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Non-thermal X-rays from colliding wind shock acceleration in the massive binary Eta Carinae

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Supplementary Table 1: Logs of the *NuSTAR* Observations

Abbreviation	Observation ID	Observation Start	ϕ_X	Exposure (ksec)	Duration (ksec)
NUS _{140331a}	30002010002	2014 March 31 06:56	2.9389	28.8	50.1
NUS _{140331b}	30002010003	2014 March 31 21:26	2.9393	49.7	90.6
NUS ₁₄₀₅₂₆	30002010005	2014 May 26 11:21	2.9669	79.4	131.8
NUS ₁₄₀₆₀₆	30002040002	2014 June 06 10:31	2.9721	32.9	50.6
NUS ₁₄₀₇₂₈	30002040004	2014 July 28 10:31	2.9979	61.3	102.1
NUS _{140811a}	30002010007	2014 August 11 05:36	3.0046	31.0	61.7
NUS _{140811b}	30002010008	2014 August 11 23:01	3.0051	56.9	111.3
NUS ₁₄₀₈₁₉	30002010010	2014 August 19 16:41	3.0089	54.5	97.1
NUS ₁₄₀₉₂₆	30002010012	2014 September 26 00:41	3.0275	81.2	143.2
NUS ₁₅₀₇₁₆	30101005002	2015 July 16 01:31	3.1719	23.6	38.7
NUS ₁₆₀₆₁₅	30201030002	2016 June 15 02:36	3.3377	69.3	120.0

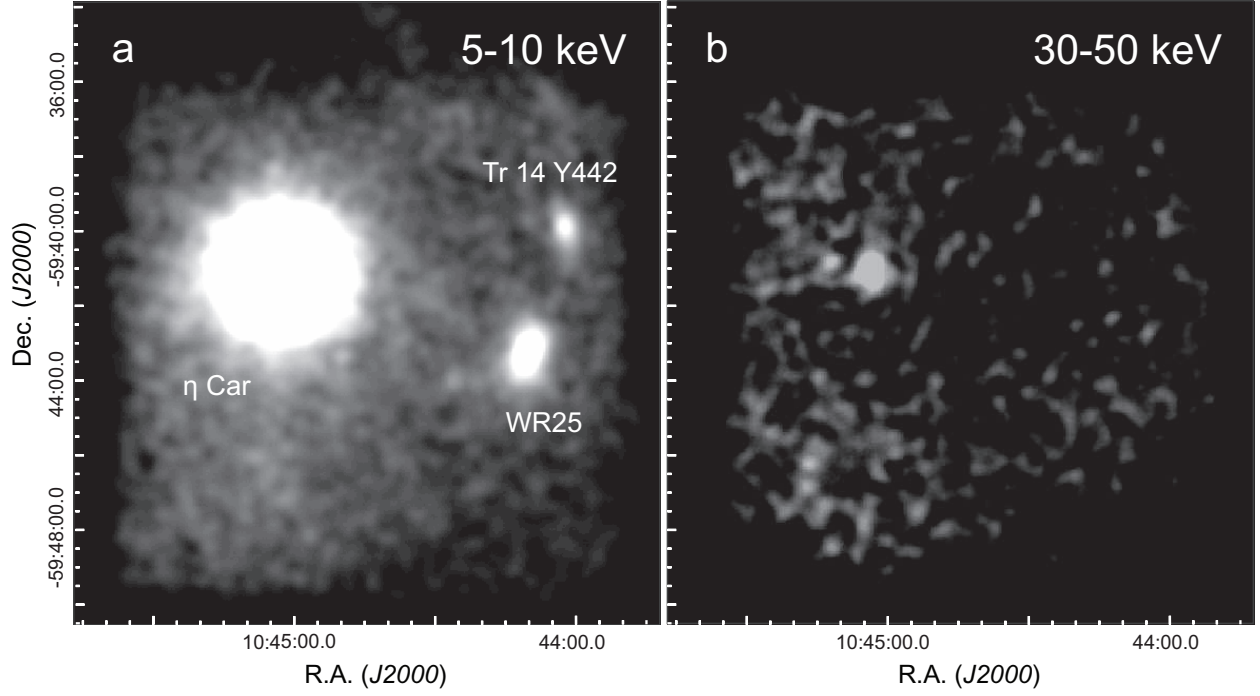
Abbreviation: Abbreviation adopted for each observation. Observation ID: Observation identification number of each observation. Observation Start: Time of the observation start. ϕ_X : Phase at the center of the observation in the X-ray ephemeris in (5), $\phi_X = (\text{JD}[\text{observation start}] - 2450799.792)/2024$. Exposure: Exposure time excluding the detector downtime. Duration: Duration of the Observation.

