

1.5m telescope reflectometry data v 1.2

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Document transcribed by Jacqueline Seron

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1.5m telescope reflectometry data

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About this document

The goal of this document is to provide a bit of history of the procedures of washing of the 1.5m mirrors.

Source:

<http://www.ctio.noao.edu/telescopes/opteng/reflec1.5m.html>

1.5m telescope reflectometry data

Primary Mirror:

3 APRIL 01:

Reflectometry and BRDF data with Iris:

5.3% (470nm), 85.7% (530nm), 83.1% (650nm), 82.5% (880nm)
4.6% (+20deg), 4.3% (-15deg), 2.0% (-45deg)

This corresponds to a 1.1% reflectivity loss per month at 530nm (average over 5 months), about twice higher than usual.

SEPTEMBER and NOVEMBER 00:

Regular washing in September improved reflectivity by 8.5% in average. Reflectometry and BRDF data with Iris (before/after wash respectively):

83.1/92.4% (470nm), 83.7/92.7% (530nm),
80.7/89.1% (650nm), 81.1/89.0% (880nm) 4.8/0.1% (+20deg),
4.3/0.2% (-15deg),
5.1/0.02% (-45deg)

These numbers are actually close (some are even slightly higher!) than what is quoted in the literature for a new coating. In October, rain leaked through the dome shutter and contaminated M1 (lots of long ugly white stripes across the mirror): in the bad areas (about 20% of the mirror), about 6% loss was measured but it was well recovered with washing in November (only about 1.8% less compared to previous wash). The reflectivity and BRDF improved to:

91.5% (470nm), 91.8% (530nm),
87.5% (650nm), 87.6% (880nm)
0.2% (+20deg), 0.2% (-15deg),
0.02% (-45deg)

MARCH 00:

Mirror washed on the 21st, see the plots of reflectivity (see figure and scattering (see figure 1, the numbers after the last aluminizing are also plotted for reference). All data with the Minolta.

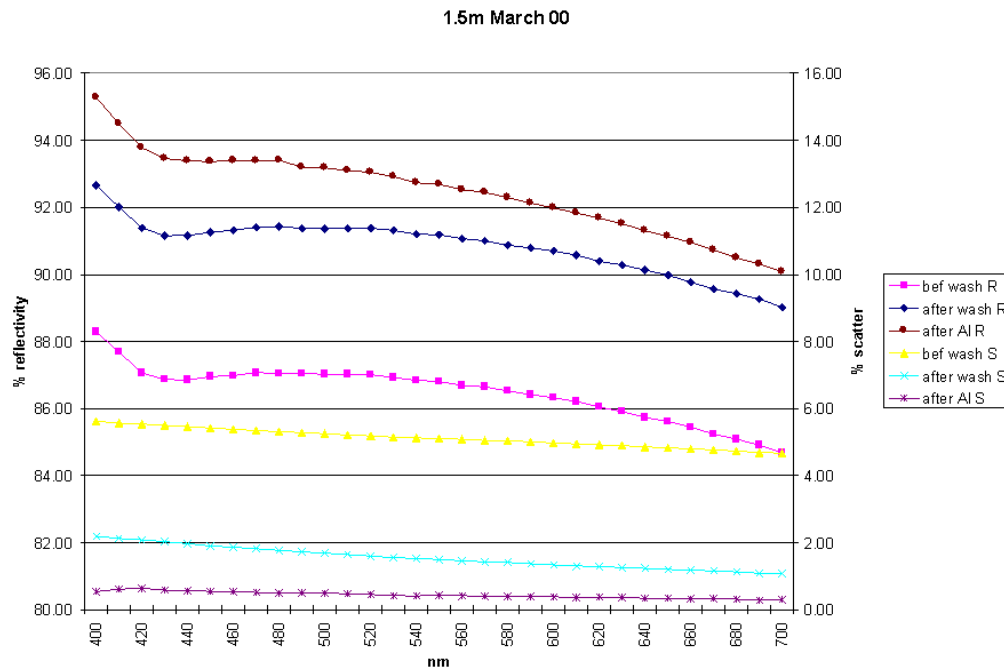


Figure 1: Reflectivity and Scattering on 1.5m mirror after aluminizing

SEPTEMBER 98 - MARCH 00: regular CO2 cleaning

See the plots of reflectivity (figure 2) and scattering (figure 3) for that period (data with the Minolta).

