

Low-Dispersion Quick-Look Sensitivity Monitoring

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Introduction/Analysis

The low-dispersion sensitivity degradation analysis has been updated to May 1992 for the primary cameras and October 1991 for the LWR. Although the Final Archive processing has begun, it is important to continue this study in order to monitor possible changes in camera sensitivity and provide an up-to-date THDA (Camera Head Amplifier Temperature) coefficient, which is used to correct for variations in camera sensitivity as a function of temperature (Garhart 1991).

The sensitivity data are analyzed using the standard methods as described by Holm and Schiffer (1980). The database consists of several hundred observations of the five standard stars. The flux data are ratioed to a reference spectrum for each star (Table 1) and separated into several wavelength bins, each 150Å wide (300Å for the LWR). The binned flux ratios are then fit with a multiple linear regression to find the time rate of change (%/yr.) in each wavelength region and the overall temperature dependence (%/°C) of the camera. The temperature coefficient is assumed to be time independent and is fit to the head amplifier temperature (THDA). The temperature and time dependent coefficients for the three cameras are listed in Table 3. The data are normalized to 1978 and corrected for camera temperature dependence before being plotted in Figures 1-4.

Table 1.

Reference Stars used for normalization

STAR	LWP	date	LWR	date	SWP	date
BD+28° 4211	3688	1984.5	1712	1978.5	2139	1978.6
HD 93521	3535	1984.4	1589	1978.4	1955	1978.5
HD 60753	3689	1984.5	1642	1978.4	1752	1978.3
BD+33° 2642	3610	1984.5	2137	1978.6	4003	1979.1
BD+75° 325	3537	1984.4	2748	1978.8	4237	1979.1

Results

The LWP degradation remains quite linear since the 1984 - 1985 epoch when it became the primary camera. The apparent increase in the rate of degradation, most evident in the short wavelength end of the camera, is due to the 1984.5 jump in sensitivity. The LWR camera continues to show some slowing in the degradation rates after its decommissioning. The rate of SWP degradation has remained relatively stable over the past several years.

However, a jump in sensitivity, similar to the one seen in the LWP plots (Figures 1 and 2) and occurring at the same time period, is visible in all three wavelength bins for the SWP camera (Figure 4). This feature is not seen in the LWR camera (Figure 2), although, one can see that the degradation rate changed at this point in time. The sensitivity results, as shown in Table 2, are derived using a starting date of 1984.5, which corresponds to the approximate time the LWP became the primary camera. These values indicate an increase in the sensitivity degradation rate for the LWP in all bandpasses when compared with the trends using all the data. The opposite effect can be seen when one uses 1984.5 as the starting/ending point for the LWR regression analysis.

Table 2.
Comparison of camera degradation rates

LWP Time Dependence [$\frac{\%}{\text{yr.}}$]			
Wavelength	1980.4	1984.5	
Region (\AA)	1992.3	1992.3	
2075 - 2225	-0.82±0.03	-1.39±0.04	
2225 - 2375	-1.36±0.03	-1.77±0.04	
2375 - 2525	-1.27±0.03	-1.67±0.04	
2525 - 2675	-1.24±0.03	-1.56±0.04	
2675 - 2825	-1.12±0.03	-1.35±0.04	
2825 - 2975	-0.90±0.03	-0.13±0.04	

LWR Time dependence [$\frac{\%}{\text{yr.}}$]			
Wavelength	1978.4	1978.4	1984.5
Region (\AA)	1991.8	1984.5	1991.8
2250 - 2550	-1.80±0.03	-2.51±0.08	-1.04±0.07
2550 - 2650	-1.46±0.03	-1.46±0.08	-1.12±0.07
2750 - 3050	-1.31±0.03	-1.49±0.08	-0.95±0.07

The THDA's for each observation are plotted in Figure 5. The statistical increase in camera temperatures is less than 1%/yr. when the least-squares analysis of the data is restricted to dates after 1981 (1983 for the LWP).

References

- Holm, A.V., and Schiffer, F.H. 1980, *IUE NASA Newsletter*, 9, 8.
Garhart, M.P. 1991, *IUE NASA Newsletter*, 46, 65.

Table 3.

