NGC376 is a relatively young, poorly investigated, star cluster in the wing of the Small Magellanic Cloud (SMC). We acquired deep F555W and F814W images of NGC376 with the Wide Field Channel (WFC) of the Advanced Camera for Surveys (ACS) on board of the Hubble Space Telescope (HST) as part of a project devoted to study the formation and evolution of young clusters in low metallicity environments (PI A. Nota, GO-10248).

Both isochrones fitting of the color magnitude diagram (CMD) and the comparison with synthetic CMD (Fig. 1) suggest that the cluster formed ~28 Myr ago.

We used the upper-main sequence (UMS) stars (14 < m$_{F814W}$ < 20, -0.5 < m$_{F555W}$-m$_{F814W}$ < 0.1, Fig. 1 - Left panel) to determine the position of the cluster center of gravity and its stellar density distribution. Fig. 2 shows the King profile (King 1966) that better fit the NGC376 stellar density. This fit indicates that the cluster has an extremely low concentration (c=0.05) with the core radius (r$_c$=27") having almost the same size of the tidal radius (r$_t$=30"), suggesting that NGC376 is dissolving into the SMC field.

We created synthetic CMDs following the procedure originally described by Tosi et al. (1991) and subsequently updated (Greggio et al. 1998; Angeretti et al. 2005) to reproduce the observed CMD (Fig. 1 - Right panel and Left panels respectively) and reconstruct the star formation history (SFH) of NGC376 and the surrounding SMC field. Our analysis indicates that in this region the SMC formed very few stars at the beginning (from ~12 to ~7 Gyr ago), with the star formation rate normalized to the observed area (NSFR) being NSFR~3 x 10$^{-5}$ M$_\odot$ yr$^{-1}$ kpc$^{-2}$. The majority of the stars in this region were formed between ~3 and ~7 Gyr ago, with the NSFR raising from 8.9 x 10$^{-4}$ to 3.2 x 10$^{-3}$ M$_\odot$ yr$^{-1}$ kpc$^{-2}$. Between ~1 and ~3 Gyr ago the NSFR lowered to ~3.2 x 10$^{-4}$ M$_\odot$ yr$^{-1}$ kpc$^{-2}$, possibly followed by a nearly quiescent phase until ~600 Myr ago. The last ~600 Myr the SMC has likely formed stars at a constant rate of ~4 x 10$^{-4}$ M$_\odot$ yr$^{-1}$ kpc$^{-2}$.

CONCLUSIONS

In order to reproduce the number of red super giants found on the observed CMD (Fig. 1 - Left panel) and of the upper-main sequence (15 < m$_{F814W}$ < 17) we had to add a very intense and short episode of star formation that likely occurred between ~24 and ~28 Myr ago. During this very short interval of time the NSFR raised up to ~6.6 x 10$^{-2}$ M$_\odot$ yr$^{-1}$ kpc$^{-2}$. This episode of SF, that is at the origin of NGC376, was of the same order of magnitude of what we currently observe in 30 Doradus (Kennicutt, 1998), however in this episode the SMC formed only 11000 M$_\odot$. This result, combined with the very low stellar concentration that characterize NGC376 further supports the hypothesis that only very massive star clusters can survive for more than 50 Myr to the violent relaxation that follows the gas expulsion due to stellar winds and supernova explosions (see i.e. Lada & Lada 2003, Fall et al. 2005, Bastian & Goodwin 2006).