Variability of the X-ray sources detected in XMM-Newton survey of M33

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Introduction & motivation

We need:

Large samples of detected X-ray sources

To study:

Individual sources & population properties

And determine:

Star formation and evolution of galaxies
Introduction & motivation

M 33 – Loc. Group Sc galaxy
795 kpc, face on
6 x 10^{20} cm^{-2}

with XMM-Newton & Chandra

ROSAT – Haberl & Pietsch 2001
184 sources, HR method for classification
Observations

24 ind. 10-ks obs
GT & AO2 (PI: W.P.)
medium/thick/thin
M33
XMM-Newton
EPIC Colour

Red
(0.2-1.0) keV

Green
(1.0-2.0) keV

Blue
(2.0-12.0) keV

FWHM 20''

408 X-ray sources

From:
Pietsch et al. 2004

EPIC XMM-Newton Consortium
Meeting
16.05.05
FWHM 6''
PSF correct
S/N max
Flux or upper limit for each source in each image
350 sources

VARIABILITY
CORRECTED POSITIONS
39 NEW SOURCES
Stars (USNO B1)

2MASS counterparts

Stars (USNO B1)

2MASS counterparts
Long-time X-ray variability

61 variable sources

$F_{\text{max}}/F_{\text{min}}$ from $\sim2$ to 145

- 10 XRB
- 4 AGN+GAL
- 3 stars
- 2 SSS
- 3 SNRs
- 39 hard
X-7: eclipsing massive XRB

$V = 50 \text{ LUM} \sim 9 \times 10^{37}$

orbital period 3.45d

(Pietsch et al. 2004b)
$V=144$
$L=2\times10^{37}$
$HP19$
$\log(x/o)=-3.2$

$V=15$
$L=5\times10^{36}$
No previous X-ray ID
**X-8**

$L > 1 \times 10^{39}$  
Period~106 day  
(Dubus et al. 1997)  
$V = 1.3$

**SSS**

$HR1 = -0.66$  
$HR2 = -1$  
$V = 90$  
$L = 2 \times 10^{37}$  
no previous  
X-ray ID
NGC 604, giant HII
Strong radio 70mJy
optical, IR
Ext 12''
V=13
XRB, SNR
X-ray sources in M33
Luminosity distribution
Summary

39 new sources in individual data
improved positional accuracy
sample of 61 variable sources
8 new XRB, 7 new SSS detected in individual data
SNRs detected in combined data
spatial & luminosity distribution