

1. Star Cluster Formation Efficiency and the Clustered Fraction of Young Stars

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- We make spatially resolved measurements of star cluster formation efficiency, the fraction of young stars formed as members of long-lived star clusters (Γ), across the PHAT survey footprint in M31. We derive robust constraints for Andromeda's cluster and field populations over the last ~ 300 Myr through color-magnitude diagram analysis of individually resolved stars. We find that 3-6% of young stars (10-100 Myr old) are star cluster members. This fraction varies across the galaxy disk and tends to increase in correlation with total gas and star formation rate surface densities (Σ_{gas} and Σ_{SFR}). These Γ measurements expand the range of well-studied galactic environments, providing high quality constraints in an H I -dominated, low intensity star forming environment. The observed trends with Σ_{gas} and Σ_{SFR} are broadly consistent with previous evidence for environmentally-dependent cluster formation efficiency derived at galaxy-integrated spatial scales. However, we find better agreement between observations and theoretical models if we