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 Hα (488 stars with $EW(H\alpha) > 8 \, \text{Å}$) and/or U-band ($U - B)_0 < -0.3$) 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 Hα ($\Gamma = -1.55$) 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 Hα 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 Hα excess (full line) or also those with U-band excess (dashed line).

**References**

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