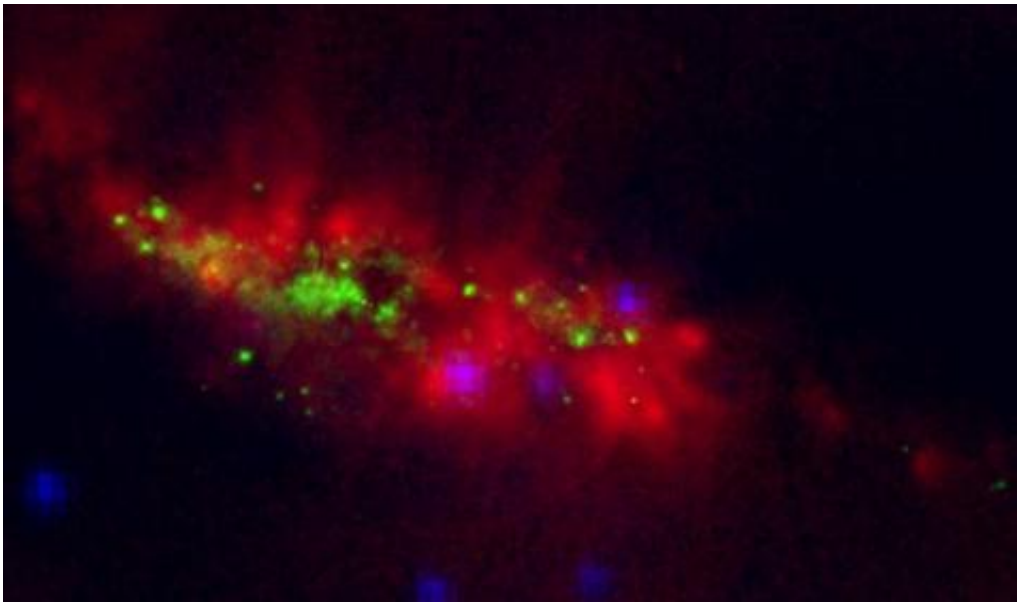
New look at Messier 82 reveals superwind source, young star clusters

March 8 2011, By Anne Minard



False color mosaic showing the Subaru COMICS image (red), a Hubble near-infrared image of stars (green) and a Chandra X-ray image (blue) dominated by extremely hot gas and black holes. Credit: JAXA

Messier 82′s galactic windstorms emanate from many young star clusters, rather than any single source, say astronomers who released this new image today.

The international team of scientists, led by Poshak Gandhi of the Japan Aerospace Exporation Agency (JAXA), has used the Subaru Telescope to produce a new view of M 82 at infrared wavelengths that are 20 times

longer than those visible to the human eye.

M 82 (09h 55m 52.2s, +69° 40′ 47″) is located close to the ladle of the Big Dipper in the constellation Ursa Major and is the nearest starburst galaxy, at a distance of about 11 million light years from Earth.

The combination of Subaru Telescope's large 8.2 m primary mirror and its Cooled Mid-Infrared Camera and Spectrometer (COMICS) allowed the team to obtain a sharp, magnified view of the inner area of the galaxy.

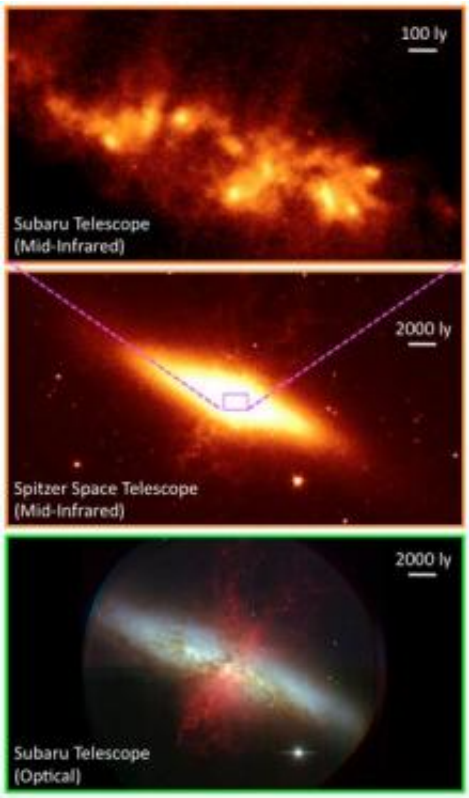
Previous observations of M 82 with infrared telescopes, including the middle and bottom image in the three-part series, have found a very strong wind emanating from it — a 'superwind' that is composed of dusty gas and extends over many hundreds of thousands of light years. This high-powered windstorm ejects material from the galaxy at a speed of about a half a million miles per hour, sweeping it up from the central regions and depositing it far and wide over the galaxy and beyond. The contents of this material are seeds for solar systems like our own, and perhaps for life itself. The dusty superwind glows brightly in the infrared, because billions of bright, newly-formed stars heat it up.

With the new Subaru image, scientists have gained insight about the sources of the superwind.

"The wind is found to originate from multiple ejection sites spread over hundreds of light years rather than emanating from any single cluster of new stars. We can now distinguish 'pillars' of fast gas, and even a structure resembling the surface of a 'bubble' about 450 light years wide," Gandhi explained.

COMICS has detectors particularly adept at indicating the presence of warm dust, which it found was more than 100 degrees hotter than the

bulk of material filling the rest of the galaxy. The widespread, continuous flow of energy from young stars into the galactic expanse keeps the dust hot.



Images of M 82. The bottom image from Subaru shows the superwind crossing the disk structure. Courtesy of JAXA.

Further insights from the Subaru image emerge when it's combined with previous images from Hubble and Chandra. Their integration produces a beautiful mosaic, represented in the lead image, that provides the first opportunity to isolate M 82′s infrared properties. Supported by these data, scientists can study the broad spectrum of radiation of different kinds of objects spread over the galaxy's plane, including supernovae, star clusters, and black holes.

Many questions remain, such as how many more stars the galaxy contains — many could still be obscured by the dust of star formation — and whether or not M 82 hosts an actively growing supermassive black hole.

The results are reported in the article "Diffraction-limited Subaru imaging of M82: sharp mid-infrared view of the starburst core" by P. Gandhi, N. Isobe, M. Birkinshaw, D.M. Worrall, I. Sakon, K. Iwasawa & A. Bamba, in the *Publications of the Astronomical Society of Japan*, v. 63 (2011), in press.

Source: Universe Today