Results of low dispersion camera sensitivity analysis - May 1992

LWP CameraTemperature dependence = -0.22 ± 0.02 [$\frac{\%}{^\circ\text{C}}$]

588 data points used in regression

Time Dependence [$\frac{\%}{\text{yr.}}$]

Wavelength Region (Å)	1980.4 to					
	1992.3	1990.3	1988.4	1986.4	1984.8	1983.4
2075 - 2225	-0.82±0.03	-0.63±0.04	+0.01±0.07	+0.56±0.12	+0.78±0.19	-0.40±0.30
2225 - 2375	-1.36±0.03	-1.25±0.04	-0.87±0.07	-0.52±0.12	-0.47±0.19	-2.28±0.30
2375 - 2525	-1.27±0.03	-1.16±0.04	-0.74±0.07	-0.43±0.12	-0.13±0.19	-2.15±0.30
2525 - 2675	-1.24±0.03	-1.18±0.04	-0.87±0.07	-0.45±0.12	-0.04±0.19	-0.98±0.30
2675 - 2825	-1.12±0.03	-1.08±0.04	-0.83±0.07	-0.50±0.12	-0.22±0.19	-0.96±0.30
2825 - 2975	-0.90±0.03	-0.88±0.04	-0.57±0.07	-0.27±0.12	+0.06±0.19	-0.44±0.30

LWR CameraTemperature dependence = -0.87 ± 0.04 [$\frac{\%}{^\circ\text{C}}$]

405 data points used in regression

-5.0 kV UVC = 309 data pts.

-4.5 kV UVC = 96 data pts.

Time dependence [$\frac{\%}{\text{yr.}}$]

Wavelength Region (Å)	1978.4 to					
	1991.8	1990.3	1988.1	1986.4	1984.8	1983.6
2250 - 2550	-1.80±0.03	-1.90±0.04	-2.06±0.04	-2.49±0.08	-2.38±0.11	-2.30±0.11
2550 - 2650	-1.46±0.03	-1.47±0.04	-1.51±0.04	-1.73±0.08	-1.77±0.11	-1.19±0.11
2750 - 3050	-1.31±0.03	-1.34±0.04	-1.34±0.04	-1.73±0.08	-1.87±0.11	-1.13±0.11

SWP CameraTemperature dependence = -0.47 ± 0.02 [$\frac{\%}{^\circ\text{C}}$]

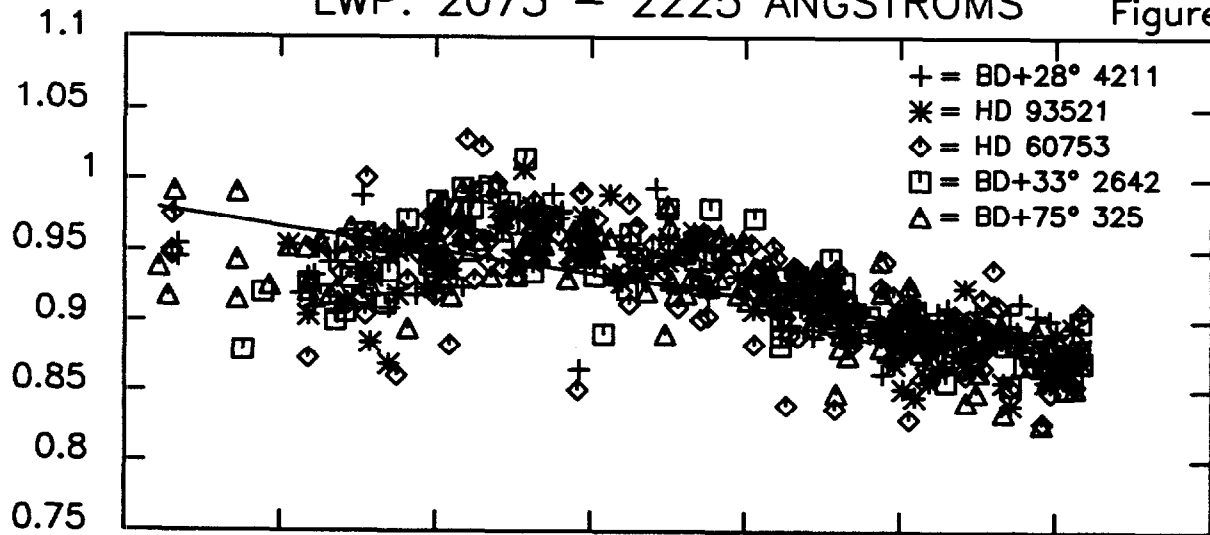
701 data points used in regression

Time dependence [$\frac{\%}{\text{yr.}}$]

