



NGC 602



NGC 602: Taken Under the “Wing” of the Small Magellanic Cloud

The Small Magellanic Cloud (SMC) is one of the closest galaxies to the Milky Way.

In this composite image the Chandra data is shown in purple, optical data from Hubble is shown in red, green and blue and infrared data from Spitzer is shown in red.

Chandra observations of the SMC have resulted in the first detection of X-ray emission from young stars with masses similar to our Sun outside our Milky Way galaxy.

The Small Magellanic Cloud (SMC) is one of the Milky Way's closest galactic neighbors. Even though it is a small, or so-called dwarf galaxy, the SMC is so bright that it is visible to the unaided eye from the Southern Hemisphere and near the equator.

Modern astronomers are also interested in studying the SMC (and its cousin, the Large Magellanic Cloud), but for very different reasons. The SMC is one of the Milky Way's closest galactic neighbors. Because the SMC is so close and bright, it offers an opportunity to study phenomena that are difficult to examine in more distant galaxies.

Chandra data of the SMC have provided one such discovery: the first detection of X-ray emission from young stars with masses similar to our Sun outside our Milky Way galaxy. The Chandra observations of these low-mass stars were made of the region known as the “Wing” of the SMC. In this composite image of the Wing the Chandra data is shown in purple, optical data from the Hubble Space Telescope is shown in red, green and blue and infrared data from the Spitzer Space Telescope is shown in red.

Astronomers call all elements heavier than hydrogen and helium—that is, with more than two protons in the atom's nucleus—“metals.” The Wing is a region known to have fewer metals compared to most areas within the Milky Way. There are also relatively lower amounts of gas, dust, and stars in the Wing compared to the Milky Way.

Taken together, these properties make the Wing an excellent location to study the life cycle of stars and the gas lying in between them. Not only are these conditions typical for dwarf irregular galaxies like the SMC, they also mimic ones that would have existed in the early Universe.

Most star formation near the tip of the Wing is occurring in a small

region known as NGC 602, which contains a collection of at least three star clusters. One of them, NGC 602a, is similar in age, mass, and size to the famous Orion Nebula Cluster. Researchers have studied NGC 602a to see if young stars—that is, those only a few million years old—have different properties when they have low levels of metals, like the ones found in NGC 602a.

Using Chandra, astronomers discovered extended X-ray emission, from the two most densely populated regions in NGC 602a. The extended X-ray cloud likely comes from the population of young, low-mass stars in the cluster, which have previously been picked out by infrared and optical surveys, using Spitzer and Hubble respectively. This emission is not likely to be hot gas blown away by massive stars, because the low metal content of stars in NGC 602a implies that these stars should have weak winds. The failure to detect X-ray emission from the most massive star in NGC 602a supports this conclusion, because X-ray emission is an indicator of the strength of winds from massive stars. No individual low-mass stars are detected, but the overlapping emission from several thousand stars is bright enough to be observed.

The Chandra results imply that the young, metal-poor stars in NGC 602a produce X-rays in a manner similar to stars with much higher metal content found in the Orion cluster in our galaxy. The authors speculate that if the X-ray properties of young stars are similar in different environments, then other related properties—including the formation and evolution of disks where planets form—are also likely to be similar.

X-ray emission traces the magnetic activity of young stars and is related to how efficiently their magnetic dynamo operates. Magnetic dynamos generate magnetic fields in stars through a process involving the star's speed of rotation, and convection, the rising and falling of hot gas in the star's interior.

NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.

CREDIT: X-ray: NASA/CXC/Univ.Potsdam/L.Oskinova et al;
Optical: NASA/STScI; Infrared: NASA/JPL-Caltech

RELEASED: April 3, 2013

SCALE: Image is 3 arcmin across
(160 light years)

COORDINATES RA 01h 29m 12.40s
(J2000): Dec -73° 32' 01.70"

CONSTELLATION: Hydrus

OBSERVATION DATE: 11 pointings between
03/31/10 and 04/29/10

OBSERVATION TIME: 80 hours 45 min (3 days 8 hours 45 min)

COLOR CODE: X-ray (Purple); Optical (Red, Green,
Blue); Infrared (Red)

DISTANCE ESTIMATE: About 180,000 light years