So Many People – the first SWG

So Many People

THE FORMAL BEGINNING - 1976

PROPOSAL TO

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FOR THE

STUDY OF THE 1.2 METER X-RAY TELESCOPE

NATIONAL SPACE OBSERVATORY

(Volume I - Technical Proposal)

P605-4-76

For the period 1 July 1976 to 30 September 1978

Principal Investigator
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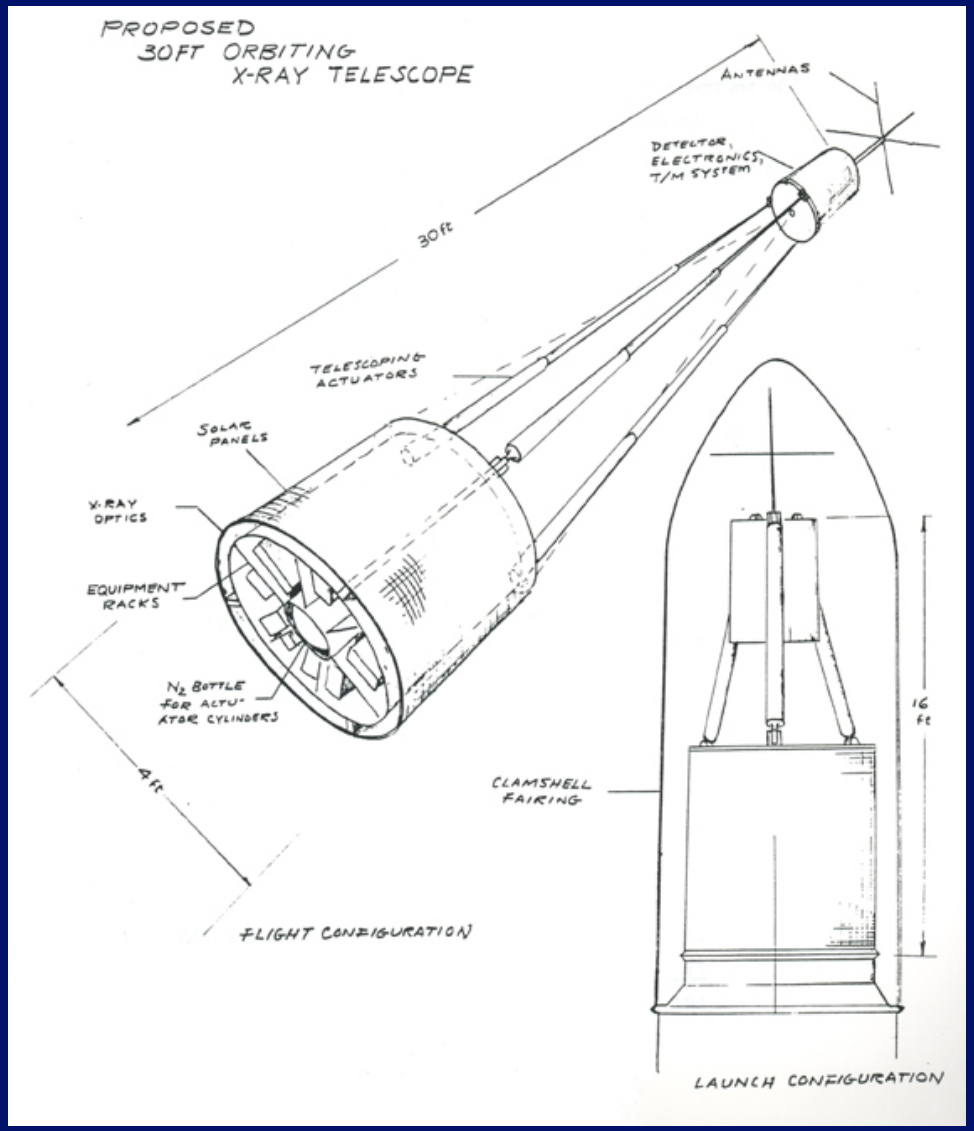
April 1976

Smithsonian Institution
Astrophysical Observatory
Cambridge, Massachusetts 02138

Director: Dr. George B. Field Assistant Director: Mr. John G. Gregory

The Smithsonian Astrophysical Observatory
and the Harvard College Observatory
are members of the
Center for Astrophysics

THE REAL BEGINNING - 1963



A Proposal for

AN EXPERIMENTAL PROGRAM
OF EXTRA-SOLAR X-RAY
ASTRONOMY

Prepared for

National Aeronautics and Space Administration
Washington 25, D. C.

Prepared by

American Science and Engineering, Inc.
11 Carleton Street
Cambridge 42, Massachusetts

25 September 1963

Approved:

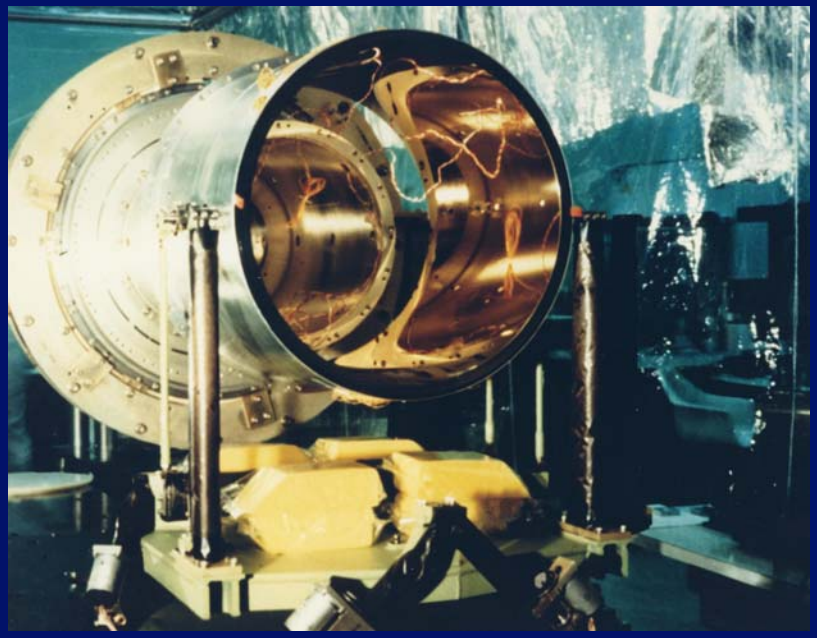
Riccardo Giacconi
Vice President
Space Research and Systems Division

This document consists of 75 pages.
Copy No. 4 of 4 Series A

ASE Log No. 63-164-b

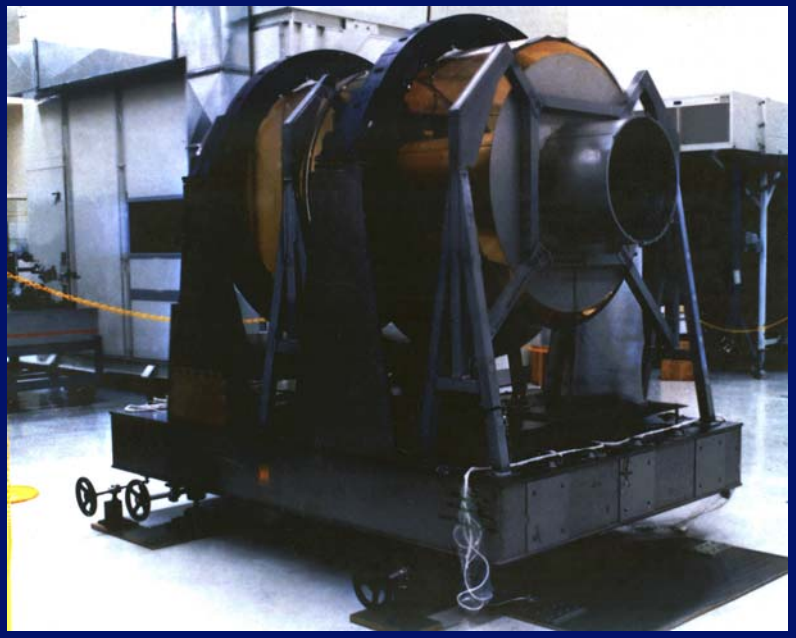
Smithsonian Institution Archives

The Optics



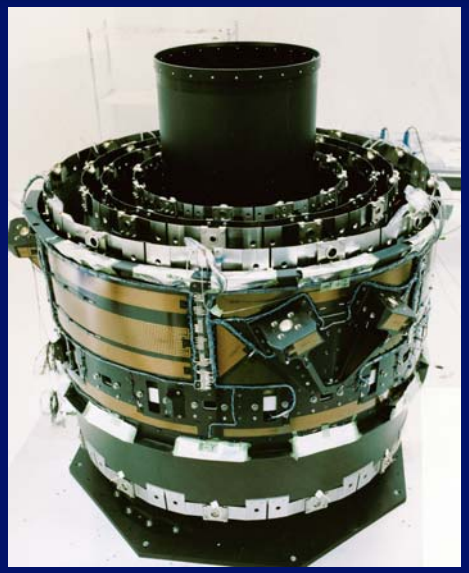
TMA 1 (1985) &

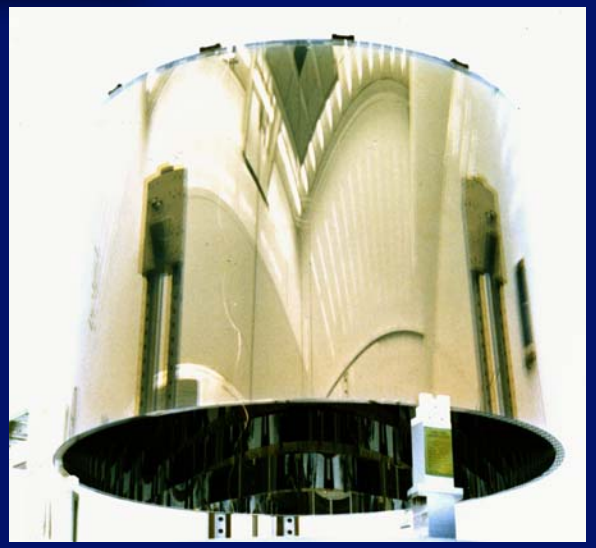
2 (1989)



VETA (1991)

THE OPTICS – FLIGHT SYSTEM



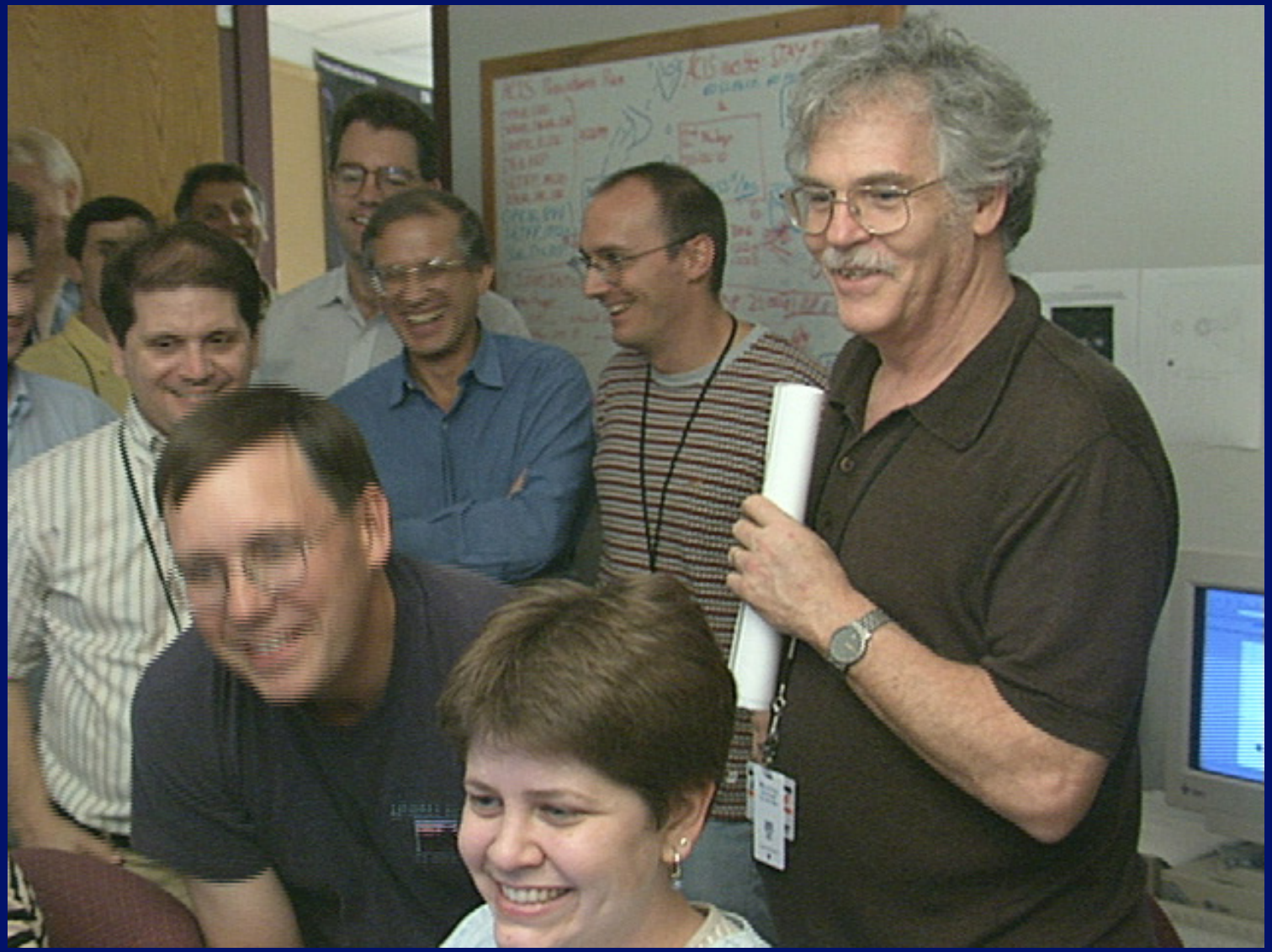


The Optics

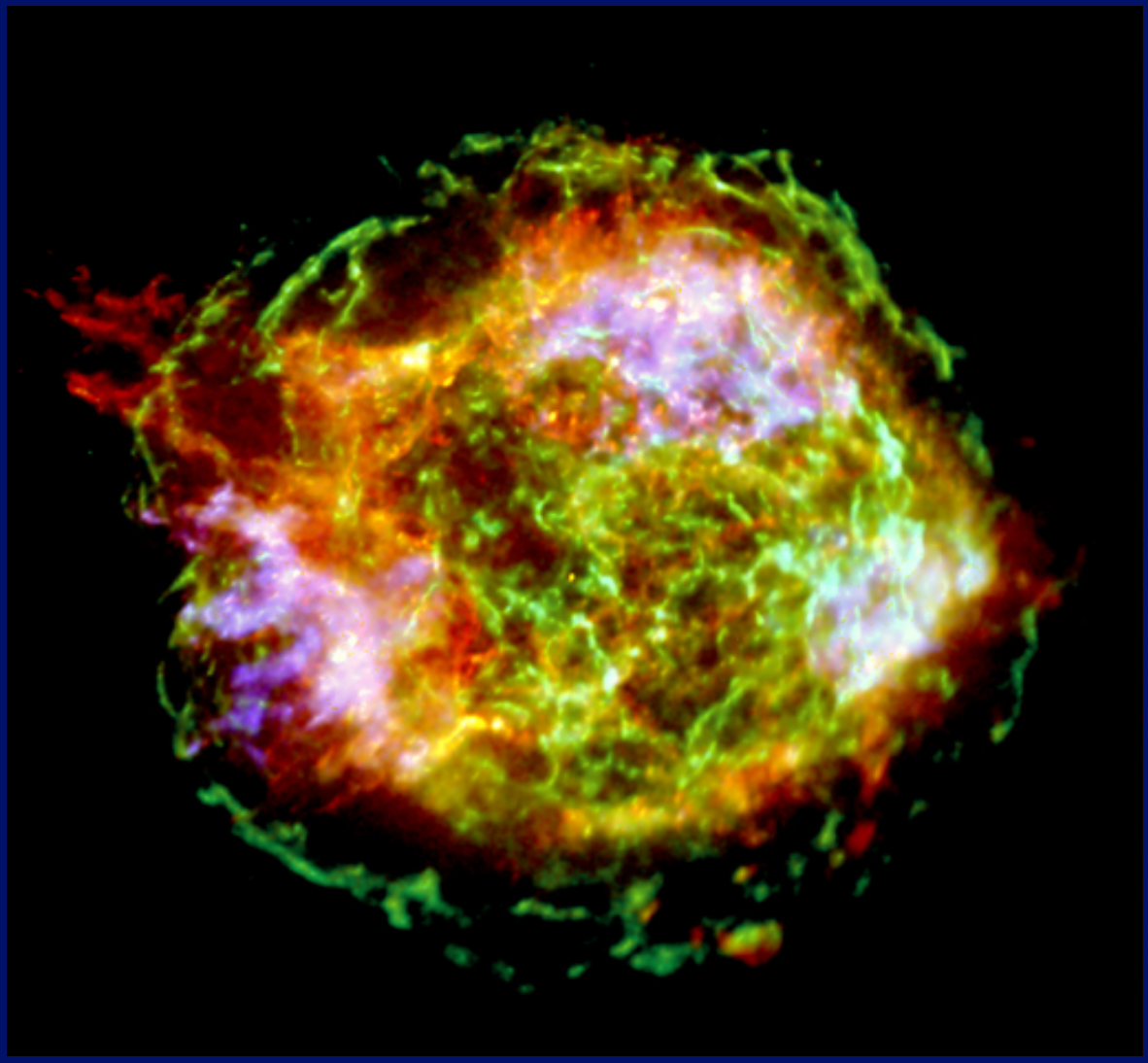
LAUNCH

- Mon/Tue July 19/20
  - Sensor spike - hydrogen in the engine compartment
- Wed/Thurs July 21/22
  - Lightning in the vicinity
- Thurs/Fri July 22/23
  - Launch!