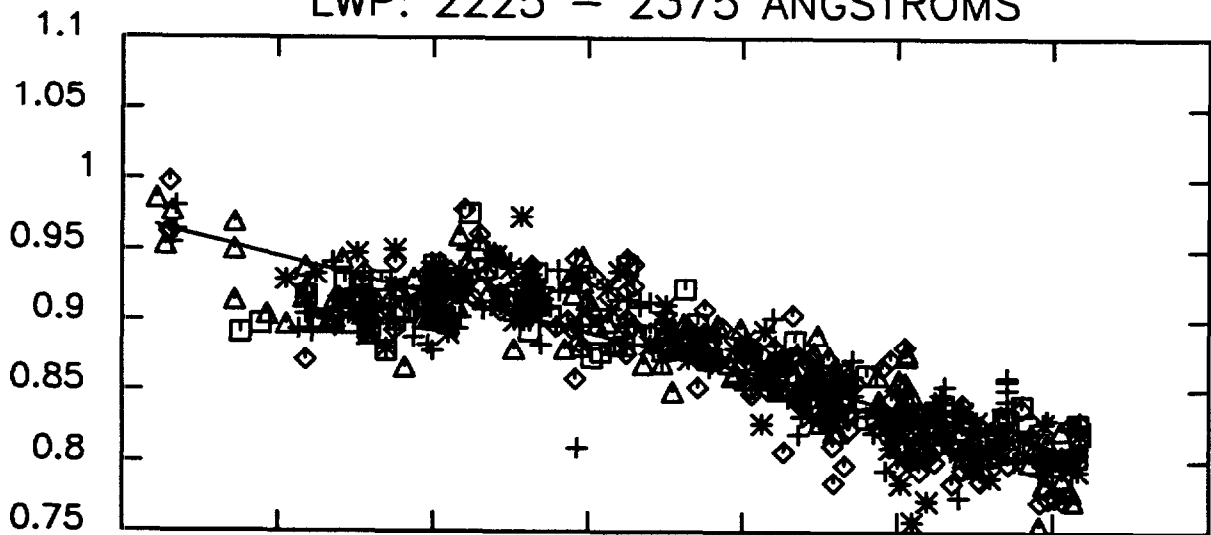
Wavelength Region (Å)	1979.5 to					
	1992.3	1990.3	1988.7	1986.3	1984.8	1983.6
1225 - 1375	-0.82±0.02	-0.83±0.03	-0.75±0.04	-0.66±0.06	-0.73±0.09	-0.46±0.16
1475 - 1625	-0.51±0.02	-0.53±0.03	-0.47±0.04	-0.22±0.06	-0.20±0.09	+0.16±0.16
1775 - 1925	-0.76±0.02	-0.80±0.03	-0.79±0.04	-0.69±0.06	-0.68±0.09	-0.63±0.16

