XMM-Newton CCF Release Note

XMM-CCF-REL-377

OM Grisms Calibration: time dependent sensitivity correction

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
OM_GRISMCAL_0006	2000-01-01T00:00:00	—	TDS_CORR	NO

2 Changes

2.1 Time dependent sensitivity degradation correction

The sensitivity of the Optical Monitor (OM) on board XMM-Newton is affected by a time dependent degradation. This is due to two main effects: the degradation of the S-20 photocathode and the aging of the MCP. The first of these effects is known to be wavelength dependent

This time dependent degradation is described, for the colour filters (V, B, U, UVW1, UVM2, UVW2) in XMM-SOC-CAL-TN-0207, where a correction factor is defined and computed. A corresponding description of the analysis of time-dependent degradation in OM grism data was provided in XMM-SOC-CAL-TN-0218 and is updated in XMM-SOC-CAL-TN-0222.

2.2 The correction

In OM_GRISMCAL_0005 CCF, an extension containing the corrections for the time dependent sensitivity degradation of both OM grisms, was introduced for the first time, in conjunction with release note XMM-CCF-REL-359.

Here we update the OM grism calibration CCF, based on the latest available OM grism calibration data derived from the routinely observed spectrophotometric standard stars, BPM16274,

Table 1: Correction factors for the time dependent degradation of the OM grisms.

Year	UV Grism	V Grism
2000	1.000	1.000
2002	1.012	1.008
2004	1.024	1.017
2006	1.036	1.025
2008	1.049	1.034
2010	1.062	1.043
2012	1.075	1.052
2014	1.088	1.061
2016	1.102	1.071
2018	1.117	1.080
2020	1.131	1.090
2022	1.146	1.100

GD 153 and Hz2.

The correction factors are given in Table 1 on a uniformly spaced grid of observation epoch, with extrapolation to 2022. It should be noted that, as of SAS 18.0, the fluxed OM grism spectra of sources processed with the XMM-Newton SAS, include a multiplicative scaling, interpolated from these factors. Note, also, that the count rates in the same spectral files are not scaled. The correction factor applied to a given fluxed spectrum is stored in the FITS keyword **TDS_CORR**.

3 Scientific Impact of this Update

These corrections allow users to compare the fluxes of any source observed with the OM grisms at different epochs. These corrections extend the range of application to 2022.

4 Estimated Scientific Quality

Absolute fluxes obtained with the OM grisms will be corrected for degradation. The data exhibit significant scatter but 1-σ uncertainties on the corrections of 1.7% (UV) and 1.4% (VIS) are estimated at 2020.0. These uncertainties do not include any systematics. For each grism, the fits are determined from the ensemble of valid data from all three standard stars and in all 6 wavelength bands - no resolution by wavelength band is currently available.

5 Expected Updates

The table of correction factors covers the period since launch until the year 2022. An update will be necessary for observations obtained after this date.

6 Test procedures

The new CCF was validated for content and format validity. The correction has been tested on grism data of the OM standard star, BPM16274, obtained in XMM-Newton revolution 3462, re-processed using **omgchain** v1.12, which employs **omgrism** v1.29, from SAS 18.0.

7 Summary of the test results

The fluxed spectra, based on use of the OM_GRISMCAL_0005 and OM_GRISMCAL_0006, were compared and found to be in accord with the changed correction factors. The TDS_CORR header keyword values were verified as correct.

