# EDUCE- flagging report for spectral data from Reading, United Kingdom

Authors/evaluators: JE Williams, PN den Outer and H Slaper (RIVM) <u>FP3 : Flagging results for Reading, United Kingdom:</u>

## Measurements details :

Location: Reading, United Kingdom Elevation (m): 66 Instrument name : Reading Optronics (green) Instrument type : OL742, Optronic Laboratories Wavelength range : Lat, Long : 51.45, 0.93 Date on which data was extracted : 07.11.02(*1993*), 11.06.02(*1994*), 21.06.02/26.06.02 (*1995*), 21.06.70 (*1996*, *1997*), 26.06.02 (*1998*, *1999*), 26.11.02 (*2000*, *2001*) Date on which slit function was extracted/received : 15.11.02 Years of submitted data : 9 complete No spectra (per year) : <u>2971 (*1993*), 3907 (*1994*), 4470 (*1995*), 4212 (*1996*), 3003 (*1997*), 4393 (*1998*), 3213 (*1999*) , 4395 (*2000*), 3139 (*2001*) No spectra (total submitted) : 33703 Slit width (FWHM) nm :1.56 SHIC version for analysis: 3 093</u>

**Special comments:** Data as retrieved from the EDUCE database probably have an error in the time-column. This document concerns an analysis of the Reading data using a 2hr time delay from the time allocated to each irradience file. Several periods with questionable data quality appear to exist.

Responsible operator/PI: Ann Webb : ann.webb@umist.ac.uk

**Operator comments:** The operator advises potential users not to use the data after Julian day 240 for the 1996 dataset due to difficuties expectienced with the instrument.

Morever, the operator also states: " ...these are uncorrected data that previous versions of the shic tool could not cope with because of the wide slit function. Other analysis tools are being developed by long-term comparison with a second instrument and the complete data set will be corrected in future. For the currently available data the user should understand and note the flagging system, with respect to their particular application." - Ann webb, personal communication, Nov 2002.

The appendix of this report is provided to exemplify the effect of using SHIC corrected data as an input into the QA analysis. Such a procedure dramatically reduces the number of flags associated with this dataset.

### <u> 1993:</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
flag	%	%	%	%	%	%					-		
Shift1_flagging	34	27.6	21.7	14.2	2.4	0	834	676	533	348	60	0	2451
Shift2_flagging	34.9	34.7	14.8	14.2	1.4	0	855	851	362	349	34	0	2451
start_irradiance_flag	99.1	0.3	0.2	0.4	0	0	2429	8	4	10	0	0	2451
Spike+local_shape	96.3	1.4	0.2	0	0.6	1.4	2395	35	6	0	15	36	2487
Transmission_2	94.2	1.6	1.3	0.1	2.9	0	2308	38	33	2	70	0	2451

#### **Comments :**

Moderate annual coverage (approximately 70%): medium potential for use in climatological studies.

Overall data-quality impression : large part of the data has questionable quality, with 35.9% of poor quality and 2.4% having undefined errors for the shift1 flag.

A large number of black flags exist for both the shift1 and shift2 flagging categories (with red flags < 22%). The percentage yellow flags exceeds 30% for the Shift2 flag.

The shift1 and shift2 flags indicate that the instrument has severe calibration errors in both the UVA and UVB regions of the spectrum compared to an extra-terrestial solar spectrum

36 (1.4%) spectra with spikes are reported.

The number of red and black flags increases after Julian day 12. From this date a high number of black flags occur which persist until Julian day 290, with the exception of the period JD 70-105. After this day very few red and black flags occur for the next 20 days, after which there is a gradual increase until Julian day 355.

<u> 1994:</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
flag	%	%	%	%	%	%					-		
Shift1_flagging	78.1	14.2	1.9	3.4	2.3	0	2605	475	65	113	77	0	3335
Shift2_flagging	46.4	44.8	4.2	4	0.6	0	1547	1495	140	134	19	0	3335
start_irradiance_flag	99.3	0.2	0.2	0.3	0	0	3312	6	7	10	0	0	3335
Spike+local_shape	95.9	2.9	0.8	0	0.2	0.2	3206	97	26	0	6	8	3343
Transmission_2	98.1	1.6	0.1	0	0.2	0	3272	53	4	0	6	0	3335

#### **Comments :**

High annual coverage (approximately 90%): high potential for use in climatological studies.

