Study of the flat-fielding of WFI data Part II

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1 Introduction

This report investigates the flat-fielding of WFI data when the twilight frames are used to correct for the large scale variation of the flat-field. The goal is to answer the following questions:

- Do we need to use a night sky flat in ASTROWISE and, if so, how often?
- Why is the shape of the night sky flat different from night to night, or even from observation to observation during the same night? What does it depend on?

2 Data analysis

Fourteen nights with a large number of frames per filter were selected in the database of ASTROWISE and are indicated in Table 1. For data reduction and easy (and fast) analysis, the same approach as in the first report of this series was used. First, the bias was removed from every image using the median of the pre-scan and over-scan regions of each row (while in the first report the master_bias was subtracted). All rows and columns of the frames were stacked together into a "master_row" and a "master_col", the median of all pixels along columns and rows, respectively. Master_row and master_col are normalized between columns 100 and 500 and rows 500 to 1800, respectively. These represent the flattest region of CCD50 and the closest to the center of the field.

The same was done for raw-science frames and raw-twilight frames. The master_row and master_col of the raw-science frames were then flat-fielded with their equivalents from the twilight frames.

The results of these bias-subtracted, flat-fielded master_rows and master_cols for CCD50 are shown for individual nights and different filters in the figures below. Each figure are also includes (in the middle of the graph) the number of frames used (n), the illuminated fraction of Moon's disk (k, with $0.0 < k < 1.0$), and the minimum and maximum values of the distance target-moon (DTM). Frames with short exposure times ($\leq 3s$) or very low sky backgrounds ($\leq 50 ADUs$) are not shown due to their low signal-to-noise.

Table 1: Number of science frames, dome and twilight flats, filter name and Moon illumination (k) for the nights analyzed in this report.

Date	Nb science	Nb dome	Nb twilight	Filter	k
1999-06-12	33	6	0	842	0.0
1999-06-13	10	1	0	842	0.0
2000-04-21	31	0	6	842	0.9
2000-04-23	18	0	7	842	0.8
2000-04-21	21	0	4	843	0.90
2000-04-23	19	0	5	843	0.75
1999-06-13	29	10	0	844	0.0
1999-06-16	27	6	4	844	0.1
1999-06-17	33	0	0	844	0.2
2000-04-21	26	0	3	844	0.9
2000-04-23	18	0	8	844	0.8
1999-06-12	19	4	0	845	0.0
2000-04-21	33	0	4	845	0.9
2000-04-23	33	0	7	845	0.8

To investigate the shape of the sky background regarding several parameters, tables give quantities for each observation and each night (see tables for details).

3 Results

3.1 Nights without (or with little) moon illumination

Figures 1 to 6 show examples of observations obtained during nights with little moon illumination. The nights are all in June 1999 and the full moon was on 1999-06-13. The flatness of the sky gives excellent results for the nights 1999-06-13 in R-band (Fig.3) and 1999-06-12 in I-band (Fig. 6), for example. However, there are often differences in the shape of the sky background for frames obtained during the same night. The most obvious example is 1999-06-12 (Fig. 1), which shows differences of up to 10 percent at the end of master_col and at the beginning of master_row. The night 1999-06-17 (Fig. 5) shows a systematic slope of 5 percent along master_col for all the frames.

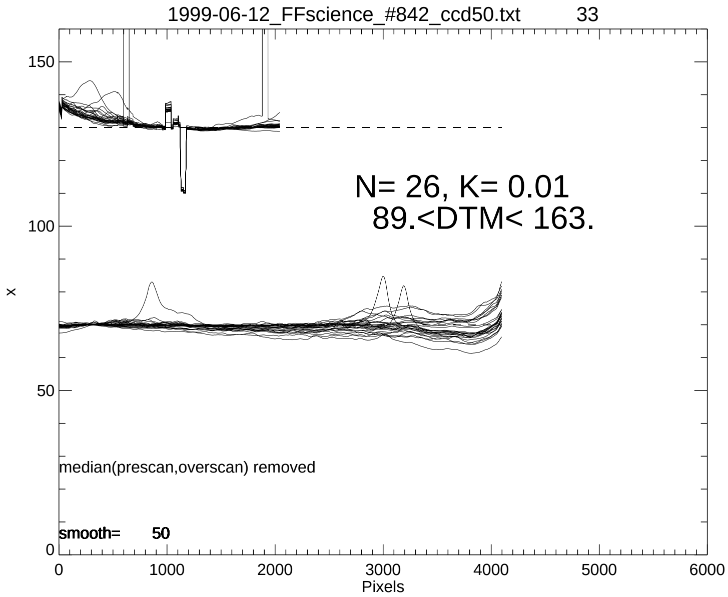

Figure 1: Master_row and master_col of CCD50 for the raw science frames of the night 1999-06-12 in B band. The master bias has been removed. Master_row and master_col are normalized to 100 but offset by 30 for rows, -30 for columns. N indicates the number of frames plotted, K the moon illumination. The range of distance target-moon (DTM) is also indicated.

