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Tracing evolutionary processes in stellar disks in nearby dwarf galaxies from X-ray light

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Overview

- Low-level star formation is observed in dwarf irregular galaxies and in the outer disks of spirals even though the gas surface density is below the critical threshold for gravitational instability. Stellar feedback, in the form of hot gas (T ~10^7 K - emitting **X-rays**) can drive shells and compress existing clouds in the outer region of the galaxy to densities above the critical threshold to trigger star formation.

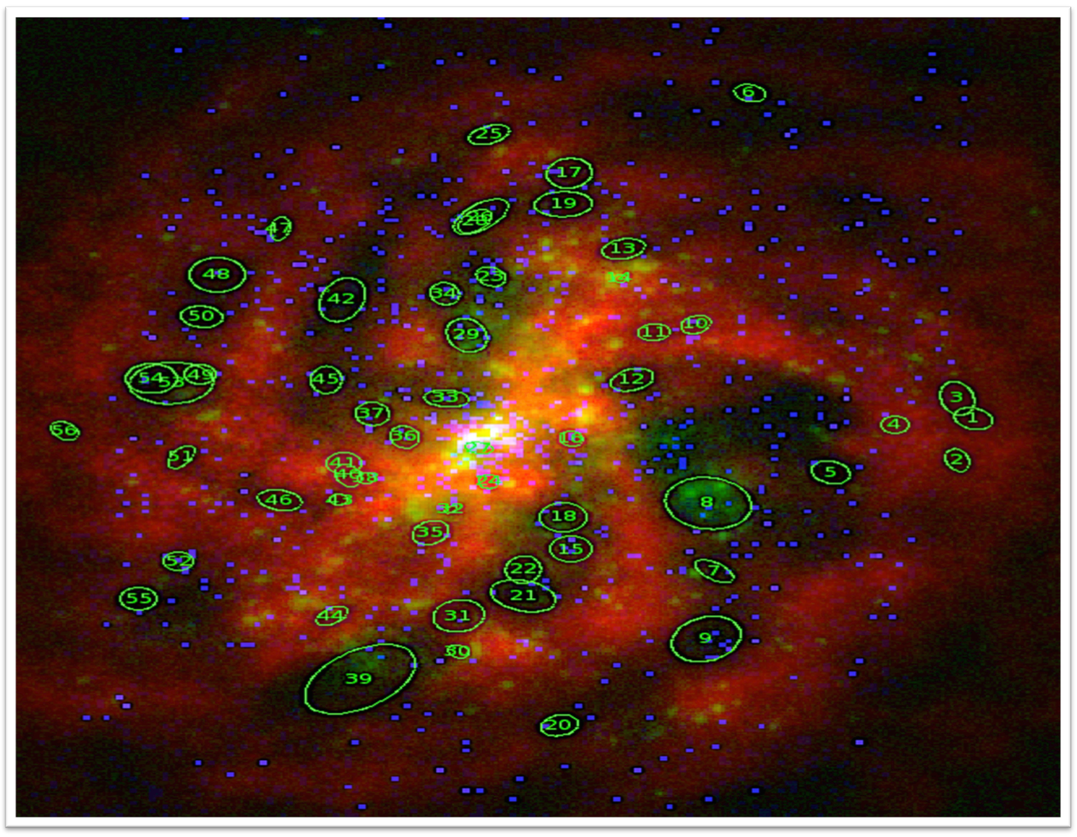

Figure1-: Three color image of NGC 4214 with the location of HI holes superimposed, shows Far Ultra Violet (FUV) and X-ray in HI holes. Cold HI gas is shown in red, young star FUV emission in green, and hot gas X-ray emission in blue.

Explanation

- At low gas densities, cooling times are long and hot gas does mechanical work to sweep up the inter stellar medium into cool shells, resulting in low X-ray luminosities per unit mechanical luminosity input from star formation (SF). At high densities, radiative cooling dominates and star-forming regions are relatively X-ray bright.

Impact

- Tracing stellar feedback in X-ray light will provide better understanding of what triggers star formation in outskirts of the dwarf galaxies.

Key Findings

✸ *The X-ray surface brightness seems to follow the recent star formation traced by Far Ultra Violet (FUV). The centrally-peaked X-ray surface brightness indicates strong radiative cooling*

