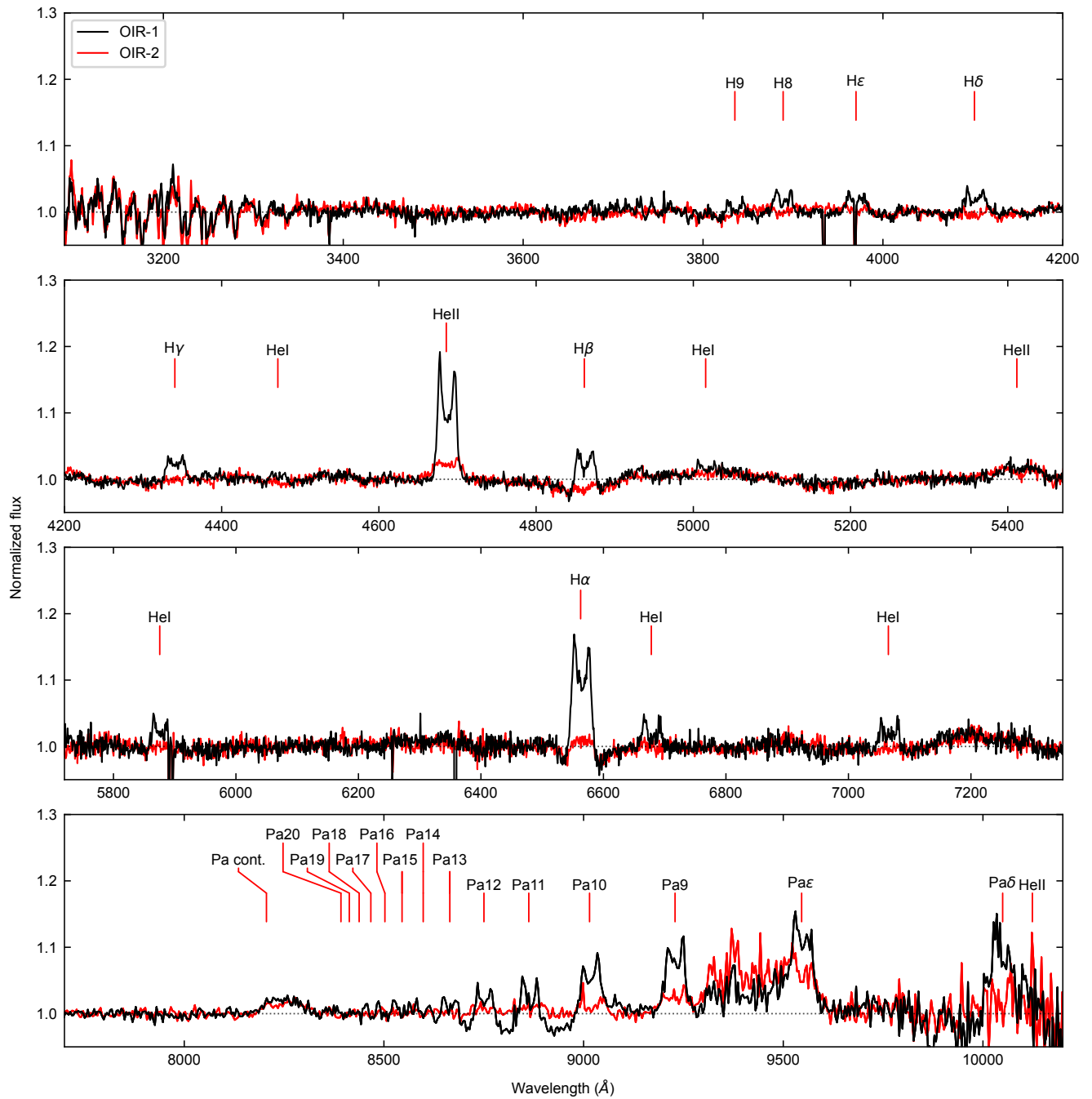
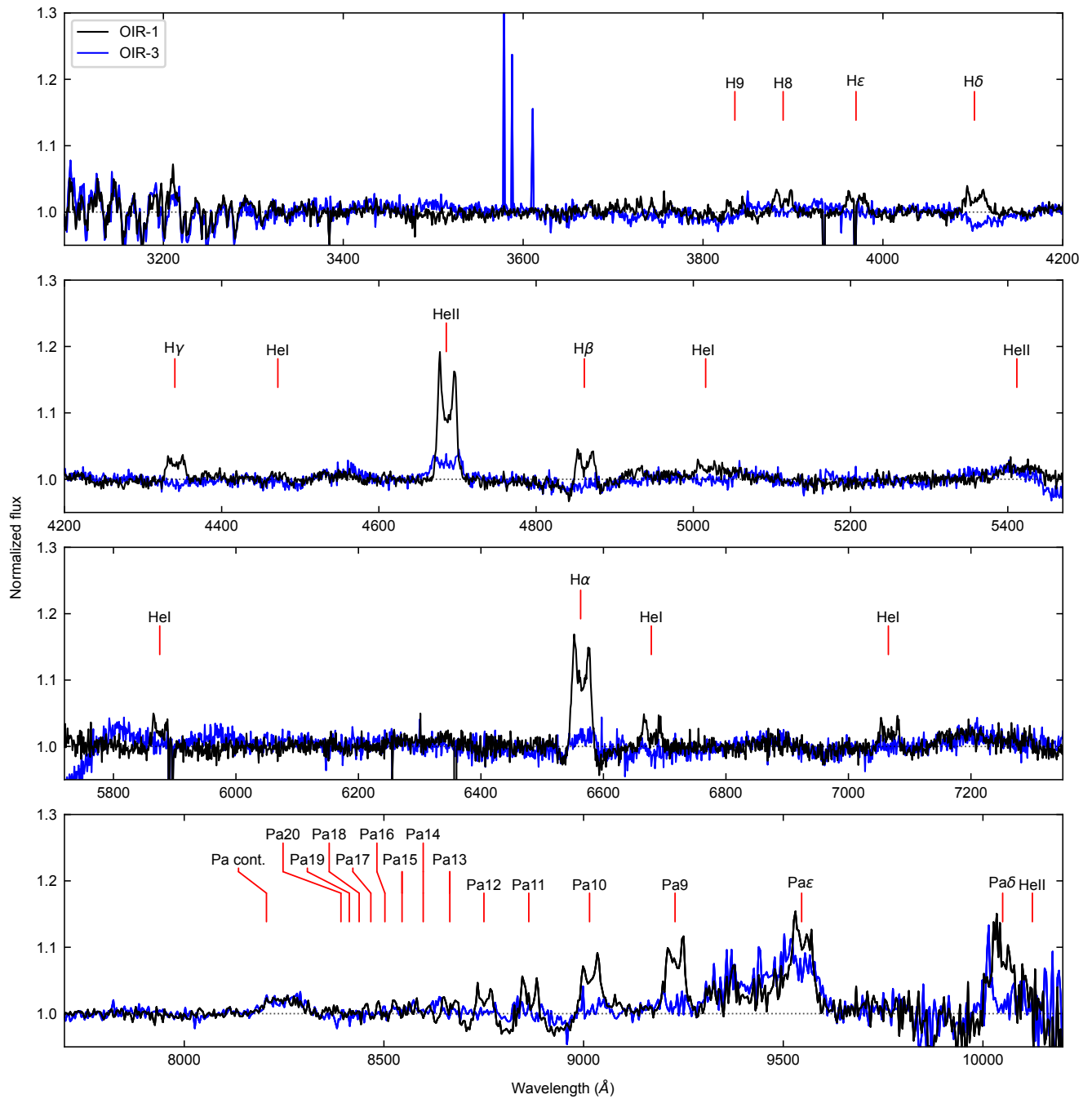

