**Star formation in the outer Galaxy:**

**NGC 1893**

G. Micela\(^1\), M. Caramazza\(^1\), F. Favata\(^2\), L. Prisinzano\(^1\), J. Sanz Forcada\(^3\), S. Sciortino\(^4\)

\(^1\) INAF – Osservatorio Astronomico di Palermo – Piazza del Parlamento 1 – Palermo - Italy
\(^2\) European Space Agency – 8-10 rue Mario Nikis -75019 - Paris - France
\(^3\) Centro de Astrobiología / CSIC-INTA, PO Box 78, 28691 Villanueva de la Cañada, Madrid, Spain
\(^4\) Spitzer Science Center, Caltech M/S 220-6, 1200 East California Boulevard, Pasadena, CA 91125, USA
\(^5\) European Southern Observatory, Karl Schwarzschild str. 2, D-85748 Garching, Germany
\(^6\) SAO-Harvard Center for Astrophysics, 60 Garden St., Cambridge, MA 02139, USA

**Introduction**

We present the results of an ongoing large project of the cluster NGC 1893, a young cluster at large distance from the galaxy center. This study is part of a larger effort to establish the role of physical conditions in the star formation process. Indeed in the outer galaxy the conditions should be much less conducive to star formation than in the solar neighborhood or in the inner Galaxy: the interstellar radiation field is weaker, prominent spiral arms are lacking and there are fewer supernovae to act as external triggers of star formation. Metal content is, on average, smaller, decreasing with distance. Notwithstanding these unfavorable conditions star formation also in the outer Galaxy.

**NGC 1893** is a young cluster (1.3 Myr) at a distance of 3600 pc in the anticenter direction, for a total distance of 12 kpc from galactic center. It was known for having several massive members (Tapias et al. 1991, Massey et al. 1995, Marco et al. 2001), with strong indication of large PMS population (Vallenari et al. 1999, Sharma et al. 2007).

We have studied the region adopting a multi wavelength approach, in which different energy bands probe different components of the stellar systems. In particular optical and near infrared data are used to determine the stellar properties, infrared observations are the tool to measure the disk properties and X-rays are used as membership criterion since stellar X-ray emission is very intense at young ages.

**Optical and Near Infrared Data**

**Dolores@TNG:** 4 (8’ x 8’ 6) fields – V(10-1000s), R(10-700s), I(10-1480s), Hα(60-1400s).

**Cafos@Calar Alto:** 1 (16’) field – V(15-1500s), R(10-600s), I(10-1500s), Hα(10-1500s).

**NICS@TNG:** 16 (4’x4’ 2) fields – J(500s), H(600s), K(700s).

**Space observations: Chandra and Spitzer data**

**ACIS@Chandra:** 17x17’ field (0.5-8.0 keV, 450 ksec)

**IRAC@Spitzer:** mosaic of 26’x30’ at 3.6, 4.5, 5.8, 8.0 μm

**Results**

(Caramazza et al. 2008, Prisinzano et al. 2010)

> NGC 1893 is a rich cluster with a conspicuous population of PMS stars.

> 1057 members with circumstellar disk

> 391 diskless members

> Mean cluster reddening E(B-V)=0.6±0.1

> Evidence of differential reddening

> Cluster distance d=3600+200 pc (previous literature values are in the [3250 – 6000] pc range)

> Class II and III YSOs show very similar age and mass distributions

> Disk fraction of about 70% (in agreement with that found in cluster of similar age, Haisch et al. 2001)

> Class II are less X-ray luminous than Class III stars at mass > 0.8 M\(_{\odot}\)

> The mass dependence of the X-ray luminosity of NGC 1893 members is similar to that of Orion stars

**REFERENCES**


Marco et al. 2001, AJ, 121, 2075