Overall data-quality impression : a useful fraction of potential high quality spectra. The number of spectra for which a spike is corrected decreases significantly as a result of using the new slit function during the analysis.

A number of black flags exist in some of the chosen flagging categories (with red flags < 5%). The percentage yellow flags exceeds 40% for the Shift2 flag. The performance is better than the previous year.

Both the shift1 and shift2 flags indicate that the instrument has calibration errors which exist for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

8 (0.2%) spectra with spikes are reported.

The number of red and black flags increases after Julian day 65. From this date the high number of both red and black flags persist until Julian day 270, after which there is a decrease, suggesting some instrument recalibration occurred towards the end of the year. At the very end of the year (the last few measurement days) there is again a substantial increase in the number of both black and red flags.





	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
flag	%	%	%	%	%	%					-		
Shift1_flagging	51.4	28.8	10.7	6.9	2.2	0	1956	1096	409	261	84	0	3806
Shift2_flagging	55.4	25.6	6	12.1	0.9	0	2109	973	228	461	35	0	3806
start_irradiance_flag	98.9	0.4	0.3	0.5	0	0	3763	14	10	19	0	0	3806
Spike+local_shape	95.1	2.9	0.9	0	0.4	0.7	3645	110	35	1	15	25	3831
Transmission_2	97.7	1.1	0.6	0	0.6	0	3717	43	24	1	21	0	3806

### **Comments :**

High annual coverage (approximately 95%): high potential for use in climatological studies.

Overall data-quality impression : a considerable fraction of the spectra is of questionable quality, with 18.1% of questionable quality and 0.9% having undefined errors for the shift2 flag.

A number of black flags exist all of the chosen flagging categories (with red flags < 11%). The percentage yellow flag is nearly 30% for the shift1 flag. The performance is worse than the previous year

Both the shift1 and shift2 flags indicate that the instrument has calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

25 (0.7%) spectra with spikes are reported.

At the start of the year (before Julian day 85) a large number of yellow flags occur with very few red and black flags. After this day there are a few days of particularly bad data, followed by a 40 day period of relatively good data. Between julian days 180 and 230 the number of black flags then reaches  $\sim 25\%$  suggesting that an error occurred during a recalibration procedure of the instrument. After this day very few black flags are designated.

#### <u> 1996:</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%							
Shift1_flagging	50.5	6.2	2.3	1.8	39.2	0	1809	221	82	65	1403	0	3580
Shift2_flagging	40.6	19.4	2.7	1.8	35.6	0	1453	693	98	63	1273	0	3580
start_irradiance_flag	67.4	0.9	0.7	28.9	2.1	0	2414	32	25	1033	76	0	3580
Spike+local_shape	50.3	2.7	1.6	20.1	2.7	22.5	2327	125	74	929	125	1042	4622
Transmission_2	73.9	2.7	2.6	17.3	3.4	0	2574	93	92	602	120	0	3481

#### **Comments**:

High annual coverage (approximately 90%): high potential for use in climatological studies.

Overall data-quality impression : a large part of the data has questionable quality, with 4.1% of questionable quality and 39.2% having undefined errors for the shift1 flag.

A large number of black flags exist in all of the chosen flagging categories (with red flags < 3%). The percentage Grey flags is nearly equal 40% for the Shift1 flag.

Both the shift1 and shift2 flags indicate that the instrument has severe and undefined calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

1042 (22.5%) spectra with spikes are reported.

At the start of the year (before Julian day 45) the quality of the data is fairly good, with no black flags. The quality of the data then gradually decreases, with a higher incidence of grey flags as the dataset progresses. The measurements are of such a low quality after Julian Day 240 as to be unusable.