Supplementary Table 2: Best-fit Parameters of the Spectral Fits

Abbreviation	Absorption	Thermal Plasma (Hot Component)			$\Gamma=1.65$ Power-law
	N_{H}	kT	Abundance	Flux[10–15 keV]	Flux[30–50 keV]
	(10^{23} cm^{-2})	(keV)	($Z_{\odot}$)	($10^{-11} \text{ ergs cm}^{-2} \text{ s}^{-1}$)	($10^{-11} \text{ ergs cm}^{-2} \text{ s}^{-1}$)
NUS _{140331a}	1.7 (1.3–2.0)	4.2 (4.1–4.4)	0.50 (0.47–0.53)	1.6	0.13 (0.10–0.17)
NUS _{140331b}	1.4 (1.2–1.6)	4.2 (4.1–4.3)	0.58 (0.56–0.60)	1.9	0.19 (0.15–0.21)
NUS ₁₄₀₅₂₆	1.9 (1.8–2.1)	4.2 (4.1–4.2)	0.58 (0.56–0.60)	2.8	0.20 (0.17–0.22)
NUS ₁₄₀₆₀₆	2.4 (2.2–2.6)	4.7 (4.6–4.8)	0.55 (0.53–0.58)	3.3	0.26 (0.21–0.31)
NUS ₁₄₀₇₂₈	4.1 (2.6–5.8)	4.4 (3.6–5.8)	0.40 (0.19–0.66)	0.034	0.045 (0.027–0.060)
NUS _{140811a}	9.7 (9.2–55)	4.5 (fix)	0.50 (fix)	<0.020	0.039 (0.001–0.043)
NUS _{140811b}	15 (13–19)	4.5 (fix)	0.50 (fix)	0.045	0.019 (0.004–0.033)
NUS ₁₄₀₈₁₉	8.0 (7.4–9.0)	3.3 (3.0–3.5)	0.34 (0.27–0.41)	0.16	0.062 (0.046–0.079)
NUS ₁₄₀₉₂₆	2.7 (2.5–2.9)	3.3 (3.2–3.4)	0.53 (0.50–0.56)	0.45	0.14 (0.12–0.15)
NUS ₁₅₀₇₁₆	1.6 (1.0–2.1)	4.0 (3.8–4.2)	0.47 (0.41–0.53)	0.43	0.18 (0.14–0.21)
NUS ₁₆₀₆₁₅	0.9 (0.5–1.3)	4.4 (4.2–4.5)	0.54 (0.50–0.57)	0.41	0.15 (0.13–0.18)

