

RCW2026 : Photometric Repeatability Estimation in the Deep Drilling Fields for DP2 Data

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This work aims to verify whether the DP2 data meet the photometric repeatability requirements of 5 mmag in the g, r, i bands and 7.5 mmag in the u, z, y bands, or if excess dispersion could be attributed to atmospheric variations not fully compensated by the photometric calibration algorithms.

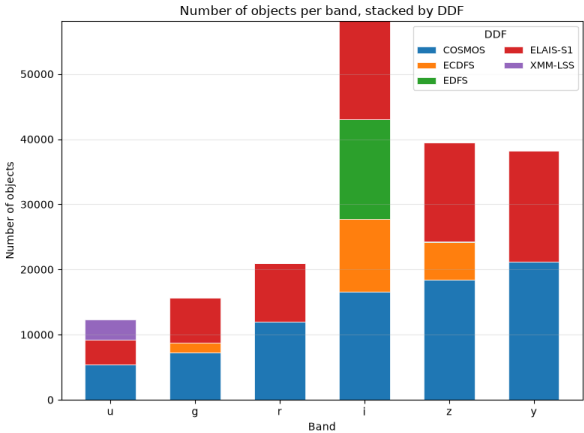
We reconstruct light curves by grouping bright sources into objects using two methods:

- astrometric clustering within a 1-arcsecond radius or
- cross-matching with the external SIMBAD catalog to ensure the stability of the stars.

The PSF flux dispersion of sources relative to the object median is calculated and compared to the mean statistical error derived by the DRP, with photometric repeatability performance assessed across methods, Deep Drilling Fields (DDFs), and bands.

Photometric repeatability from any source

- select all sources in sources table, in [17-19.5] mag, in DDF
- No extendedness, $N_s > 20$ in u,y , $N_s > 50$ in g,r,i
- group sources in objects $r < 1\text{arcsec}$, independent of bands
- $psfFlux$ dispersion wrt $pdfFlux$ median (calibrated)
- Compare dispersion – photon statistical fluctuations
- Dependence on magnitude



--- RMS (mmag) ---

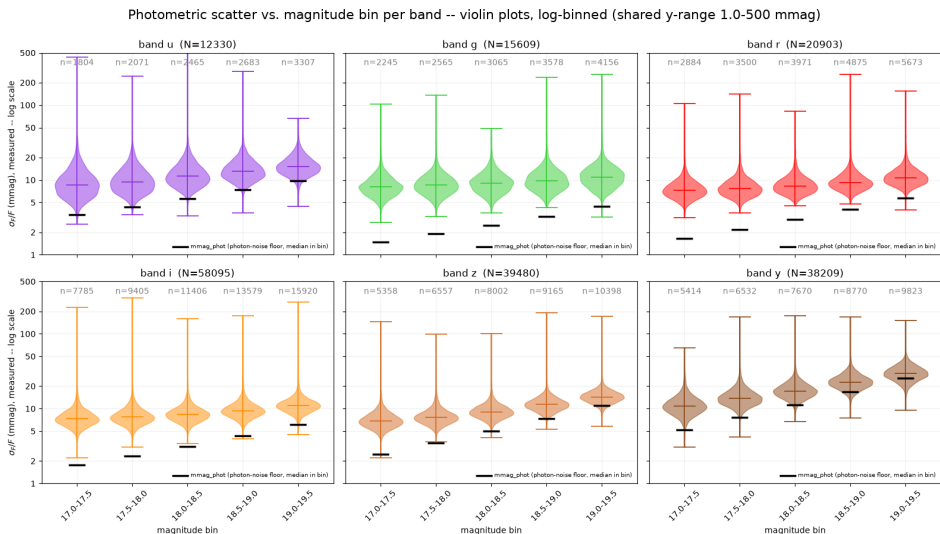
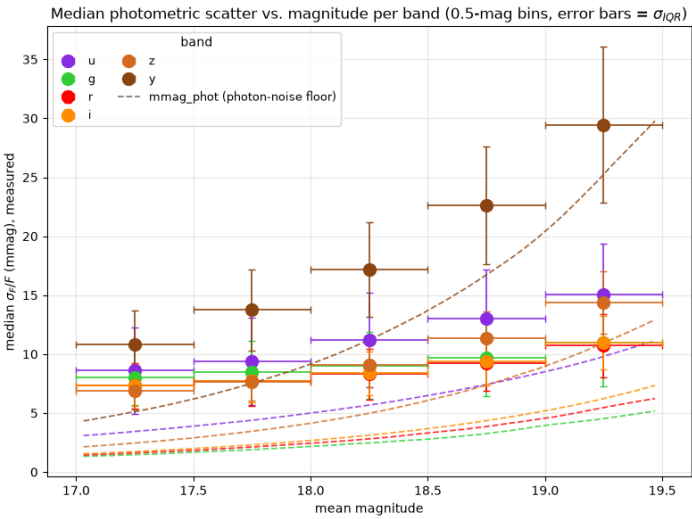
band	u	g	r	i	z	y
mag_bin						
[17.0, 17.5]	15.02	15.16	21.90	15.50	11.92	15.94
[17.5, 18.0]	18.23	12.48	14.66	13.30	11.16	18.67
[18.0, 18.5]	18.19	12.86	14.07	13.62	12.55	22.10
[18.5, 19.0]	20.45	15.58	18.24	15.63	15.60	28.94
[19.0, 19.5]	19.45	18.37	16.99	16.57	17.77	32.87