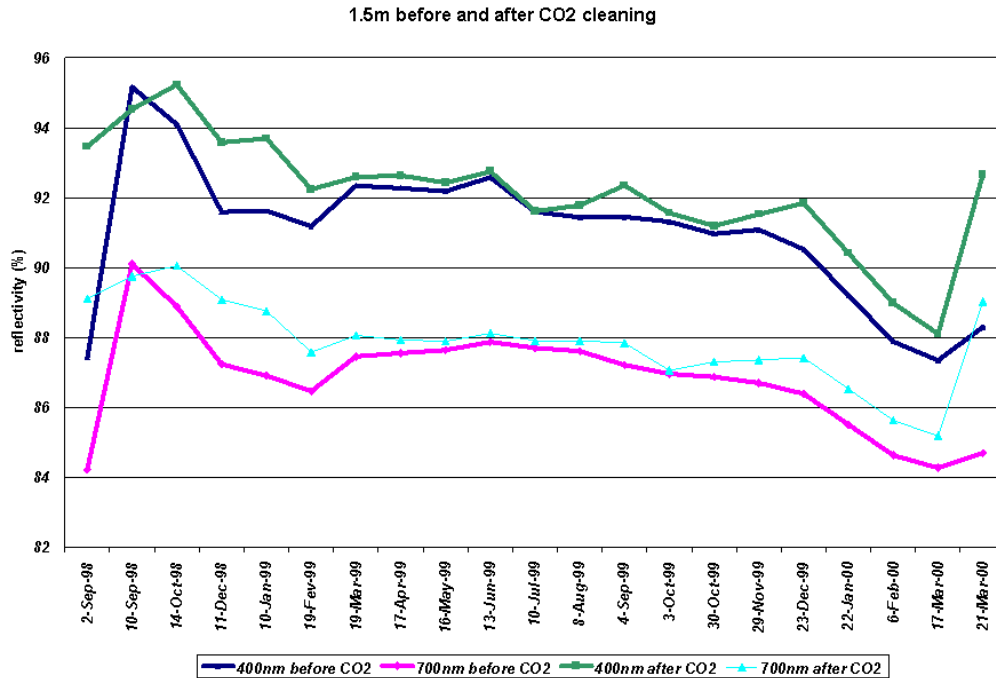


Figure 2: Reflectivity before and after the Wash 00

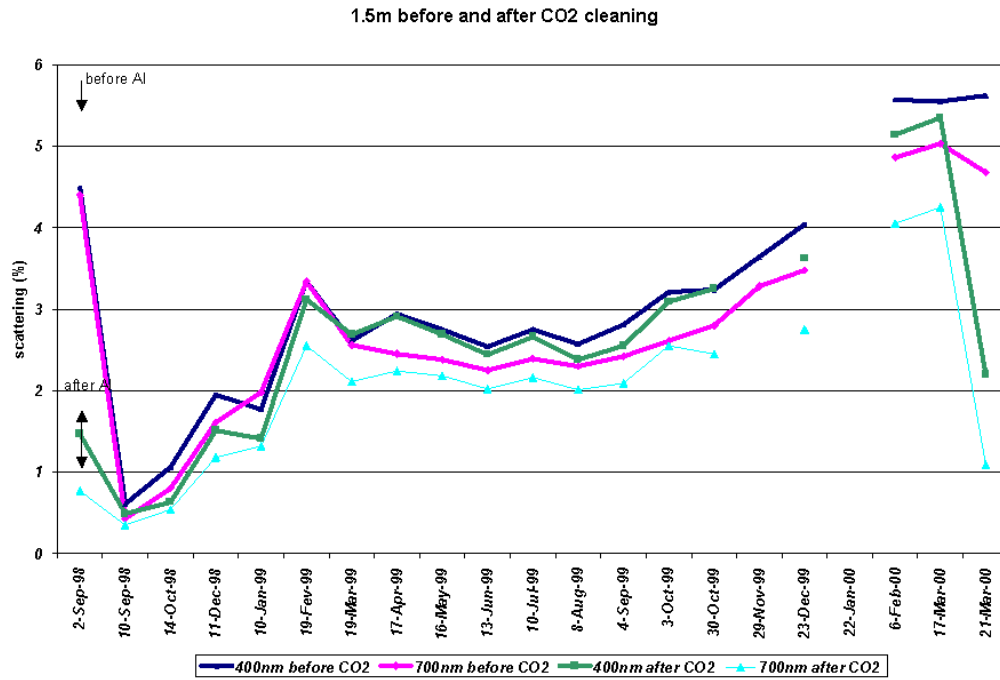


Figure 3: Scattering before and after the Wash 00

Reflectivity decreases in average by 2.5% per year and scatter increases by 2.0% per year. There seems to be a seasonal trend as the slopes are much higher in 'summer' (October to April) when the site humidity is higher (32-55%), which makes the dust stick more easily onto the glass: summer slope for R and SC is about 0.63% per month, whereas it is only about 0.05% per month in 'winter' (May to September, RH is 12-32%).

Numerical data: in parenthesis (last column) is the number of points sampled on the mirror for each result. Each point on the mirror is sampled 3 times (averaged by the reflectometer). On some dates (like 10Jan98), we also indicate the variations (+/-) in the data. For the first row, replace "before/after CO2 cleaning" by "before/after Al". The case "before Al" means the mirror was CO2 dusted and measured just before realuminizing.

DATE	% Reflectivity			% Scattering			Elapsed time (weeks) between new Al and CO2
	before CO2	after CO2	after CO2	before CO2	after CO2	after CO2	
2-Sep-98	87.42	84.22	93.46	89.11	4.49	4.40	700nm 400nm 700nm
