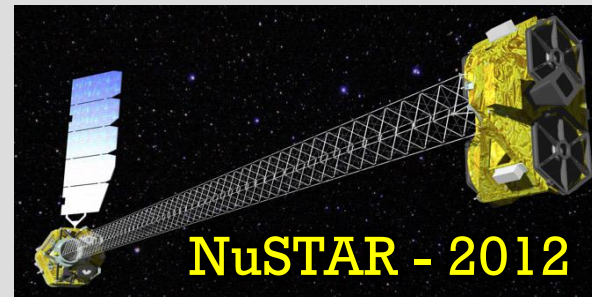
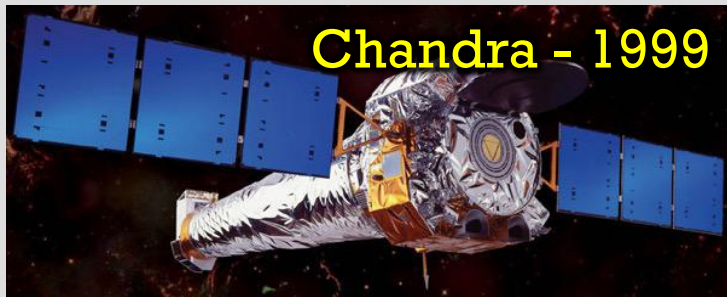
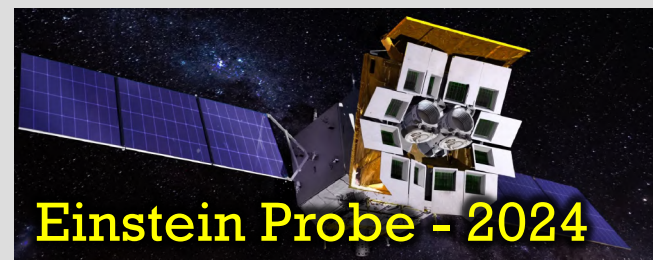
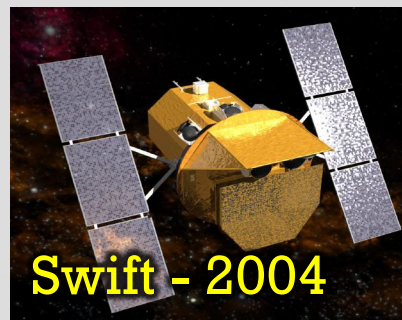


From Deep to Wide: Mapping the Evolving Universe Through Extragalactic X-ray Surveys

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For More Information

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REVIEW PAPER

Cosmic X-ray surveys of distant active galaxies

The demographics, physics, and ecology of growing supermassive black holes

W. N. Brandt · D. M. Alexander

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Abstract We review results from cosmic X-ray surveys of active galactic nuclei (AGNs) over the past ≈ 15 years that have dramatically improved our understanding of growing supermassive black holes in the distant universe. First, we discuss the utility of such surveys for AGN investigations and the capabilities of the missions making these surveys, emphasizing *Chandra*, *XMM-Newton*, and *NuSTAR*. Second, we briefly describe the main cosmic X-ray surveys, the essential roles of complementary multi-wavelength data, and how AGNs are selected from these surveys. We then review key results from these surveys on the AGN population and its evolution (“demographics”), the physical processes operating in AGNs (“physics”), and the interactions between AGNs and their environments (“ecology”). We conclude by describing some significant unresolved questions and prospects for advancing the field.

Keywords Surveys · Cosmology: observations · Galaxies: active · Galaxies: nuclei · Galaxies: Seyfert · Galaxies: quasars · Galaxies: evolution · Black hole physics

X-Ray Cluster Cosmology

Nicolas Clerc and Alexis Finoguenov

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Surveys of the Cosmic X-ray Background

W.N. Brandt* and G. Yang

Abstract We provide a highly concise overview of what X-ray surveys and their multiwavelength follow-up have revealed about the nature of the cosmic X-ray background (CXRB) and its constituent sources. We first describe early global studies of the CXRB, the development of imaging CXRB surveys, and the resolved CXRB fraction. Second, we detail the sources detected in CXRB surveys describing their identification, classification, and basic nature. Third, since active galactic nuclei (AGNs) are the main contributors to the CXRB, we discuss some key insights about their demographics, physics, and ecology that have come from CXRB surveys. Finally, we highlight future prospects for the field.

Keywords Surveys; Cosmic X-ray background; Cosmology; observations; Galaxies: active; Galaxies: evolution; Galaxies: clusters; Galaxies: groups; X-ray astronomy

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The *Chandra* deep fields: Lifting the veil on distant active galactic nuclei and X-ray emitting galaxies

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ABSTRACT

The *Chandra* Deep Fields (CDFs), being a major thrust among extragalactic X-ray surveys and complemented effectively by multiwavelength observations, have critically contributed to our dramatically improved characterization of the 0.5–8 keV cosmic X-ray background sources, the vast majority of which are distant active galactic nuclei (AGNs) and starburst and normal galaxies. In this review, I highlight some recent key observational results, mostly from the CDFs, on the AGN demography, the interactions between AGNs and their host galaxies, the evolution of non-active galaxy X-ray emission, and the census of X-ray galaxy groups and clusters through cosmic time, after providing the necessary background information. I then conclude by summarizing some significant open questions and discussing future prospects for moving forward.

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15 years of galactic surveys and hard X-ray background measurements

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ABSTRACT

The *INTEGRAL* hard X-ray surveys have proven to be of fundamental importance. *INTEGRAL* has mapped the Galactic plane with its large field of view and excellent sensitivity. Such hard X-ray snapshots of the whole Milky Way on a time scale of a year are beyond the capabilities of past and current narrow-FOV grazing incidence X-ray telescopes. By expanding the *INTEGRAL* X-ray survey into shorter timescales, a productive search for transient X-ray emitters was made possible. In more than fifteen years of operation, the *INTEGRAL* observatory has given us a sharper view of the hard X-ray sky, and provided the triggers for many follow-up campaigns from radio frequencies to gamma-rays. In addition to conducting a census of hard X-ray sources across the entire sky, *INTEGRAL* has carried out, through Earth occultation manoeuvres, unique observations of the large-scale cosmic X-ray background, which will without question be included in the annals of X-ray astronomy as one of the mission's most salient contributions to our understanding of the hard X-ray sky.