LWP: 2075 - 2225 ANGSTROMS

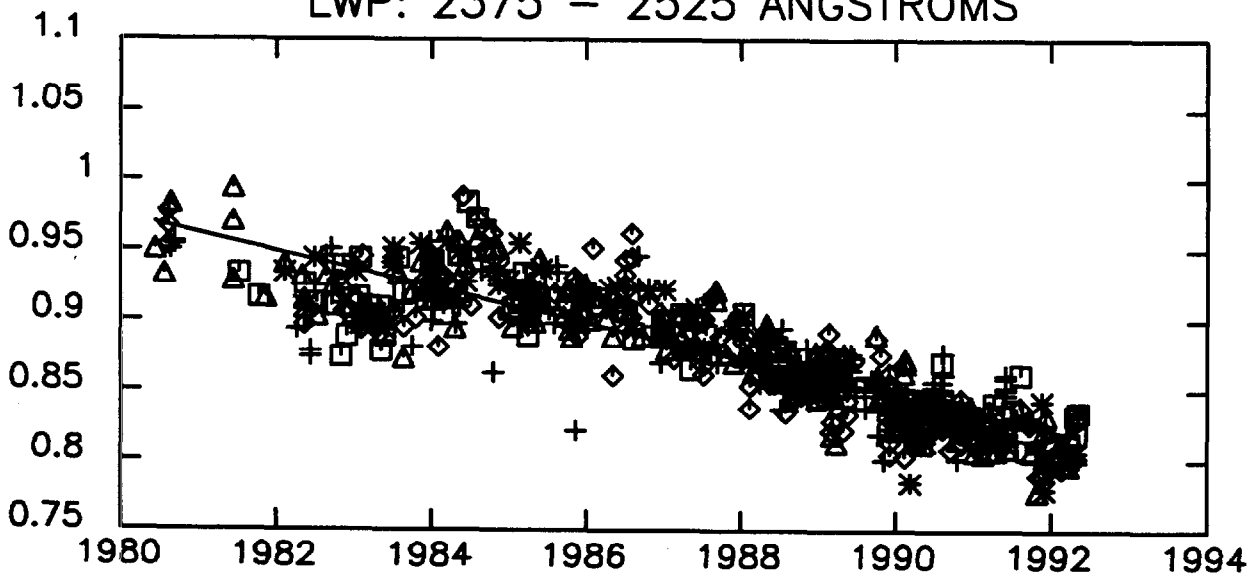
Figure 1



LWP: 2225 - 2375 ANGSTROMS

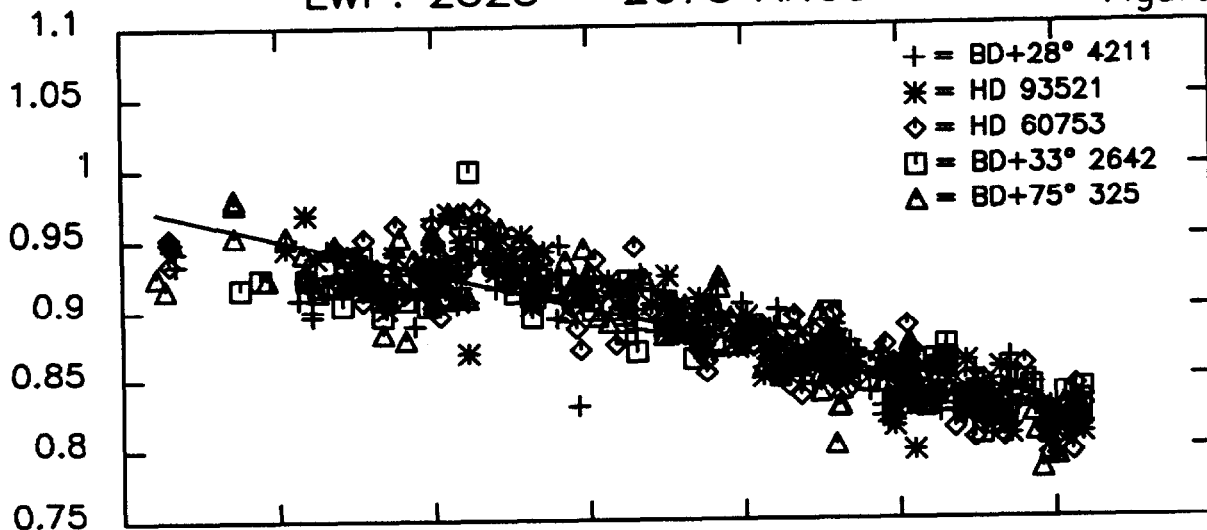