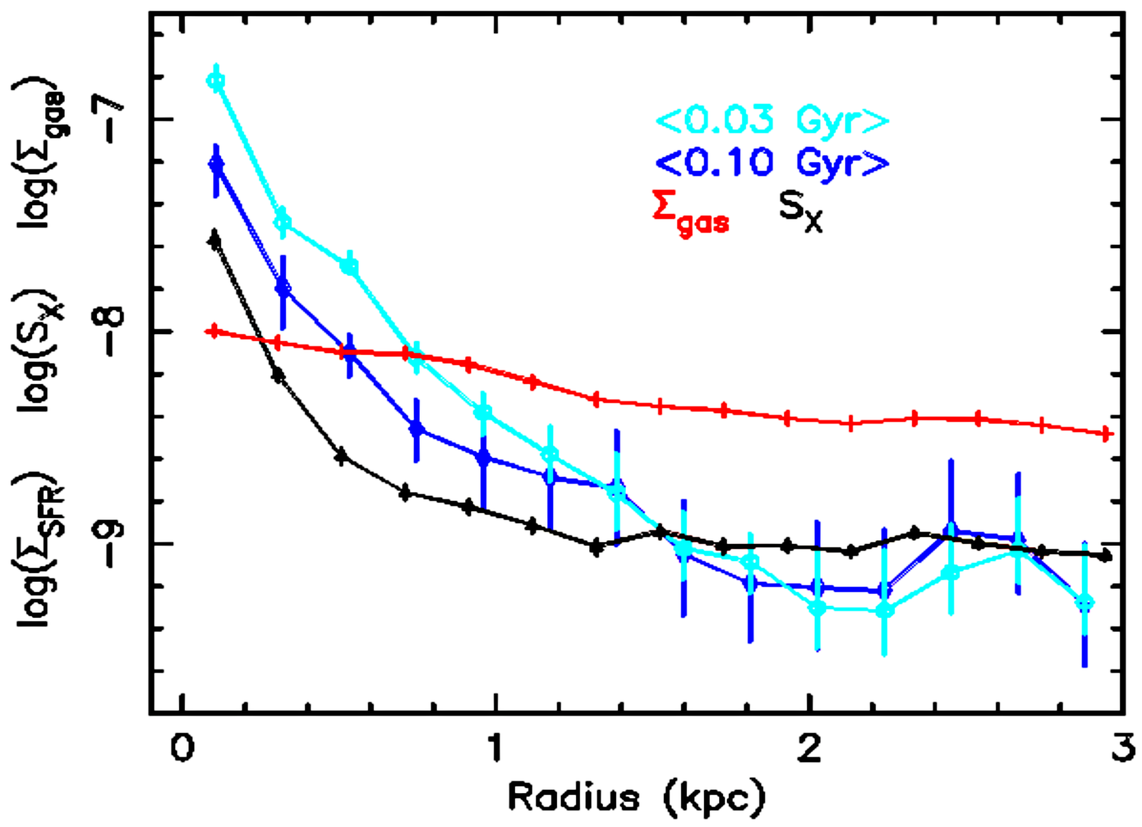

Figure2-: Radial profiles of the X-ray surface brightness is compared to the HI and to the most recent SFRs (<30 and <100 Myr) for NGC 4214.

✸ *Only young, highly-active, star-forming regions (traced by HI holes) in NGC 4214 show an excess of X-ray light.*

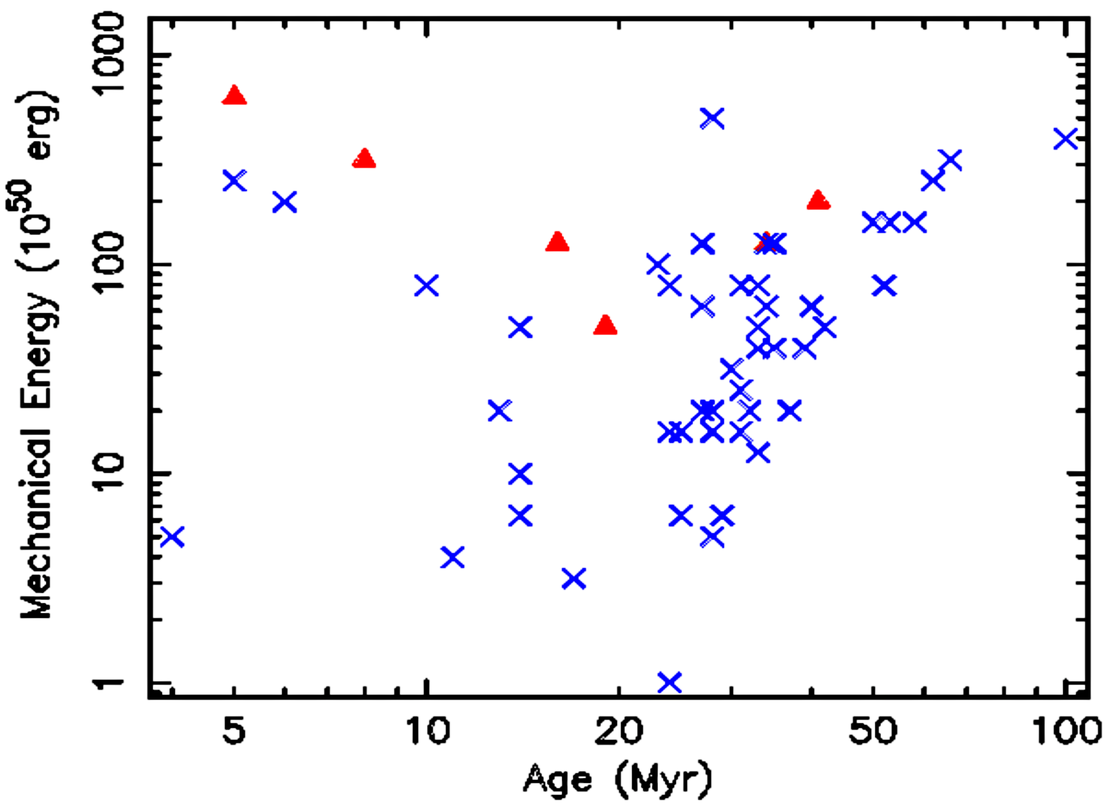

Figure3-: Mechanical energy input needed to create the HI holes is shown against their age (from Bagetakos et al. 2011- Figure1). Highlighted in red are those holes with significant X-ray excesses.

Acknowledgements

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