First Light

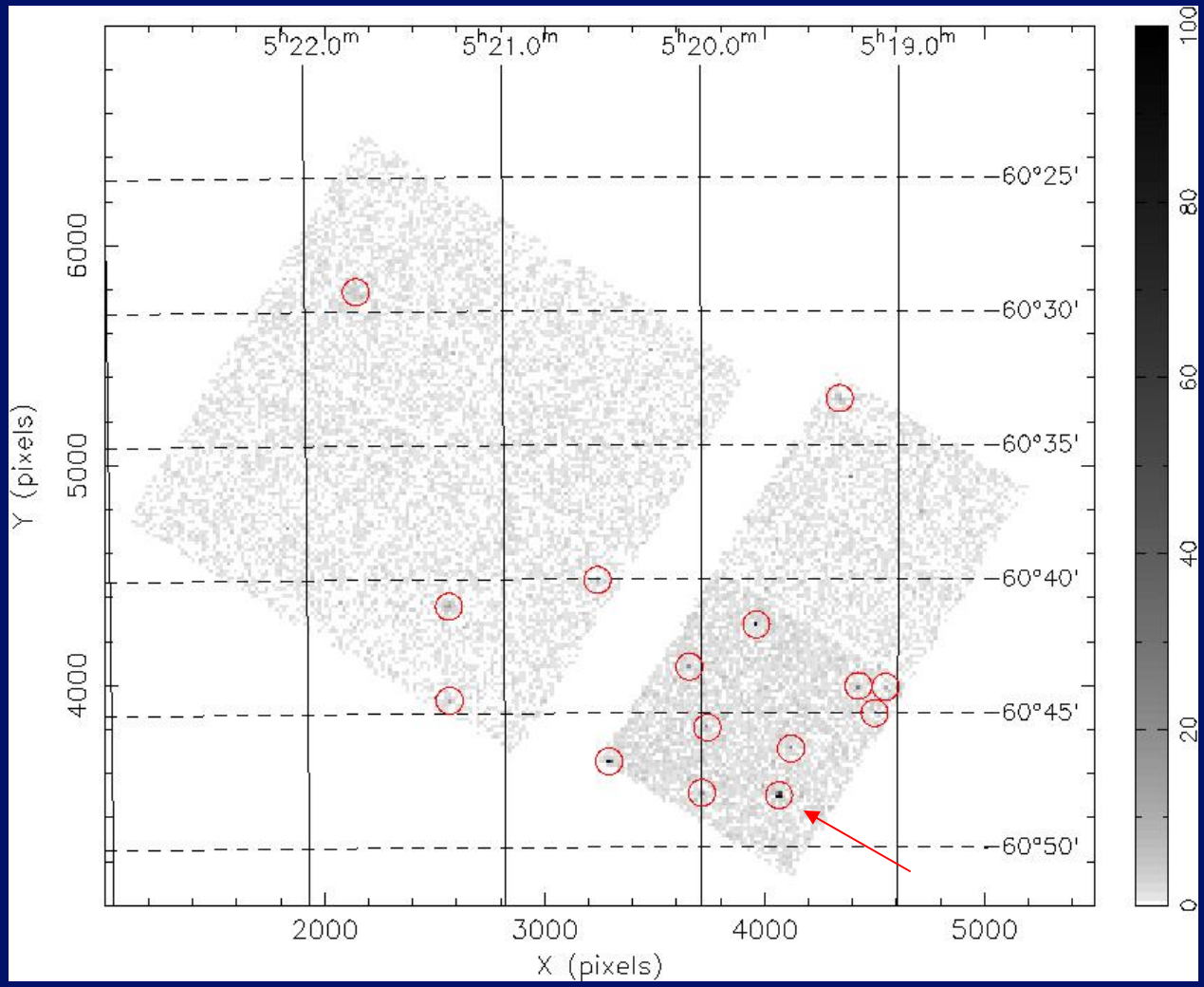


CASSIOPEIA A



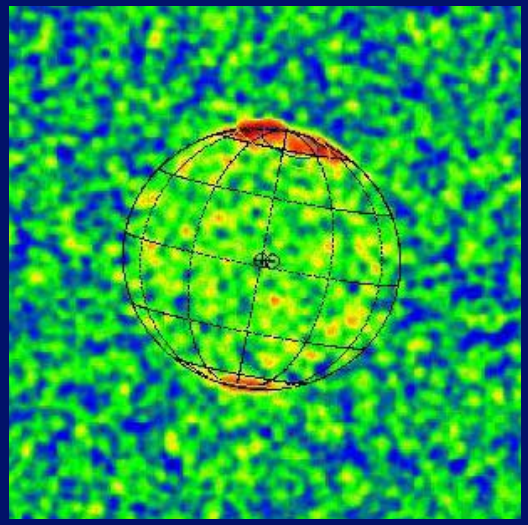
Hwang et al. 2004 *Tananbaum et al. 1999*

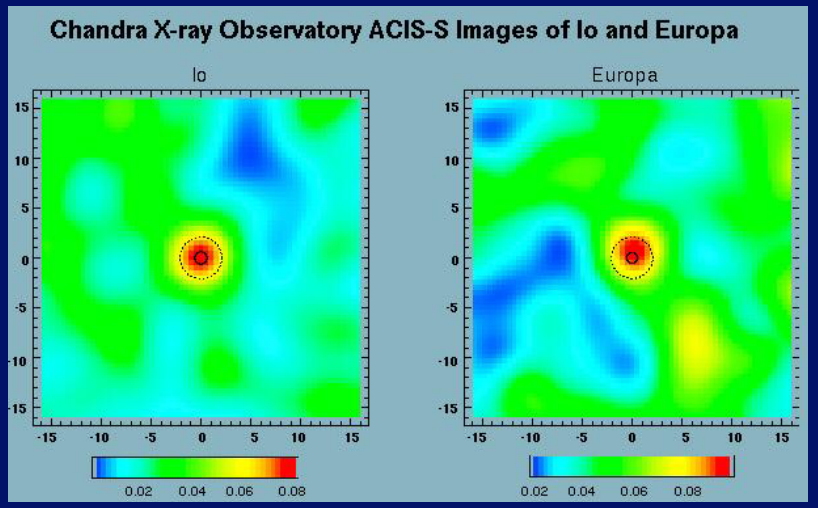
THE REAL FIRST LIGHT - "LEON X-1"

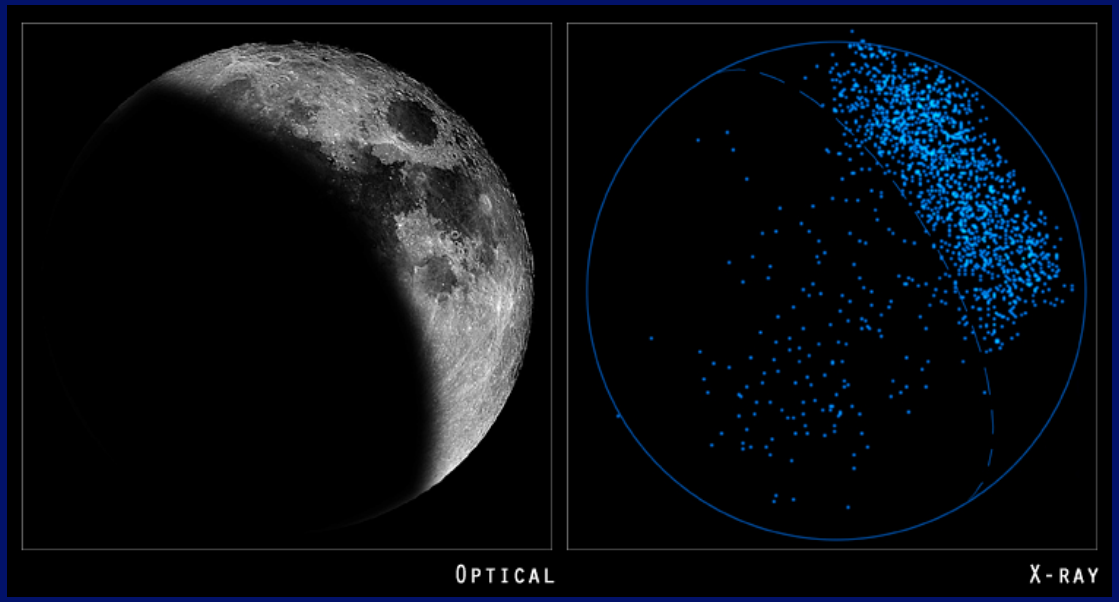


Weisskopf et al. 2005

Solar System Objects



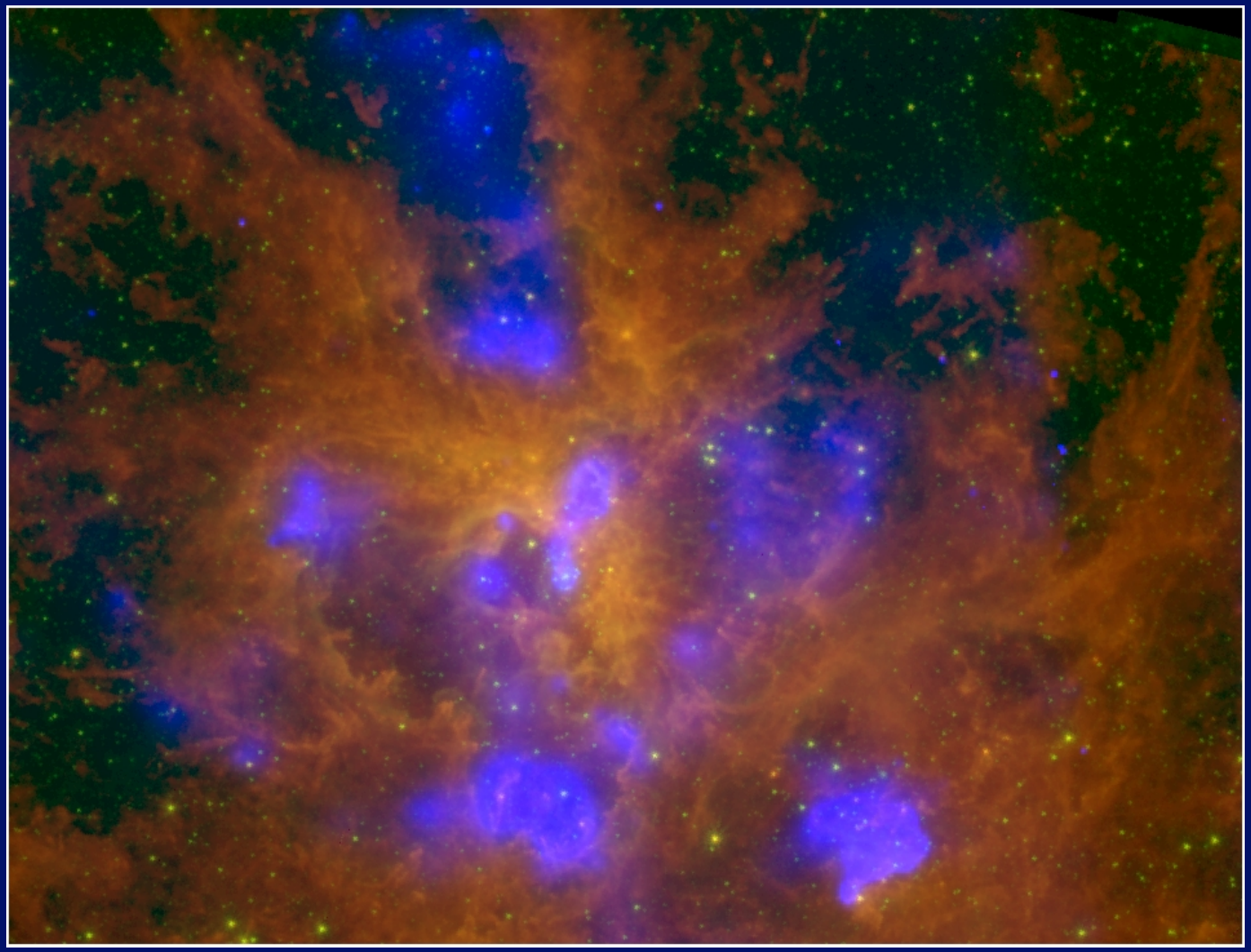




Optical: Gendler;
X-ray: J.Drake et al.

30 Doradus

19’

