IUE DATA REDUCTION

XI. Mean Dispersion Relations for Low Dispersion Spectra

Pt-Ne lamp wavelength calibration images for IUE are customarily obtained approximately every two weeks. Heretofore, the dispersion relations determined from these images have been adopted for standard production processing in a continual way, so that new wavelength calibrations have been installed roughly biweekly. Although such a procedure does insure that any long-term changes in the true dispersion relations are reflected in the adopted scales, no significant long-term trends have been detected. Furthermore, short-term changes due to thermal shifts, which have timescales on the order of several hours, are insufficiently sampled under this system, and one runs the risk of using a possibly atypical calibration if an extreme thermal condition happened to exist at the time the Pt-Ne image was exposed. For these reasons a transition to a calibration procedure utilizing average dispersion relations (and ultimately average reseau positions) is planned. As the first step in this transition, mean dispersion constants for low dispersion IUE spectra have been defined and implemented in routine production as of 30 October 1979 (GMT day 303).

The adopted mean values for the small aperture are listed in Table 1 for each camera. The offsets used to derive the large aperture constants are discussed in memo V of this series in IUE Newsletter No. 6. The meaning of the dispersion constant terms are defined through Equations 1 and 2.

$$\text{Sample Number} = a_0 + a_1 \lambda \qquad (1)$$

$$\text{Line Number} = b_0 + b_1 \lambda \qquad (2)$$

Table 1: Mean Dispersion Constants for Low Dispersion Spectra
(Day 221 1978-Day 274 1979)

Camera	Aperture	a_0	a_1	b_0	b_1
SWP	Small	981.37	-.46657	-263.68	.37618
LWR	Small	-298.22	.30242	-266.66	.22577

The individual measurements used in calculating the means in Table 1 span the time period from GMT day 221 of 1978 to GMT day 274 of 1979. The measurements were all made using the improved low dispersion line libraries discussed in memo III of the IUE Data Reduction series, which appeared in IUE Newsletter No. 5. Plots of the behavior of the individual measurements as a function of time are given in Figures 1 and 2. Figure 1 shows the deviations of the individual zero-point terms a_0 and b_0 from the adopted means $\langle a_0 \rangle$ and $\langle b_0 \rangle$. Figure 2 shows the ratio of the individual linear terms a_1 and b_1 to the adopted means $\langle a_1 \rangle$ and $\langle b_1 \rangle$. In both figures the straight lines connecting the measurements are intended to kepp the stakced plots distinguishable, not to suggest interpolated behavior.

Having defined mean values appropriate for use at the current epoch, we shall continue to analyze all wavelength calibration images as they are taken in the future at the normal intervals. The behavior of the derived dispersion relations will be monitored in order to verify the continuing applicability of the adopted means and ascertain the need for updating the means if secular changes are detected. So long as the necessary monitoring of possible systematic changes is performed, the use of mean dispersion relations will statistically provide more accurate wavelength scales.

The extension of the concept of using mean calibrations to the case of high dispersion wavelengths, and to the case of reseau positions in either mode, is being actively pursued and is expected to be executed in the near future.