LWP: 2375 - 2525 ANGSTROMS

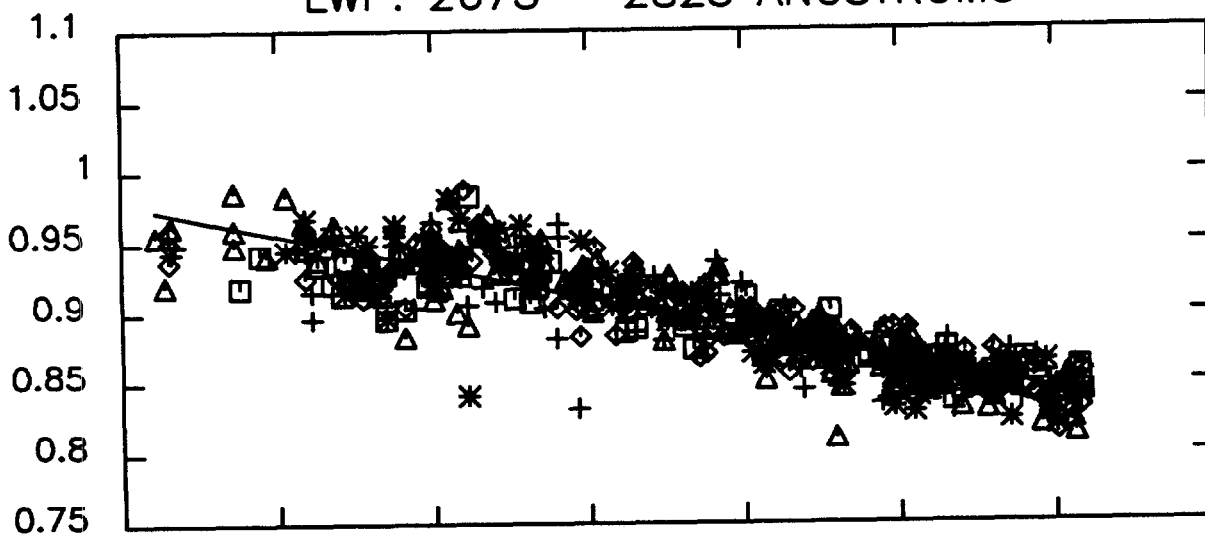


LWP: 2525 - 2675 ANGSTROMS

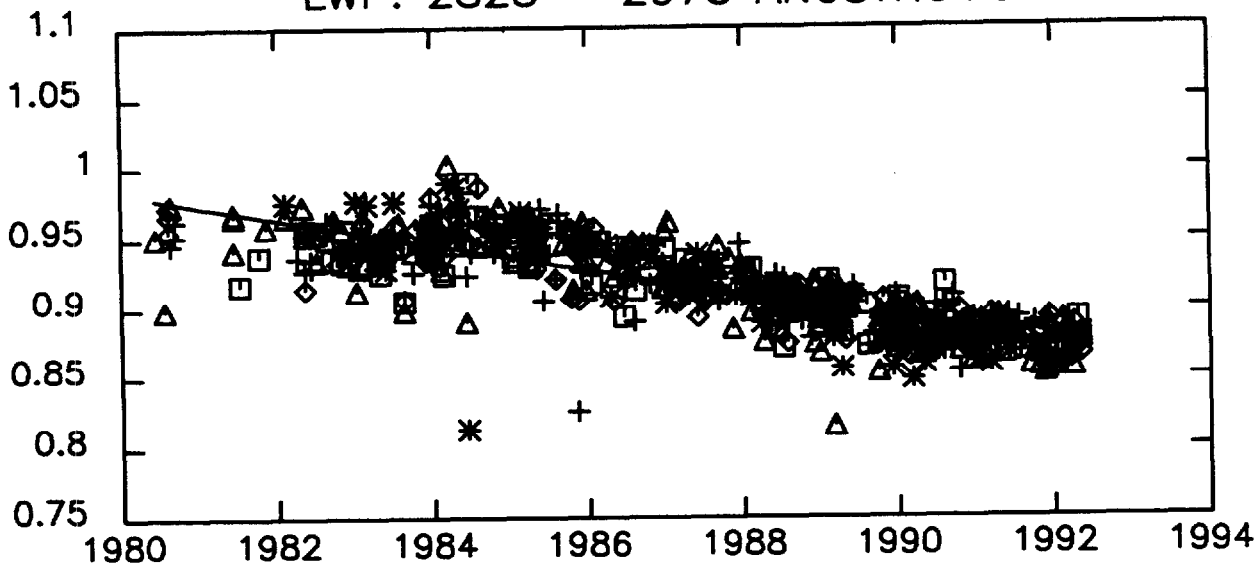
Figure 2