+/-	0.47	0.13	0.74	0.50	0.71	0.39	0.71
10-Sep-98	95.16	90.1	94.53	89.75	0.61	0.43	0.35
14-Oct-98	94.1	88.89	95.23	90.05	1.06	0.80	0.54
13-Nov-98	no data						10 (0)
11-Dec-98	91.59	87.23	93.58	89.08	1.95	1.61	1.18
10-Jan-99	91.62	86.91	93.69	88.76	1.77	1.98	1.32
+/-	1.78	0.83	0.9	0.78	0.01	0.04	0.22
19-Feb-99	91.18	86.46	92.24	87.58	3.34	3.34	2.55
19-Mar-99	92.34	87.46	92.59	88.06	2.61	2.56	2.11
17-Apr-99	92.27	87.55	92.63	87.93	2.94	2.45	2.24
16-May-99	92.18	87.64	92.43	87.89	2.75	2.38	2.18
13-Jun-99	92.58	87.87	92.75	88.12	2.54	2.25	2.02
10-Jul-99	91.59	87.7	91.61	87.91	2.75	2.39	2.16
8-Aug-99	91.44	87.61	91.78	87.91	2.57	2.3	2.01
4-Sept-99	91.45	87.21	92.35	87.84	2.81	2.42	2.09
3-Oct-99	91.31	86.96	91.56	87.06	3.21	2.61	2.55
30-Oct-99	90.96	86.87	91.19	87.3	3.24	2.80	2.45
29-Nov-99	91.08	86.7			3.64	3.28	63(3) no cleaning
23-Dec-99	90.52	86.39	91.84	87.42	4.04	3.48	67 (3)
22-Jan-00							71 no data taken
6-Feb-00	87.88	84.63	88.98	85.63	5.57	4.86	73 (3)
17-Mar-00	87.34	84.27	88.1	85.18	5.55	5.03	78 (3)
21-Mar-00	88.3	84.69	92.66	89.03	5.62	4.68	78(3) WASH

See the efficiency plots of the CO2 cleaning: reflectivity (figure 4) and scatterometry (figure 5). Average gain per cleaning session is R+0.70% and SC-0.30% in the visible.

