Faint accreting binary populations in the SMC



Andreas Zezas University of Crete

V. Antoniou, J. Drake, P. Plucinsky, J. Hong, and the SMC Deep Survey Team

Demographics of accreting binaries



or neutron star

The SMC

Second nearest star-forming galaxy Unique laboratory for the study of HMXBs Advantages :

Well determined star-formation parameters

Probe very faint populations

 Address accretion physics, interaction of accretion flow and magnetic fields

"Disadvantage"

 Dominated by a very particular type of sources (Be-X-ray binaries).

HMXB populations in the SMC



Chandra and XMM observations of the SMC Strategy : observe regions of different stellar content

Identifying the binaries



Relation with star-formation

Enhanced formation of X-ray binaries in the 30-70 Myr range.

Consistent with peak in Be-star phenomenon at these ages

Explains large number of XRBs in the SMC

Evidence for small kicks (c.f. van den Heuvel etal. 2000; Coe 2005; Linden etal 2008)



Antoniou, AZ, etal, 2010

Relation with star-formation

Relation between XRBs and SFR of parent population: (0.40±0.04) XRBs /(M_☉/γr)

The first <u>direct</u> calibration of HMXB formation efficiency



Antoniou, AZ, et al 2010

The low-luminosity XLF

The luminosity function: Flat slope : α ~0.35 Indication for break



Zezas etal, in prep.

The deep Chandra Survey

"X-ray Visionary Program"

Extending the study to a wider range of stellar populations (P.I. A. Zezas)

~10 Myr

20-50 Myr

60-100 Myr

10-20 Myr

>50-80 Myr

10 Myr

11

60-100Myr

10-20 Myr 20-50 Myr

02

04

03

VGC346

The deep Chandra Survey

VGC346

Strategy: 11 Fields 2 x 50ksec exposures (1.1Msec total)

Goals:

A deep census of accreting pulsars
HMXB formation efficiency at different ages
Long-term variability of accreting pulsars

•Detailed studies of SNRs

•Stars at low metallicity

First results

- Survey underway (Dec 2012-Dec 2013) Half-depth survey completed
- 2 pulsars
 5 SNRs
 60-80 sources / field
 Limiting Luminosity 5×10³² erg/s



First results

The luminosity function: Flat slope : a ~0.2 / 0.8 Indication for break consistent with accretion in an inhomogeneous environment and the onset of the propeller effect.



Summary

SMC: a test-bed for studies of HMXBs

Direct measurement of formation efficiency
Evidence for the propeller effect
Detailed studies of SNR structure
... stay tuned

Relation with star-formation

Enhanced formation of X-ray binaries in the 30-70 Myr range.

Consistent with peak in Be-star phenomenon at these ages Explains large number of XRBs in the SMC

Evidence for small kicks (c.f. van den Heuvel etal. 2000; Coe 2005; Linden etal 2008)