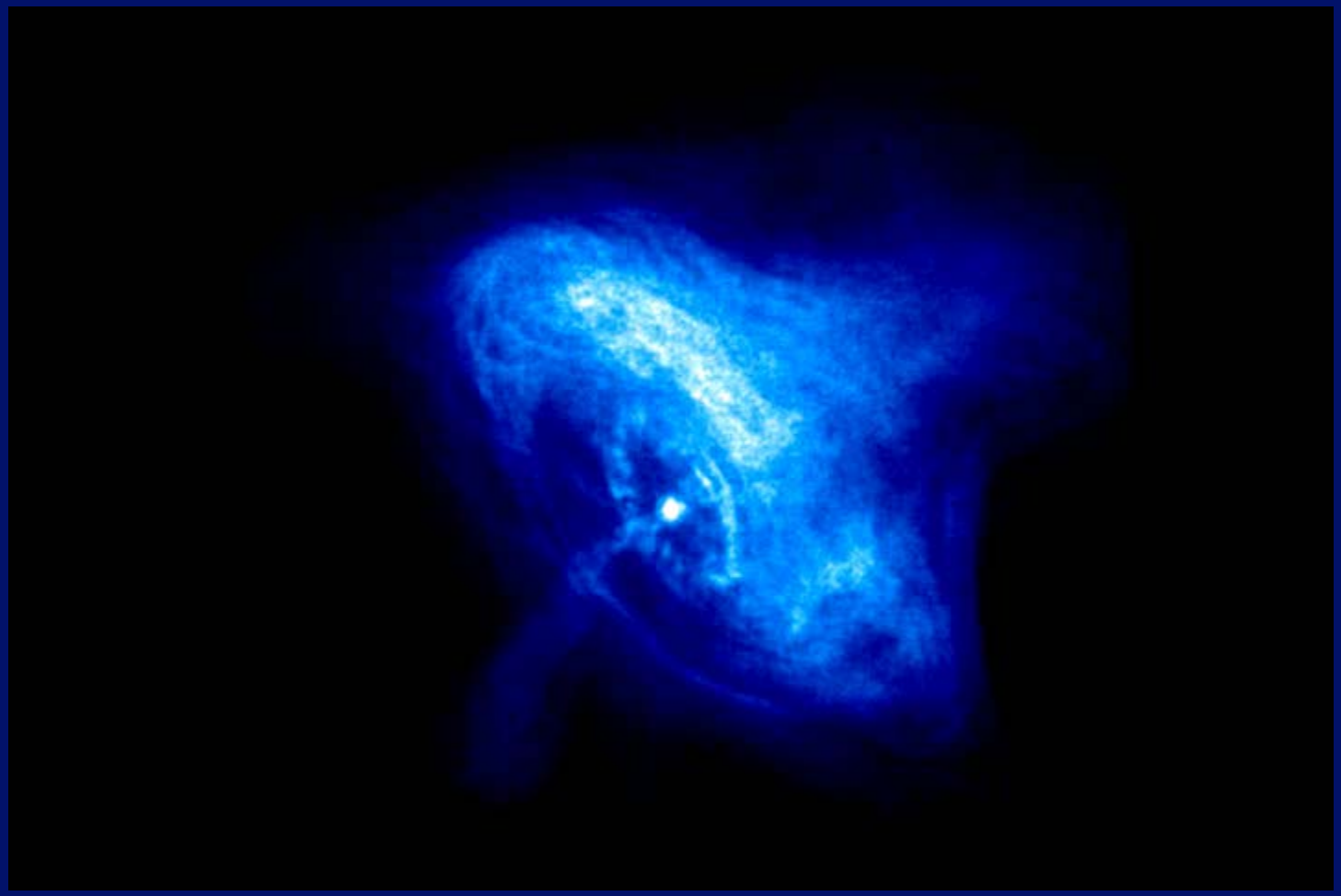


B. Brandl, L. Townsley, et al. 2005

Crab Nebula

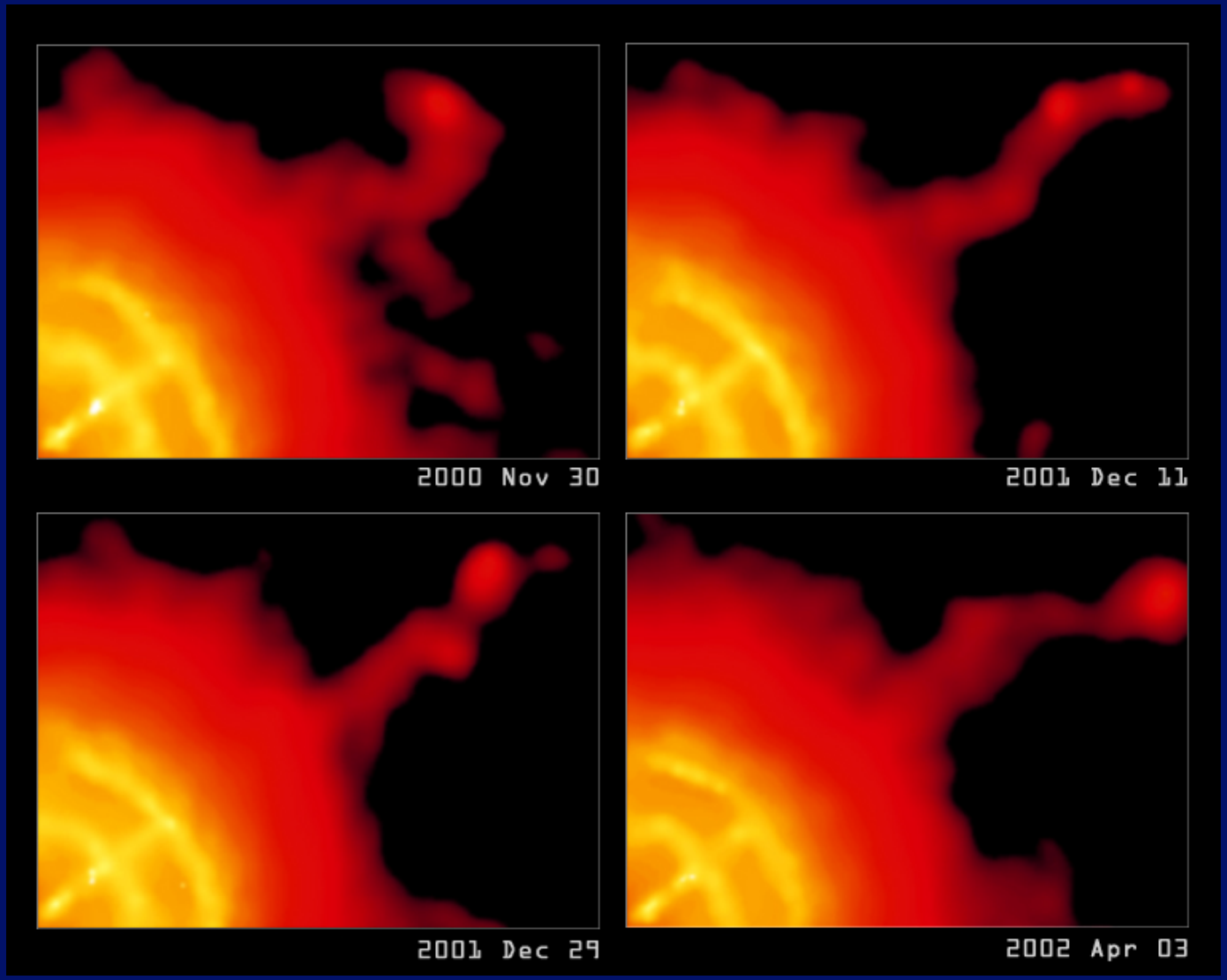
Weisskopf et al. 2000; Hester et al. 2002

Crab Nebula



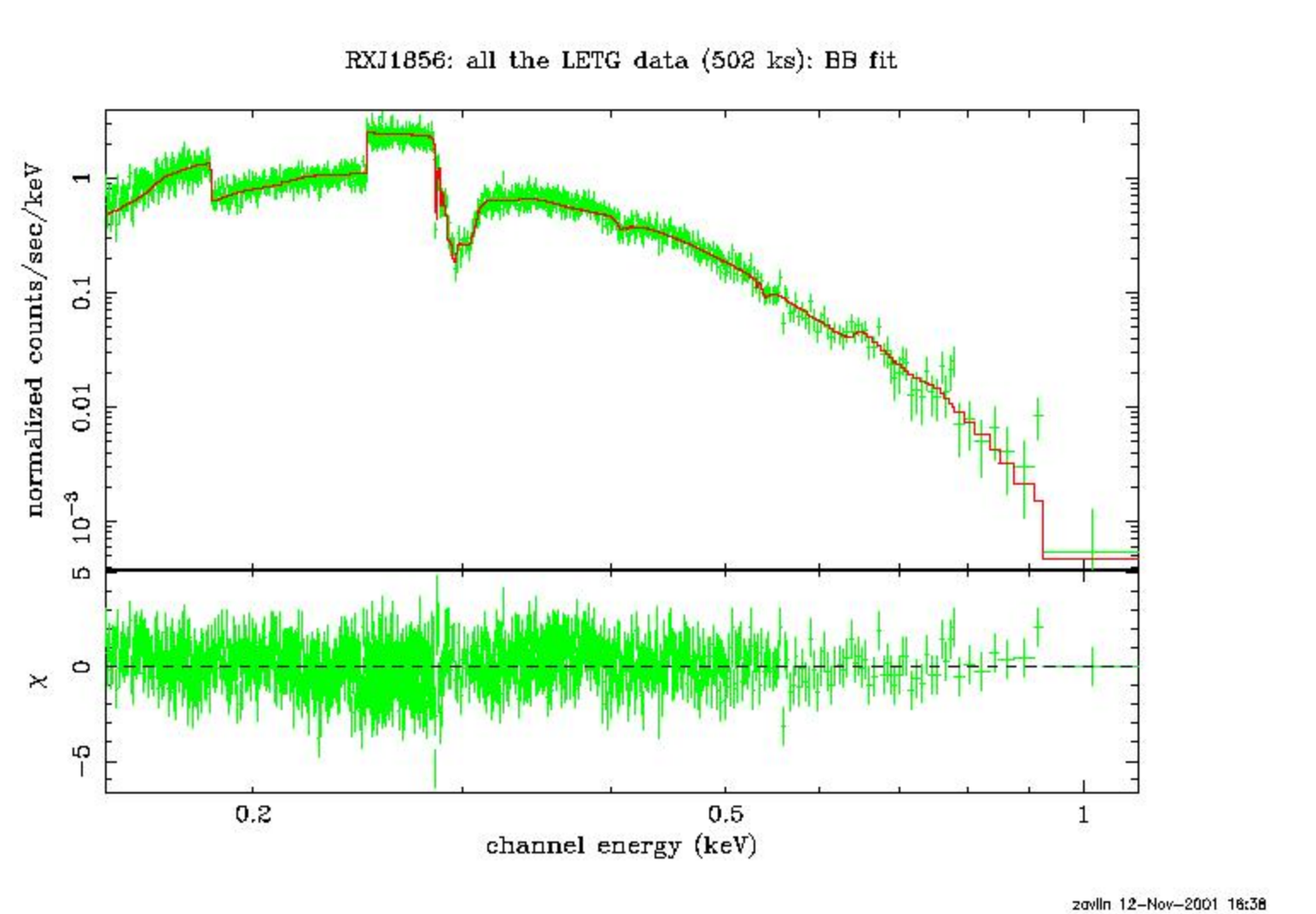
Weisskopf et al. 2000; Hester et al. 2002

