

## NEWSIPS Wavelength Calibration Accuracy: SWP Low-Dispersion Data

Matthew P. Garhart  
*Computer Sciences Corporation*  
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### Introduction

IUE science images have been analyzed in order to provide a test of the accuracy of the NEWSIPS low-dispersion wavelength calibration for the SWP camera (Bushouse 1991). This wavelength calibration is based on a mean dispersion relation (as is the case for IUESIPS), so that one should not expect a perfect solution (*i.e.*, there are certain errors associated with modeling a large dataset of images). In order to obtain the most accurate wavelength assignments possible, a Guest Observer would have to obtain their own calibration images as close in time, temperature, and intensity as their science image.

### Accuracy of the Wavelength Calibration

The central wavelengths of several emission features from the star RR Tel were measured and compared with the known wavelengths of these lines. Preliminary results (Fig. 1 and 2), after compensating for radial velocity shifts due to the star itself, indicate that a negative residual remains which is not being compensated for by the NEWSIPS dispersion relation. This error is on the order of  $-0.3\text{\AA}$  and does not appear to correlate with either time or temperature. This analysis was repeated using three of the low-dispersion standard stars in order to provide an independent check. The wavelength of the geocoronal Lyman Alpha absorption feature was compared with the rest wavelength (Fig. 3). The average of the differences showed a  $-0.27\text{\AA}$  residual which is comparable to the RR Tel error. However, when the analysis was restricted to images with zero target centering errors this average difference was reduced to about  $-0.12\text{\AA}$  (Fig. 4). Considering the fact that the errors associated with the measuring routine (GAUSSFITS) are of the same order as this amount, the accuracy of the wavelength calibration is excellent.

### Wavelength Calibration Reproducibility Error

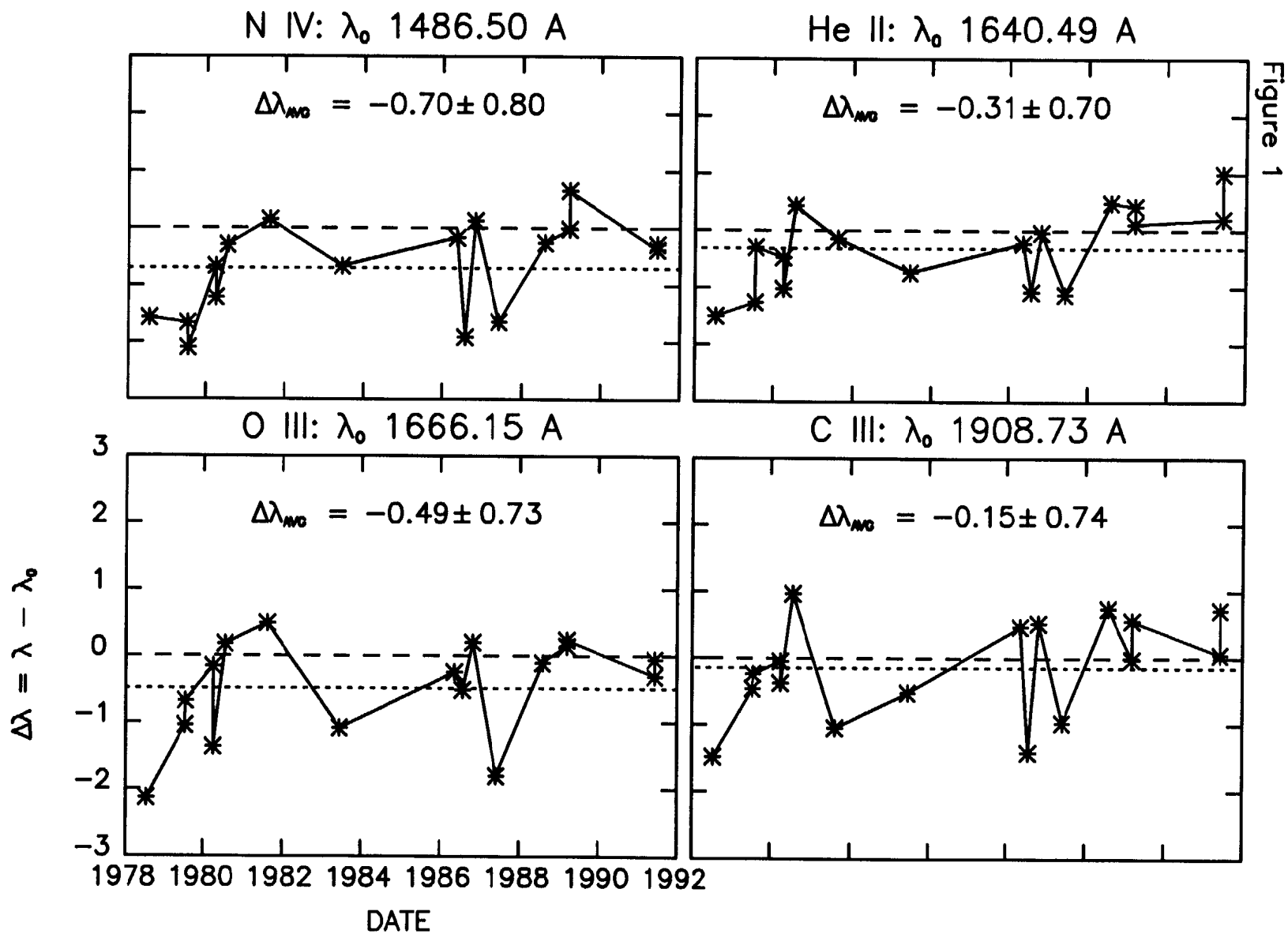
Another aspect to consider when determining the accuracy of the wavelength calibration is the reproducibility (or repeatability) error. That is, wavelength measurements of spectral features from two exposures taken under similar conditions (*i.e.*, time, temperature, and target centering) will not yield the same results. Of the seventeen images used in the RR Tel analysis, two pairs were selected. The measured wavelengths of the nine spectral features for each pair were differenced and averaged, yielding an approximate reproducibility error of  $0.5\text{\AA}$ .

