



Herschel/HerMES: The X-ray - Infrared correlation for star-forming galaxies at $z \sim 1$

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For the first time, we investigate the X-ray/infrared (IR) correlation for star-forming galaxies at $z \sim 1$, using SPIRE submm data from the recently-launched Herschel Space Observatory and deep X-ray data from the 2Ms Chandra deep field north (CDFN) survey. We examine the X-ray/IR correlation in the soft X-ray (SX, 0.5-2 keV) and hard X-ray (HX, 2-10 keV) bands by comparing our $z \sim 1$ SPIRE-detected star-forming galaxies (SFGs) to equivalently IR-luminous ($L_{\text{IR}} > 10^{10} L_{\text{sun}}$) samples in the local/low redshift Universe. Our results suggest that the X-ray/IR properties of the SPIRE SFGs are on average similar to those of their local counterparts, as we find no evidence for evolution in the $L_{\text{SX}}/L_{\text{IR}}$ and $L_{\text{HX}}/L_{\text{IR}}$ ratios with redshift. We note however, that at all redshifts, both $L_{\text{SX}}/L_{\text{IR}}$ and $L_{\text{HX}}/L_{\text{IR}}$ are strongly dependent on IR luminosity, with luminous and ultraluminous infrared galaxies (LIRGs and ULIRGs, $L_{\text{IR}} > 10^{11} L_{\text{sun}}$) having up to an order of magnitude lower values than normal infrared galaxies ($L_{\text{IR}} < 10^{11} L_{\text{sun}}$). We derive a $L_{\text{SX}}-L_{\text{IR}}$ relation and confirm the applicability of an existing $L_{\text{HX}}-L_{\text{IR}}$ relation for both local and distant LIRGs and ULIRGs, consistent with a scenario where X-ray luminosity is correlated with the star-formation rate (SFR).

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