Vela Pulsar



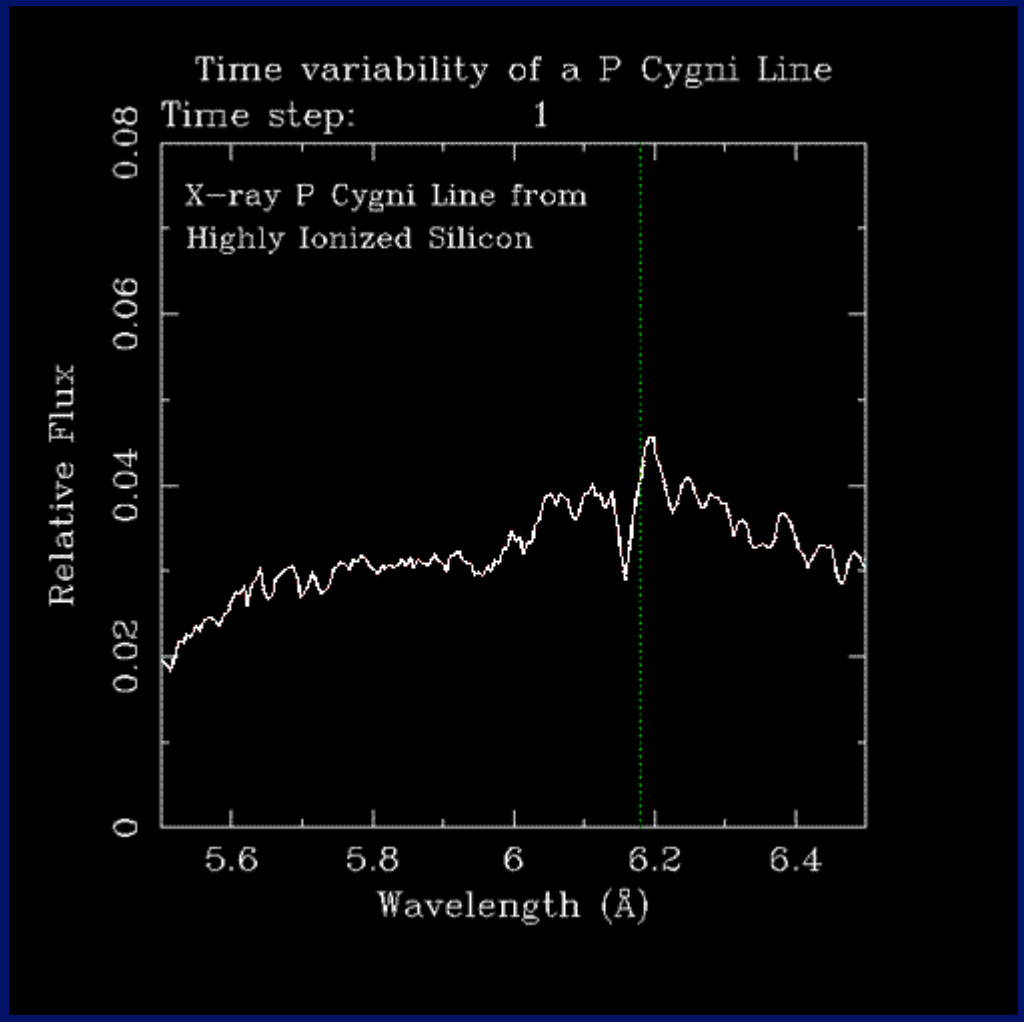
Pavlov et al. 2003

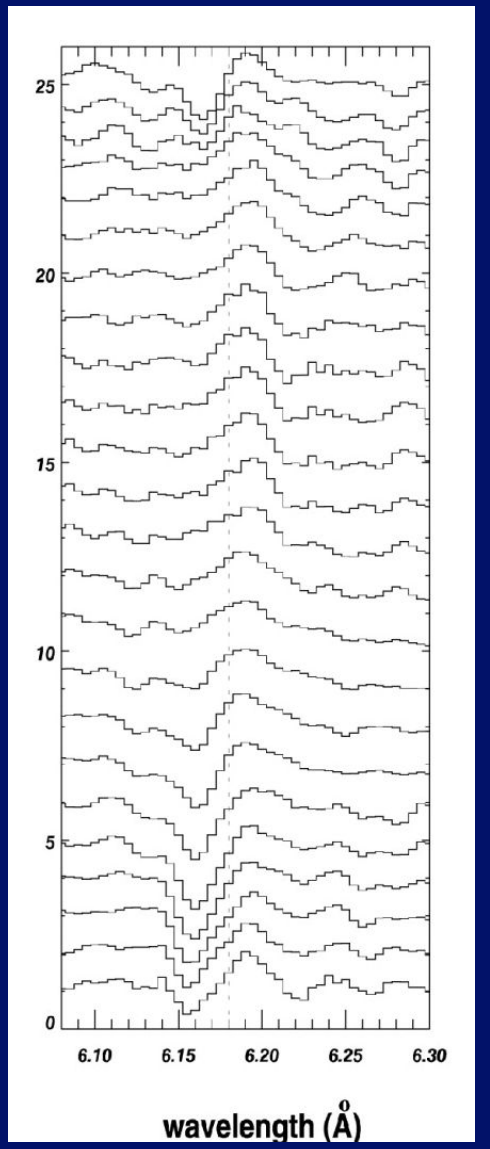
The Puzzling Case of RX J1856.5-3754



Burwitz et al. 2003

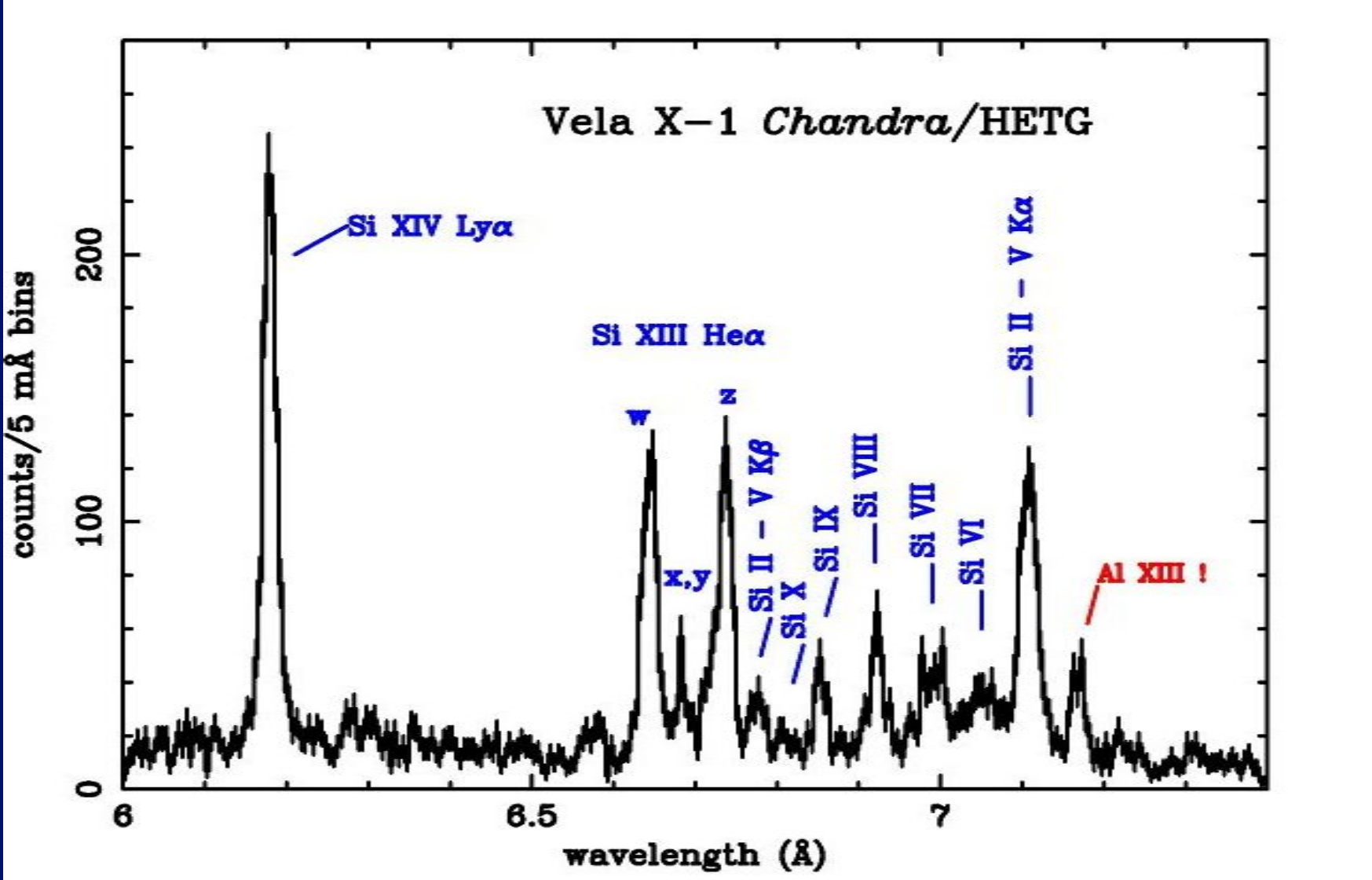
CIRCINUS X-1





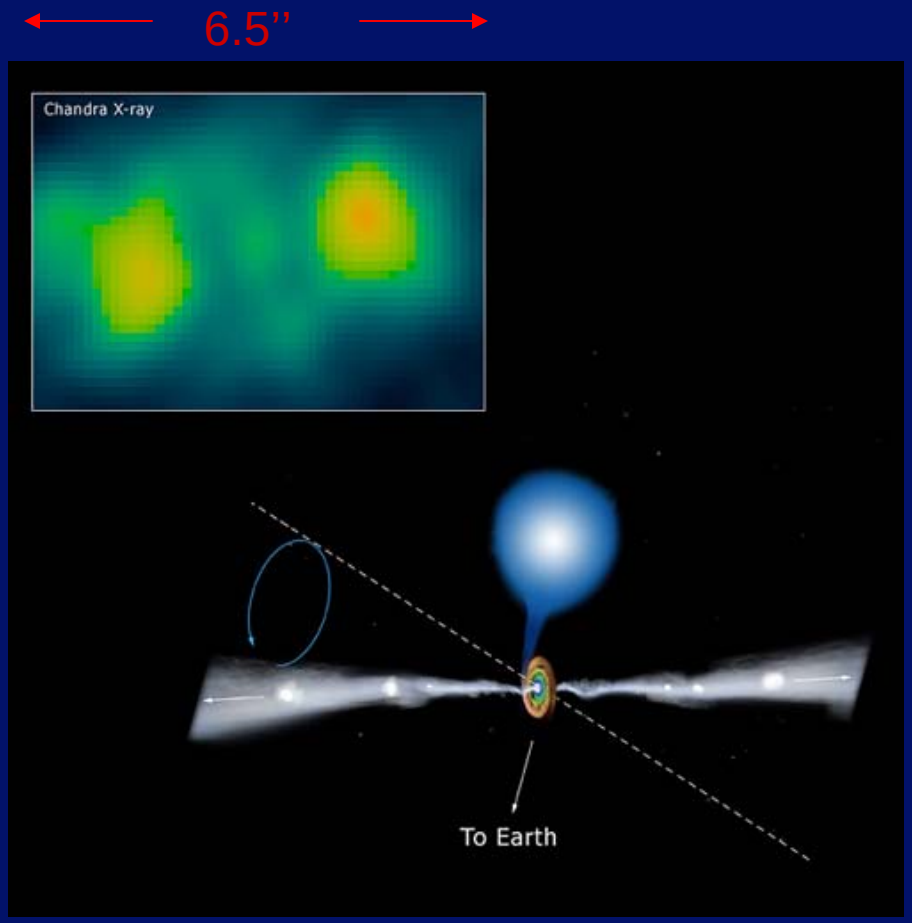
Brandt & Schulz 2000; Schulz & Brandt 2002

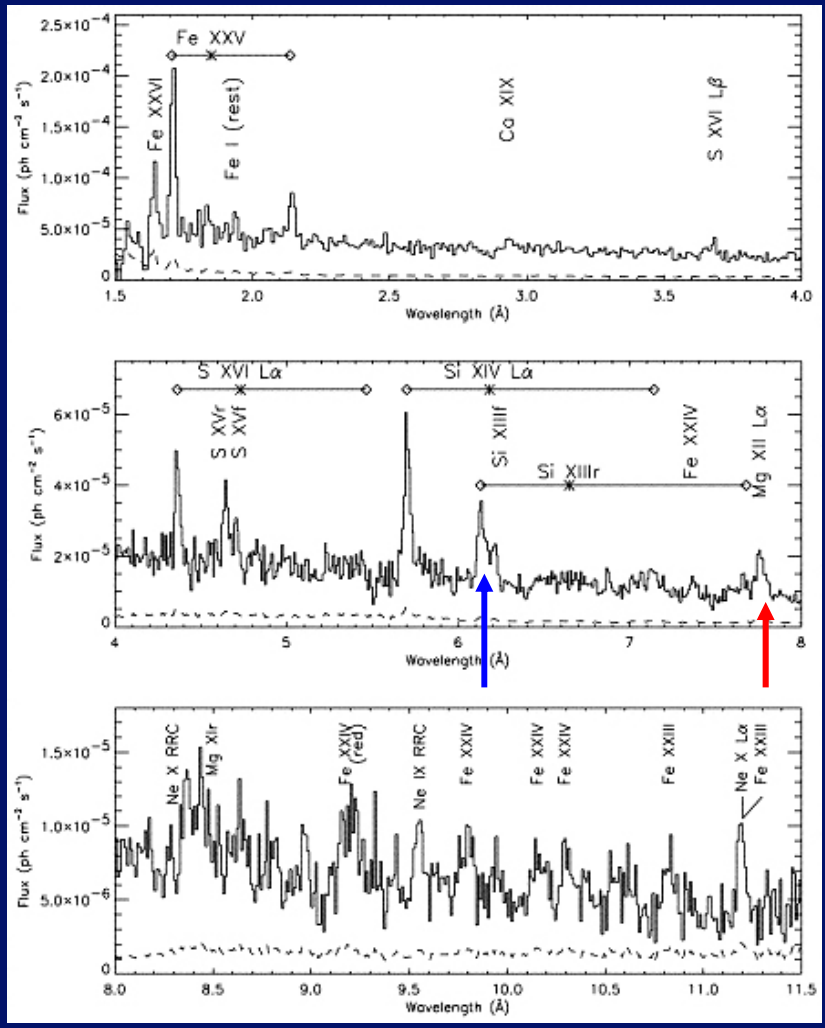
VELA X-1



M.Sako

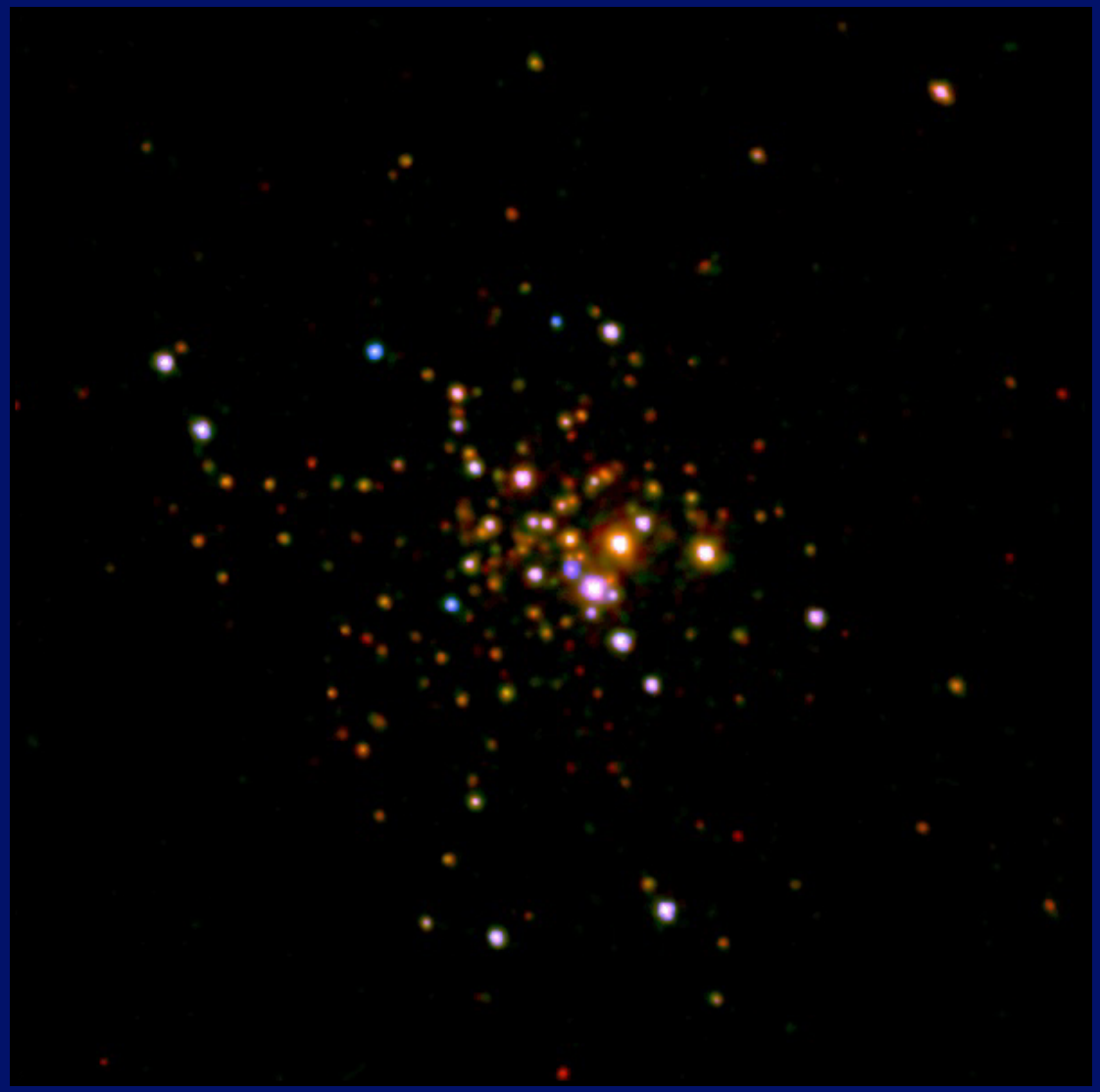
SS 433





Marshall, Canizares, and Schulz 2002, Migliari et al. 2002, Lopez et al. 2005

GLOBULAR CLUSTERS – 47 TUC



Heinke et al. 2005

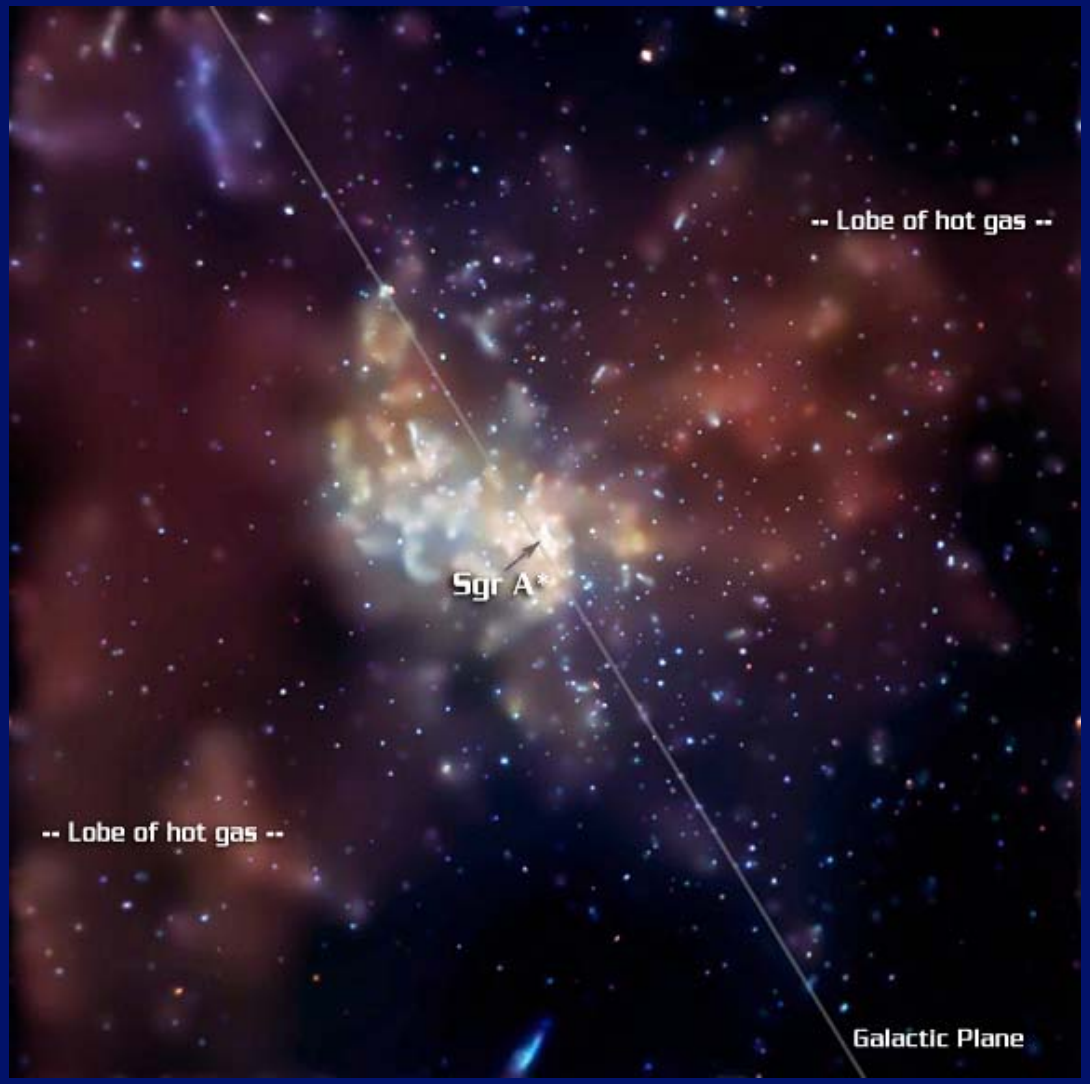
GALACTIC CENTER -1-

48’