<u> 1997:</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%					_		
Shift1_flagging	28.6	24.6	27.5	14.6	4.7	0	728	628	700	373	119	0	2548
Shift2_flagging	30.9	4.2	49.3	14.6	1	0	787	107	1257	372	25	0	2548
start_irradiance_flag	98.3	0.5	0.4	0.7	0	0	2505	13	11	19	0	0	2548
Spike+local_shape	94.4	2.8	1.4	0	0.4	0.9	2429	72	36	0	11	24	2572
Transmission_2	98.3	1	0.1	0	0.5	0	2505	26	3	0	14	0	2548

#### **Comments**:

High annual coverage (approximately 75%): high potential for use in climatological studies.

Overall data-quality impression : data is of questionable quality, with 63.9% of questionable quality and 1.0% having undefined errors for the shift2 flag.

A number of black flags exist in some of the chosen flagging categories (with red flags < 50%). The percentage grey flags is approximately 5% for the Shift1 flag. The performance is worse than all the preceding years.

Both the shift1 and shift2 flags indicate that the instrument has severe calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

24 (0.9%) spectra with spikes are reported.

At the start of the measurements (Julian day 82) the quality of the data is questionable, with a large percentage of red and black flags, with the red flags persisting for the next 40 days ( $\sim$ 50% red flags), after which there is a period of  $\sim$ 30 days when the quality is much improved. Thereafter, the quality of the data again decreases until JD 217. During the second measurement period (from JD 270 until the end of the year) the number of black flags increases indicating that the instrument calibration has become worse.

#### <u>1998:</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%					-		
Shift1_flagging	33.1	24.8	23.9	14.6	3.5	0	1230	922	889	543	131	0	3715
Shift2_flagging	24.5	22.3	39	12.7	1.5	0	910	828	1450	473	54	0	3715
start_irradiance_flag	98.3	0.4	0.5	0.9	0	0	3651	14	17	32	1	0	3715
Spike+local_shape	90.5	3.2	1.3	0	0.3	4.8	3529	123	49	1	13	186	3901
Transmission_2	98	1.3	0.1	0.2	0.3	0	3642	47	5	8	13	0	3715

#### **Comments :**

Full annual coverage (approximately 95%): excellent potential for use in climatological studies.

Overall data-quality impression : the data is of a questionable quality, with 51.7% of questionable quality and 1.5% having undefined errors for the shift2 flag. The number of green flags increases marginally for the start\_irradience flag and the spike/local shape flag compared to FP3b.

A number of black flags exist in all but one of the chosen flagging categories (with red flags < 40%). The percentage grey flags approximately 3.5% for the Shift1 flag. No improvement on the previous year.

Both the shift1 and shift2 flags indicate that the instrument has severe calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

186 (4.8%) spectra with spikes are reported.

Throughout the entire dataset there is a high incidence of both red and black flags, especially during the summer. Towards the end of the year (after JD 310) the quality of the data improves somewhat, with the exception of intermitant periods.





	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%					-		
Shift1_flagging	36.3	21.7	19.7	18.6	3.8	0	1013	606	549	519	106	0	2793
Shift2_flagging	37.1	20.2	30.7	10.6	1.4	0	1037	564	858	296	38	0	2793
start_irradiance_flag	98.2	0.8	0.1	0.6	0.3	0	2744	22	4	16	7	0	2793
Spike+local_shape	93.5	2.8	1.1	0	0	2.5	2681	81	31	0	0	73	2866
Transmission_2	95	1.3	1.6	0.4	1.7	0	2652	37	45	12	47	0	2793

#### **Comments :**

High annual coverage (approximately 80%): high potential for use in climatological studies.

Overall data-quality impression : a large part of the data is of questionable quality, with 41.3% of questionable quality and 1.4% having undefined errors for the shift2 flag.

A number of black flags exist in most of the chosen flagging categories (with red flags < 31%).

Both the shift1 and shift2 flags indicate that the instrument has severe calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum. The performance is slightly better than the previous year.

73 (2.5%) spectra with spikes are reported.

