

HST Study of the Stellar Populations Within 30 pc of SN1987A

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Abstract. We present the results of a study of the stellar population around SN1987A in the Large Magellanic Cloud based on an analysis of multi-band HST-WFPC2 images.

We recover the intrinsic luminosity and temperature, as well as the reddening, of individual stars by fitting the observed fluxes in six bands, from the UV to the I band, to the ones computed from the model atmospheres by Bessel et al (1998). T Tauri stars, i.e., low-mass Pre-Main Sequence stars, are identified through their H α (488 stars with $EW(H\alpha) > 8 \text{ \AA}$) and/or U-band (850 stars with $(U - B)_0 < -0.3$) excesses. The resulting HR diagram is shown in the left panel of Figure 1, together with the theoretical Zero Age Main Sequence for $Z = 6 \times 10^{-3}$. A number of different generations of stars are required to explain the observations. In particular, the most luminous stars and the bulk of T Tauri stars indicate that a burst of star formation took place roughly 12 Myr ago, i.e., when the progenitor of SN1987A was born.

The *spatial distribution* of the stars belonging to the same young generation is shown in the right panel of Figure 1. The stars more massive than $6 M_{\odot}$ are mainly concentrated in a cluster, whereas the low mass ones ($M < 2 M_{\odot}$) are more evenly distributed. In fact, *the surface density of T Tauri stars is highest where that of the massive stars is lowest*. For comparison, the spatial density of Red Giant clump stars is uniform, as expected for the LMC field.

The Star Formation Rate (SFR) as a function of time is shown in the left panel of Figure 2. The right panel shows the IMF derived if T Tauri stars are identified through their H α ($\Gamma = -1.55$) or their U-band ($\Gamma = -1.87$) excesses.

Full account of this work can be found in Panagia et al. (1999) and Romaniello (1998).

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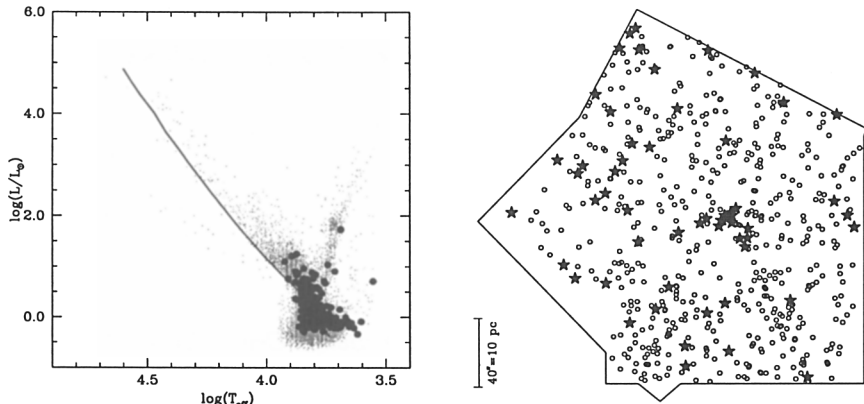


Figure 1. *Left panel:* HR diagram; T Tauri stars identified through their $H\alpha$ excess are shown as dots. *Right panel:* Spatial distribution of massive (star symbol) and Pre-Main Sequence (circles) stars.

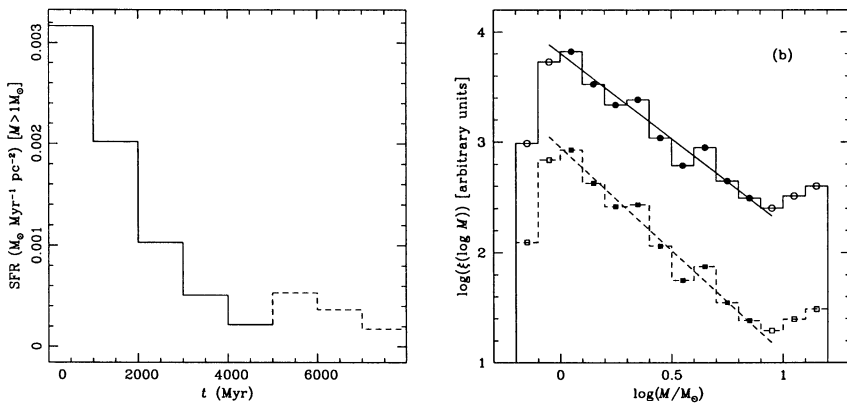


Figure 2. *Left panel:* SFR for the field around SN1987A. Look back times greater than 5 Gyr are affected by incompleteness (dashed histogram). *Right panel:* IMF including only stars with $H\alpha$ excess (full line) or also those with U-band excess (dashed line).

References

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