Wang et al. 2002

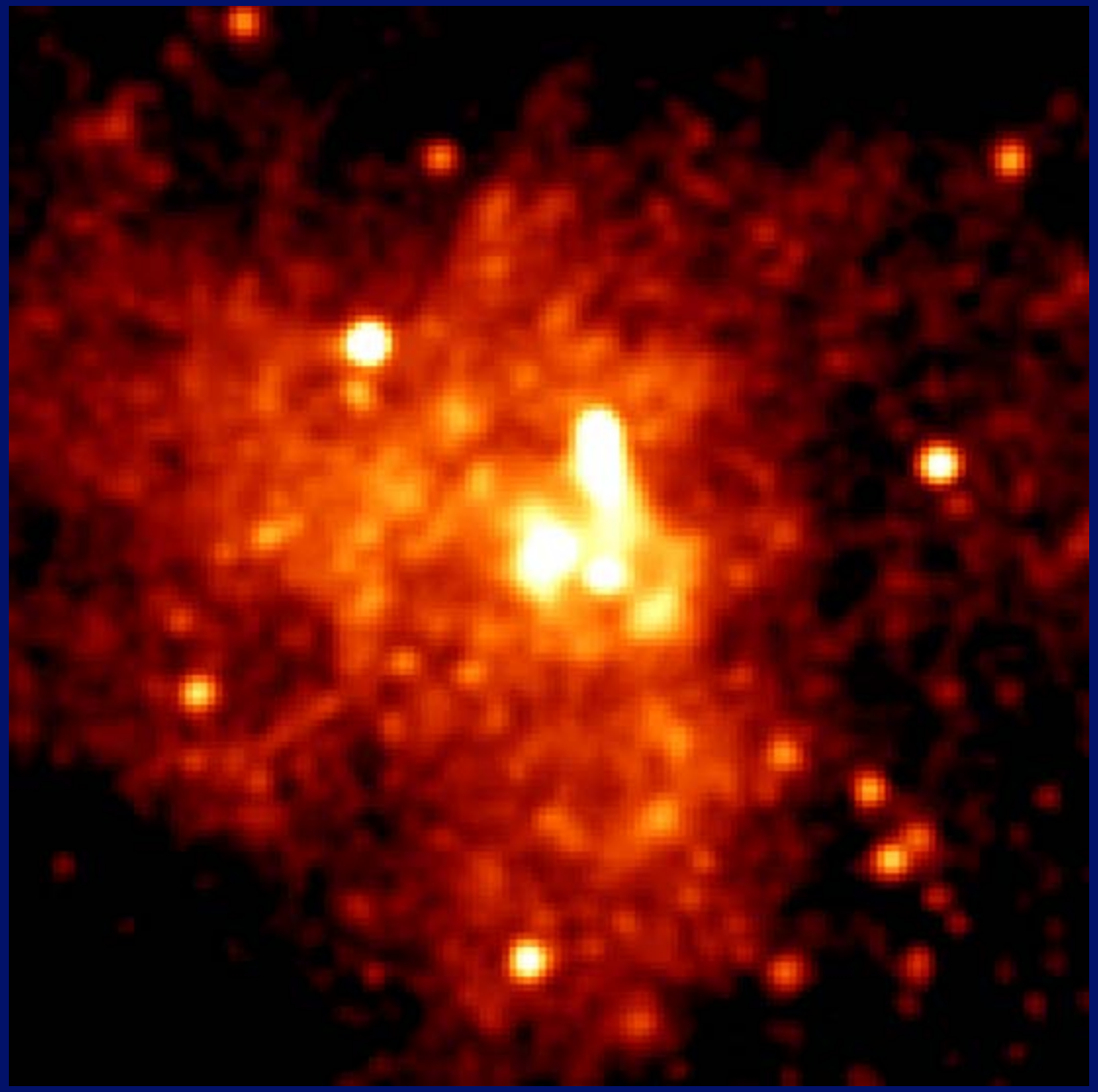
GALACTIC CENTER -2-

8.4’



