In order to do that, the geometric properties of both FESs must be well determined. The geometric mapping of FES No. 2 has been underway for some time, and was completed in July. Once FES No. 1 was found to be operational, it too was mapped out. Thus geometric mapping for both FESs should allow one to place a star accurately in the FES field of view, to 2 arcsec or better. This should be sufficient to perform blind offsets under the one-gyro/FSS mode.

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IUE's New VAX Computer System

The long-awaited new VAX computer system has finally arrived at IUE. The new system includes a VAX 8350, three tape drives, four RA81 disk drives, a Gould image processing system with two work stations, two laser printers, and a line printer. A primary purpose of the new system is to permit the timely reprocessing of all IUE images to produce a final archive. The new system will also help the Observatory fulfill several other goals:

(1) to develop a faster, more efficient IUESIPS image processing system to handle the current images, standard reprocessing requests, and the new recalibration work, (2) to free up more time on the Sigma-9 computer for one-gyro/FSS backup system development and other engineering activities, and (3) to provide enhanced capabilities for Goddard's Regional Data Analysis Facility.

Considerable progress has been made in modifying the IUESIPS software to run on the VAX. The entire system, including the system environment and operational procedures, has been redesigned to take advantage of the capabilities of the VAX system, while retaining the basic IUESIPS processing software. The image processing routines will be run within the MIDAS image processing system, using Gould image processing work stations. Care has been taken to insure that the resulting data and data products are as identical as possible to those obtained from the Sigma-9 system. The move of IUESIPS to the VAX will occur early this winter, at which time all images will be processed on the VAX. This will include current images (i.e., those just read down from the satellite), standard reprocessing requests, and special reprocessing for calibration work. Because of the faster, more efficient system, all these processing activities should go much faster.

A number of enhancements to the image processing system are under discussion at Goddard and Vilspa. Such changes include implementing new calibrations, adding an absolutely calibrated high dispersion file to the output data products, and including the time-dependent terms to the absolute calibrations. The various items are under study to decide which are most important, which require further study, which are highest priority, and which are most feasible to include. The new calibrations and processing enhancements will eventually be added to the IUESIPS processing system.

The IUE Observatory is planning its efforts to produce a final archive, consisting of all IUE images reprocessed with the enhanced IUESIPS software and new calibrations. The actual reprocessing of old images to the final standard is not expected to begin until late 1989 or so. In conjunction with this effort, an enhanced version of the IUE data base used to produce the Merged Log will be created. New fields of useful information, such as camera temperatures, will be added to the catalog.

The IUE Users' Committee has made several recommendations to guide the Observatory in its efforts, and we continue to keep them informed of our progress. Of course, we are happy to discuss these plans with our Guest Observers and listen to your suggestions. Please feel free to contact us.

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New Merged Log Data Base

IUE staff members are in the process of designing and creating a new IUE Merged Log data base for the final archive. This effort is being undertaken in conjunction with the final archive reprocessing effort. The data base will be an enhanced version of the one now used to generate the IUE Merged Log of observations. This will be the data base used by astronomers ten and twenty years from now, so it is important that it be as complete, correct, and easy to use as possible. A preliminary format has been proposed to the IUE Three Agencies to be considered for adoption. In addition, any errors which are found are being corrected. Input from the IUE user community would be very welcome. Please send your comments about the format of the final data base, plus any errors in the current Merged Log that you know of, to Marion Schmitz at either Code 684.9, GSFC, Greenbelt, MD 20771, or to one of the following network addresses: Bitnet ZB4MS@SCFVM, SPAN IUE::SCHMITZ, and Telemail [IUE/GSFCMAIL]GSFC/USA.

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Battery No. 1 Performs OK

Some concern arose this spring over the health of Battery No. 1. Some unusual readings were seen on the third electrode of the battery. A test was performed to determine the health of the battery. It was found that when the spacecraft was placed in a power-negative position, i.e. when it must draw on its batteries for power in addition to the solar panels, the battery did not carry its proper load at first. However, as Battery No. 2 discharged to supply power to the spacecraft, Battery No. 1 did eventually start discharging. The battery then proceeded to perform well during the spring shadow season. In addition, it has been performing well during the current fall shadow season. The conclusion thus far is that the battery is

just not holding full charge quite as well as it used to. Therefore it will need to be recharged periodically, even if it hasn't been explicitly discharged.

A reevaluation of IUE's battery health maintenance program has been made. Some new rules have been invoked to keep the elderly batteries in good health. One of these is the requirement to "top off" the batteries (that is, recharge them fully) before any planned battery discharge. In addition, the batteries will be "topped off" once a week. Another change is that we must avoid "power neutral" (i.e. just enough power to run the spacecraft without using the batteries) observations. This has the effect of reducing the beta range by a degree or two at which normal observations may be obtained. Finally, the allowable depth of discharge of the batteries (known as the "red line" limit) has been lowered. This benefits observers who are making extreme beta observations, because it means that they can continue their observations for roughly 25% longer.