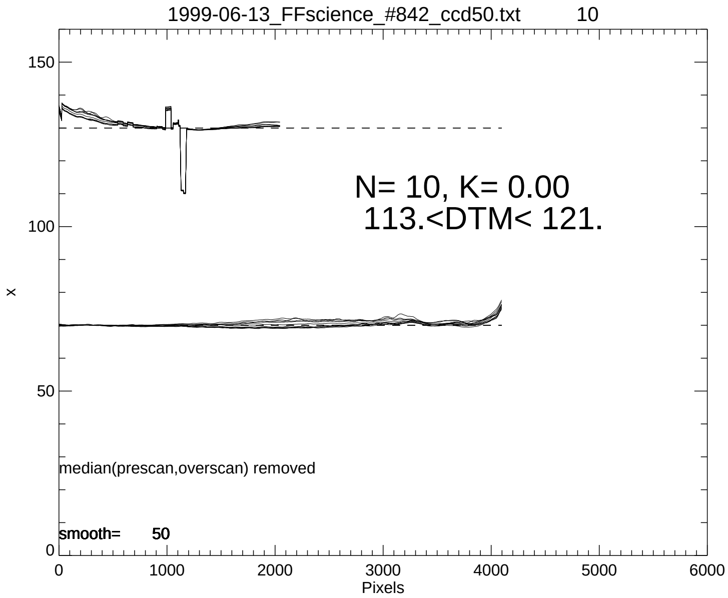

Figure 2: Same as figure 1 for the night “1999-06-13” in the B-band.

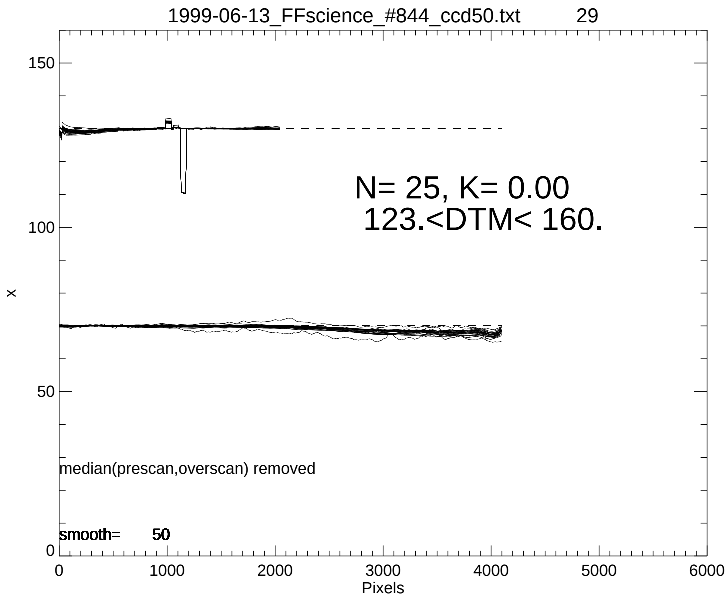

Figure 3: Same as figure 1 for the night “1999-06-13” in the R-band.

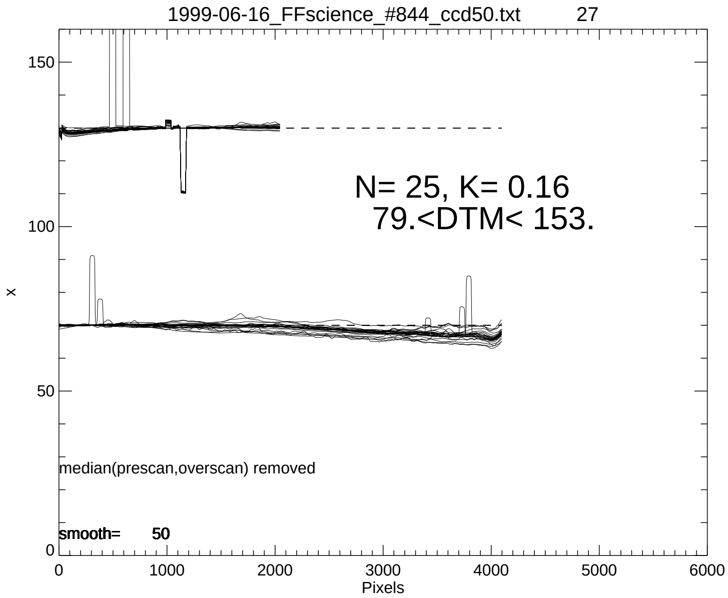

Figure 4: Same as figure 1 for the night “1999-06-16” in the R-band.

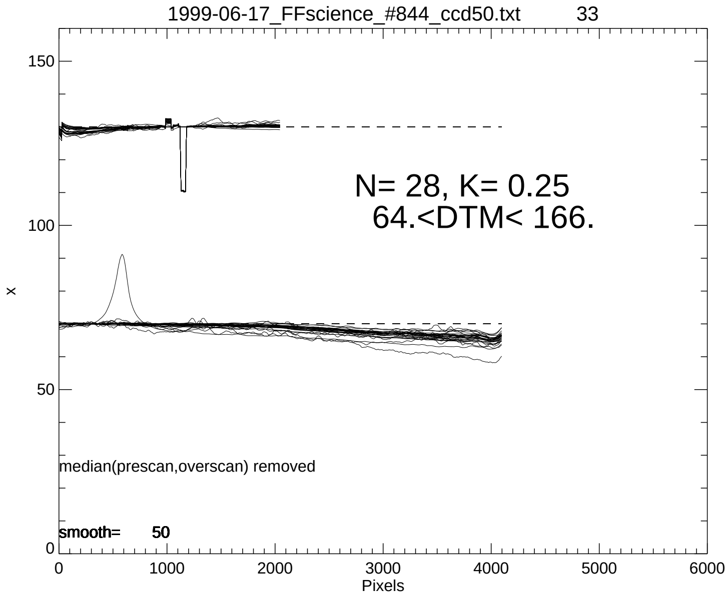

Figure 5: Same as figure 1 for the night “1999-06-17” in the R-band.