Between Julian Days 20-50 and 325-365 the quality of the data is moderate (with little or no black/red flags). For the rest of the year the quality is worse, with the periods between JD 70-90 272-320 being particularly bad. Although there are a few periods in which no measurements are made in this location no improvements in the instrumental performance occur once measurements are resumed.

#### <u>2000</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%					-		
Shift1_flagging	15	18	28.8	26.7	11.5	0	576	689	1104	1023	441	0	3833
Shift2_flagging	9.2	15.1	43.2	27.6	4.9	0	351	580	1654	1059	189	0	3833
start_irradiance_flag	98.5	0.7	0.4	0.4	0	0	3774	28	15	16	0	0	3833
Spike+local_shape	94.6	3.6	0.5	0	0.1	1.3	3674	138	19	0	2	50	3883
Transmission_2	98.2	1.6	0.2	0	0	0	3763	62	8	0	0	0	3833

#### **Comments :**

Full annual coverage (approximately 95%): excellent potential for use in climatological studies.

Overall data-quality impression : the data is of questionable quality, with 70.8% of questionable quality and 4.9% having undefined errors for the shift2 flag.

A number of black flags exist in some of the chosen flagging categories (with red flags < 45%). The Instrument performance for this year is the worst of all the datasets.

Both the shift1 and shift2 flags indicate that the instrument has severe calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

50 (1.3%) spectra with spikes are reported.

Throughout the entire dataset there is a high incidence of both red and black flags, especially during the summer. Towards the end of the year (after JD 290) the number of grey flags gradually increases until it accounts for 50% at the end of the dataset.

### <u>2001</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
Flag	%	%	%	%	%	%							
Shift1_flagging	24.3	14.7	29.5	26.6	4.8	0	670	406	812	733	132	0	2753
Shift2_flagging	14	27.5	32.7	24.1	1.8	0	385	756	899	664	49	0	2753
start_irradiance_flag	98.3	0.7	0.4	0.6	0	0	2707	18	11	16	1	0	2753
Spike+local_shape	94.9	3.5	0.6	0	0	0.9	2637	98	18	0	0	26	2779
Transmission_2	98.5	1.5	0	0	0	0	2712	41	0	0	0	0	2753

#### **Comments**:

Moderate annual coverage (approximately 70%): medium potential for use in climatological studies.

Overall data-quality impression : the data is of questionable quality, with 56.1% of questionable quality and 4.8% having undefined errors for the shift1 flag.

A number of black flags exist in some of the chosen flagging categories (with red flags < 30%). No real improvement in performance compared to the previous year.

Both the shift1 and shift2 flags indicate that the instrument has severe calibration errors for both the UVA and UVB spectral regions, compared to an extra-terrestial solar spectrum.

26 (0.9%) spectra with spikes are reported.

The distribution of flags is fairly uniform throughout the entire dataset, with a high incidence of both red and black flags. Around JD 330 approximately 50% of flags are black over a period of 20 days.

## **Appendix**

### <u> 1993 :</u>



	Green	Yellow	Red	Black	Grey	Cor.	Green	Yellow	Red	Black	Grey	Cor.	Num
flag	%	%	%	%	%	%							
Shift1_flagging	93.5	0	0	0	6.5	0	2291	0	0	0	160	0	2451
Shift2_flagging	98.8	0.4	0	0	0.9	0	2421	9	0	0	21	0	2451
start_irradiance_flag	96.4	1.2	1.7	0.7	0	0	2363	30	42	16	0	0	2451
Spike+local_shape	92.9	4.4	0.8	0	0.1	1.8	2318	111	19	0	3	45	2496
Transmission_2	94.2	1.5	1.3	0.1	2.8	0	2309	37	33	3	69	0	2451

The graph and table shown above concerns a re-analysis of the 1993 dataset using a corrected version of the submitted data. The number of green flags increases dramatically for both the shift1 and shift2 flagging categories as a consequence of a redistribution of all other flags. From this it can be concluded that if corrected datasets are submitted to the database then a useful fraction of potential high quality spectra will most probably result (as shown for this dataset).