It should be emphasized that Guest Observers should not always avoid extreme beta observations that would discharge the batteries. Like the batteries in calculators and other electronic equipment, IUE's batteries perform best if they are discharged every once in a while. If you need an observation at an extreme beta that might discharge the batteries, do not assume that it can't be done. The primary concern is simply that we plan ahead so that the batteries can be fully charged just before an extreme beta observation is performed. Extreme beta observations have been performed for comet observers who need to observe the comet while it is still relatively close to the Sun, and for Venus observers, since Venus is never very far from the Sun. Please call a Resident Astronomer and see about scheduling your observation.

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SWP Wavelength Error

We have recently noted that an error has crept into the SWP low-dispersion wavelength calibration. The wavelengths appear to be about 3 Angstroms too small. IUE staff have been investigating the problem and seeking to derive an updated calibration. The error appears to be due to a divergence of the second-order polynomial fit for the time-dependence term

In the calibration from the actual time dependence. The error affects only the SWP low-dispersion spectra obtained in the last year or so, and does not affect SWP high-dispersion spectra or the other cameras.

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FES Photometric Calibration Error

Ironically, an error has crept into the most recent FES photometric calibration which resembles that affecting the SWP wavelength scale. The time-dependent term in the calibration described by Imhoff and Wasatonic (1986, NASA IUE Newsletter No. 29, pg. 45) has begun to diverge from the actual time dependence. This second-order polynomial term yields fluxes which are about 0.2 mag too bright for data obtained in mid-1987. Work is underway to rederive the FES photometric correction with new data and to use a better functional representation of the time dependence. (No, there is no reason to believe that the two calibration errors are related!)

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IUE Goes NOVA

A special program on Supernova 1987A has been put together for the PBS series Nova. The Nova crew visited IUE as well as a number of other observatories for this show. We understand that the supernova episode will be the first program to be aired during the new fall season, perhaps the first week of October.

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SIPS Goes to 1600 BPI

When the IUESIPS moves to the VAX computer sometime this winter, it will be possible to routinely generate 1600 bpi Guest Observer tapes. Therefore the higher tape density will become the default. GOs who require 800 bpi tapes may still request them. This change has been discussed for some time, but has not been feasible with the peripherals available on the Sigma-9 processing system.

Overexposure Policy Under Consideration

The Three Agencies which operate IUE, NASA, ESA, and the UK's SERC, are considering the implementation of a new policy which would limit the frequency with which large overexposures of the IUE cameras may be performed. As our GOs continue to push IUE's capabilities, use of both very long exposures and heavy overexposures has increased. Unfortunately very heavy overexposures can contaminate long exposures for many days afterwards.

At present, the IUE Observatory is asking GOs to notify us of any planned heavy overexposures and obtain approval for them. A "heavy overexposure" is defined to be more than a 50 times overexposure, relative to an optimum exposure of 210 DN. The notification and approval will allow time to check for possible schedule conflicts and scheduling changes, if needed.

If you are planning any heavy overexposures, please write to the IUE Project Scientist (Code 684, GSFC, Greenbelt, MD 20771) as soon as possible. The letter should describe which of the program's shifts are to be used for heavy overexposures, the targets, cameras, dispersion modes, desired exposure times, optimum exposure times, and the basis of the overexposure estimates. Please contact the Resident Astronomers (301-286-7537) for additional information.

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VILSPA Photowrites

The IUE Observatory has been generating photowrites of Vilspa images on a "time available" basis. For compactness, six raw images are placed on each sheet of film. The photowrites have been placed in the IUE Browse File, in the IUE area at Goddard, and are available through the National Space Science Data Center (NSSDC). Progress has been gradual due to the large workload, but most of the images from the first few years of IUE's operation are available for quick-look inspection. As of mid-August, photowrites were available for LWR 1283 - 12227 (through the end of 1981) and SWP1303 - 7766 (to the beginning of 1980).

Staff Changes

Dr. Terry Teays has joined the staff as a Resident Astronomer. Terry comes to us from the University of Nebraska, where he received his doctorate. Terry's interests include pulsating stars, stellar chromospheres, and clusters.

Ms. Gwyn Fireman, Ms. Betsy Park, and Mr. Otto Bruegman have joined the IUE Observatory as Telescope Operators. Gwyn comes to us from the University of Colorado, where she studied geology and helped operate the Solar Mesospheric Explorer satellite. Betsy is from Ohio State University, where she obtained a master's in astronomy. Otto comes to us from the University of Nebraska, where he obtained a master's degree in astronomy.

Two of our telescope operators, Peter Summers and Kent Thurston, have left the Observatory. Kent will be attending graduate school in physics at Washington State University this fall.

Dr. Jaylee Mead, whom many astronomers know from her involvement in various IUE Observatory functions, such as the symposia, has taken a new position at Goddard Space Flight Center. She is now the Associate Chief of the Space Data and Computing Division, and will be the NASA coordinator for the recently-established Center of Excellence for Space Data and Information Sciences (CESDIS). Jaylee's involvement with IUE continues, and you can expect to see her at the tenth year symposium!

Catherine L. Imhoff
IUE Observatory