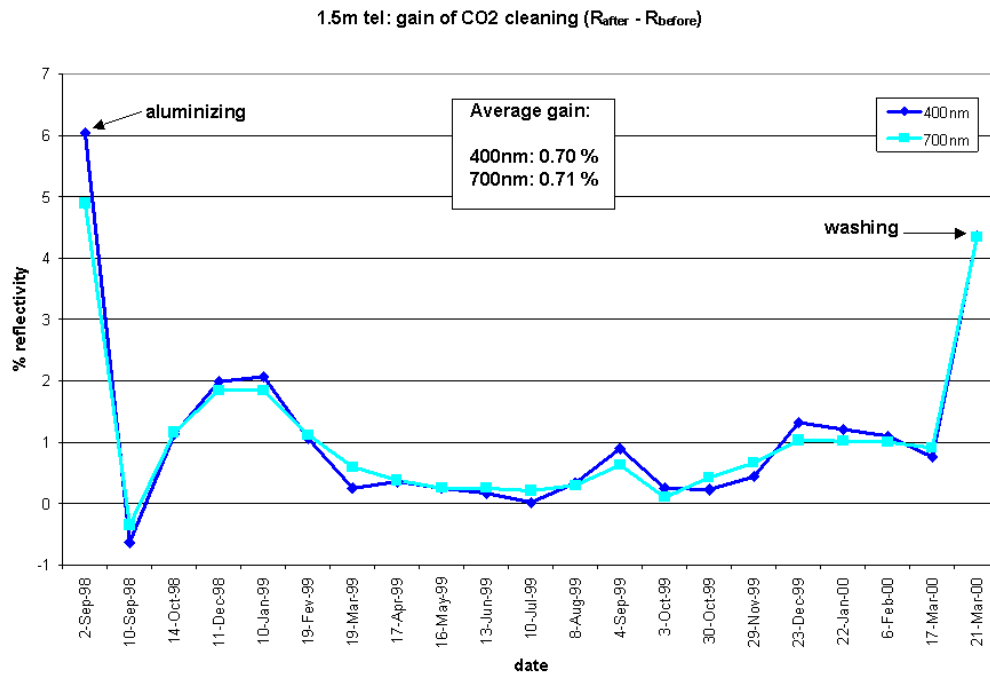


Figure 4: Reflectivity efficiency plot for CO2 cleaning

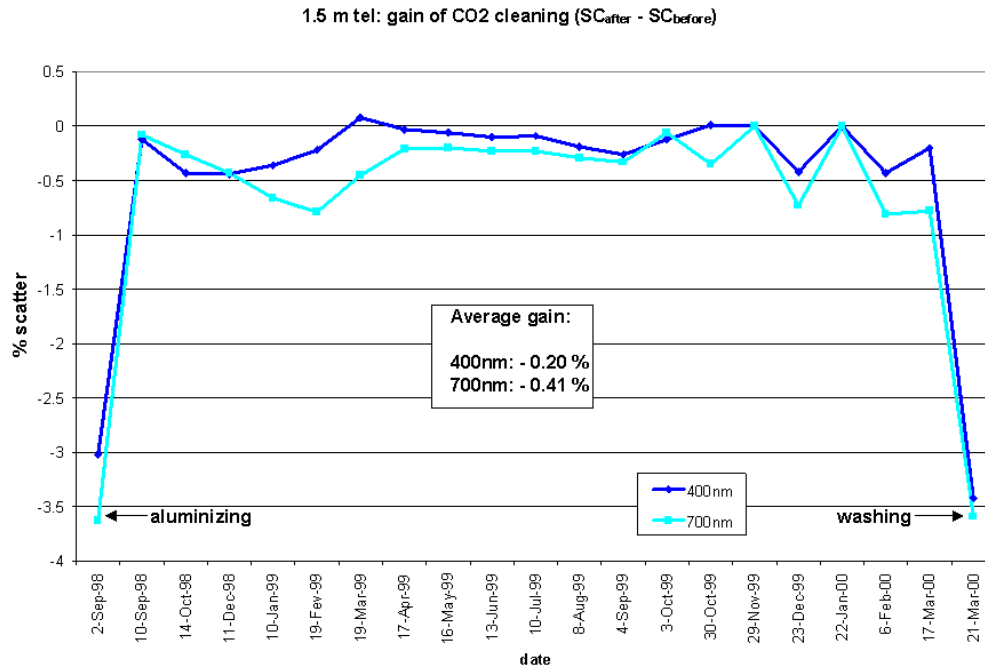


Figure 5: Scatterometry efficiency plot for CO2 cleaning

2 SEPTEMBER 98:

Aluminizing, see the plot of reflectivity and scattering before and after aluminizing (last one was in Apr 97).

SECONDARY MIRRORS

Aluminized together on August 26, 1999. Measurements with the Minolta. See figures 7 and 8 for mirror reflectometry and scatterometry for F13.5 and F/7.5 respectively.

Last update: 18 April 01.