A self-shadowing black hole accretion disk at sub-Eddington luminosities

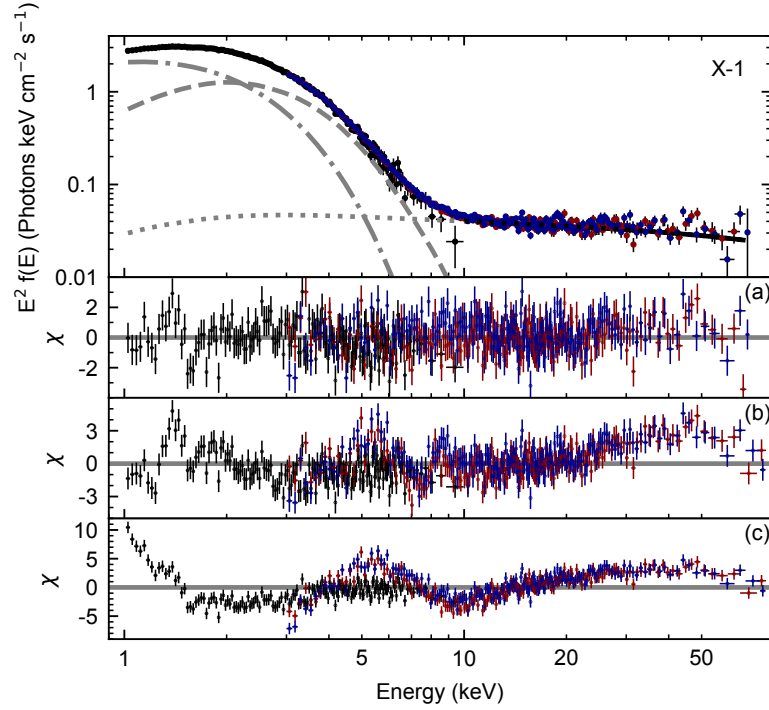
In the format provided by the
authors and unedited



Supplementary Figure 1. | Full optical and near-infrared spectra during two epochs of the outburst decay. Normalized VLT/X-shooter spectra of epoch OIR-1 (black) and OIR-2 (red) of MAXI J0637–430, showing the full optical and near-infrared coverage. Major emission line features are marked, including Balmer and Paschen series lines, as well as prominent He I and He II transitions. During epoch OIR-1, strong double-peaked Balmer and He I emission lines are clearly visible, characteristic of an optically thick, low-ionisation accretion disc. By OIR-2, these features have significantly weakened or disappeared, consistent with an increase in ionisation conditions in the outer disk.