LWP: 2675 - 2825 ANGSTROMS

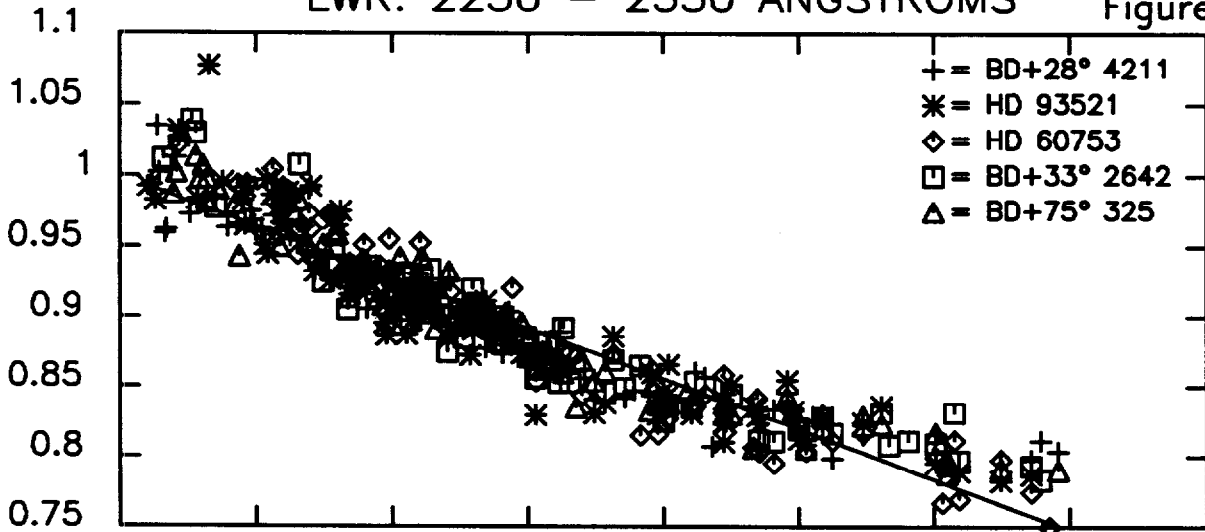


LWP: 2825 - 2975 ANGSTROMS

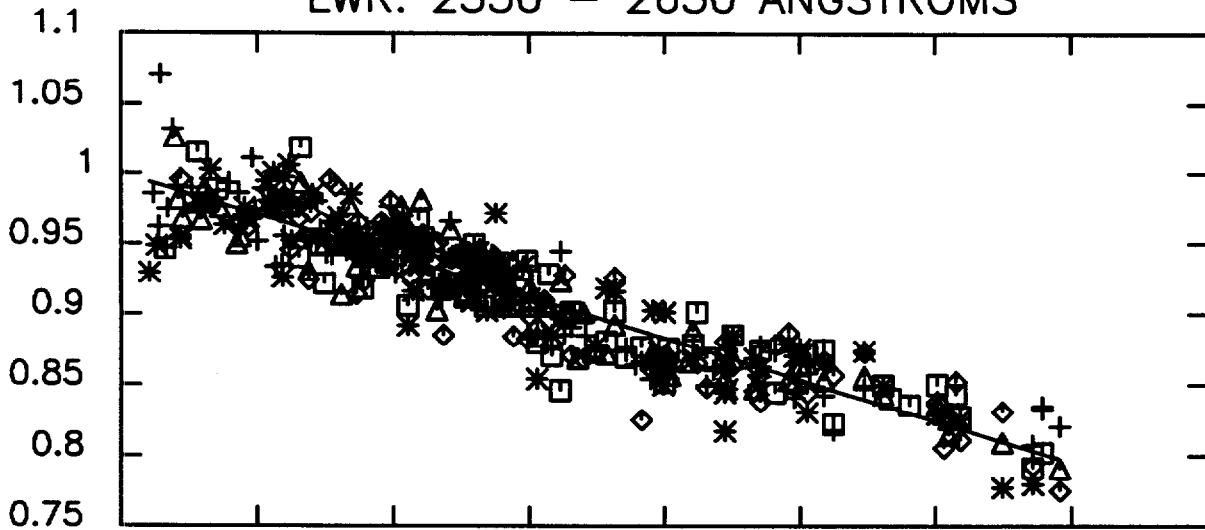