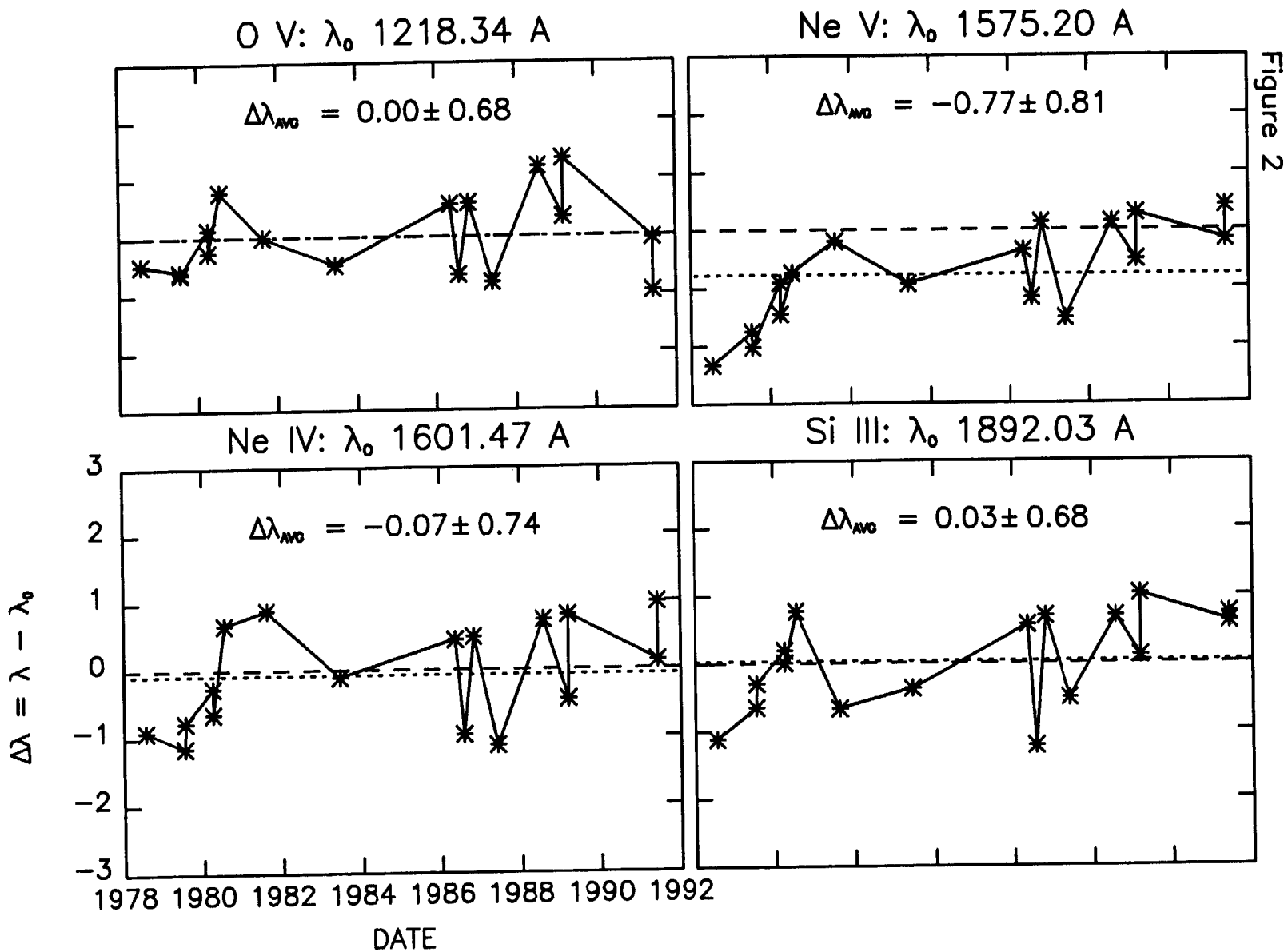
### Accuracy of the Small-to-Large Offset