B. Turnrose

R. Bohlin

C. Harvel

October 1979

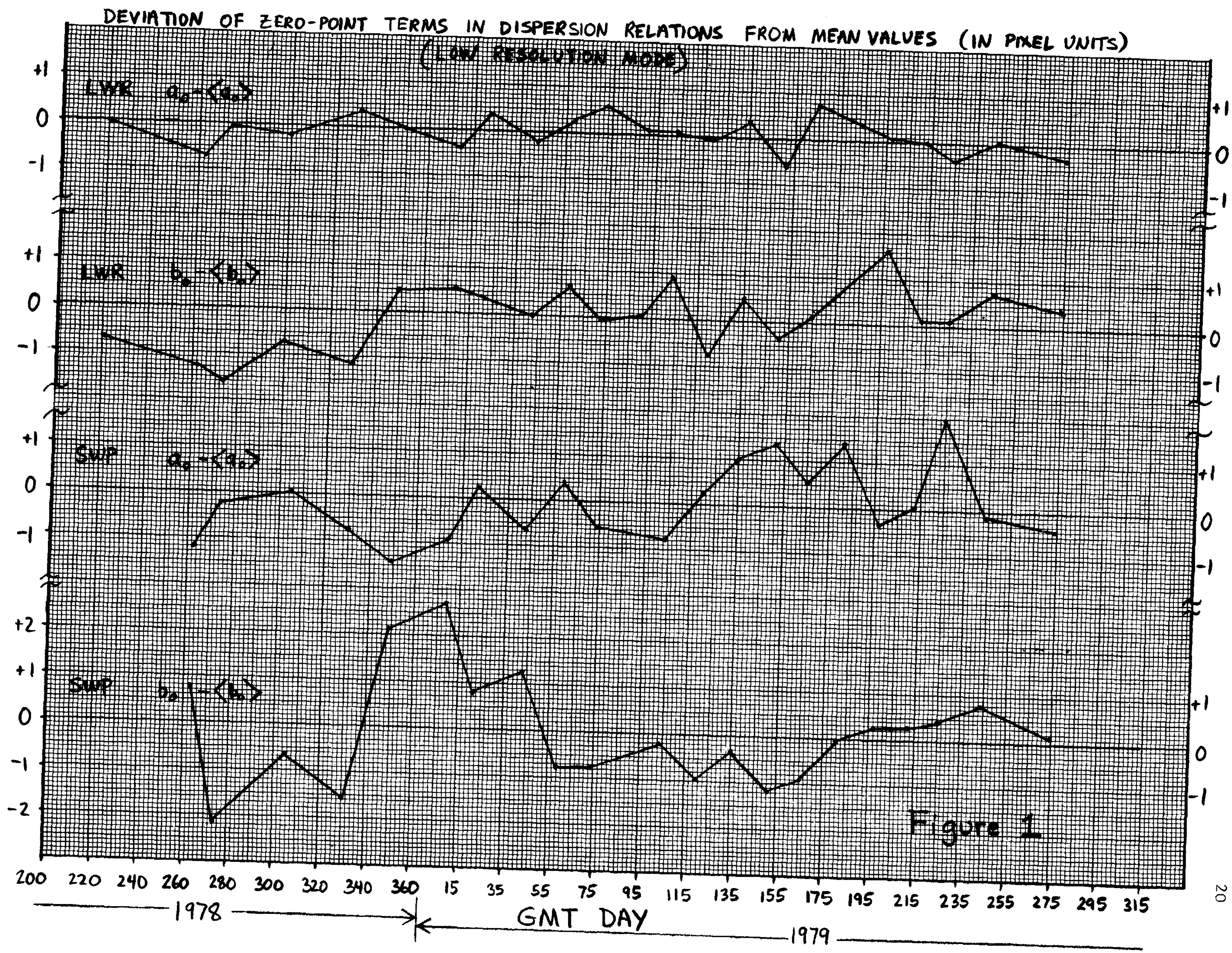
DEVIATION OF ZERO-POINT TERMS IN DISPERSION RELATIONS FROM MEAN VALUES (IN PIXEL UNITS)
(LOW RESOLUTION MODE)
LWR $a_0 - \langle a_0 \rangle$
LWR $b_0 - \langle b_0 \rangle$
SWP $a_0 - \langle a_0 \rangle$
SWP $b_0 - \langle b_0 \rangle$
+2
+1
0
-1
-2
200 220 240 260 280 300 320 340 360 15 35 55 75 95 115 135 155 175 195 215 235 255 275 295 315
1978
GMT DAY
1979

