

## Tracing the Conversion of Gas in to Stars in Young Massive Clusters

(Main) co-authors:

Longmore, Steven (LJMU, UK)

Bastian, Nathan (LJMU, UK)

Kruijssen, Diederik (MPA, Germany)

Rathborne, Jill (ATNF, Australia)

Email: [D.L.Walker@2009.ljmu.ac.uk](mailto:D.L.Walker@2009.ljmu.ac.uk)

Abstract:

Whilst young massive clusters (YMCs) have been identified in significant numbers, their progenitor clouds have eluded detection. As such, little is known about the initial conditions from which these clusters form. Recently, four extreme, quiescent molecular clouds residing within 200 pc of the Galactic Centre have been identified as having the properties thought necessary to form YMCs. In this talk I will present the results of a study investigating how these clouds may be used to trace the conversion of gas in to stars during the earliest stages of YMC formation. Utilising HiGAL and MALT90 data, we confirm their status as YMC precursors and show that they are all likely gravitationally bound. Comparison with more advanced stages of YMC evolution shows that despite these being the most massive and dense molecular clouds in the Galaxy, the gas is not compact enough to form an Arches-like stellar distribution without further dynamical processes to condense the resultant stellar population. The observations unequivocally show that mass becomes more centrally concentrated as a (proto)-cluster evolves. We conclude that at no stage of the YMC formation process are the global stellar and gaseous components at higher or similar densities than the final YMC distribution. I will conclude the talk by discussing how these results imply that YMC formation proceeds hierarchically rather than through monolithic collapse, placing constraints on the nature of cluster formation across the observed mass range.