Calibrating Star Formation Rates on the Galactic Mesoscale

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Any theory of star formation as a driver of galaxy evolution must apply over spatial scales ranging from low-mass molecular clouds within the local 500 pc ("microscale" studies, Lada et al. 2012, Evans et al. 2014) to whole galaxies ("macroscale" studies, Kennicutt et al. 2009). Two critical gaps in scale complicate comparisons between these regimes: (1) Extragalactic analogs of the local clouds are severely "beam diluted" in radio observations, leading to underestimates of their molecular gas surface densities (Calzetti et al. 2012, Lada et al. 2013). (2) While extragalactic SFR measurements rely on population synthesis models that implicitly assume a fully-sampled stellar initial mass function (IMF), no local star-forming region fully samples the high-mass IMF. Much attention is currently devoted to understanding scale gap (1), but scale gap (2) is no less important.

Building on Chomiuk & Povich (2011), I will present a strategy and recent progress report for bridging scale gap (2) using spatially-resolved studies of YSOs, pre-main-sequence stars, and OB stars on the Galactic "mesoscale." Mesoscale regions (e.g. the Carina Nebula complex) are massive, luminous Galactic molecular clouds with well-sampled IMFs, and they are sufficiently nearby (<3 kpc) that their stellar populations can be resolved using *Chandra* X-ray imaging and complementary IR data. A new, empirical calibration of SFRs against total IR and radio luminosity in mesoscale regions is within reach. Such a calibration could be applied consistently across the Milky Way and external galaxies.

References

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