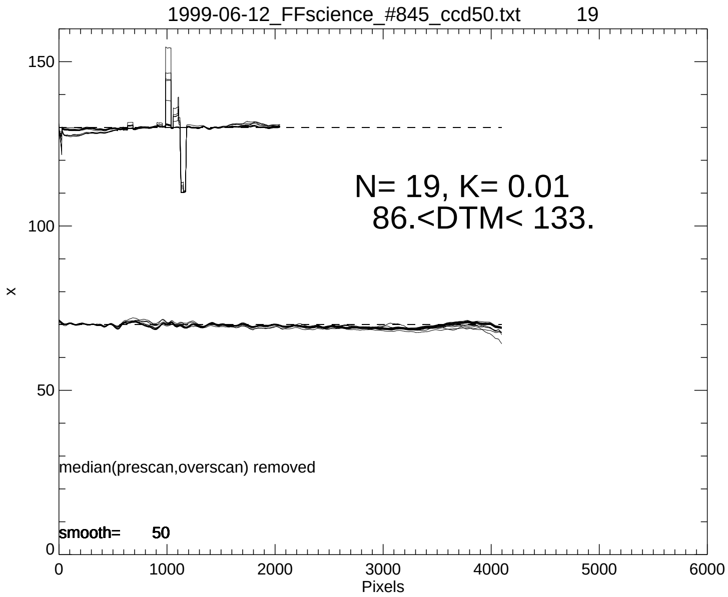

Figure 6: Same as figure 1 for the night “1999-06-12” in the I-band.

3.2 Nights with moon illumination

Figures 7 to 14 show examples of observations obtained during nights with moon illumination. First, the presence of two shapes in the sky background of the frames can be noticed. The first shape (shape_1) is almost flat; the second (shape_2) goes up by 5 to 15 percent at the end of master_col and by 5 to 20% at the beginning of master_row (see Figs. 7 and 8 for B-band, 9 and 10 for V-band, 11 and 12 for R-band, and 13 and 14 for I-band).

The tables corresponding to these figures (e.g. Tables 2 and 3 for B-band) give values of several parameters related to these observations and ordered regarding the values of master_col at row 4000, which reflects the shape of the sky backgrounds (a flat sky background would have $master\_col = 100$ everywhere.

Tables 2 and 3 show that shape_2 (corresponding to $master\_col \geq 107$ in B-band and for the target SA110) is in general well correlated with the proximity of the moon (distance target-moon $DTM \simeq 34$ degrees for night 2000-04-21 and $DTM \simeq 22$ degrees for night 2000-04-23). The intensity of the sky also changes with the position and phase of the moon. Indeed, the sky values decrease from 17-27 ADU/S for night 2000-04-21 and an illumination of the moon disk equal to 0.9 (almost full moon) to 10 ADU/S for night 2000-04-23 when the moon illumination was only 0.76.

There are however a few observations as close from the moon as 30 degrees which do not show the shape_2 (see lines 10-11 and 14-15 in Table 2 for example). But in these cases, the sky background does in general not have the large values noticed above.

Tables 4 and 5, 6 and 7, and 8 and 9 show very similar values and correlations for V-band (Figs. 4 and 5) , R-band (Figs. 6 and 7) and I-band (Figs. 8 and 9), respectively.

These tables also give master_row values at column 200. Master_row(200) is well correlated to master_col(4000) for night 2000-04-21 (see Tables 2, 4 and 6 for filters B, V and R, respectively), the larger master_col(4000), the larger master_row(200). However, the opposite behaviour is also seen for the night 2000-04-23 (Tables 3, 5 and 7) when lower master_row(200) values are associated to the increase of master_col(4000) values.

4 Conclusions

- The analysis of the flatness of frames obtained during nights without (or with little) moon illumination reveals remaining differences of up to 5-10 percent in the sky background flatness, in particular at the beginning of master_row (left part of CCD50) and at the end of master_col (upper part of CCD50). There is a systematic slope of typically 5 percent for some nights. It is not clear why the shape of the sky background changes during nights without moon.

- The shape of the sky background of frames obtained during nights with moon illumination shows two shapes. One is flat within a few percent or shows small trends ($\simeq$ 5%) as in the case of nights without moon. The second shows an increase of 10 to 15 percent at the end of master_col. This trend is correlated with the proximity and brightness of the moon, and therefore with the sky background value.

There are exceptions to these general trends. Some observations are close to the moon or have large sky background values without their sky background following a particular shape. The increase at the end of master_col is correlated with an increase or a decrease of the values at the beginning of master_row.

However, it is difficult to exactly quantify the changes regarding moon phase, moon position and filter with the data available in the archive. Dedicated observations would be necessary to do so.

- A night flat is required to remove the large scale variations from frames observed close to the moon and to reach the 1% level flatness of the sky background. It can also be used to improve the correction of frames obtained during nights without strong moon illumination but which show some systematic trends.