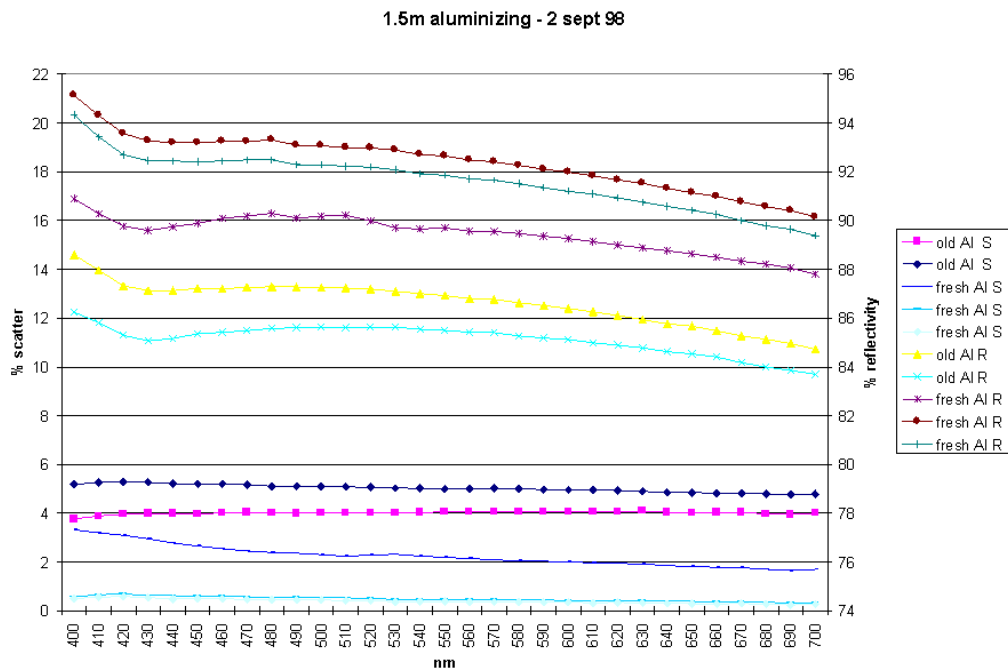


Figure 6: Reflectivity and Scattering before and aluminizing

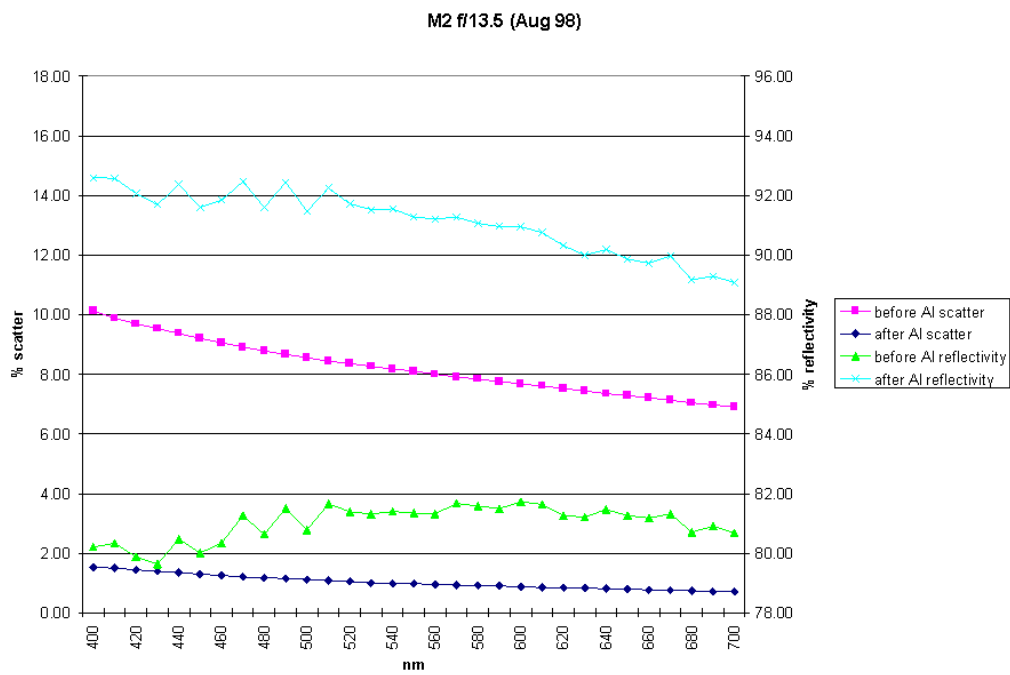


