IUE Data Reduction

XXXVI. Wavelength Correction For Recent Low Dispersion LWR and SWP Spectra

As described in IUE Data Reduction memo XXXV (in this Newsletter), the time correction for shifts in the location of the spectral format implemented in production processing on June 20th, 1984 (see IUE Data Reduction Memo XXXIV in Newsletter 26) caused an error in the low dispersion wavelength assignments that gradually increased with time. The error affected all low dispersion long wavelength redundant (LWR) and short wavelength prime (SWP) spectra obtained at Goddard between the above date and April 1st of this year, when the new dispersion relations were implemented. Note different end dates will apply to data obtained at VILSPA. Wavelength errors appear to be as large as 5 angstroms too high for recent LWR spectra and 3 angstroms too low for recent SWP spectra. Long wavelength prime (LWP) spectra were not affected by this error since a time correction is not used for this camera.

A comparison was made of the old and new dispersion constants and correlation coefficients using software available at the IUE RDAF at GSFC. The differences in predicted line and sample positions for a given wavelength and THDA (i.e. camera temperature) were calculated as a function of time. These values were converted to differences along the dispersion direction and scaled to be in units of angstroms. The scale factors used were 1.67 angstroms/pixel for SWP and 2.65 angstroms/pixel for LWR as derived from the recently implemented mean dispersion constants.

The results are shown in Figures 1 and 2. The differences in the wavelength assignments between the old and new dispersion relations are plotted for 3 different THDA values as a function of time. The 3 temperatures represent the minimum, maximum, and mean THDA values for each set of WAVECAL images used in deriving the current dispersion constants. In both figures, the middle curve represents the average THDA for each camera (13.3 degrees for LWR and 8.9 degrees for SWP). As is shown, the wavelength error is fairly independent of temperature. Similiar plots showed that the error was even less dependent on wavelength. As expected, the plots basically reflect the difference in the 2nd-order time corrections used in the old and new dispersion relations.

Users interested in correcting the wavelengths assignments for recent LWR and SWP low dispersion spectra can use the following relation:

DELTAW = A0 + A1 * DELTAT + A2 * DELTAT**2

where

DELTAW = correction factor in angstroms to be SUBTRACTED from the previous assigned wavelengths
DELTAT = date of observation - 1984.0 in decimal years (e.g., 1987.6 - 1984.0 = 3.6)

and the coefficients are:

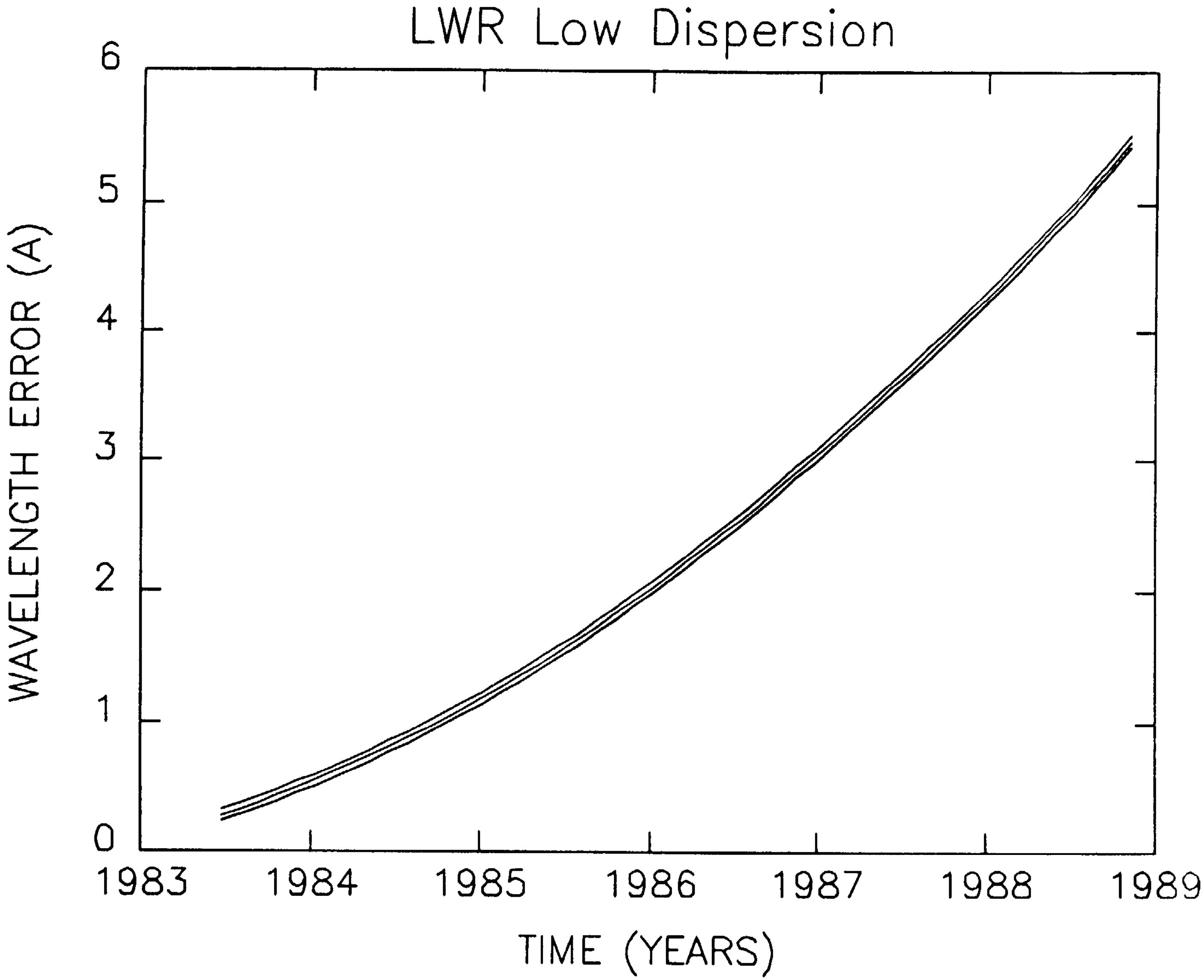
	A0	A1	A2
LWR	0.55	0.55	0.0976
SWP	-0.091	-0.31	-0.0697