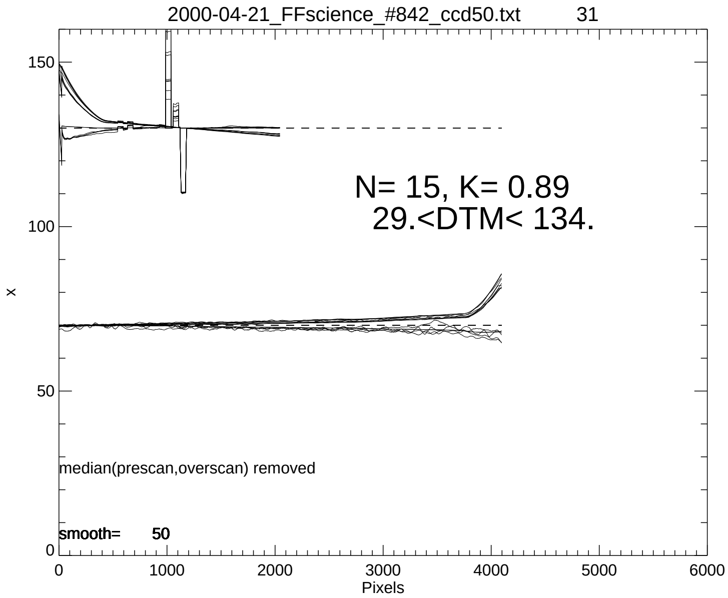

Figure 7: Same as figure 1 for the night “2000-04-21” in the B-band.

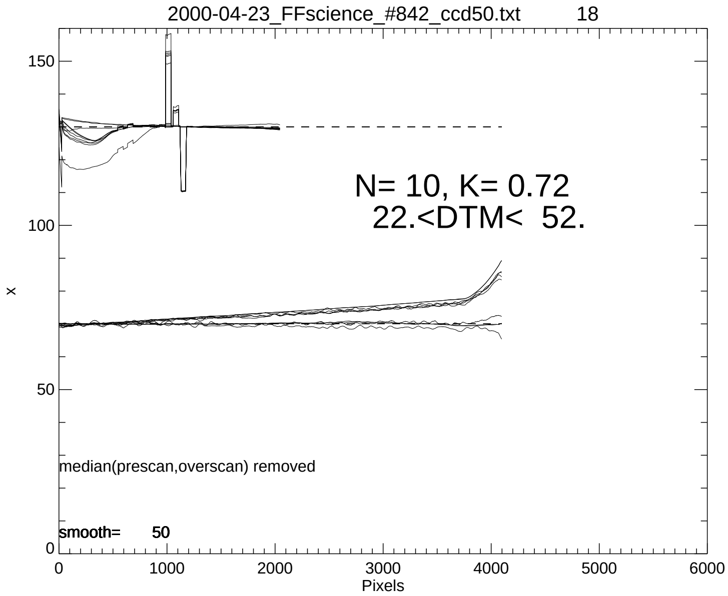

Figure 8: Same as figure 1 for the night “2000-04-23” in the B-band.

Table 2: Parameters of each observation for the night "2000-04-21" in B-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	111.	109.	13525.	23.	sa110/NW/B	599	6.744	280.	1.	0.88	14.	34.	33.	2.
002	111.	108.	161.	20.	sa110/NE/B	7	7.388	281.	0.	0.88	11.	34.	33.	1.
003	111.	109.	13775.	23.	sa110/NW/B	599	6.541	280.	1.	0.88	16.	34.	33.	2.
004	110.	107.	123.	25.	sa110/NW/B	4	5.728	280.	1.	0.88	26.	34.	33.	2.
005	109.	109.	11486.	19.	sa110/NE/B	599	7.802	281.	1.	0.88	11.	34.	33.	1.
006	108.	108.	9974.	17.	sa110/NE/B	599	7.994	281.	1.	0.88	12.	34.	33.	1.
007	108.	107.	126.	25.	sa110/NW/B	4	5.673	280.	0.	0.88	26.	34.	33.	2.
008	108.	107.	132.	26.	sa110/B/5	4	5.368	281.	0.	0.88	30.	34.	32.	2.
009	108.	106.	213.	27.	sa110/B/8	7	5.333	281.	0.	0.88	31.	34.	32.	2.
010	98.	100.	5629.	9.	ngc5904/NW	599	4.323	229.	2.	0.89	43.	30.	4.	47.
011	98.	100.	5575.	9.	ngc5904/NW	599	4.514	229.	2.	0.89	41.	30.	4.	47.
012	98.	97.	62.	6.	mark/test	9	9.574	311.	-11.	0.87	29.	56.	36.	-30.
013	97.	98.	55.	7.	runbin149/	7	23.19	111.	-0.	0.90	106.	134.	217.	8.
014	96.	97.	80.	10.	ngc5904/B/	7	3.408	230.	2.	0.89	55.	29.	4.	46.
015	95.	98.	79.	10.	ngc5904/NW	7	3.611	229.	2.	0.89	52.	29.	4.	47.

Table 3: Parameters of each observation for the night "2000-04-23" in B-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	115.	97.	5980.	10.	SA110/SE/B	599	8.246	280.	0.	0.73	14.	22.	32.	2.
002	115.	97.	6011.	10.	SA110/SE/B	599	8.436	280.	0.	0.73	12.	22.	32.	2.
003	113.	95.	81.	10.	SA110/B/SW	7	7.485	280.	-0.	0.73	23.	22.	32.	2.
004	113.	97.	80.	10.	SA110/B/8	7	9.960	281.	0.	0.72	14.	22.	32.	2.
005	112.	95.	82.	10.	SA110/B/8	7	7.285	281.	0.	0.73	25.	22.	32.	2.
006	112.	96.	79.	10.	SA110/B/8	7	9.430	281.	0.	0.72	9.	22.	32.	2.
007	102.	87.	63.	8.	SA107/B/8	7	9.730	235.	-0.	0.72	11.	48.	6.	41.
008	100.	102.	2347.	4.	ngc5904/SW	599	5.526	229.	2.	0.74	47.	52.	4.	46.
009	100.	102.	2374.	4.	ngc5904/SW	599	5.740	229.	2.	0.74	45.	52.	4.	46.
010	97.	99.	96.	12.	mark/B/8	7	10.22	311.	-11.	0.72	17.	32.	36.	-30.