LWR: 2250 - 2550 ANGSTROMS

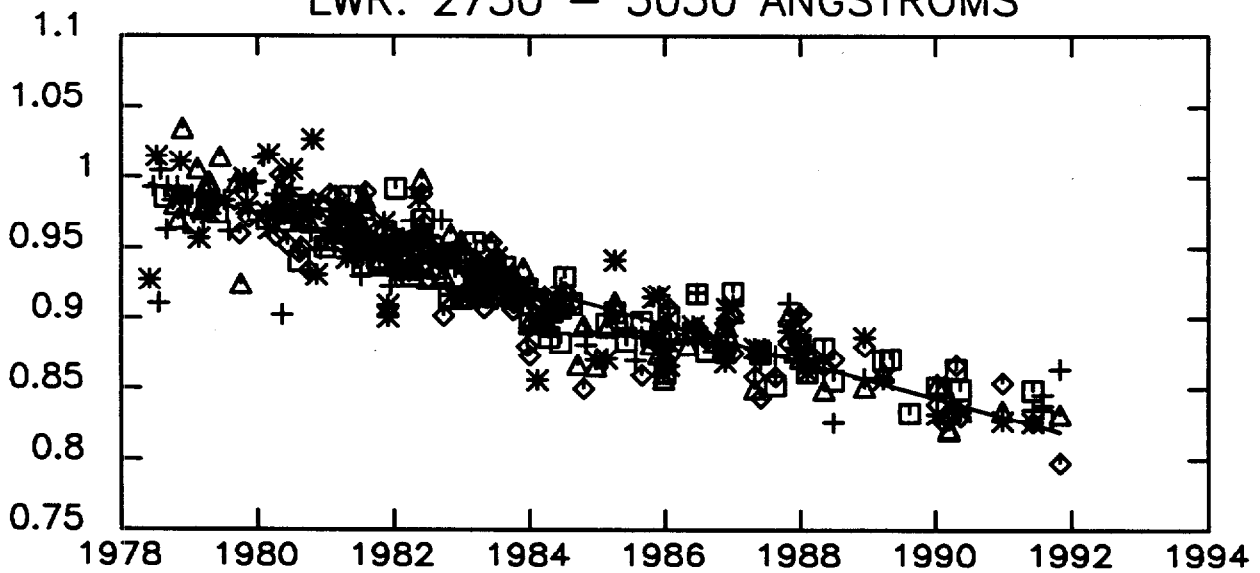
Figure 3

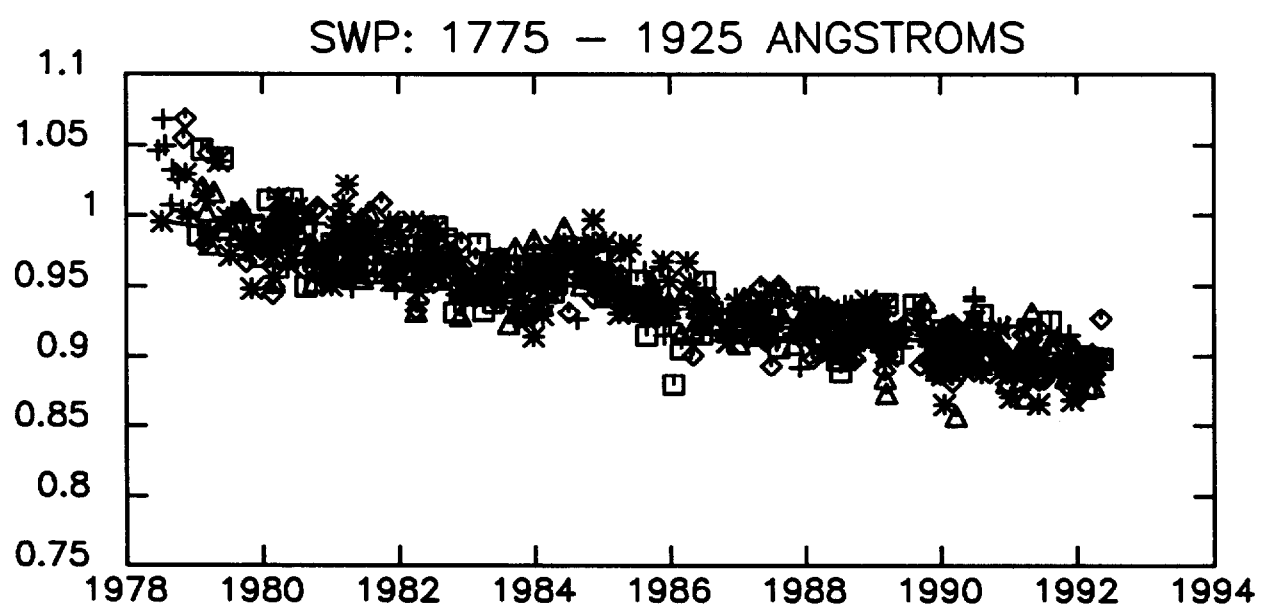
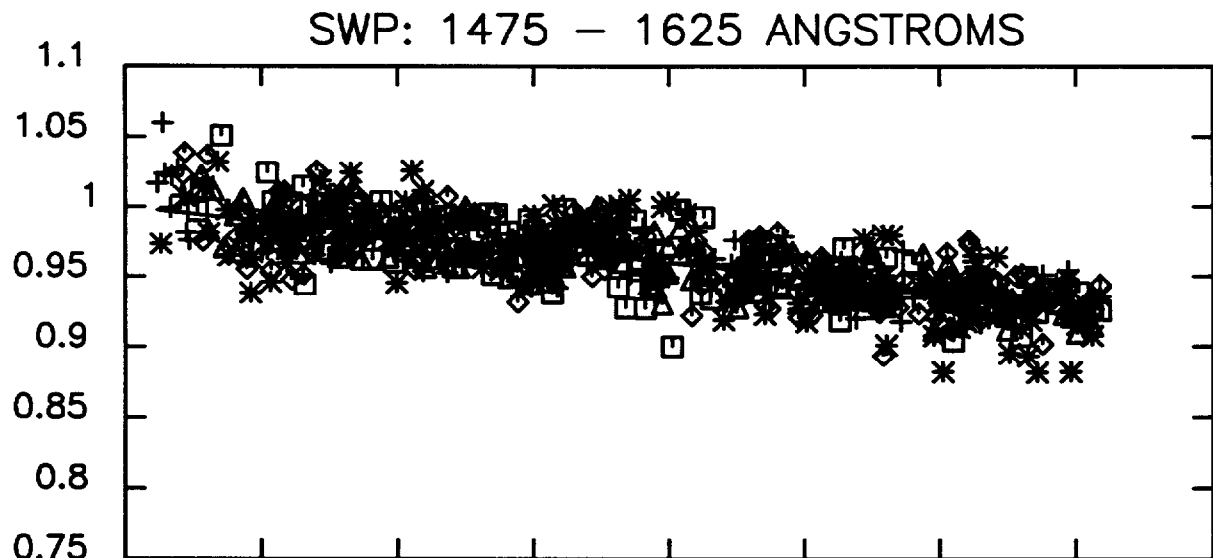