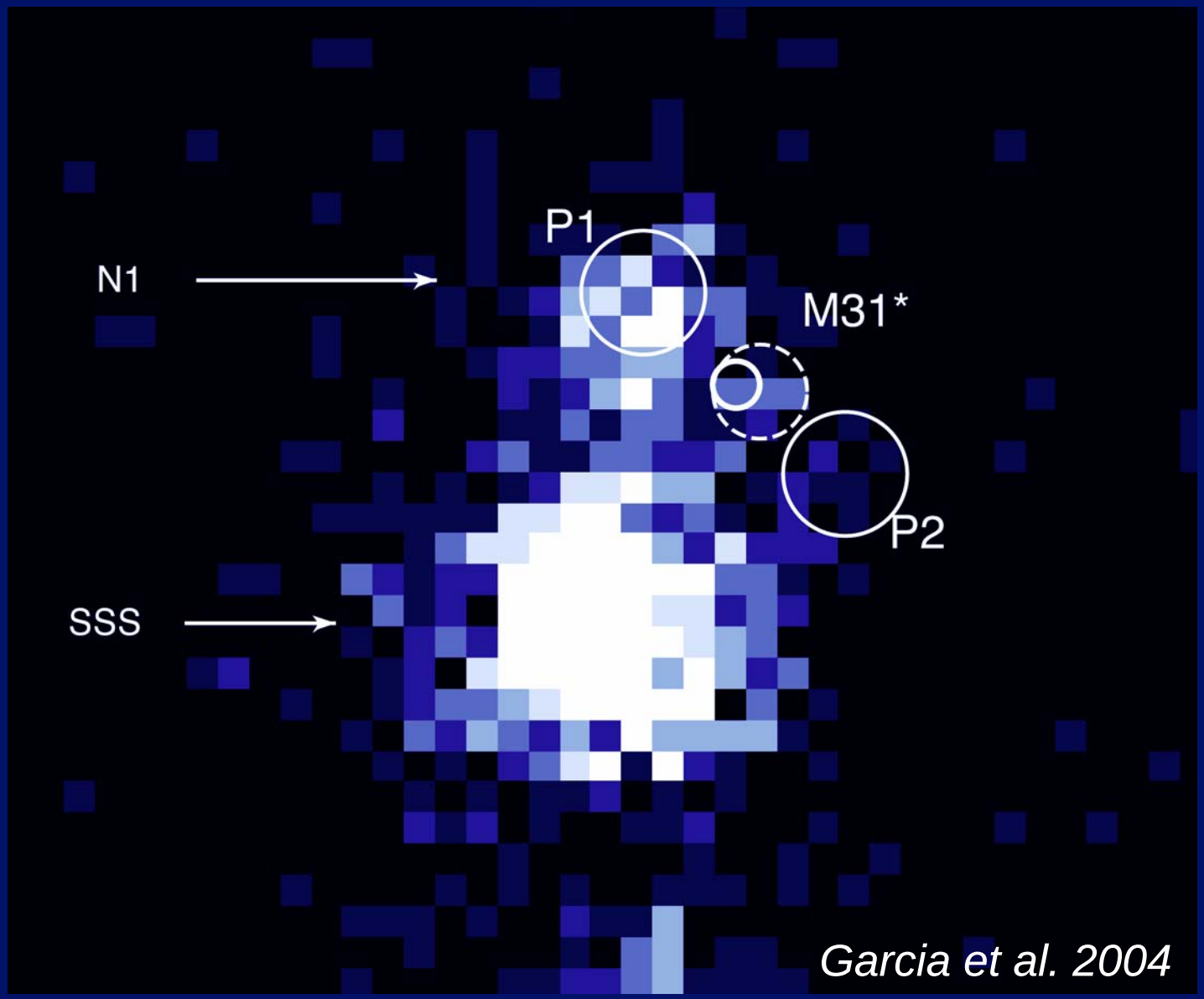
Baganoff et al. 2003

GALACTIC CENTER -zoom in-



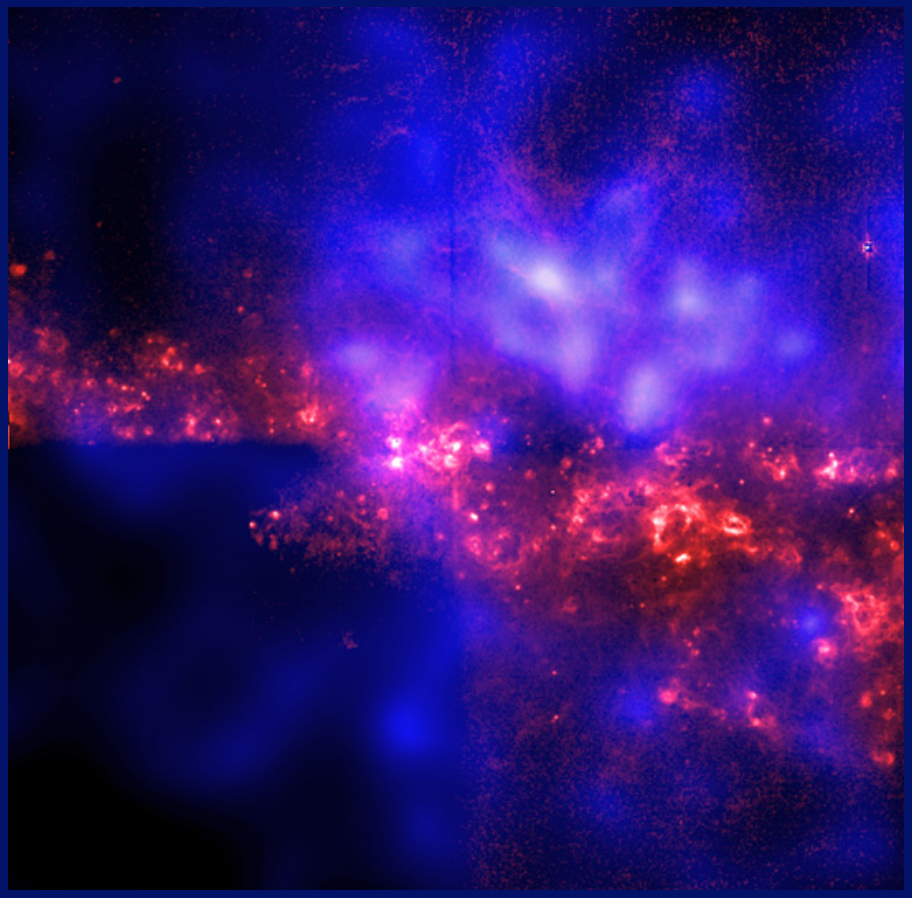
Baganoff et al. 2003

HRC Image of Nuclear Region of M31



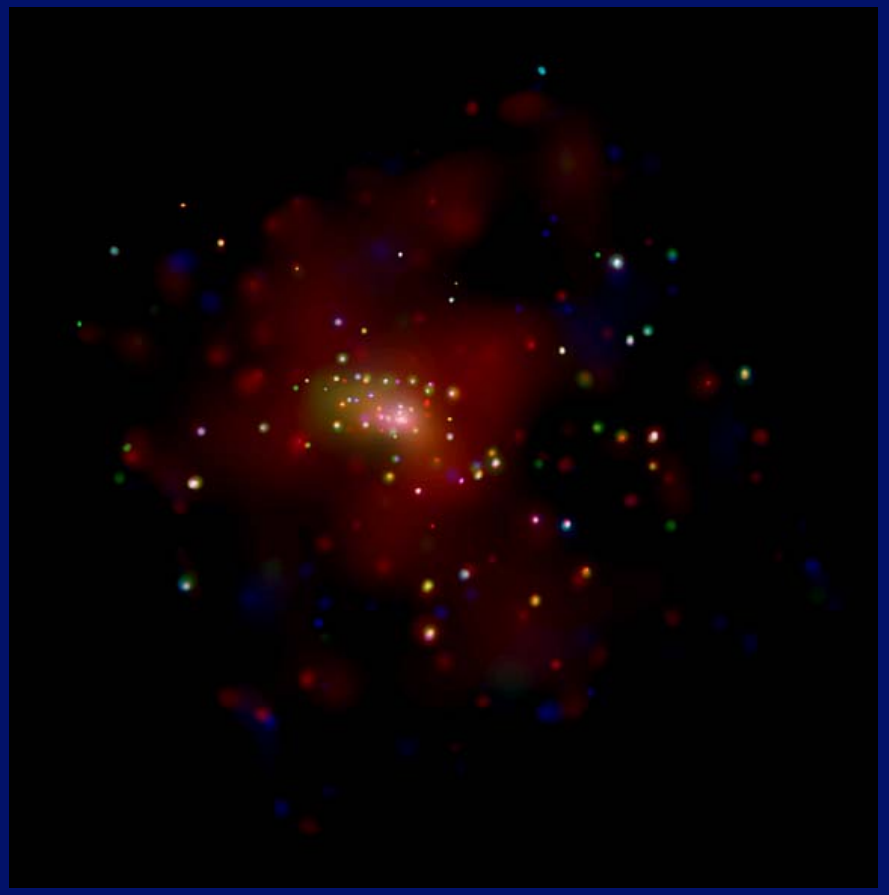
Spiral & Elliptical Galaxies

NGC 4631



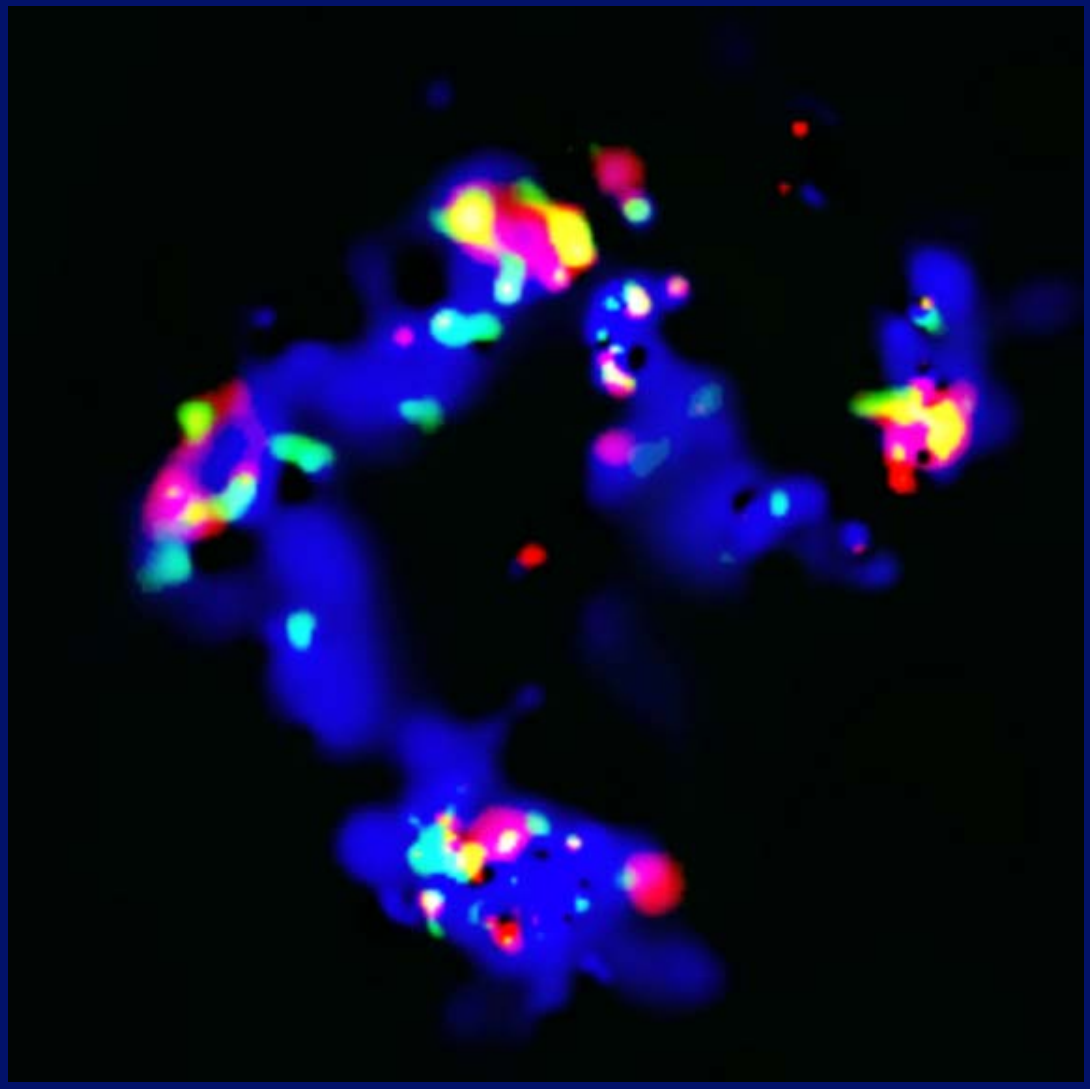
D. Wang et al. 2001

NGC 4697



Sarazin et al. 2002

The Antennae



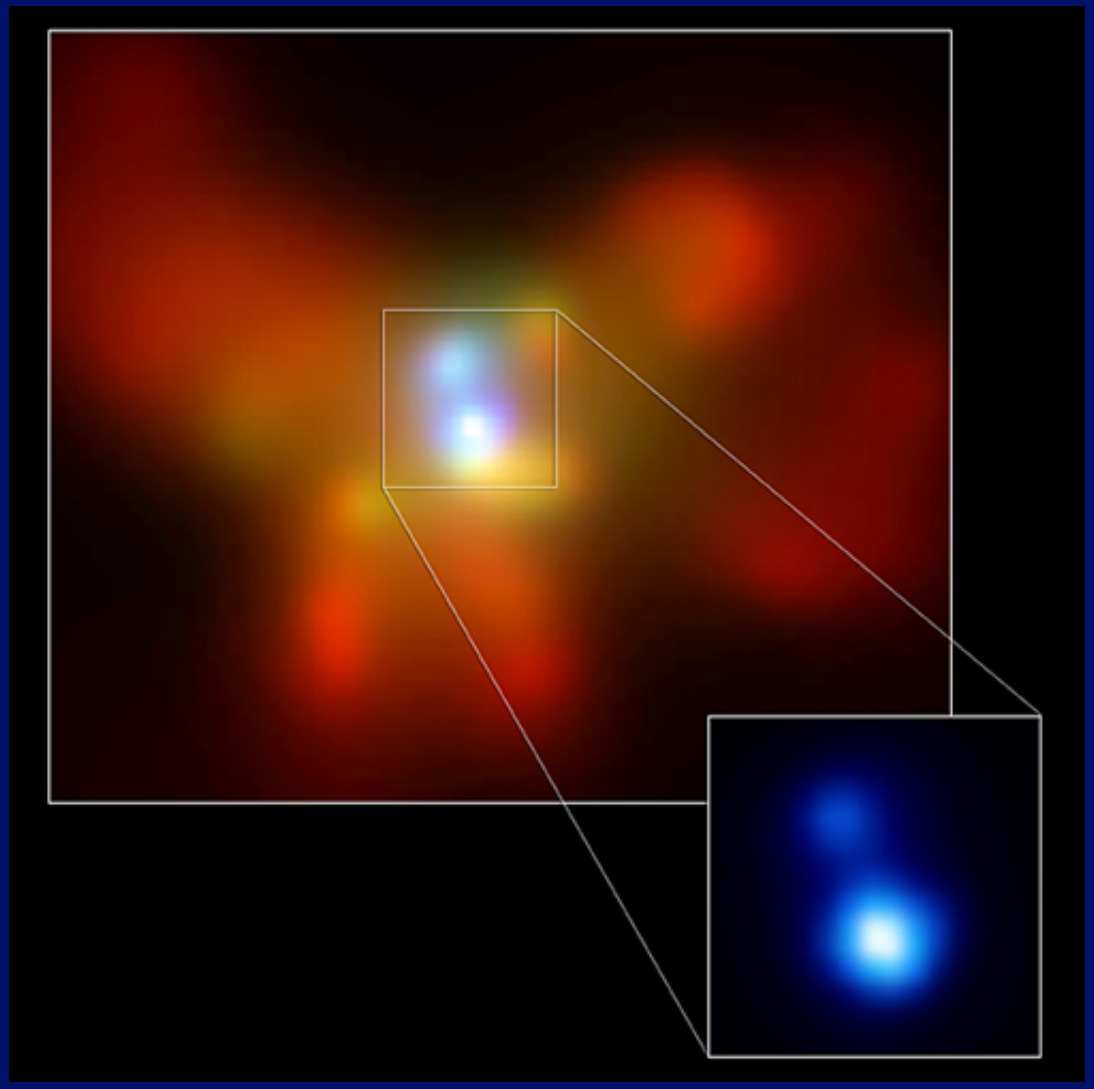
Red = Fe

Green = Mg

Blue = Si

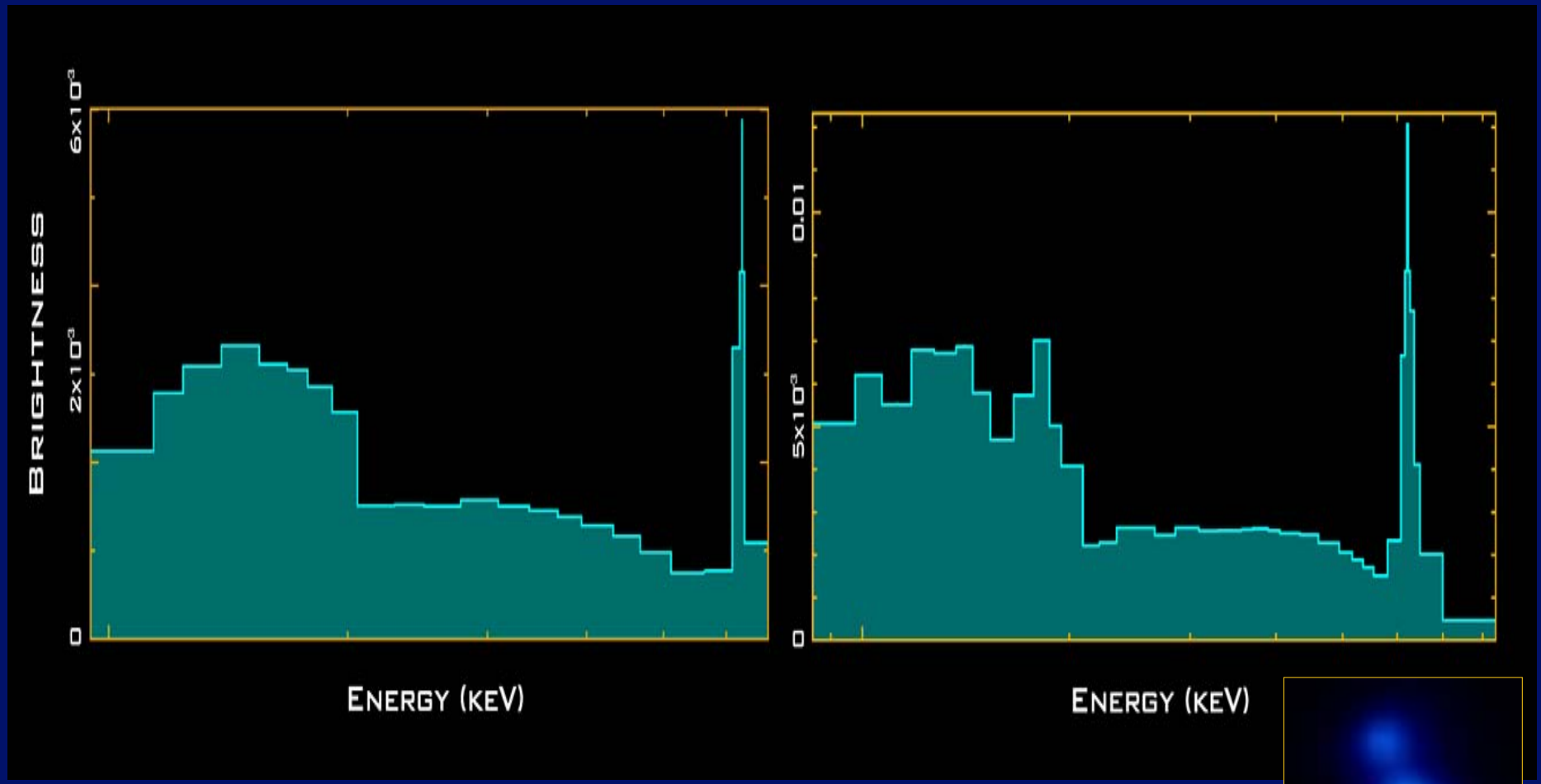
Fabbiano et al. 2004

NGC 6240



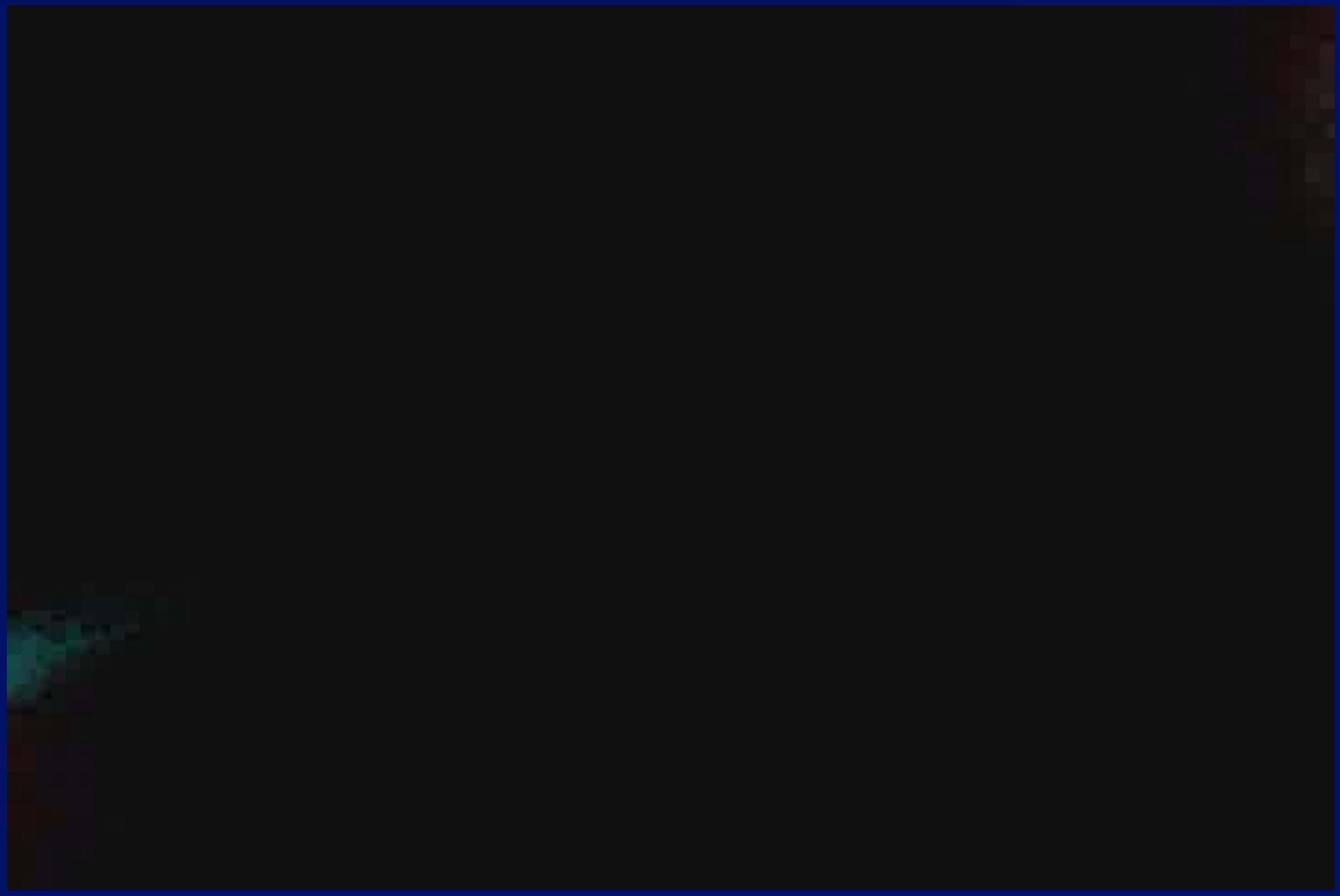
Komossa et al. 2002

NGC 6240



Komossa et al. 2002