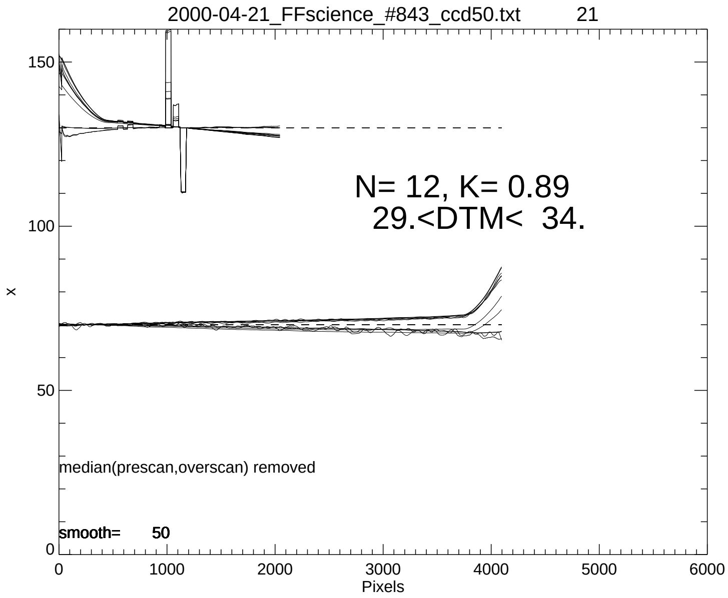

Figure 9: Same as figure 1 for the night "2000-04-21" in the V-band.

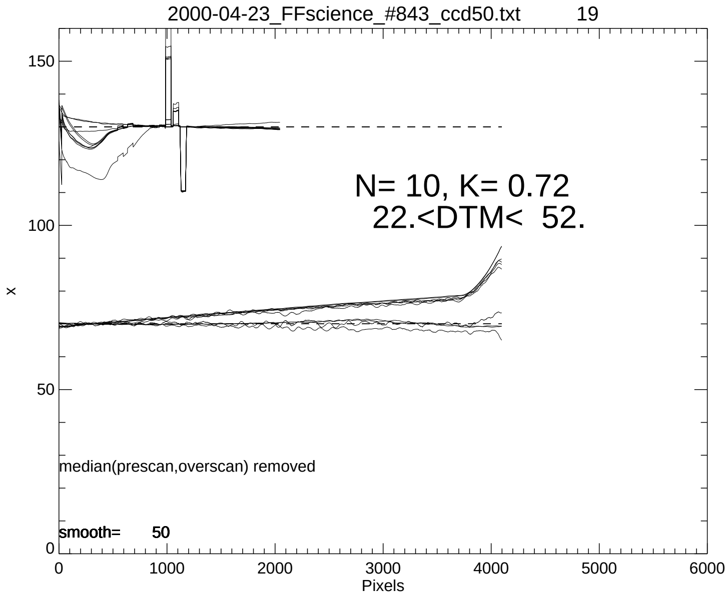

Figure 10: Same as figure 1 for the night "2000-04-23" in the V-band.

Table 4: Parameters of each observation for the night "2000-04-21" in V-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	112.	110.	5783.	23.	sa110/NW/V	249	7.046	280.	1.	0.88	12.	34.	33.	2.
002	111.	110.	5733.	23.	sa110/NW/V	249	6.945	280.	1.	0.88	13.	34.	33.	2.
003	110.	109.	205.	26.	sa110/NW/V	7	5.855	280.	1.	0.88	24.	34.	33.	2.
004	110.	110.	169.	21.	sa110/NE/V	7	7.426	281.	0.	0.88	10.	34.	33.	1.
005	110.	108.	216.	27.	sa110/V/8	7	5.406	281.	0.	0.88	30.	34.	32.	2.
006	110.	108.	134.	27.	sa110/V/5	4	5.432	281.	0.	0.88	29.	34.	32.	2.
007	105.	108.	3440.	14.	sa110/NE/V	249	8.198	281.	1.	0.88	14.	34.	33.	1.
008	102.	106.	2817.	11.	sa110/NE/V	249	8.299	281.	1.	0.88	15.	34.	33.	1.
009	99.	98.	59.	7.	ngc5904/NW	7	3.641	229.	2.	0.89	52.	29.	4.	47.
010	98.	100.	1729.	7.	ngc5904/NW	249	4.853	229.	2.	0.88	37.	30.	4.	47.
011	98.	100.	1740.	7.	ngc5904/NW	249	4.731	229.	2.	0.88	38.	30.	4.	47.
012	95.	98.	60.	8.	ngc5904/V/	7	3.436	230.	2.	0.89	55.	29.	4.	46.

