X-ray Emission from Supernova Remnants in Starburst Galaxies

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Abstract

The X-ray emission from starburst galaxies is due primarily to X-ray binaries and supernova remnants (SNRs). We present a detailed study of the SNR contribution. We have calculated the X-ray spectra of individual remnants in the Sedov evolutionary phase at a range of ages, using spectral modeling codes in the XSPEC software package. We consider a range of upstream densities ranging from 0.01 to 10.0 cm^{-3}. We calculate the total X-ray luminosities in the 0.5 to 7 keV range, and produce an X-ray luminosity history profile for each remnant. These luminosity profiles rise steeply and appear to peak at a mean post-shock temperature of a few tenths of a keV. By combining the profiles for many different supernova remnants, we are able to describe the overall X-ray luminosity profile resulting from supernova remnants for an entire starburst galaxy for different assumptions about the star formation history, distribution of stellar masses, and supernova environment. We also examine the predicted spectra in detail, convolving them with the Chandra instrument response to produce predictions that can be directly compared to data obtained from Chandra. We hope to find spectral signatures of supernovae that would distinguish them from X-ray binaries, even in galaxies too distant to separate the point sources spatially. Since the X-ray spectrum of the remnant can give us a relative indication of heavy element abundances and their relative distributions, a clearer understanding of how these heavy elements become distributed throughout the galaxy can, in turn, be applied to theories of stellar evolution and planet formation.

CATEGORY: SUPERNOVAE, SUPERNOVA REMNANTS AND ISOLATED NEUTRON STARS