

Long-term Study of Bias Jumps

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ABSTRACT

We have studied long-term trends in the bias jumps. We found no significant evidence for any long-term change in either the frequency of the jumps, their mean/median amplitude, or in the dispersion of their amplitudes. Apparently, while the jumps are sporadic in nature, their long-term properties are stable.

1. Introduction

The on-orbit properties of the WFPC2 bias frames were discussed by O'Dea et al. (ISR WFPC2 97-04). In this TIR we report on a follow-up study of long-term trends in the bias jumps. These jumps are small changes in the background level of images which are caused by spurious electronic signals during readout of the CCDs; they are usually correctable during data analysis. Interest in this subject was generated by a recent image showing a very unusual series of strong bias jumps. Thus, there was some concern that bias jumps were increasing in severity since SM-2.

2. Results

We examined all dark calibration frames obtained between 01-Jan-1994 and 27-Jul-97, as these provide a long-term series of images with uniform properties. We used the bias jump detection algorithm to detect bias jumps above 0.1 DN in amplitude. The results are given in Tables 1-3. We found no significant evidence for any long-term change in either the frequency of the jumps, their mean/median amplitude, or in the dispersion of their amplitudes. Apparently while the jumps are sporadic in nature, their long-term properties are stable.

In addition, we have compared the statistics of bias jumps in the dark images in this TIR with the statistics of bias jumps in the bias images reported in ISR 97-04. We find that bias jumps occur more often in the dark frames than in the bias frames, though the mean

amplitudes are similar. It is not yet clear why bias jumps are more frequent in the darks. This may be related to the higher counts (e.g., cosmic rays) in the dark images.

Table 1: Number of Bias Jumps in Dark Calibration Images

	Period			
	1994	1995	1996	1997 (post smov)
Total datasets	458	472	367	203
# with jumps	389	399	307	167
# in PC	255	288	224	114
# in WF2	113	131	100	49
# in WF3	127	140	113	35
# in WF4	184	164	122	91

Table 2: Statistics on Frequency of Occurrence of Bias Jumps in Dark Frames

CCD	Period			
	1994	1995	1996	1997 (post smov)
PC	56%	61%	61%	56%
WF2	25%	28%	27%	24%
WF3	28%	30%	31%	17%
WF4	40%	35%	33%	45%

Table 3: Statistics on Amplitude of Bias Jumps in Dark Frames

Year	Mean	Std. Dev.	Median	Min.	Max.
1994					
PC	0.147	0.097	0.128	0.101	1.342
WF2	0.119	0.017	0.113	0.1	0.190
WF3	0.142	0.106	0.118	0.1	0.970
WF4	0.128	0.039	0.120	0.1	0.513
1995					
PC	0.155	0.120	0.126	0.1	1.244
WF2	0.138	0.119	0.117	0.1	1.188
WF3	0.163	0.273	0.119	0.1	3.091
WF4	0.125	0.031	0.116	0.1	0.328
1996					
PC	0.149	0.073	0.1285	0.1	0.773
WF2	0.134	0.127	0.116	0.1	1.372
WF3	0.125	0.042	0.114	0.1	0.403
WF4	0.155	0.235	0.123	0.1	2.677
1997 Pre SMOV					
PC	0.122	0.019	0.121	0.1	0.162
WF2	0.144	0.085	0.112	0.101	0.407
WF3	0.170	0.099	0.125	0.101	0.414
WF4	0.146	0.057	0.1275	0.107	0.327
1997 Post SMOV					
PC	0.146	0.111	0.126	0.1	1.267
WF2	0.118	0.015	0.113	0.1	0.165
WF3	0.158	0.167	0.112	0.1	0.983
WF4	0.137	0.057	0.121	0.1	0.506