Table 5: Parameters of each observation for the night "2000-04-23" in V-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	118.	97.	2701.	11.	SA110/SE/V	249	8.748	280.	0.	0.73	9.	22.	32.	2.
002	118.	97.	2631.	11.	SA110/SE/V	249	8.645	280.	0.	0.73	10.	22.	32.	2.
003	117.	95.	83.	10.	Sa110/V/8	7	9.463	281.	0.	0.72	9.	22.	32.	2.
004	116.	94.	84.	10.	SA110/V/SW	7	7.518	280.	-0.	0.73	22.	22.	32.	2.
005	115.	95.	84.	11.	Sa110/V/8	7	9.995	281.	0.	0.72	14.	22.	32.	2.
006	115.	95.	85.	11.	SA110/V/8	7	7.318	281.	0.	0.73	25.	22.	32.	2.
007	101.	87.	55.	7.	SA107/V/8	7	9.763	235.	-0.	0.72	12.	48.	6.	41.
008	99.	102.	822.	3.	ngc5904/SW	249	6.024	229.	2.	0.73	41.	52.	4.	46.
009	99.	102.	820.	3.	ngc5904/SW	249	5.933	229.	2.	0.73	42.	52.	4.	46.
010	98.	99.	74.	9.	mark/V/8	7	10.25	311.	-11.	0.72	17.	32.	36.	-30.

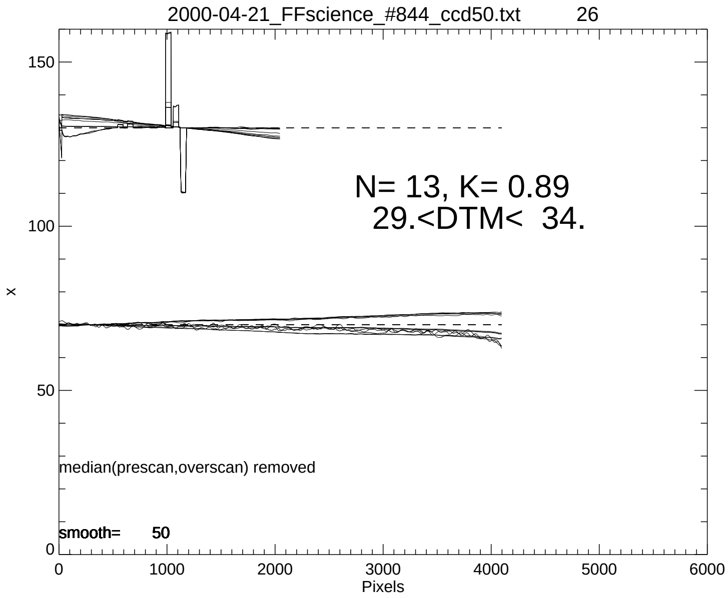

Figure 11: Same as figure 1 for the night “2000-04-21” in the R-band.

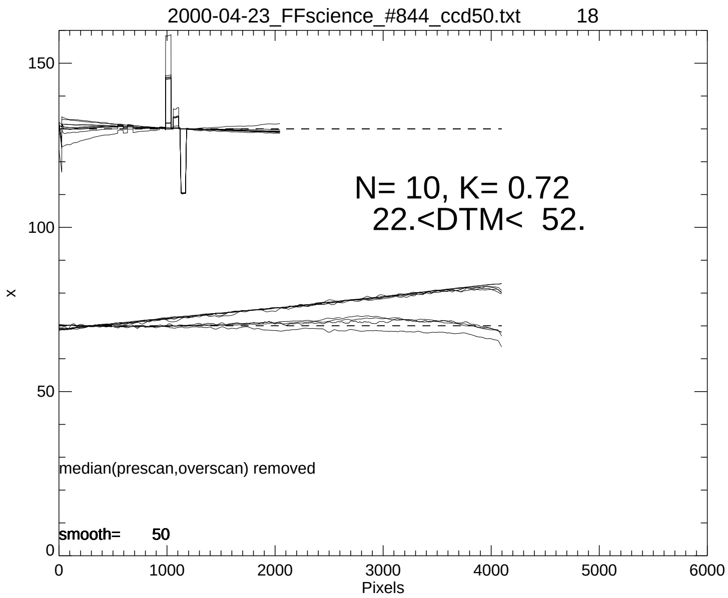

Figure 12: Same as figure 1 for the night “2000-04-23” in the R-band.

Table 6: Parameters of each observation for the night "2000-04-23" in R-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk $(0.0 < k < 1.0)$; 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	104.	104.	10531.	53.	sa110/NW/R	199	7.151	280.	1.	0.88	11.	34.	33.	2.
002	103.	104.	10269.	51.	sa110/NW/R	199	7.235	280.	0.	0.88	11.	34.	33.	2.
003	103.	103.	302.	61.	sa110/R/5	4	5.475	281.	0.	0.88	29.	34.	32.	2.
004	103.	103.	300.	60.	sa110/NW/R	4	5.593	280.	0.	0.88	27.	34.	33.	2.
005	103.	103.	247.	50.	sa110/NE/R	4	7.463	281.	0.	0.88	10.	34.	33.	1.
006	98.	100.	2539.	13.	ngc5904/NW	199	3.712	229.	2.	0.89	51.	29.	4.	47.
007	98.	100.	2513.	13.	ngc5904/NW	199	3.807	229.	2.	0.89	50.	30.	4.	47.
008	98.	100.	2518.	13.	ngc5904/NW	199	3.888	229.	2.	0.89	49.	30.	4.	47.
009	97.	98.	63.	13.	ngc5904/te	4	3.308	230.	2.	0.89	56.	29.	4.	46.
010	96.	102.	3023.	15.	sa110/NE/R	199	8.482	281.	1.	0.87	17.	34.	33.	1.
011	96.	98.	63.	13.	ngc5904/R/	4	3.336	230.	2.	0.89	56.	29.	4.	46.
012	96.	103.	3729.	19.	sa110/NE/R	199	8.402	281.	1.	0.87	16.	34.	33.	1.
013	95.	98.	63.	13.	ngc5904/NW	4	3.670	229.	2.	0.89	52.	29.	4.	47.