Supplementary Figure 2. | Full optical and near-infrared spectra during two epochs of the outburst decay. Normalized VLT/X-shooter spectra of epoch OIR-1 (black) and OIR-3 (blue) of MAXI J0637–430, showing the full optical and near-infrared coverage. As in the comparison between epochs OIR-1 and OIR-2 (Supplementary Fig. 1), major emission lines such as those of the Balmer and Paschen series, as well as He I and He II, are marked. Strong Balmer and He I lines observed during OIR-1 have further weakened or disappeared by epoch OIR-3, consistent with a continued increase in the ionisation of the outer disk.



Supplementary Figure 3. | Spectral residuals of alternative models for epoch X-1. Unfolded 1–70 keV X-ray spectrum of MAXI J0637–430 from epoch X-1 (*NICER* in black, and *NuSTAR* in dark red and dark blue for FPMA and FPMB, respectively). The solid line shows the best fit obtained with `Const*Tbabs(diskpbb+Nthcomp+relxillNS)`, with the individual thermal, Comptonized, and reflection components shown as dash-dotted, dotted, and dashed lines, respectively. Residuals (χ , in units of σ) are shown in the subpanels for fits with: (a) `Const*Tbabs(diskpbb+Nthcomp+relxillNS)` (final model), (b) `Const*Tbabs(diskbb+relxillCp)`, and (c) `Const*Tbabs(diskbb+Nthcomp)`. All uncertainties are given at the 90 per cent confidence level.

Supplementary Table 1. Best-fit parameters for the `Const*Tbabs(diskpbb+Nthcomp+relxillNS)` model at the three broad-band X-ray epochs. Epoch X-1 corresponds to the joint *NICER*+*NuSTAR* spectrum, while X-2 and X-3 correspond to the joint *Swift*+*NuSTAR* spectra.

	Epoch X-1	Epoch X-2	Epoch X-3
TBABS			
$N_{\mathrm{H}} (\times 10^{-22} \text{ cm}^{-2})$	0.04 (fixed)		
DISKPBB			
$kT_{\mathrm{in}} \text{ (keV)}$	$0.522^{+0.006}_{-0.017}$	$0.523^{+0.005}_{-0.014}$	$0.506^{+0.005}_{-0.003}$
p	0.58 ± 0.01	0.73 ± 0.04	$0.78^{+0.01}_{-0.06}$
N_{diskpbb}	2392^{+330}_{-241}	3021^{+514}_{-430}	3172^{+42}_{-540}
NTHCOMP			
Γ	2.14 ± 0.02	2.09 ± 0.02	2.22 ± 0.03
$kT_{\mathrm{e}} \text{ (keV)}$	> 81	> 145	> 45
$kT_{\mathrm{seed}} \text{ (keV)}$	(linked to kT_{in})		
N_{nthcomp}	0.032 ± 0.001	0.044 ± 0.002	0.018 ± 0.001
RELXILLNS			
a_*	$0.58^{+0.08}_{-0.11}$ (tied)		
$i \text{ (deg)}^{\mathrm{c}}$	$69.98^{+0.01}_{-2.17}$ (tied)		
$kT_{\mathrm{bb}} \text{ (keV)}$	0.523 ± 0.002	0.55 ± 0.001	0.66 ± 0.02
$\log \xi$	$4.4^{+0.2}_{-0.3}$	$4.4^{+0.2}_{-0.4}$	$4.5^{+0.1}_{-0.5}$
$A_{\mathrm{Fe}} \text{ (solar)}$	1.4 ± 0.2 (tied)		
$\log N \text{ (cm}^{-3}\text{)}$	16.03 ± 0.01	19.00^b	17 ± 2
$N_{\mathrm{relxillns}} (\times 10^{-3})$	$6.2^{+0.4}_{-0.2}$	$2.1^{+0.3}_{-0.1}$	$0.30^{+0.03}_{-0.04}$
$F_{\mathrm{x}}^{\mathrm{a}} (\times 10^{-9} \text{ erg cm}^{-2} \text{ s}^{-1})$	8.76 ± 0.02	5.38 ± 0.05	3.28 ± 0.05
Diskpbb fraction	63	73	91
RelxillNS fraction	33	18	4
Nthcomp fraction	4	9	5
χ^2/dof	4532.05/4233 = 1.07		

^a Unabsorbed 0.5–100 keV X-ray flux in units of $\times 10^{-9}$ erg cm $^{-2}$ s $^{-1}$. We derived the unabsorbed fluxes and uncertainties in the 0.5–100 keV range using `CFLUX` and the best-fitting model.

^b Parameter pegged upper bound during fit

^c An upper limit of 70 deg was imposed.

Note: Uncertainties are quoted at the 90% confidence level and calculated from Markov Chain Monte Carlo (MCMC) of chain length 10^6