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The Power of Combined Infrared and X-ray Data: Probing Stellar Ages in Obscured Massive Galactic Star-Forming Regions

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I will present two new techniques for constraining the evolutionary ages of intermediate-mass (2-8 Msun), pre-main-sequence stars (IMPS) in obscured, massive Galactic star-forming regions using combined infrared (IR) and X-ray photometry catalogs containing thousands of objects. High-spatial-resolution X-ray images identify IMPS that lack IR excess emission from circumstellar dusk disks. IMPS complete their evolution across the Henyey tracks to reach the ZAMS as AB stars in <10 Myr, hence placing them on the HR diagram by modeling IR SEDs gives a more robust constraint on (model-dependent) evolutionary age than is possible for lower-mass stars on Hayashi tracks. There is also mounting evidence that IMPS with GK spectral types produce intrinsic X-ray emission that rapidly decays with time following the development of a radiative zone, providing a second, independent age constraint. These techniques will be applied to calibrate star formation rates in high-luminosity Galactic regions.

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