References

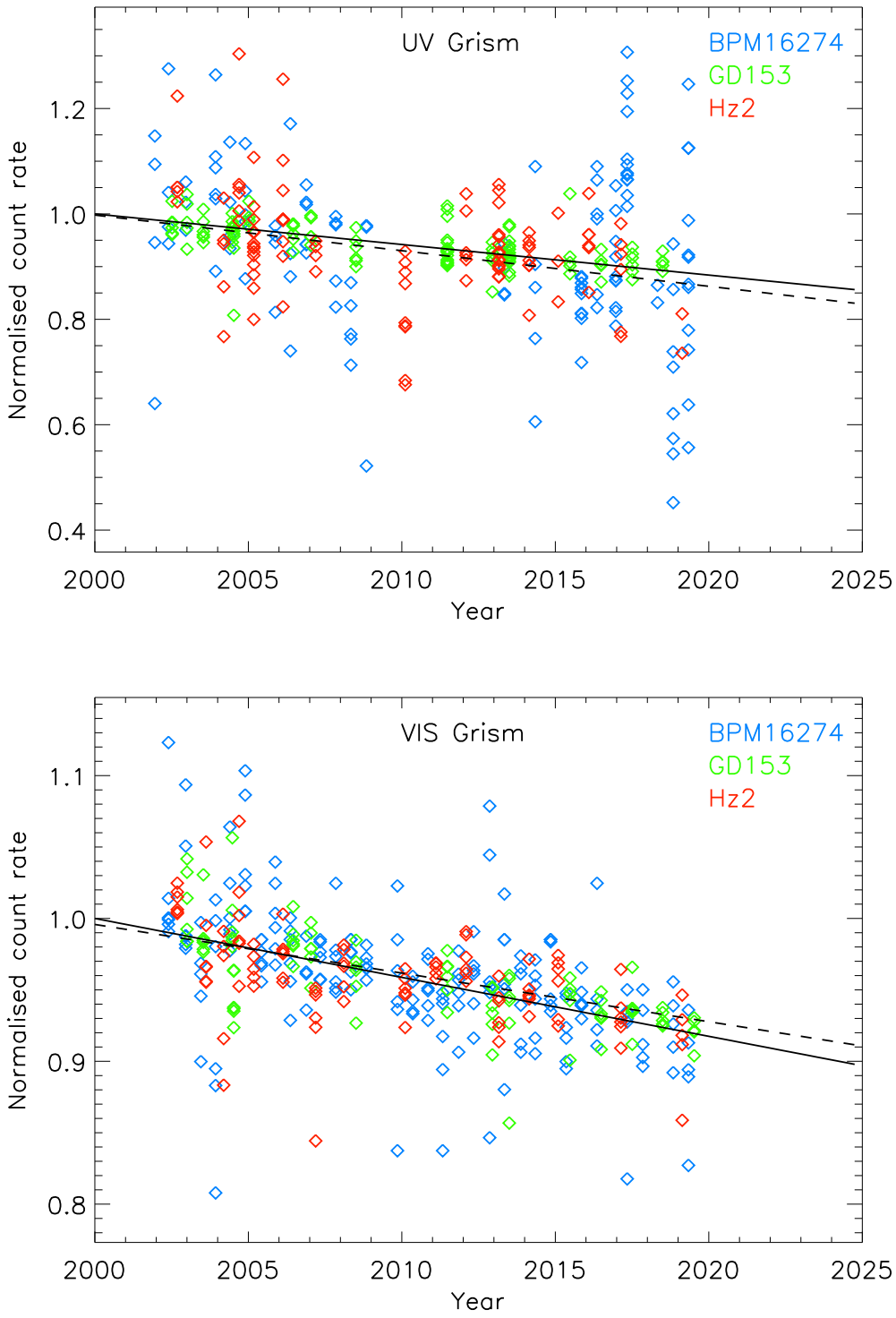

Figure 1: Normalised measured count rates in various spectral bands from the spectra of BPM16274 (blue), GD153 (green) and Hz2 (red) for the UV grism (upper panel) and Visible grism (lower panel). The solid black lines are the linear fits to the decline in the current analysis while the dashed black lines are the fits from the previous analysis that went into OM_GRISMCAL_0005. For each grism, the results are obtained via a simultaneous linear fit to all the wavelength band measurements from all 3 stars, where the slope is common to all stars and wavelength bands but the normalisations, computed at 2000.0, are star and band dependent (see XMM-SOC-CAL-TN-0222).