Highlights of Astronomy, Volume 15
XXVIIth IAU General Assembly, August 2009
Ian F. Corbett, ed.

doi:10.1017/S1743921310011804

Star Formation Histories from Pan-Chromatic Infrared Continuum Surveys

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Abstract. One of the currently most disputed issues in Star Formation is the timeline of the whole process. Is it a "slow" process of cloud assembly which, mediated by magnetic fields, evolve toward turbulence-supported clumps which are eventually super-critical to collapse, e.g. McKee & Tan (2003)? Or do clumps originate in already super-critical state in the post-shock regions of large-scale Galactic converging flows, e.g. Hartmann *et al.* (2001) with a rapid collapse in a crossing time or so (Elmegreen 2000)?

A pan-chromatic 1μm-1mm continuum view of cluster forming regions in their early stages offers access to the most massive members longward of 5-10μm, as well as the low-mass members which instead dominate the emission in the near-IR, offering an interesting potential in stimulating advances in theoretical modelling of clustered star formation, its history and rate.

Keywords. stars: formation

Molinari *et al.* (2008) used mid-IR to submm images to reconstruct the Spectral Energy Distribution (SED) and luminosity for the dominant YSOs in 42 high-mass star forming regions from Molinari *et al.* (1996), and used extensive radiative transfer modelling to disentangle massive YSOs in their hot-core or UCHII stage, from massive YSOs still in their active pre-ZAMS accretion phase. The modelled timescales for the formation are in the range 1 to a few 10^5 years depending on the mass.

In a recent analysis of near-IR images toward 26 high-mass star forming regions (also from Molinari *et al.* (1996)) Faustini *et al.* (2009) found a cluster of low mass objects associated with the massive YSOs in 80% of the cases. An extensive grid of Monte Carlo simulations was used to try and deduce fundamental cluster parameters, including indications on their ages. In less than a dozen clusters where the analysis delivered significant results, the median age of the cluster members was found between 1 and a few 10^6 years, with an indication for a spread of ages of similar magnitude within each cluster.

Taken at face value, the ages estimated for the low and high-mass members of young embedded clusters seem inconsistent with a single burst of star formation and suggest that low-mass members are the first to start collapse, and that the entire cluster formation process encompasses several dynamical timescales. Therefore this is difficult to reconcile with fast formation scenarios.

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