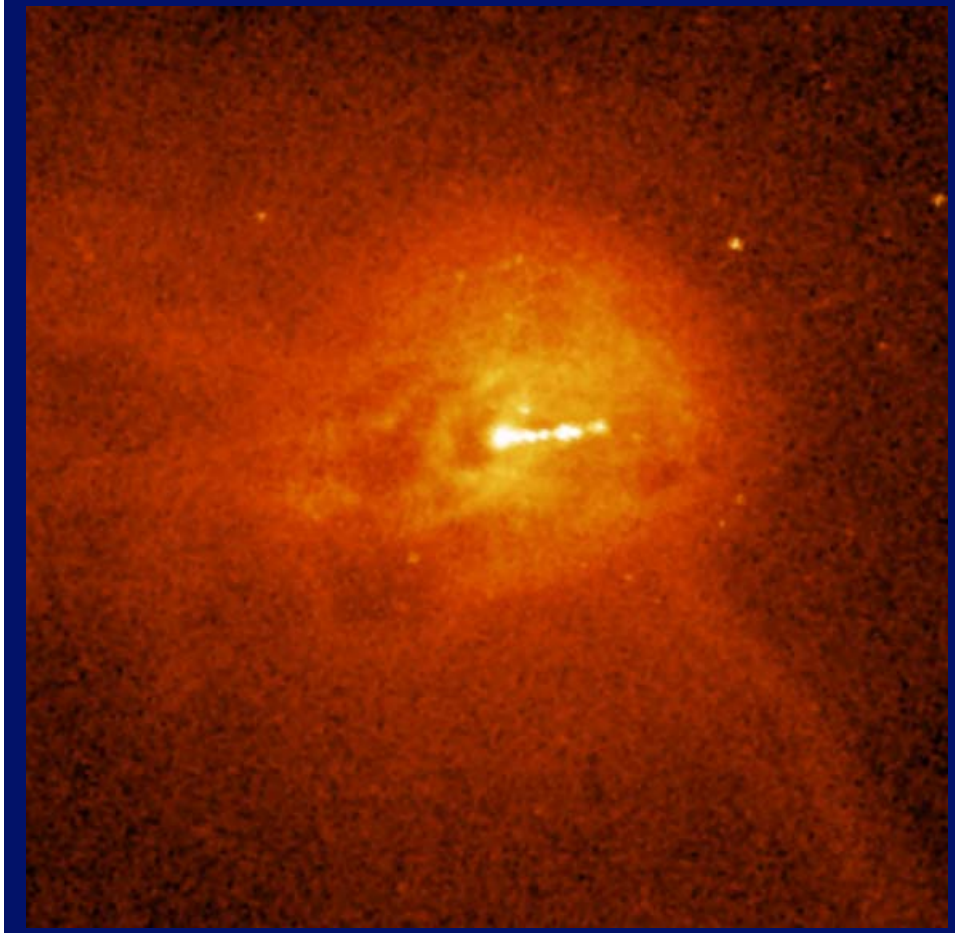
NGC 6240



CHANDRA

JETS

M87



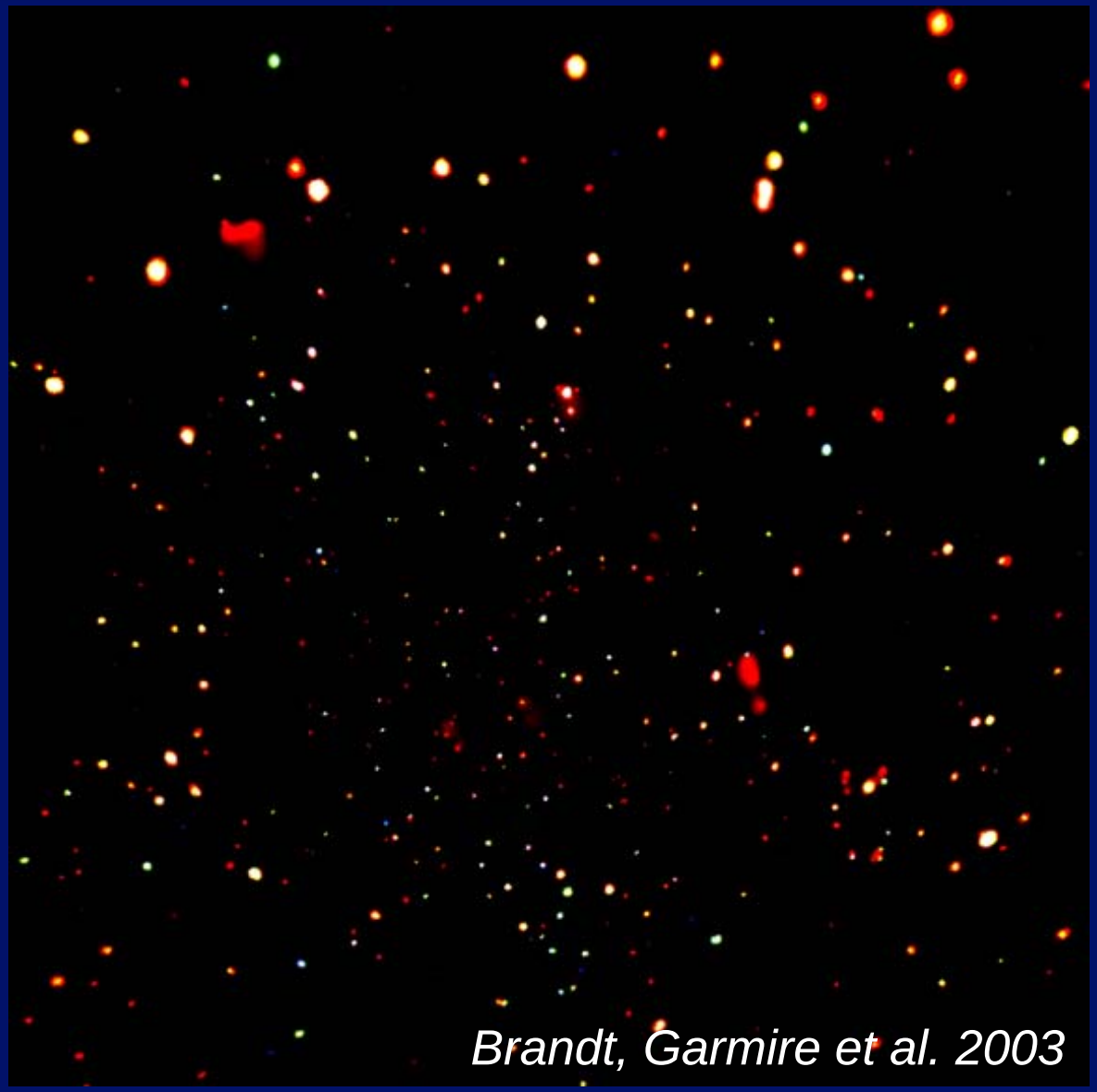
Forman et al. 2004

GB 1508+5714

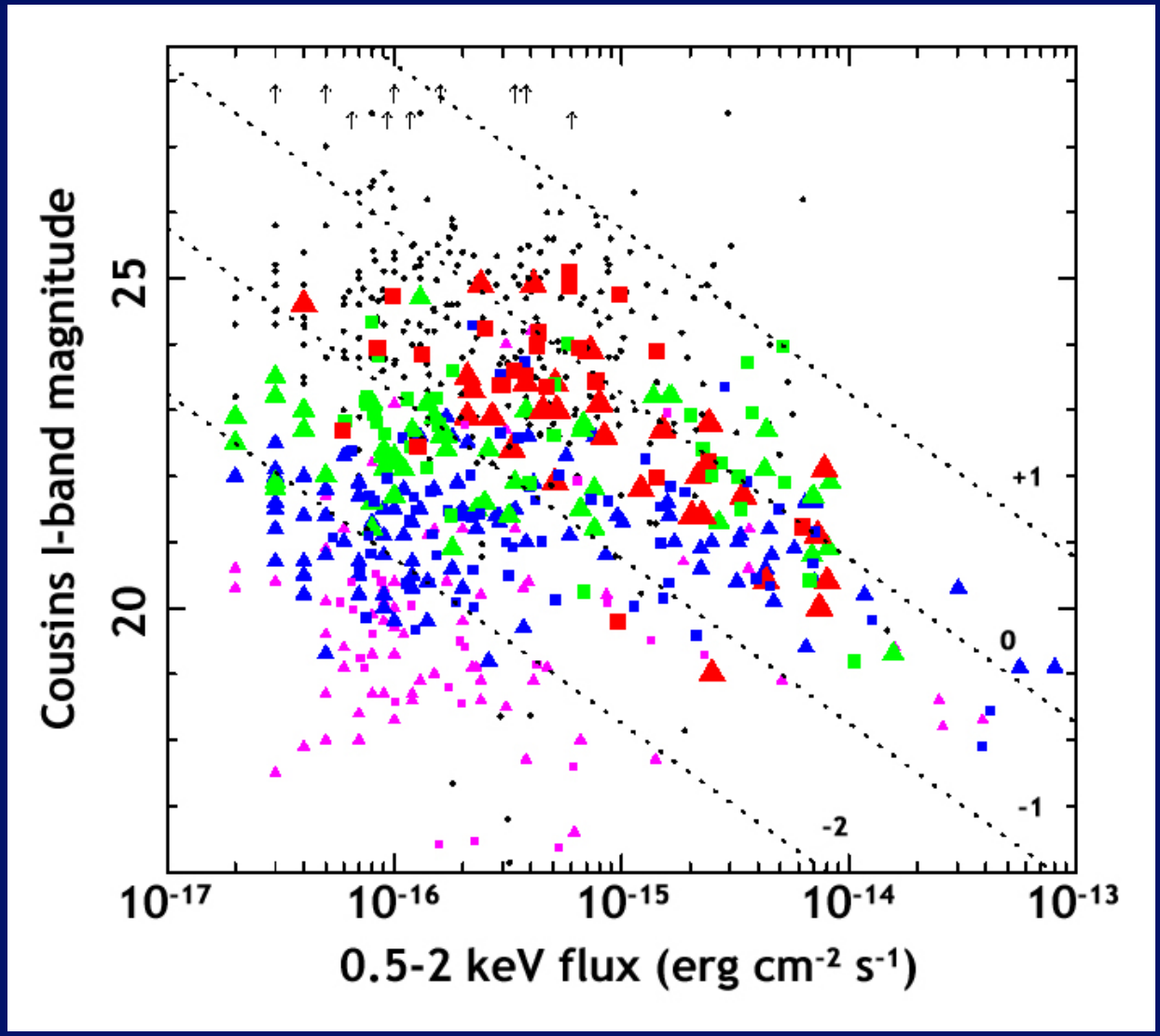
Jet at Redshift 4.3

Siemiginowska et al. 2003

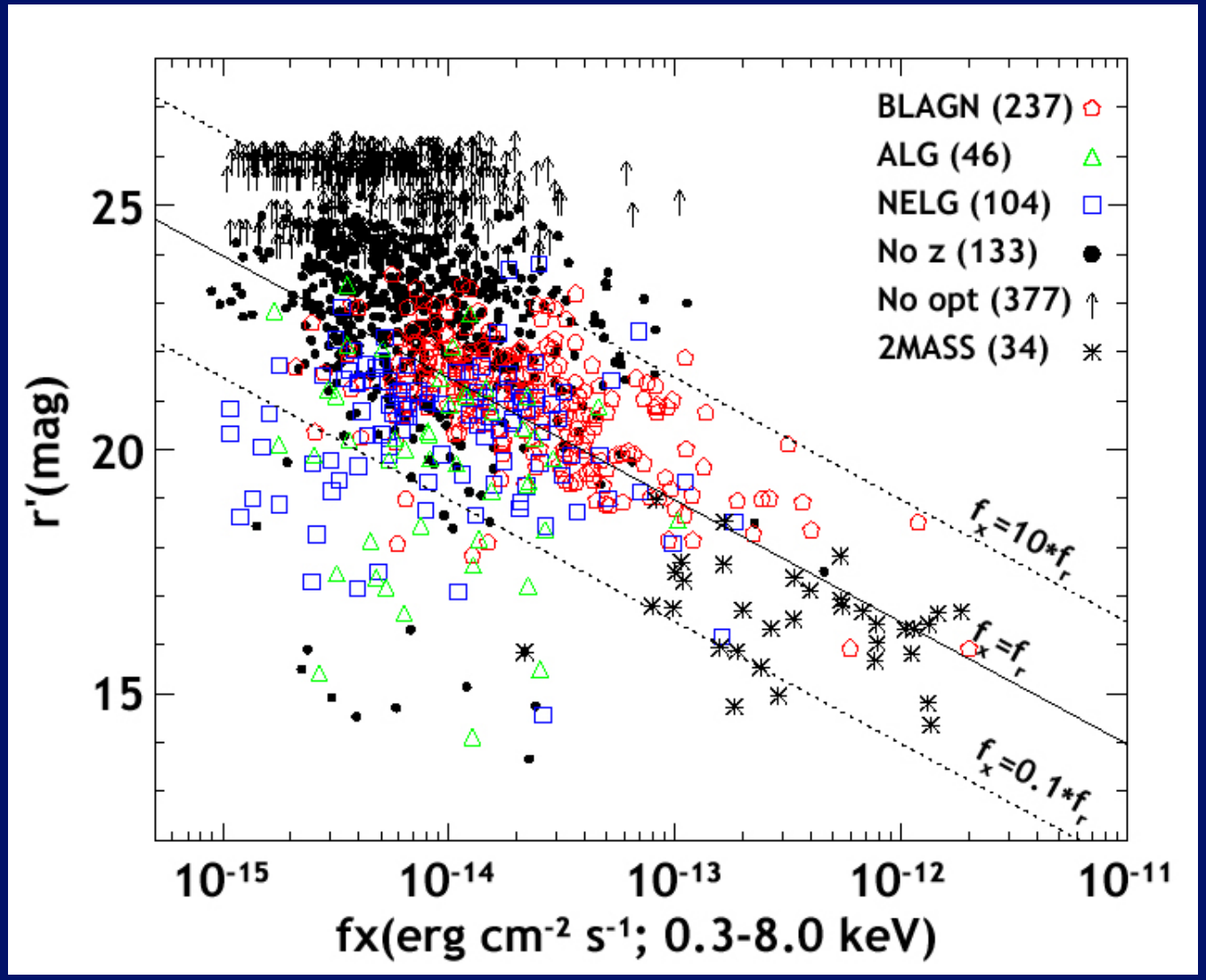
Chandra Deep Field North



Optical-X-ray Brightness for Chandra Deep Field Sources



Optical-X-ray Brightness for ChaMP Sources



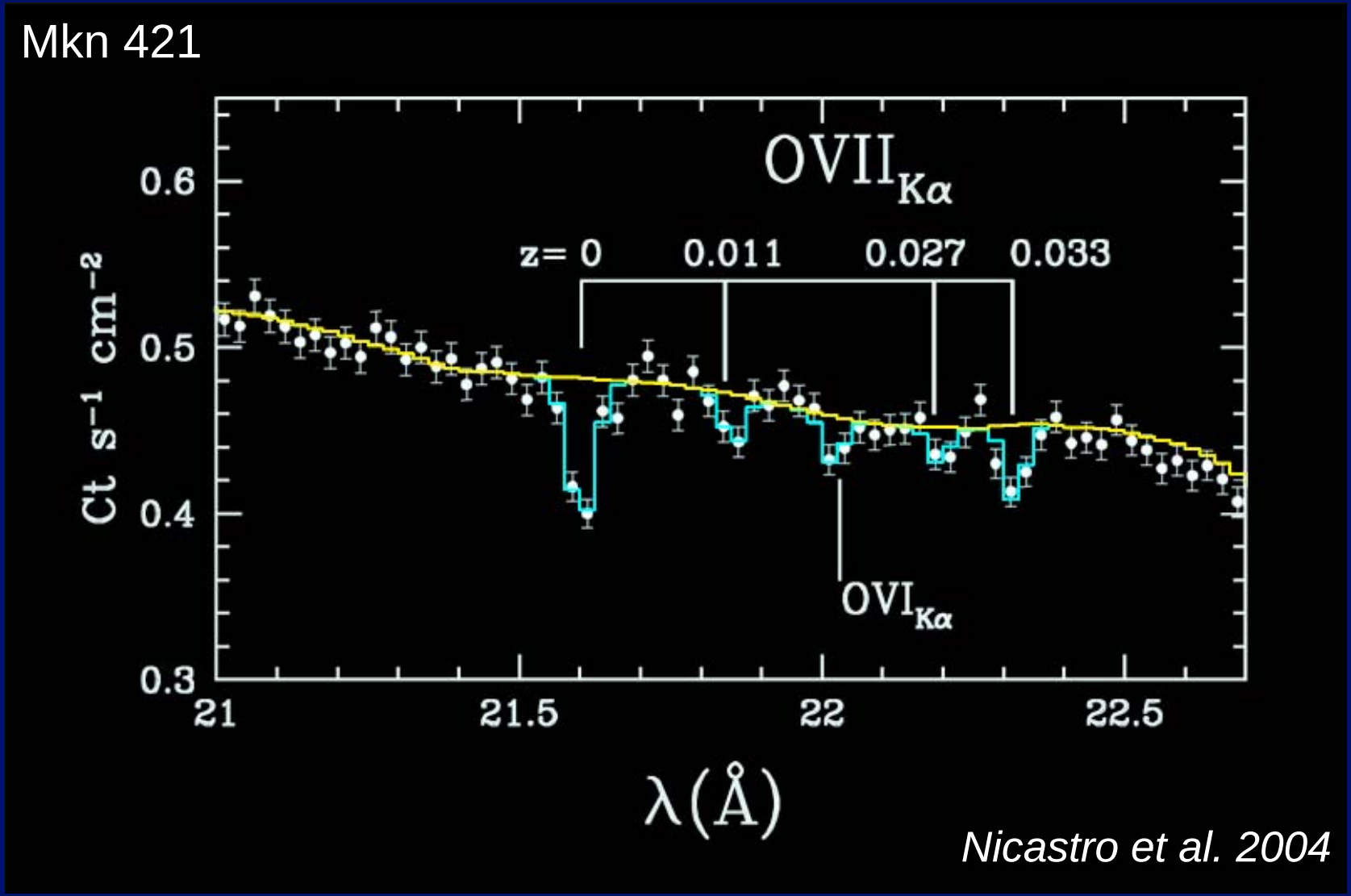
Silverman et al. 2004

CHANDRA (and XMM-Newton) View of AGNs

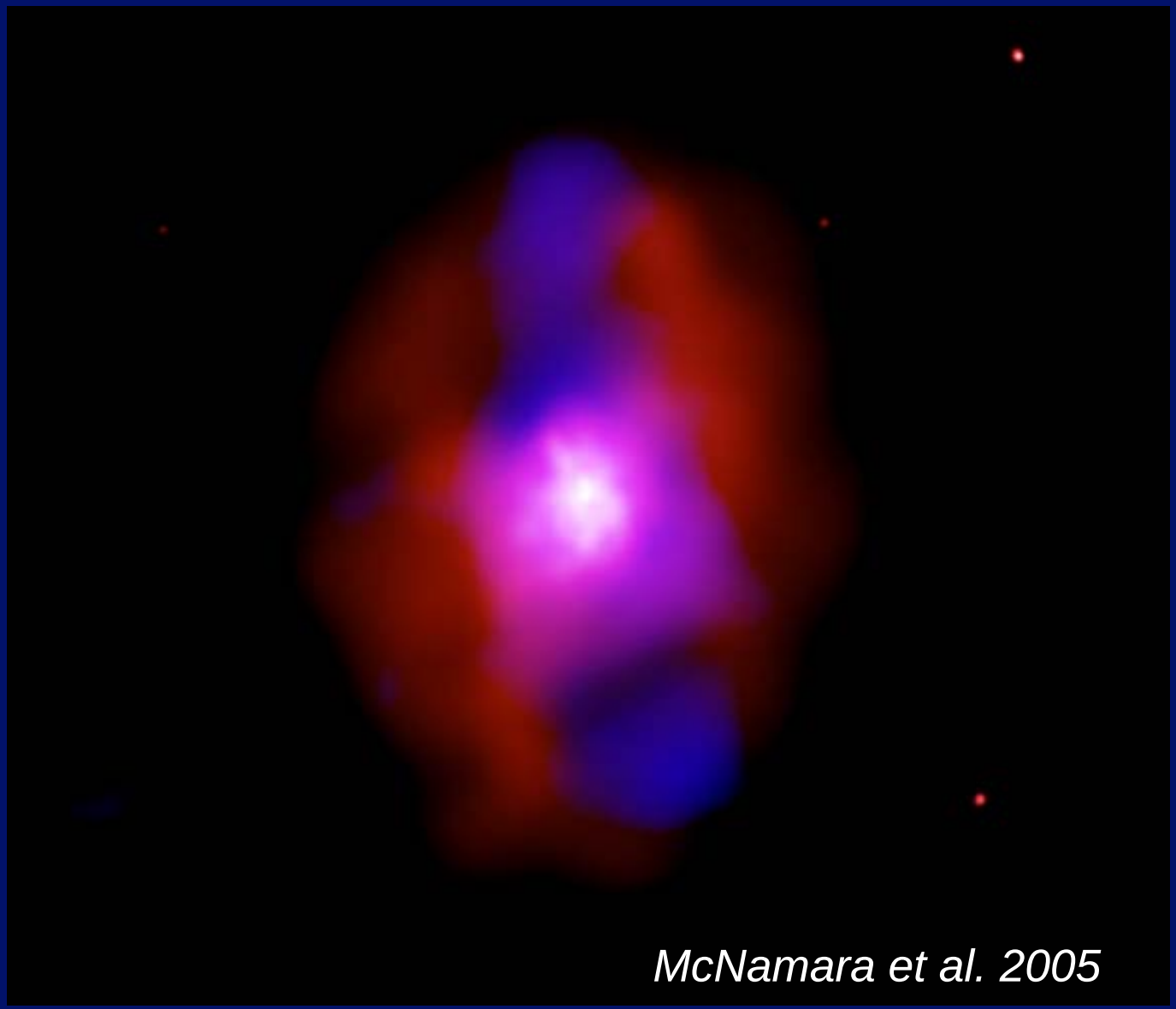
CHANDRA (and XMM-Newton) View of AGNs

CHANDRA (and XMM-Newton) View of AGNs

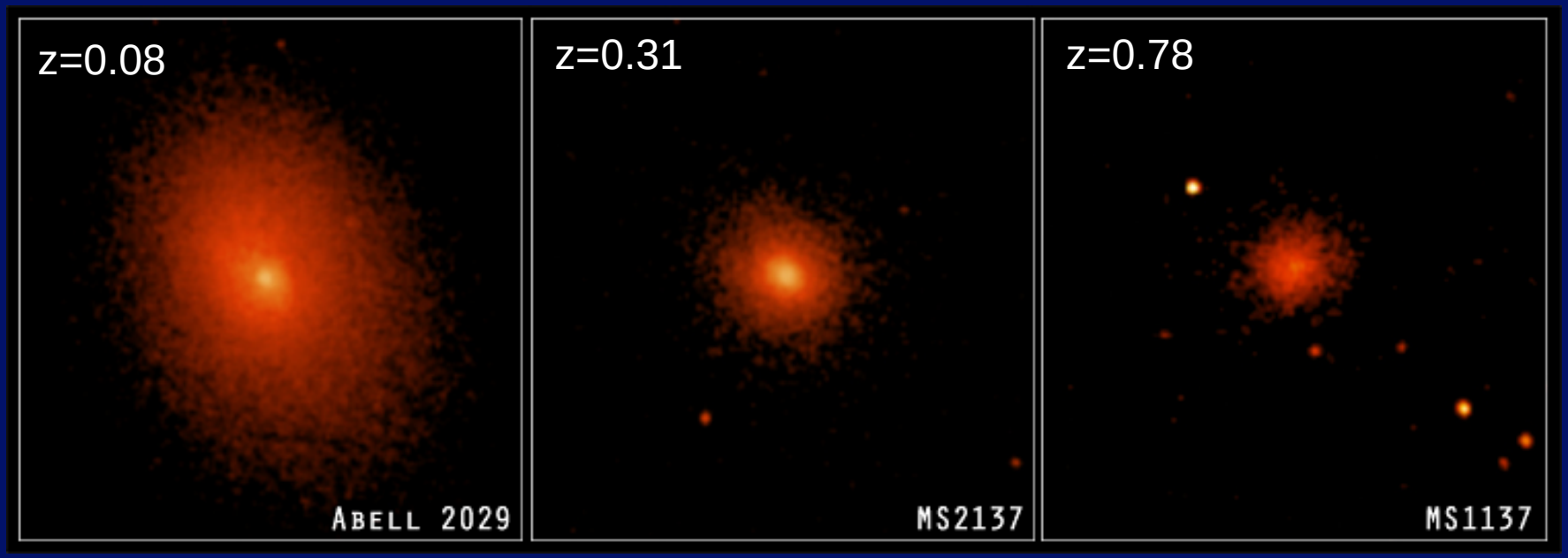