--- sigma_MAD (mmag) ---

band	u	g	r	i	z	y
mag_bin						
[17.0, 17.5]	8.17	8.18	7.24	7.49	6.94	10.66
[17.5, 18.0]	8.98	8.62	7.60	7.90	7.74	13.65
[18.0, 18.5]	10.66	9.10	8.18	8.54	9.12	17.02
[18.5, 19.0]	12.64	9.94	9.11	9.63	11.41	22.42
[19.0, 19.5]	14.50	11.18	10.53	11.21	14.38	29.23

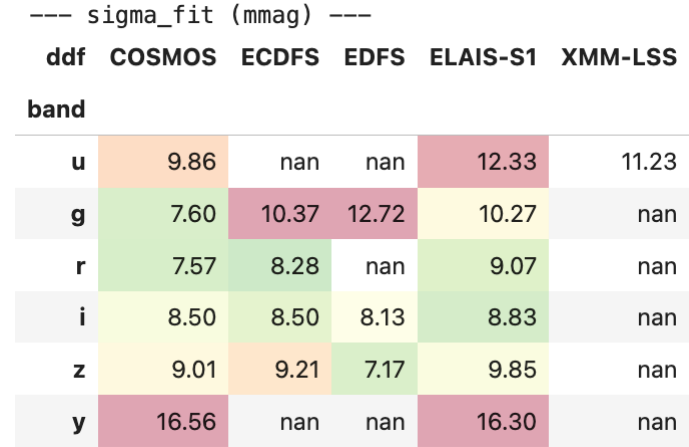
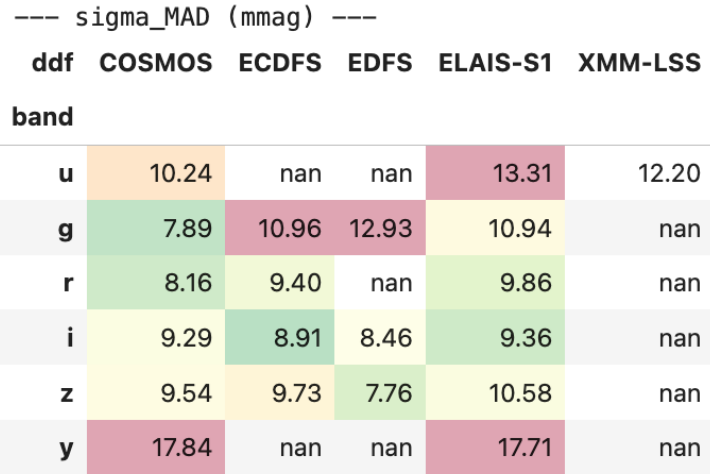
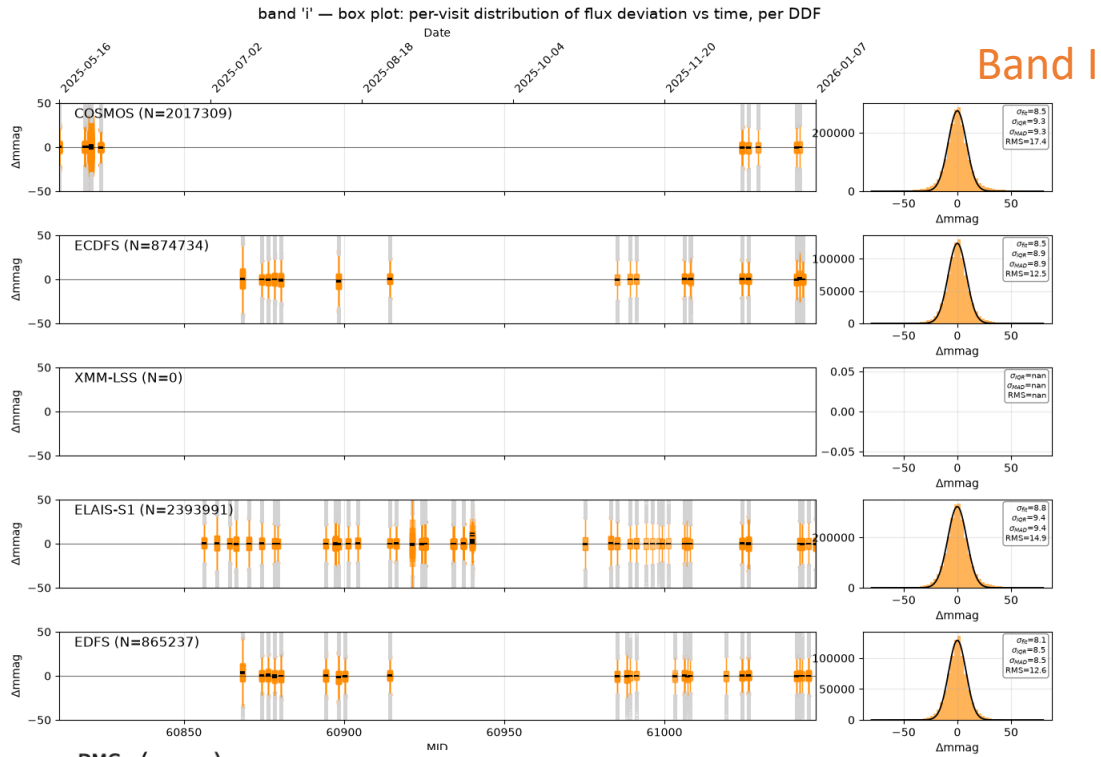
--- sigma_fit (mmag) ---