Table 7: Parameters of each observation for the night "2000-04-23" in R-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	113.	101.	4810.	24.	SA110/SE/R	199	8.856	280.	0.	0.72	8.	22.	32.	2.
002	113.	101.	4830.	24.	SA110/SE/R	199	8.939	280.	-0.	0.72	8.	22.	32.	2.
003	112.	100.	114.	23.	SA110/R/SW	4	7.552	280.	-0.	0.73	22.	22.	32.	2.
004	112.	100.	115.	23.	SA110/R/5	4	10.02	281.	0.	0.72	14.	22.	32.	2.
005	112.	100.	115.	23.	SA110/R/5	4	9.498	281.	0.	0.72	9.	22.	32.	2.
006	112.	100.	114.	23.	SA110//R/5	4	7.352	281.	0.	0.73	24.	22.	32.	2.
007	99.	103.	1070.	5.	ngc5904/SW	199	6.140	229.	2.	0.73	40.	52.	4.	46.
008	99.	96.	65.	13.	SA/107R/5	4	9.798	235.	-0.	0.72	12.	48.	6.	41.
009	99.	102.	1074.	5.	ngc5904/SW	199	6.218	229.	2.	0.73	39.	52.	4.	46.
010	96.	99.	112.	22.	mark/R/5	4	10.29	311.	-11.	0.72	17.	32.	36.	-30.

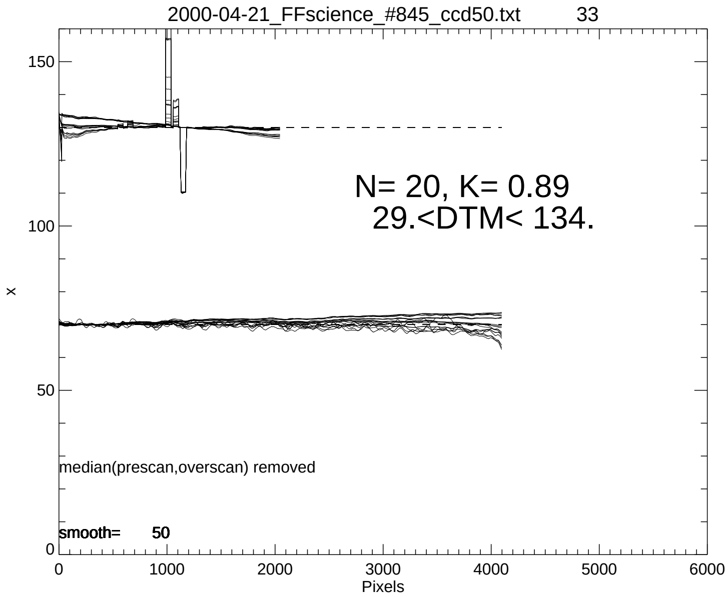

Figure 13: Same as figure 1 for the night "2000-04-21" in the I-band.

Table 8: Parameters of each observation for the night "2000-04-21" in I-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	104.	103.	10733.	36.	sa110/NW/I	299	5.938	280.	1.	0.88	23.	34.	33.	2.
002	104.	103.	10611.	35.	sa110/NW/I	299	6.060	280.	1.	0.88	22.	34.	33.	2.
003	103.	103.	299.	37.	sa110/I/8	7	5.261	281.	0.	0.88	31.	34.	32.	2.
004	103.	103.	286.	36.	sa110/NW/I	7	5.894	280.	1.	0.88	24.	34.	33.	2.
005	103.	103.	300.	38.	sa110/test	7	5.178	281.	0.	0.88	32.	34.	32.	2.
006	102.	103.	244.	31.	sa110/NE/I	7	7.495	281.	0.	0.88	10.	34.	33.	1.
007	102.	103.	9196.	31.	sa110/NE/I	299	7.557	281.	0.	0.88	10.	34.	33.	1.
008	102.	103.	9067.	30.	sa110/NE/I	299	7.671	281.	1.	0.88	11.	34.	33.	1.
009	100.	100.	1359.	136.	runbin149/	9	22.89	111.	-1.	0.90	109.	134.	218.	8.
010	100.	100.	468.	59.	runbin149/	7	22.97	111.	-1.	0.90	108.	134.	218.	8.
011	100.	100.	654.	82.	runbin149/	7	22.94	111.	-1.	0.90	108.	134.	218.	8.
012	99.	100.	163.	20.	runbin149/	7	23.09	111.	-0.	0.90	107.	134.	217.	8.
013	99.	100.	123.	25.	runbin149/	4	23.07	111.	-0.	0.90	107.	134.	217.	8.
014	99.	97.	51.	6.	smark/I/8	7	9.976	311.	-11.	0.87	34.	56.	36.	-30.
015	98.	100.	1977.	7.	ngc5904/NW	299	5.064	229.	2.	0.88	34.	30.	4.	47.
016	98.	100.	1992.	7.	ngc5904/NW	299	4.955	229.	2.	0.88	35.	30.	4.	47.
017	98.	97.	50.	6.	sa104/I/8	7	3.104	191.	-1.	0.89	59.	61.	299.	62.
018	97.	98.	69.	9.	ngc5904/NW	7	3.539	229.	2.	0.89	53.	29.	4.	47.
019	96.	97.	71.	9.	ngc5904/I/	7	3.465	230.	2.	0.89	54.	29.	4.	46.
020	96.	98.	70.	9.	ngc5904/NW	7	3.519	229.	2.	0.89	53.	29.	4.	47.