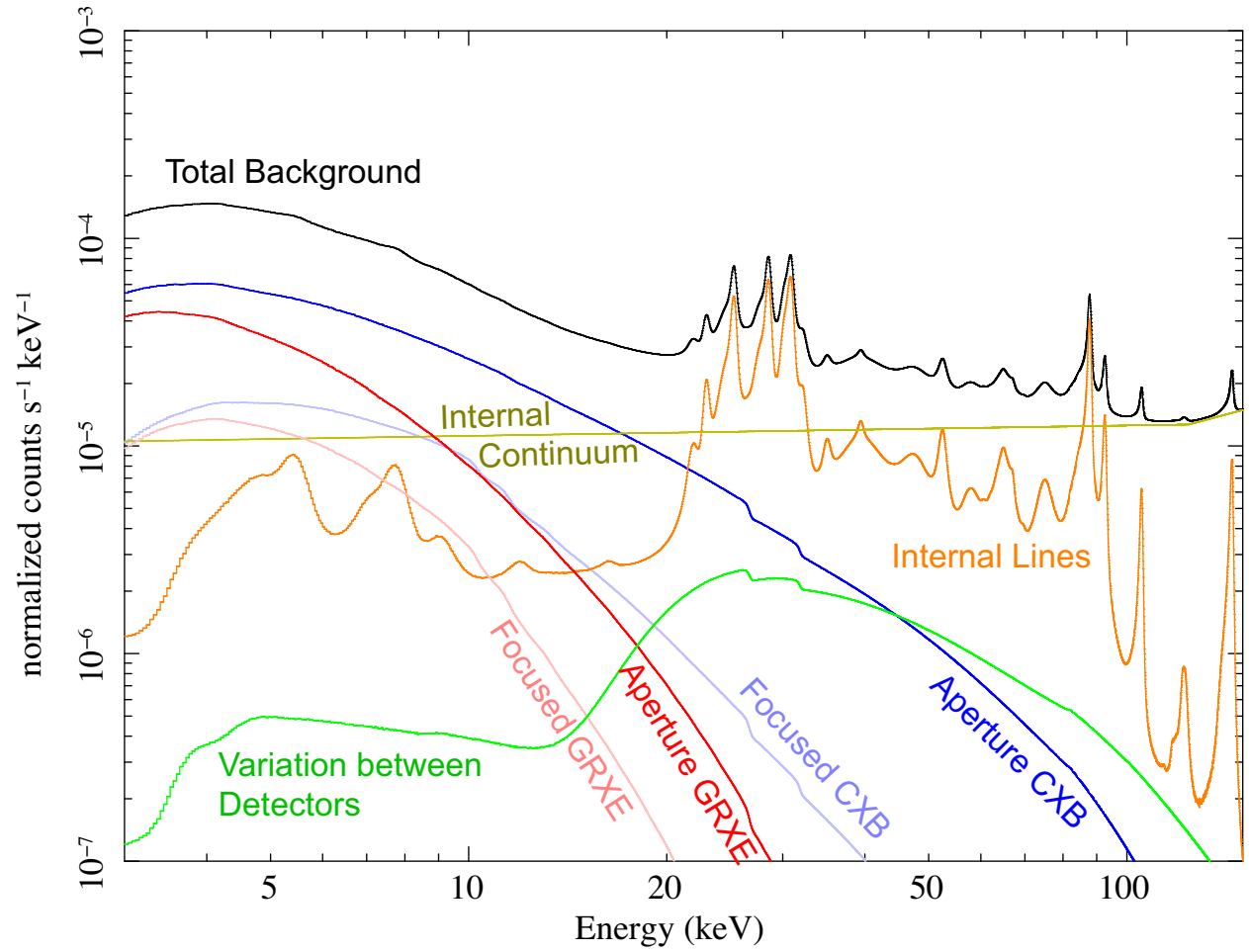
The parentheses quote 90% confidence ranges. The plasma temperatures and abundances for NUS_{140811a} and NUS_{140811b} are fixed as they are not well determined with limited photon statistics. The values in the flux columns are not corrected for absorption.

Supplementary Figure 1: Whole *NuSTAR* images of the η Car field.

