

Updated FES Photometric Calibration at the Reference Point (-144,-176)

Mario R. Pérez

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1 Abstract

After the nearly 2 1/2 years that the FES reference point (-144, -176) has been in use, we study here its photometric performance. In this report we present a noticeable sensitivity degradation of the order of 2% and 1.5% per year for overlap and underlap stars, respectively. This yields a cumulative degradation of about 5% since this reference point became operational.

2 Introduction

On January 22, 1990 at GSFC and on July 23, 1990 at VILSPA, a new FES reference point (-144, -176) was implemented to replace the fatigued old reference point (-16,-208). A preliminary calibration of this reference point is presented by Pérez (1991) based both on first principles and via comparisons of the previous reference point. The continuous usage of the FES counts to derive light curves and optical fluxes makes necessary a permanent monitoring of the photometric performance of the FES. From the lessons learned from the previous reference point it is known that the FES experiences sensitivity degradation of about 2-3% per year under normal usage.

3 Database

Before the current reference point was implemented a few UVB standard stars such as the one in the Praesepe cluster (Johnson 1954) and in the Harvard E-2 regions (Graham 1982) were observed in order to have a solid initial photometric reference. In addition, the regularly monitored PHCAL standard stars being observed under the routine sensitivity monitoring program are included in this database. Despite of the quality of these data the current reference point is somewhat more challenging to calibrate due to the FES scattered light present after January 22, 1991. Therefore, faint stars are more subject to errors even when the background counts are considered. Of the five regular overlap PHCAL stars observed, we have selected the brightest three in order to perform this study (i.e., HD 60753, HD 93521 and BD+75° 0325). In the case of underlap stars three PHCAL stars were included in this study (i.e., HD 3360, HD 120315 and HD 149438). The total number of calibration points used were 444 for overlap stars and 144 for underlap stars. The data for individual stars were corrected for focus as described by Pérez (1991) and normalized before they were added into a single file for each FES mode.

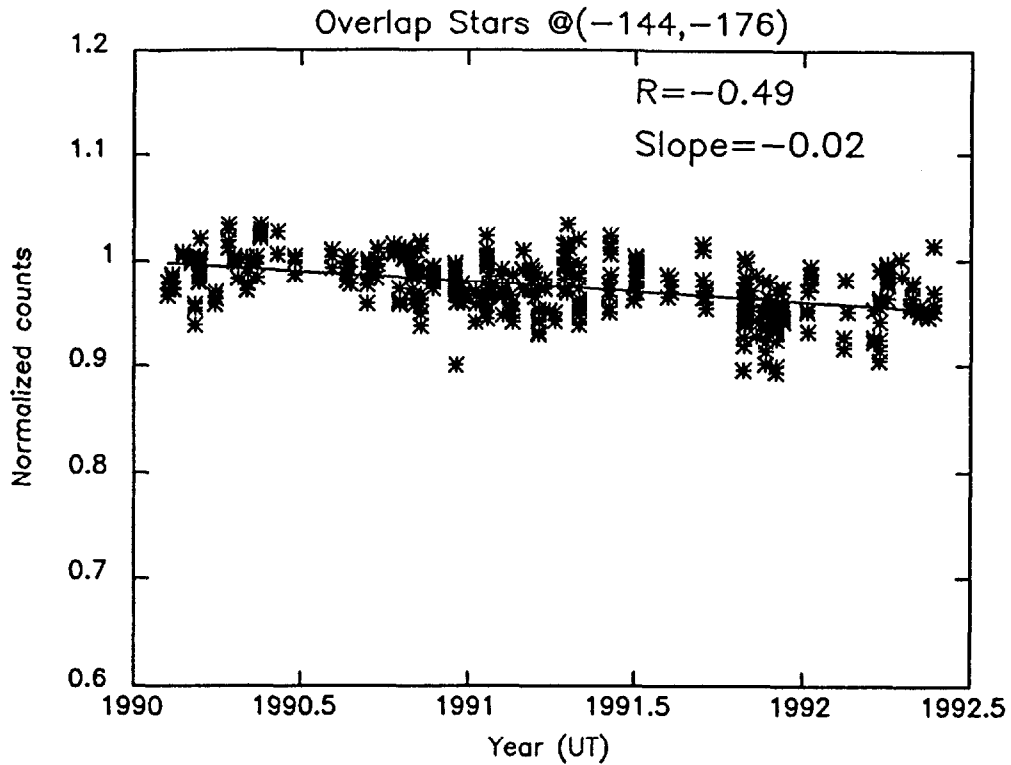


Figure 1: Sensitivity degradation for Overlap Stars (n=444 data points)

4 Results

An appreciable sensitivity degradation is already clearly present in the data as it is shown in Figure 1 for overlap stars and in Figure 2 for underlap stars.