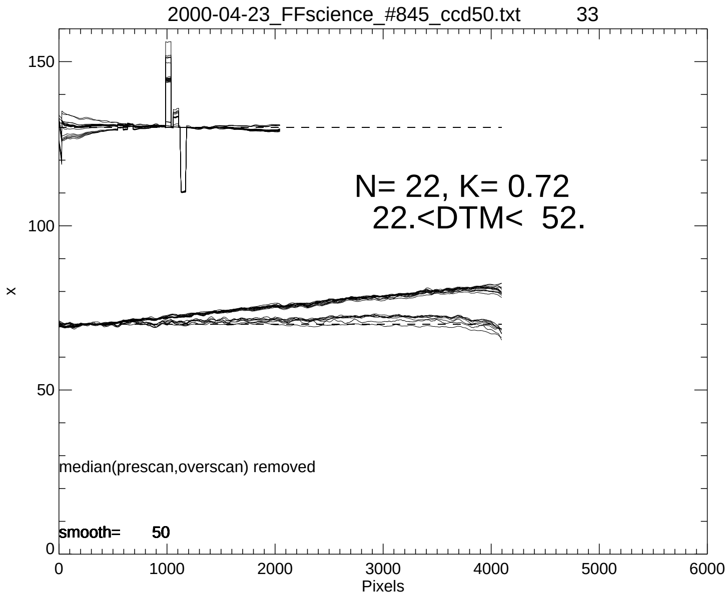

Figure 14: Same as figure 1 for the night "2000-04-23" in the I-band.

Table 9: Parameters of each observation for the night "2000-04-23" in I-band: 1: Number; 2 and 3: values of master_row and master_col at column 200 and row 3800, respectively; 4: mean sky background value in ADU; 5: mean sky background value in ADU s^{-1}; 6: Target name; 7: Exposure time in sec; 8: Universal time of beginning of the observation; 9 and 10: Right ascension and declination (equinox 2000) of the target; 11: illuminated fraction of Moon's disk ($0.0 < k < 1.0$); 12: Zenith distance of moon (ZDM); 13: Distance target-moon (ZDM); 14 and 15: Galactic longitude and latitude of target (l and b for equinox 2000).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nb	col(4000)	row(200)	Sky	Sky	OBJECT	EXPO	Time	R.A.	Dec.	K	ZDM	DTM	l	b
			ADU	ADU s^{-1}		Sec	Hours	Deg.	Deg.		Deg.	Deg.	Deg.	Deg.
001	112.	101.	4833.	16.	SA110/SE/I	299	7.813	280.	0.	0.73	19.	22.	32.	2.
002	112.	101.	4813.	16.	SA110/SE/I	299	7.701	280.	-0.	0.73	20.	22.	32.	2.
003	112.	100.	128.	16.	SA110/SE/t	7	7.633	280.	-0.	0.73	21.	22.	32.	2.
004	111.	100.	127.	16.	SA110/SE/t	7	7.659	280.	-0.	0.73	21.	22.	32.	2.
005	111.	100.	124.	16.	SA110/test	7	7.005	281.	0.	0.73	29.	22.	32.	2.
006	111.	100.	126.	16.	SA110/I/8	7	7.385	281.	0.	0.73	24.	22.	32.	2.
007	111.	100.	125.	16.	SA110/I	7	7.131	281.	0.	0.73	27.	22.	32.	2.
008	111.	100.	126.	16.	SA110/I	7	7.182	281.	0.	0.73	26.	22.	32.	2.
009	111.	100.	125.	16.	SA110/test	7	7.060	281.	0.	0.73	28.	22.	32.	2.
010	111.	100.	128.	16.	SA110/I/SW	7	7.583	280.	-0.	0.73	21.	22.	32.	2.
011	110.	100.	133.	17.	SA110/test	7	9.871	281.	0.	0.72	13.	22.	32.	2.
012	110.	101.	134.	17.	SA110/I/8	7	9.530	281.	0.	0.72	10.	22.	32.	2.
013	109.	100.	133.	17.	SA110/I/8	7	10.06	281.	0.	0.72	15.	22.	32.	2.
014	109.	101.	133.	17.	SA110/test	7	9.337	281.	0.	0.72	8.	22.	32.	2.
015	101.	98.	91.	11.	SA107/test	7	9.643	235.	-0.	0.72	10.	48.	6.	41.
016	101.	98.	98.	12.	SA107/I/8	7	9.831	235.	-0.	0.72	12.	48.	6.	41.
017	100.	97.	87.	11.	SA107/test	7	9.575	235.	-0.	0.72	10.	48.	6.	40.
018	100.	97.	89.	11.	SA107/test	7	9.613	235.	-0.	0.72	10.	48.	6.	40.
019	100.	103.	1306.	4.	ngc5904/SW	299	6.416	229.	2.	0.73	36.	52.	4.	46.
020	99.	102.	1294.	4.	ngc5904/SW	299	6.308	229.	2.	0.73	37.	52.	4.	46.
021	99.	96.	74.	9.	SA107/I/8	7	9.301	235.	-0.	0.72	8.	48.	6.	40.
022	97.	99.	136.	17.	mark/I/8	7	10.32	311.	-11.	0.72	18.	32.	36.	-30.