Disk population in the outer galaxy: the star forming region NGC1893

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1. Introduction

Stars form also in the outer Galaxy, although the conditions are less favourable than in the inner Galaxy.

Key question: does star formation proceed in the same way under the very different environmental conditions of the inner and outer Galaxy?

We present an *IRAC* observation of **NGC1893**, a **young cluster** (3 Myrs), far away form the galactic center with the aim to study star formation in the outer region of the Galaxy and investigate on the disk properties of the cluster stars.

This is part of a Large, joint *Chandra* and *Spitzer* project.

2. Observation

NGC1893 was observed with 4 channels of the Infrared Array Camera (*IRAC*, Fazio et al., 2004) on board of the *Spitzer* Space Telescope.

By means of the SSC Mopex code (Makovoz & Khan, 2005), we obtained for each channel a mosaic of 31'.20x 26'.00.

Fig. 1 shows the IRAC image of the observed region.

Figure 1: *False color image of NGC1893. Red: 8.0 μm, Green: 4.5 μm Blue: 3.6 μm*

3. Photometry and Catalog

We analyzed each mosaic image with the *DAOPHOT II* procedures (Stetson, 1987), obtaining for each channel a list of point sources, positions, aperture (radius=3.6") and PSF magnitudes.

In order to eliminate false sources, we merged the 4 *IRAC* lists and the 2MASS K band, by cross identifying sources, using a radius of 0.6", maintaining in the catalog the objects identified at least in two bands. Considering sources present in all the four IRAC bands, we found **1028** objects, **25 % of which were not previously detected by 2MASS**.

4. Results: Stars with disks

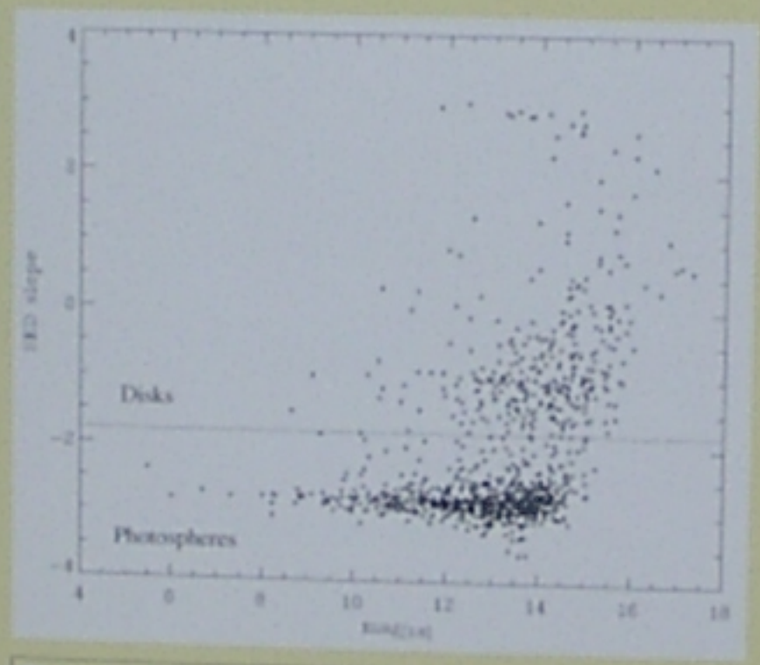

Figure 2: *Power-law slopes of the IRAC SEDs for stars identified in the NGC1893 region. Sources with disks have SED slope > -1.8.*

In the *IRAC* bands the shape of the Spectral Emission Distribution (SED) can be approximated with a **power law** and its slope is a useful parameter to identify disks (Lada, 1987). Lada et al. (2006) found that in the *IRAC* bands, stars with disks or circumstellar envelopes have **slope > -1.8**.

We evaluate the slope of the SED in the IRAC range for the stars detected in all the four IRAC channels. In this way, we found **316** objects identified as **stars with disks**. In Fig. 2 we plotted the slope of SED power law versus the magnitude at 3.6 μm.