For overlap stars the parameters of the linear fit indicate a degradation of 2% per year, which produces a cumulative degradation of about 5% until mid-1992. This is somewhat larger than the initial degradation of the reference point at (-16, -208) presented by Pérez et al. (1991); however, the degradation rates are nominal when compared with subsequent years. Similarly, the degradation for underlap stars appears less steep: about 1.5% per year. Therefore, we suggest that current FES counts taken at the reference point should be subject to the following sensitivity correction:

$$cts(corr) = \frac{cts(obs)}{[1 + a * (T - 1990.00)]}, \quad (1)$$

where, T is the time in decimal years after 1990.00, and $a=0.020207$ for overlap and $a=0.015347$ for underlap stars. The other calibration equations presented in Pérez (1991) remain unchanged.

References

- Graham, J. A. 1982, *P. A. S. P.*, **94**, 244.
 Johnson, H. L. 1954, *Ap. J.*, **119**, 181.
 Pérez, M. 1991, Three-Agency Report, November 1990, pE-14.
 Pérez, M., Loomis, C., Eaton, N., Bradley, R. 1991, Three-Agency Report, November 1991, pF-13.

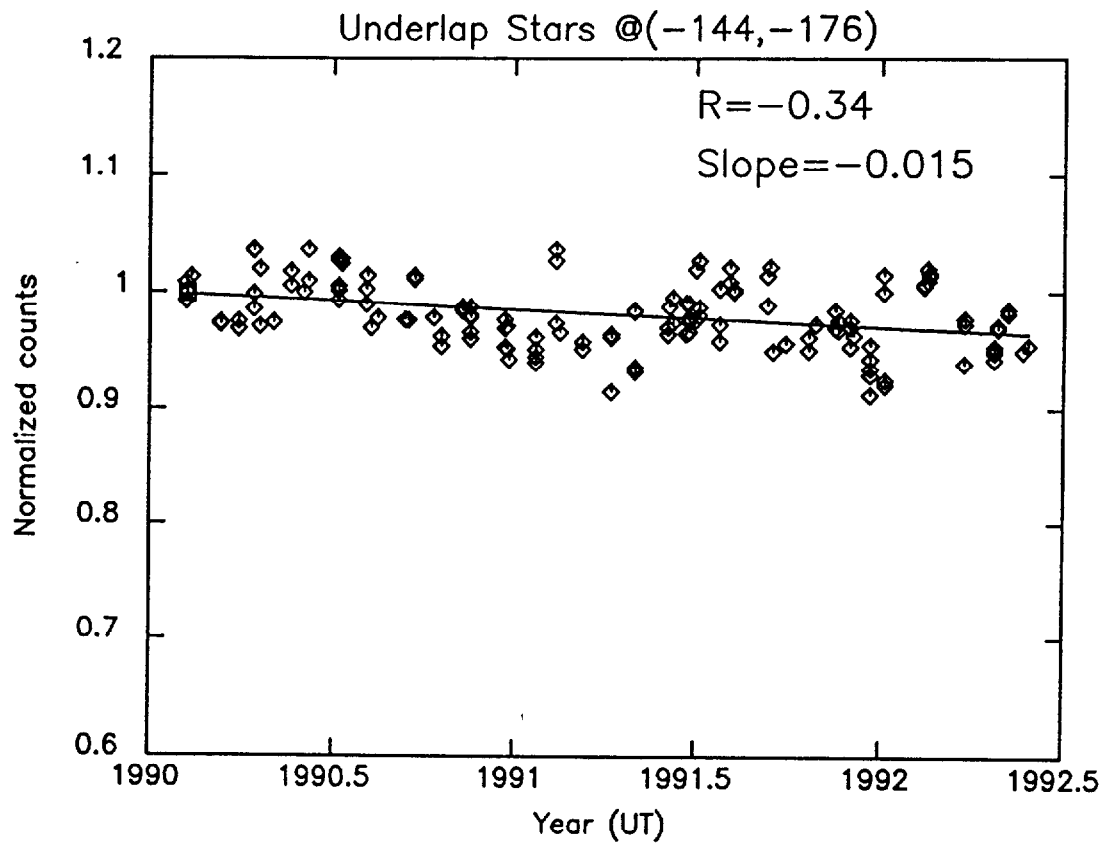


Figure 2: Sensitivity degradation for Underlap Stars (n=144 data points)