Figure 1

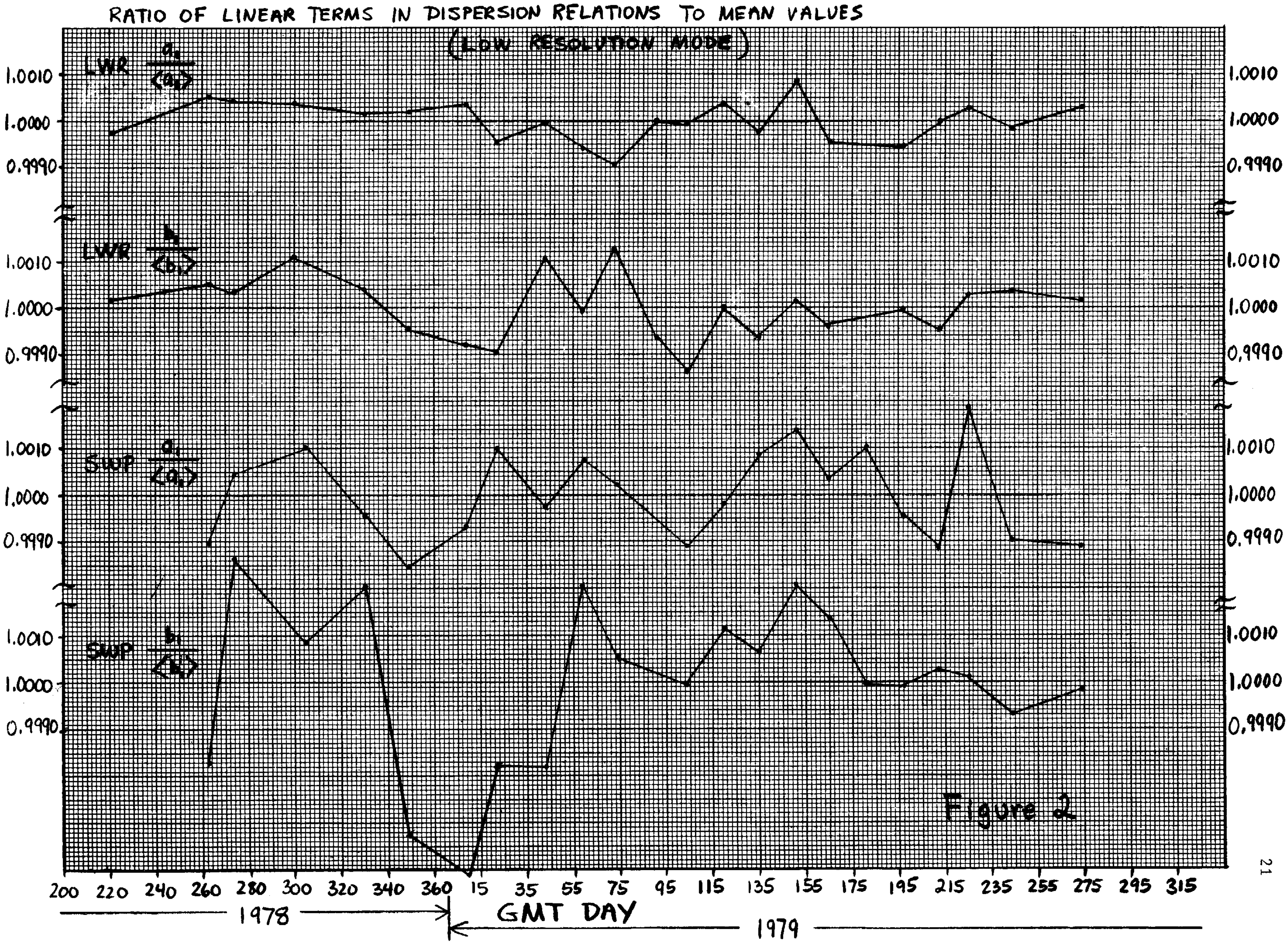
RATIO OF LINEAR TERMS IN DISPERSION RELATIONS TO MEAN VALUES
(LOW RESOLUTION MODE)
LWR $\frac{a_1}{\langle a_1 \rangle}$
LWR $\frac{b_1}{\langle b_1 \rangle}$
SWP $\frac{a_1}{\langle a_1 \rangle}$
SWP $\frac{b_1}{\langle b_1 \rangle}$
1.0010
1.0000
0.9990
200 220 240 260 280 300 320 340 360 15 35 55 75 95 115 135 155 175 195 215 235 255 275 295 315
1978
GMT DAY
1979

Figure 2