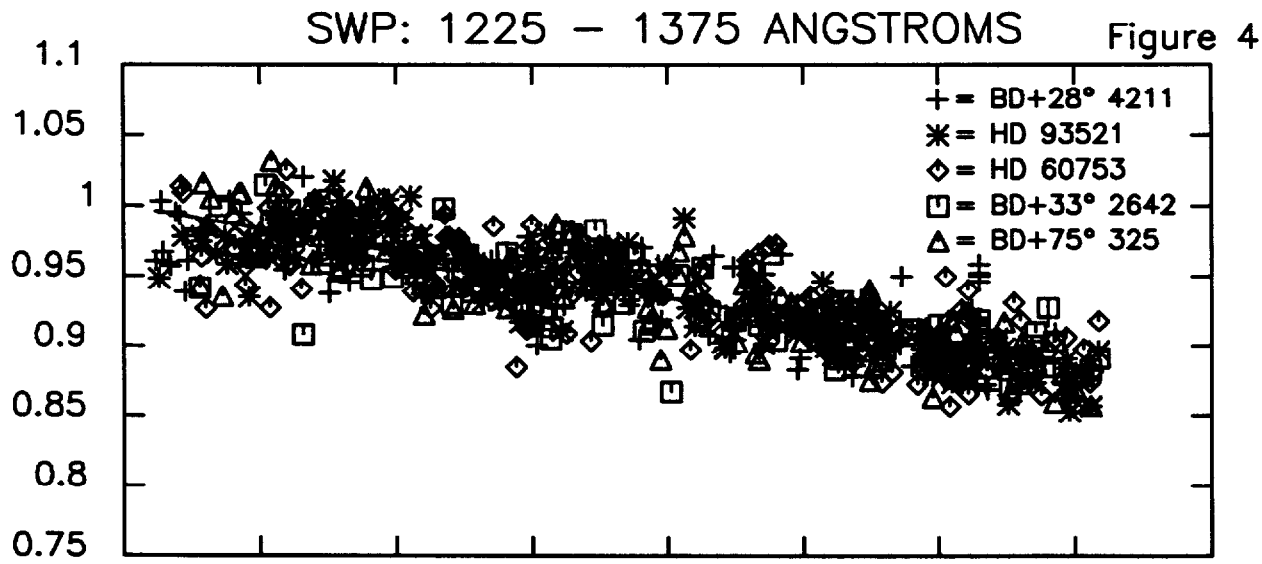


LWR: 2550 - 2650 ANGSTROMS



LWR: 2750 - 3050 ANGSTROMS





HEAD AMPLIFIER TEMPERATURES (°C)

Figure 5