band	u	g	r	i	z	y
mag_bin						
[17.0, 17.5]	7.61	7.66	6.62	6.96	6.54	10.07
[17.5, 18.0]	8.43	8.07	6.95	7.36	7.31	12.95
[18.0, 18.5]	10.03	8.54	7.51	7.98	8.65	16.29
[18.5, 19.0]	11.99	9.31	8.38	9.02	10.86	21.67
[19.0, 19.5]	13.91	10.47	9.76	10.57	13.80	28.51

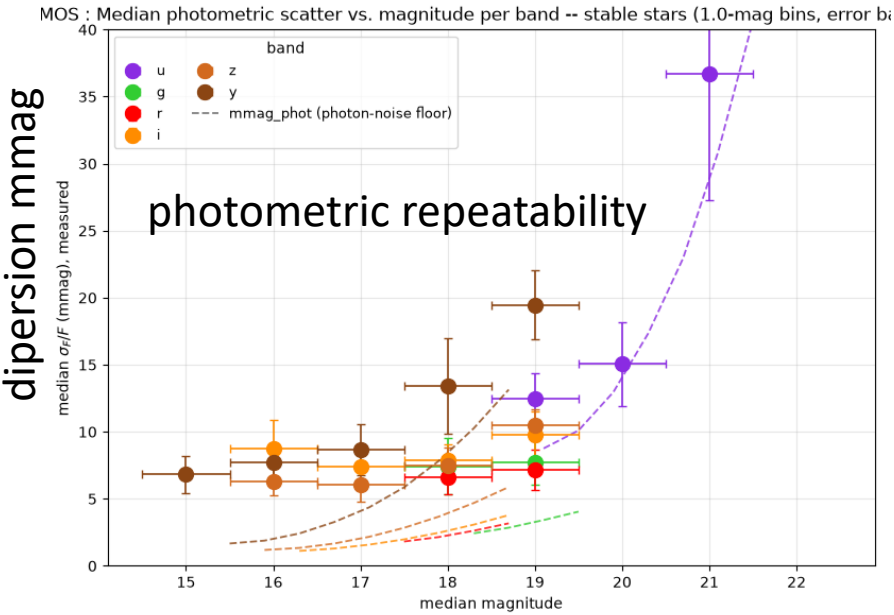
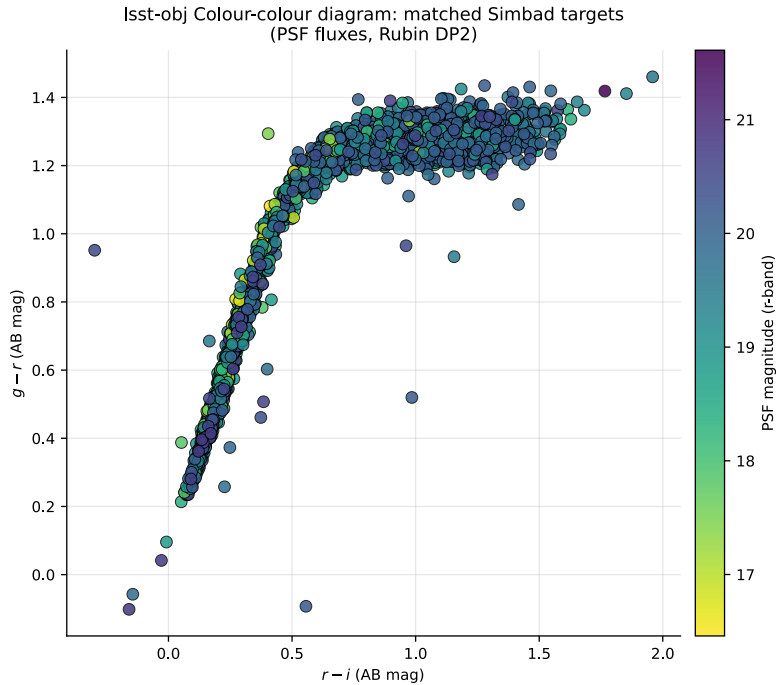
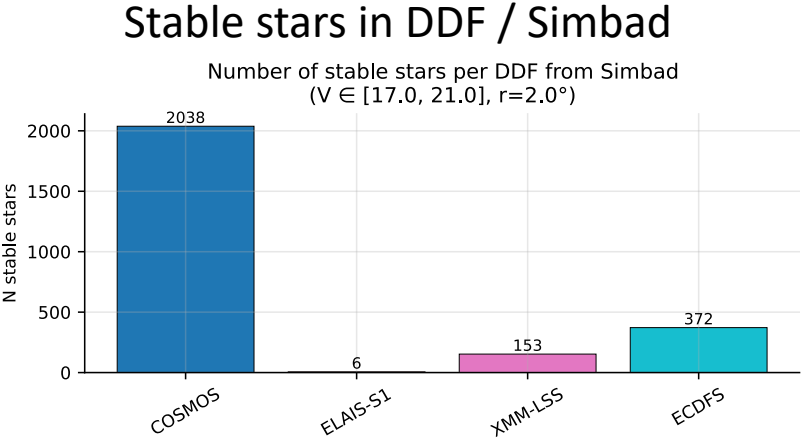


Per-Night photometric repeatability in the DDF : psfFlux dispersion in mmag

DDF



Photometric repeatability from “stable sources” in simbad in COSMOS



--- RMS (mmag) ---

band	u	g	r	i	z	y
mag_bin						
14.5-15.5	nan	nan	nan	nan	12.73	8.89
15.5-16.5	nan	nan	nan	9.43	7.06	9.34
16.5-17.5	nan	nan	8.11	9.39	7.56	10.38
17.5-18.5	nan	8.55	8.16	9.90	8.68	14.77
18.5-19.5	13.91	8.99	8.56	10.74	10.71	19.45

--- sigma_fit (mmag) ---

band	u	g	r	i	z	y
mag_bin						
14.5-15.5	nan	nan	nan	nan	7.86	6.65
15.5-16.5	nan	nan	nan	7.24	5.69	7.27
16.5-17.5	nan	nan	5.73	6.47	5.93	8.29
17.5-18.5	nan	7.08	6.20	7.05	7.20	13.09
18.5-19.5	12.18	7.52	6.76	8.40	9.86	18.33

--- sigma_MAD (mmag) ---

band	u	g	r	i	z	y
mag_bin						
14.5-15.5	nan	nan	nan	nan	8.70	6.75
15.5-16.5	nan	nan	nan	7.41	5.99	7.68
16.5-17.5	nan	nan	6.22	6.99	6.20	8.62
17.5-18.5	nan	7.42	6.56	7.63	7.46	13.39
18.5-19.5	12.44	7.82	6.99	8.91	10.19	18.65