In Fig. 3 we plot the color-color diagram for all the detected stars: we note that the stars selected as sources with disks (red points) by means of the SED method show, as expected, large infrared excesses.

The spatial distribution of stars with disks traces the cluster as shown in Fig. 4.

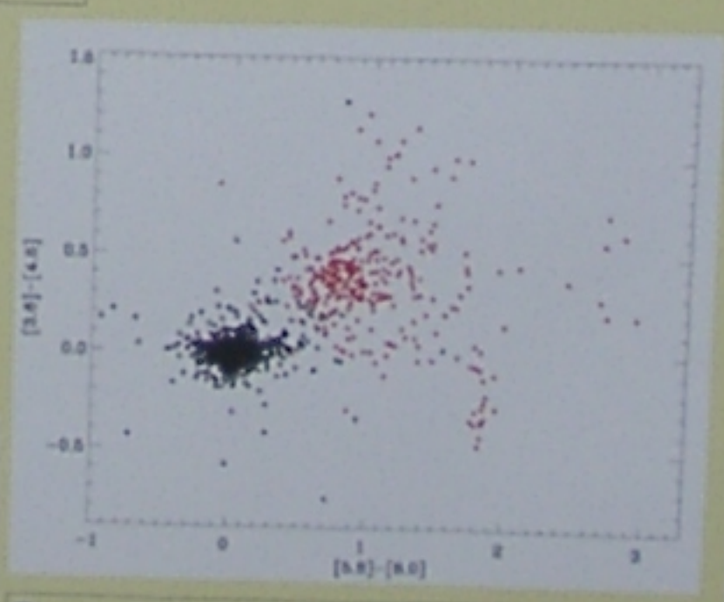

Figure 3: *Color-color diagram in the four IRAC bands. Black Dots represent stars with the slope of the power law less than -1.8, while red dots represent stars with disks.*

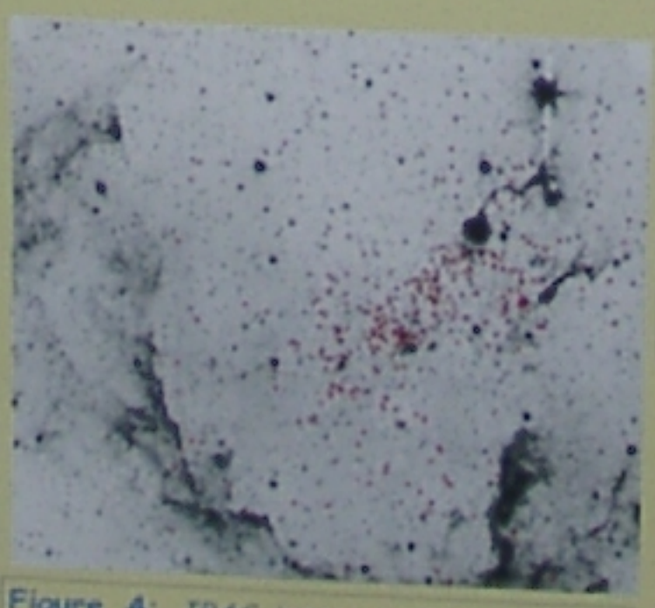

Figure 4: *IRAC image at 3.6m. The star with disks, highlighted with red circles, are candidate members of the young cluster NGC1893.*

5. Conclusions

The analysis of the *IRAC* images of NGC1893 permitted us to find **1028 sources**, 25% of which were not previously detected by 2MASS.

The study of the SED of the detected sources permitted to identify **316 stars with disks**, and confirms that **star formation is an active process also in the outer Galaxy**.

The high number of stars with disk indicates that NGC1893 is a quite **rich cluster** and confirms the **very young estimated age**.

While the infrared observation permitted us to identify objects with infrared excesses, with the analysis of the *Chandra* X-ray Observation , completed in January, we will be able to detect also the young stars without disks and we will compare the two populations.

References

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