A comparison of the same Lyman Alpha absorption feature wavelengths from exposures taken in both the large and small apertures was also made to test the accuracy of the small-to-large offset. This offset is applied to the constant term of the dispersion relation in order to translate the wavelength calibration from the small to the large aperture. A total of sixteen spectra were analyzed (Fig. 5) and, although the scatter in the measured differences was large ( $\pm 0.44\text{\AA}$ ), the average difference was almost zero ( $0.08\text{\AA}$ ). This indicates that the offset is quite accurate.

### References

Bushouse, H. 1991, IUE NASA Newsletter, No. 45, 46





Ly  $\alpha$ :  $\lambda_0$  1215.67 A

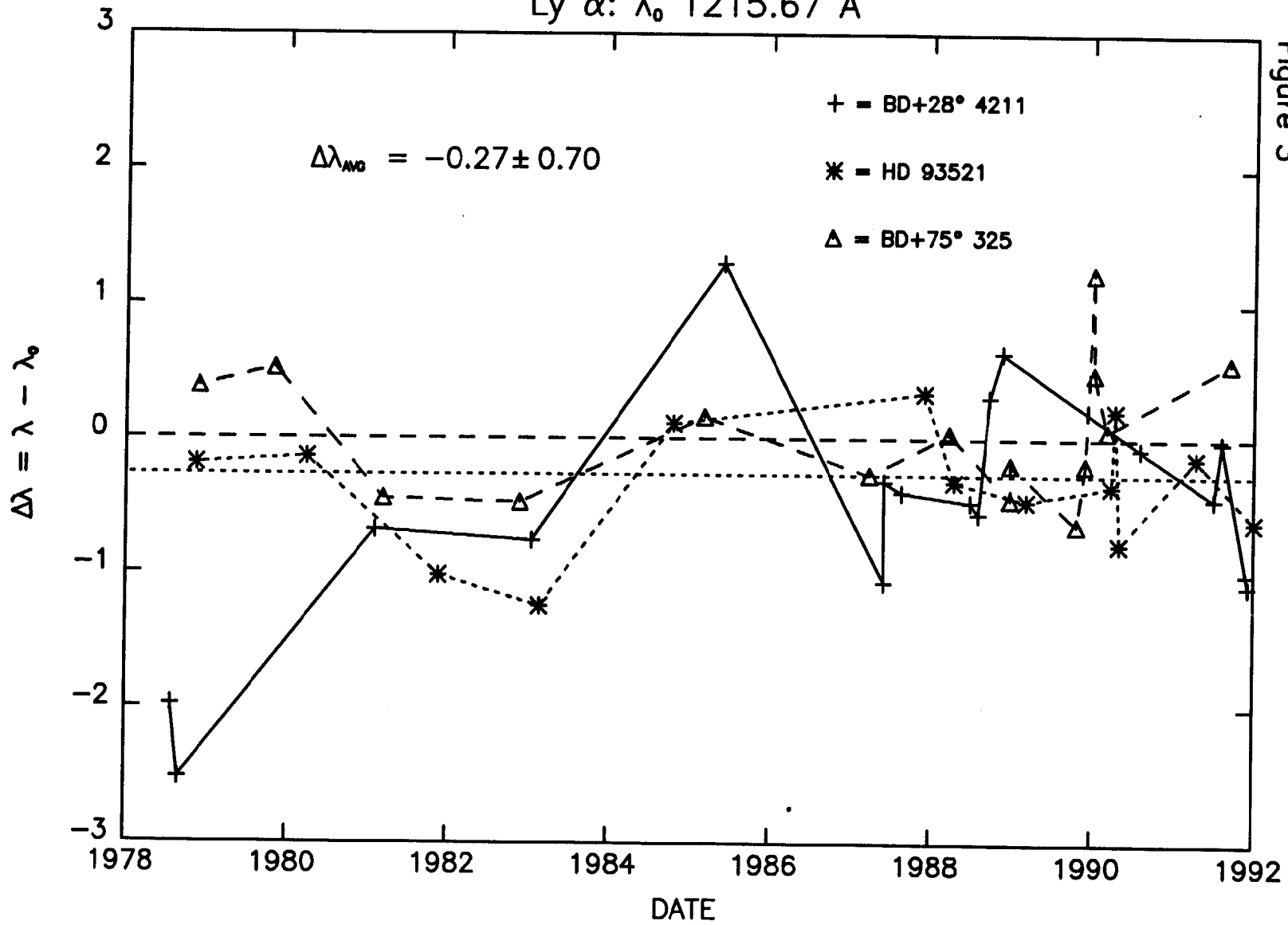


Figure 3

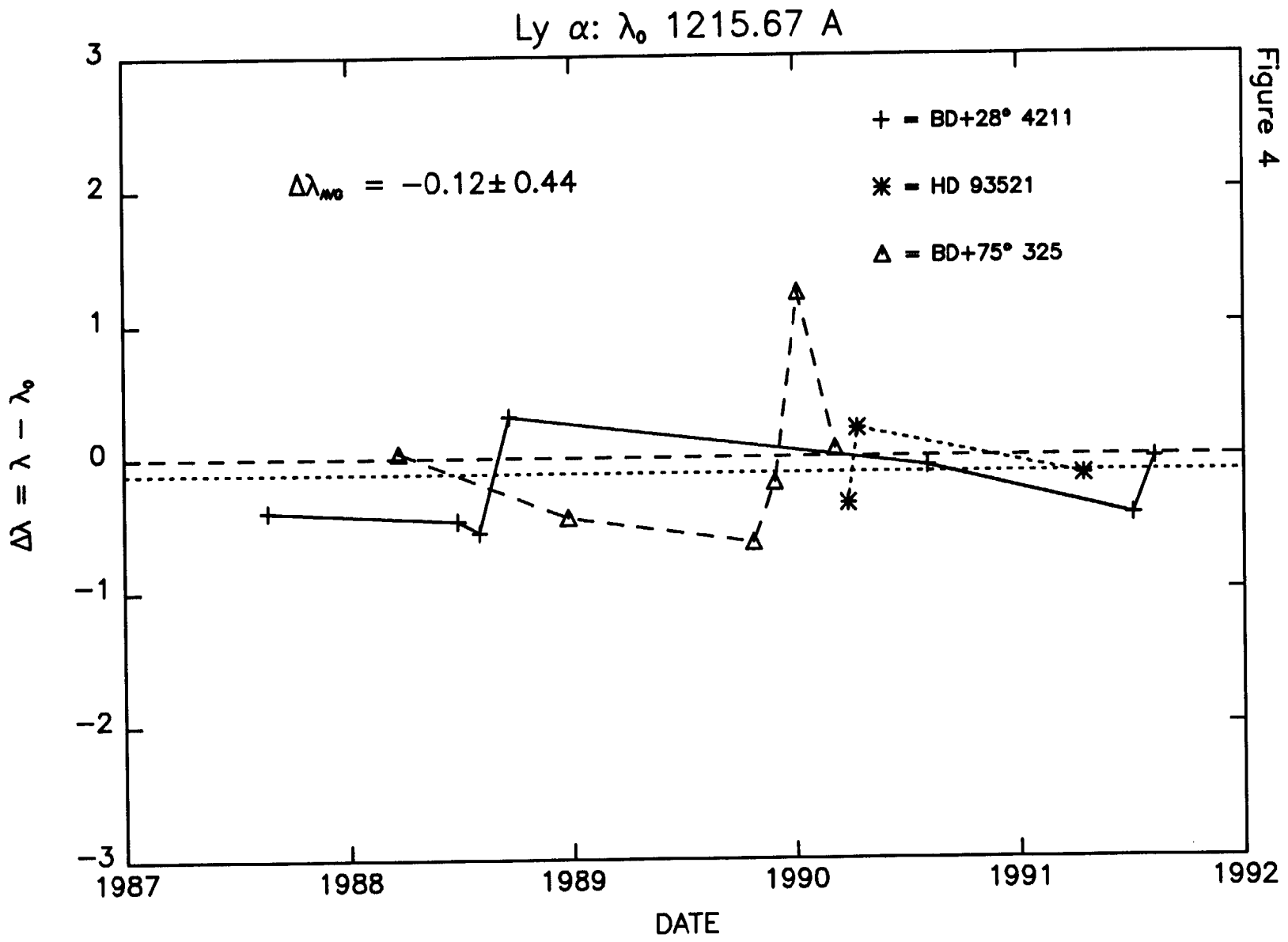


Figure 4

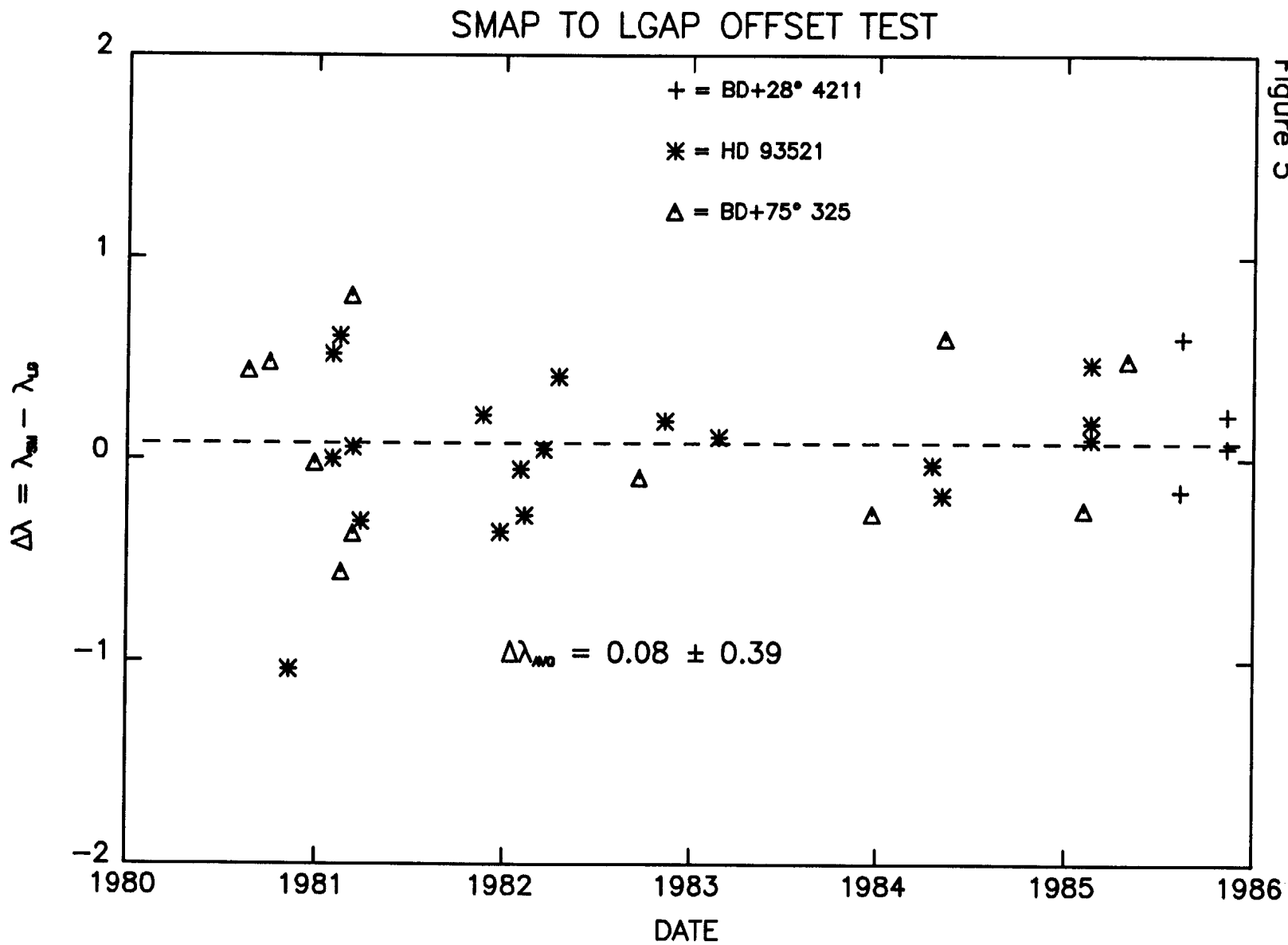


Figure 5