SEARCHING FOR MISSING BARYONS IN THE WHIM



MS 0735.6+7421

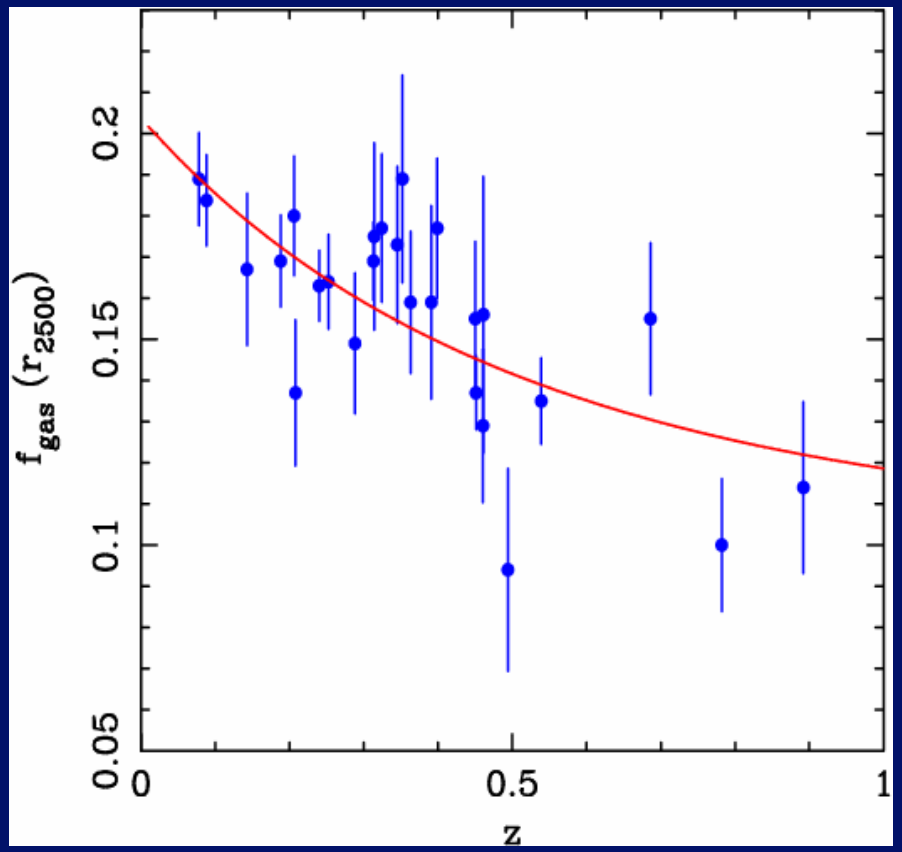


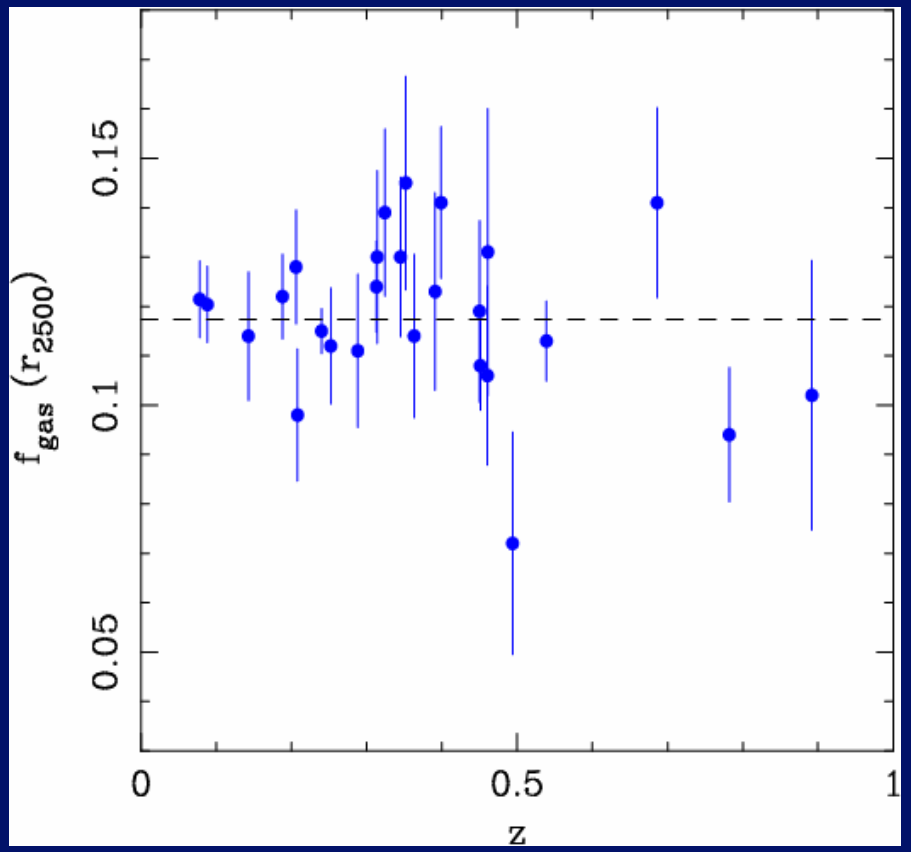
CHANDRA OBSERVATIONS OF CLUSTERS TO STUDY DARK MATTER & DARK ENERGY



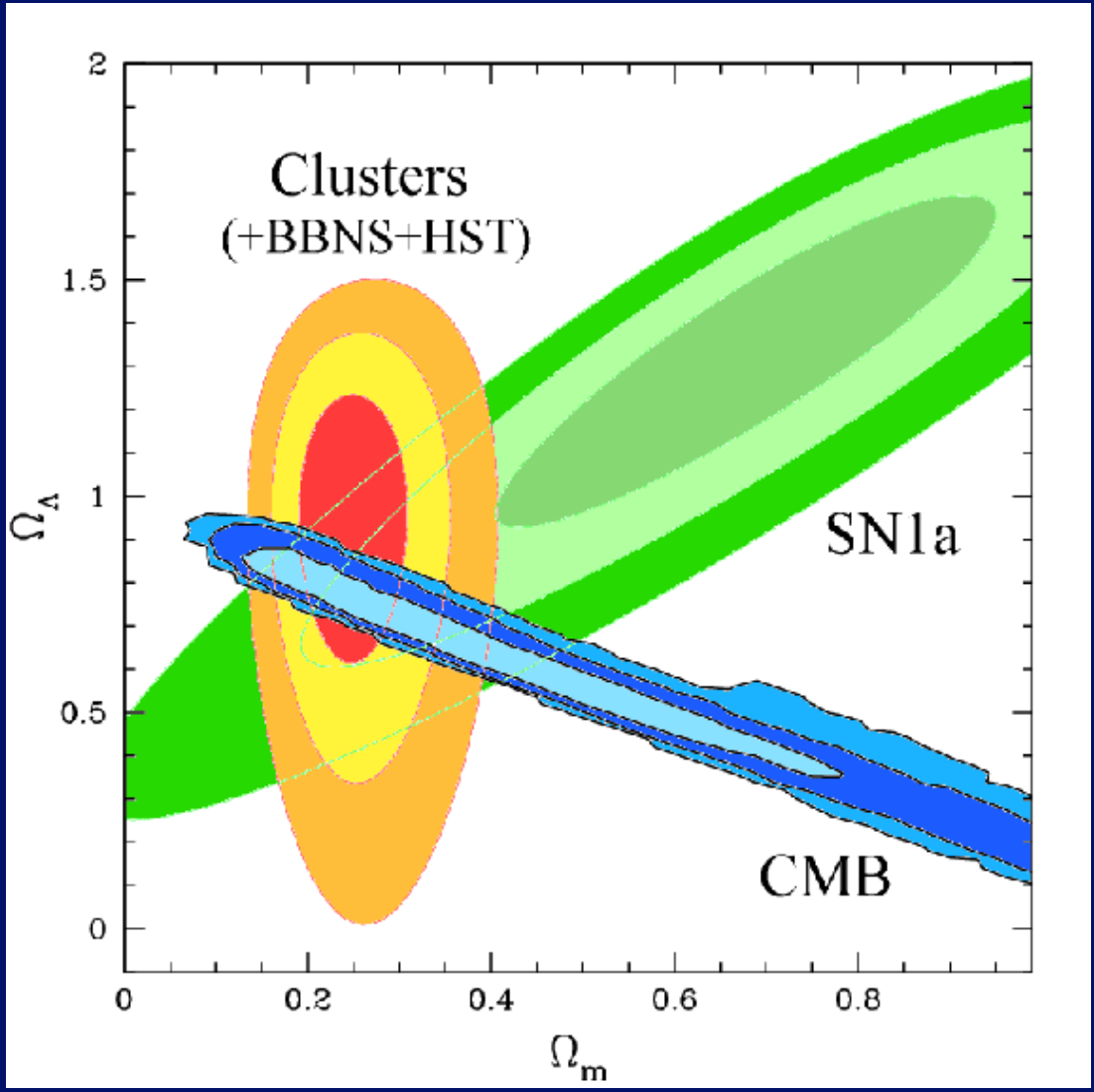
Allen et al. 2004

RATIO OF BARYONIC TO DARK MATTER VS REDSHIFT



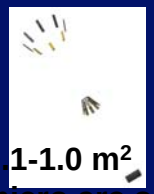


Dark Matter & Dark Energy Parameters



Allen et al. 2004

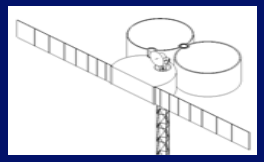
finer imaging



0.1-1.0 m²
0.1 micro arc sec

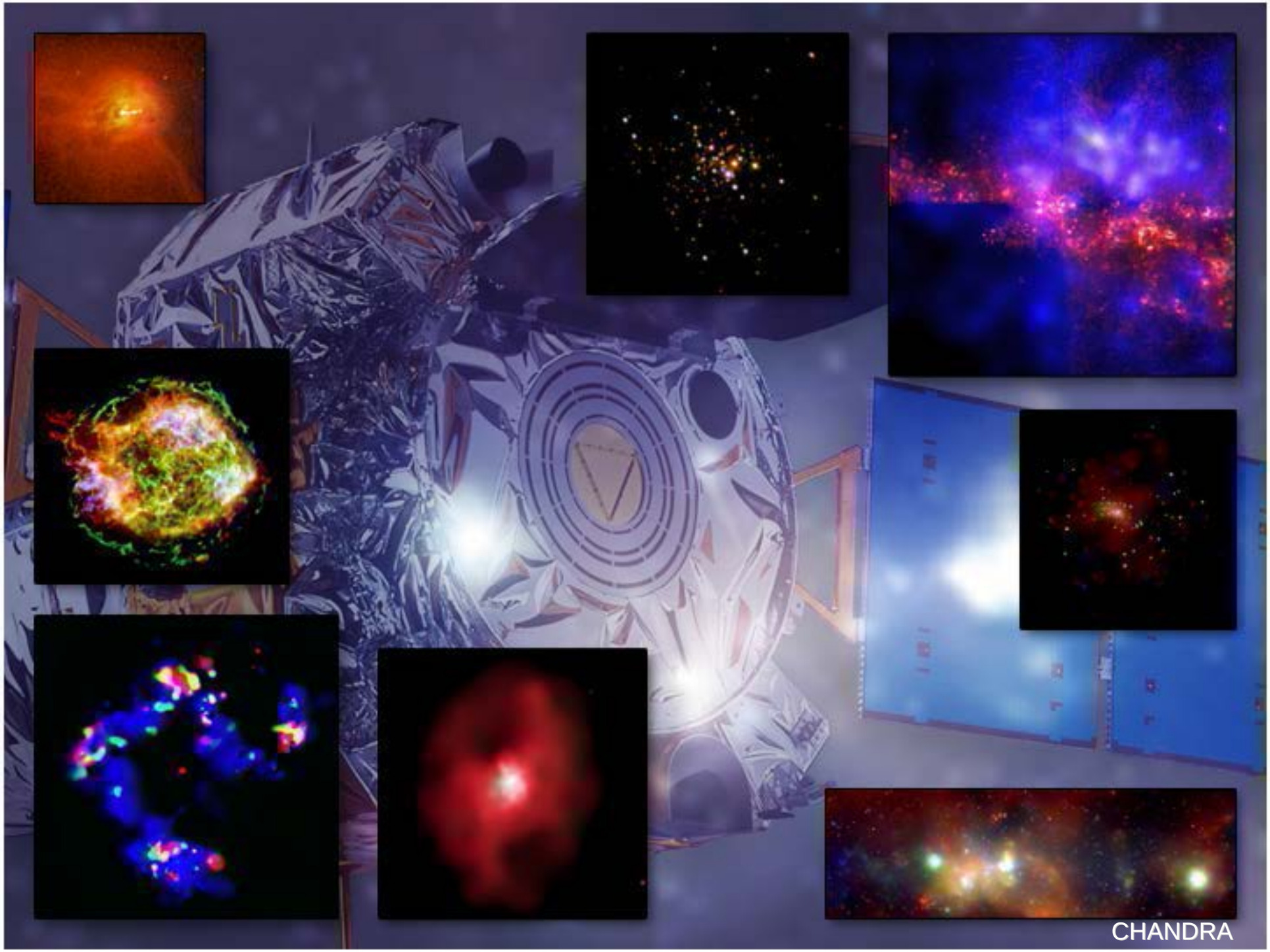
Generation-X

1000 times deeper X-ray imaging



50-150 m²
0.1-1 arc sec

CHANDRA


CHANDRA