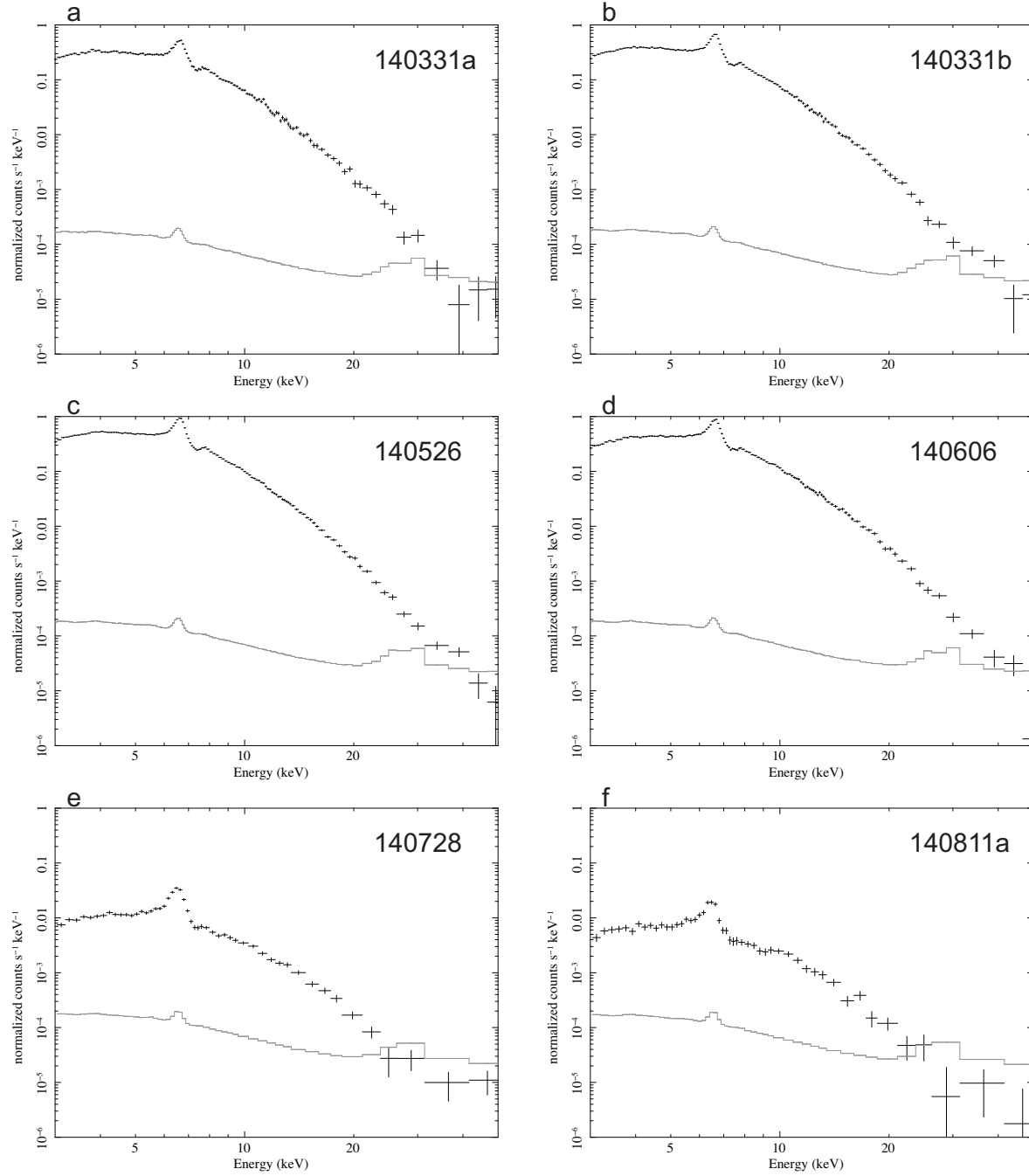


The images between 5–10 keV (**a**, log scale) and 30–50 keV (**b**, linear scale) are produced from the 2015 July 16 ($\phi_{\text{orb}} = 0.17$) and 2016 June 15 ($\phi_{\text{orb}} = 0.34$) observations. Each image is smoothed with a Gaussian function of $\sigma=8$ pixels. The bright X-ray source in the 5–10 keV image, Tr 14 Y442, is a young star in the Carina nebula, which had a giant flare during the 2015 observation (45).

Supplementary Figure 2: Individual background components for the FPMA η Car spectrum of the 2016 June 15 observation.



Supplementary Figure 3: Background subtracted *NuSTAR* FPMA+FPMB spectrum of each observation.



The solid grey line shows the background level.

Supplementary Figure 3: Continue.