Figure 7: F/13.5 mirror reflectometry and scatterometry

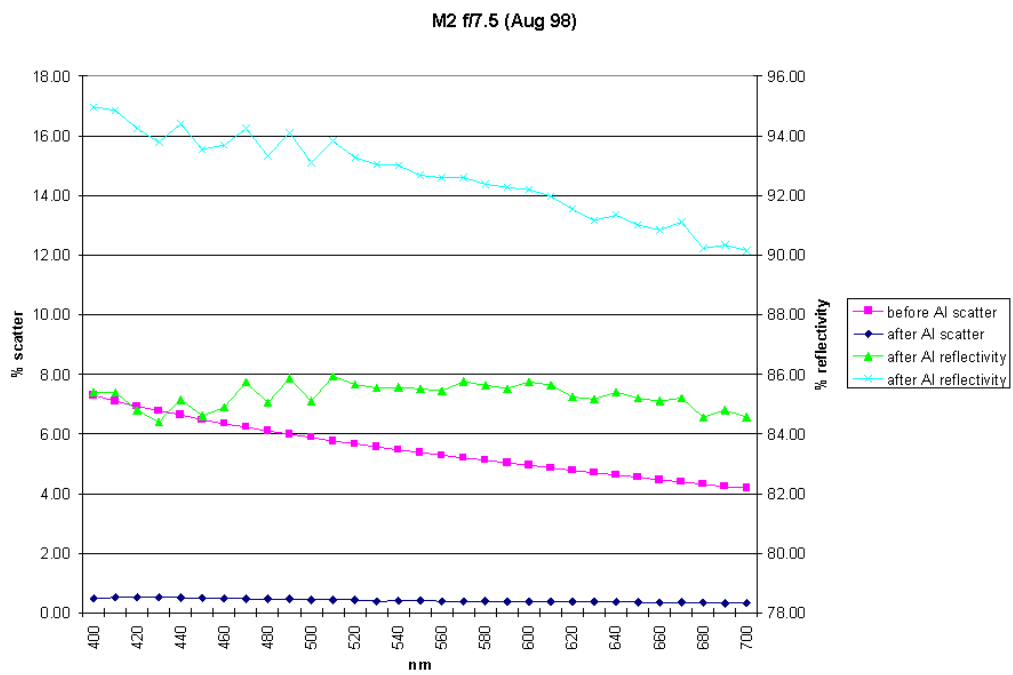


Figure 8: F/7.5 mirror reflectometry and scatterometry