The above equations simply represent the difference between the old and new dispersion relations (using mean temperatures and wavelengths) and transformed to a coordinate system which runs along the dispersion direction. It should be emphasized that the correction is only appropriate for low dispersion LWR and SWP spectra processed with the dispersion relations previously implemented in IUE production processing. This corresponds to images processed at Goddard between 6/20/84 and 4/1/88. Since different end dates apply for images processed at VILSPA, the image processing history portion of the image header label should be examined for a line which begins "MEAN DC". This line would show that for images processed with the old set of dipsersion relations, less than 110 wavelength calibration images (WLC) were used (i.e. 105 for SWP and 107 for LWR). Any other number appearing in this line would indicate that the above correction is not appropriate for that image.

An IUE RDAF procedure called DCCOR was written for correcting wavelength assignments as described above and is available to anyone upon request.

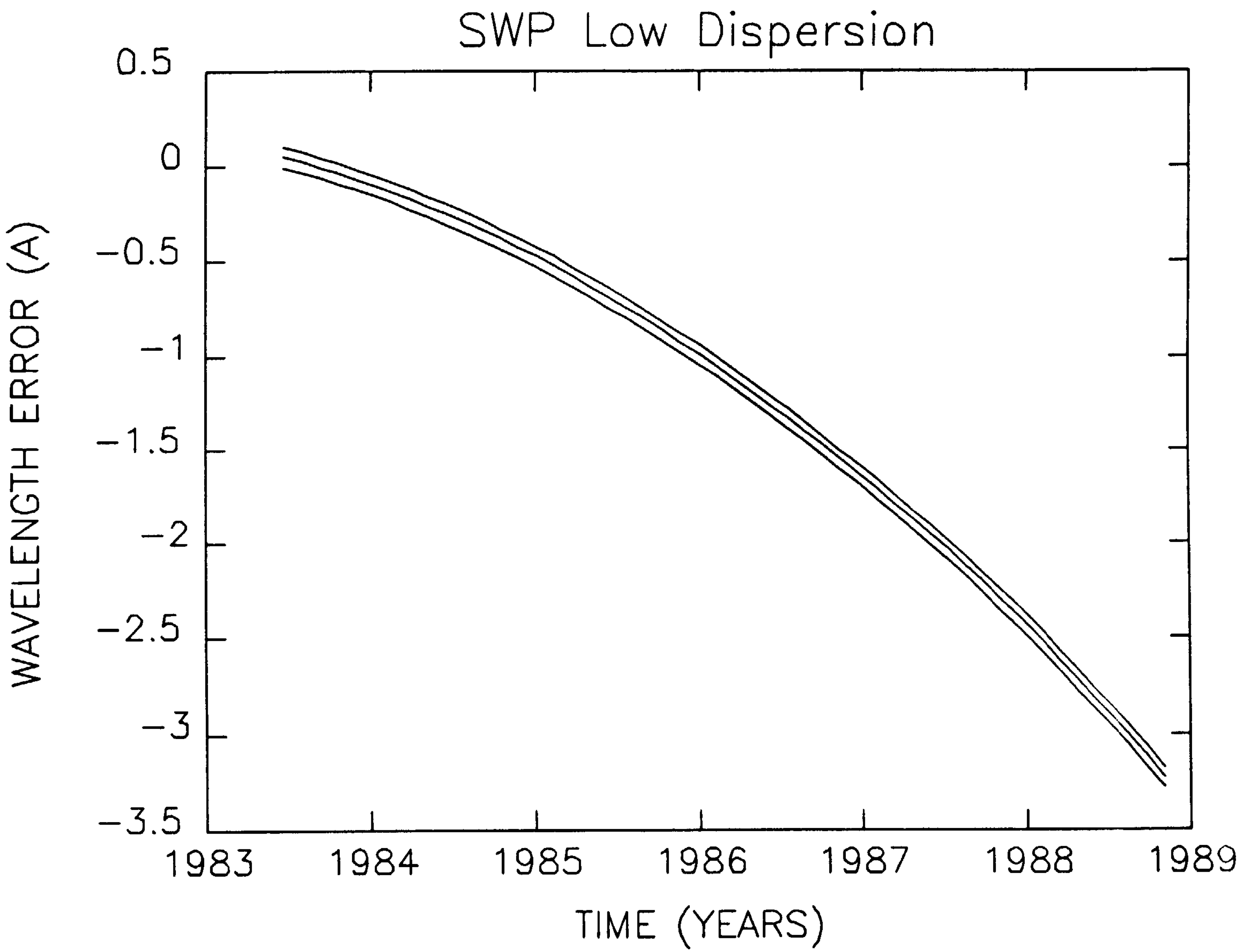
Randy Thompson
IUE Observatory

Figure 1



LWR Low Dispersion
WAVELENGTH ERROR (A)
0
1
2
3
4
5
6
1983
1984
1985
1986
1987
1988
1989
TIME (YEARS)

Figure 2



SWP Low Dispersion
WAVELENGTH ERROR (A)
0.5
0
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
1983
1984
1985
1986
1987
1988
1989
TIME (YEARS)