Spitzer spots a starry region bursting with bubbles

September 30 2019

This cloud of gas and dust in space is full of bubbles inflated by wind and radiation from massive young stars. Each bubble is about 10 to 30 light-years across and filled with hundreds to thousands of stars. The region lies in the Milky Way galaxy, in the constellation Aquila (aka the Eagle).Credit: NASA/JPL-Caltech

This infrared image from NASA's Spitzer Space Telescope shows a cloud of gas and dust full of bubbles, which are inflated by wind and

radiation from young, massive stars. Each bubble is filled with hundreds to thousands of stars, which form from dense clouds of gas and dust.

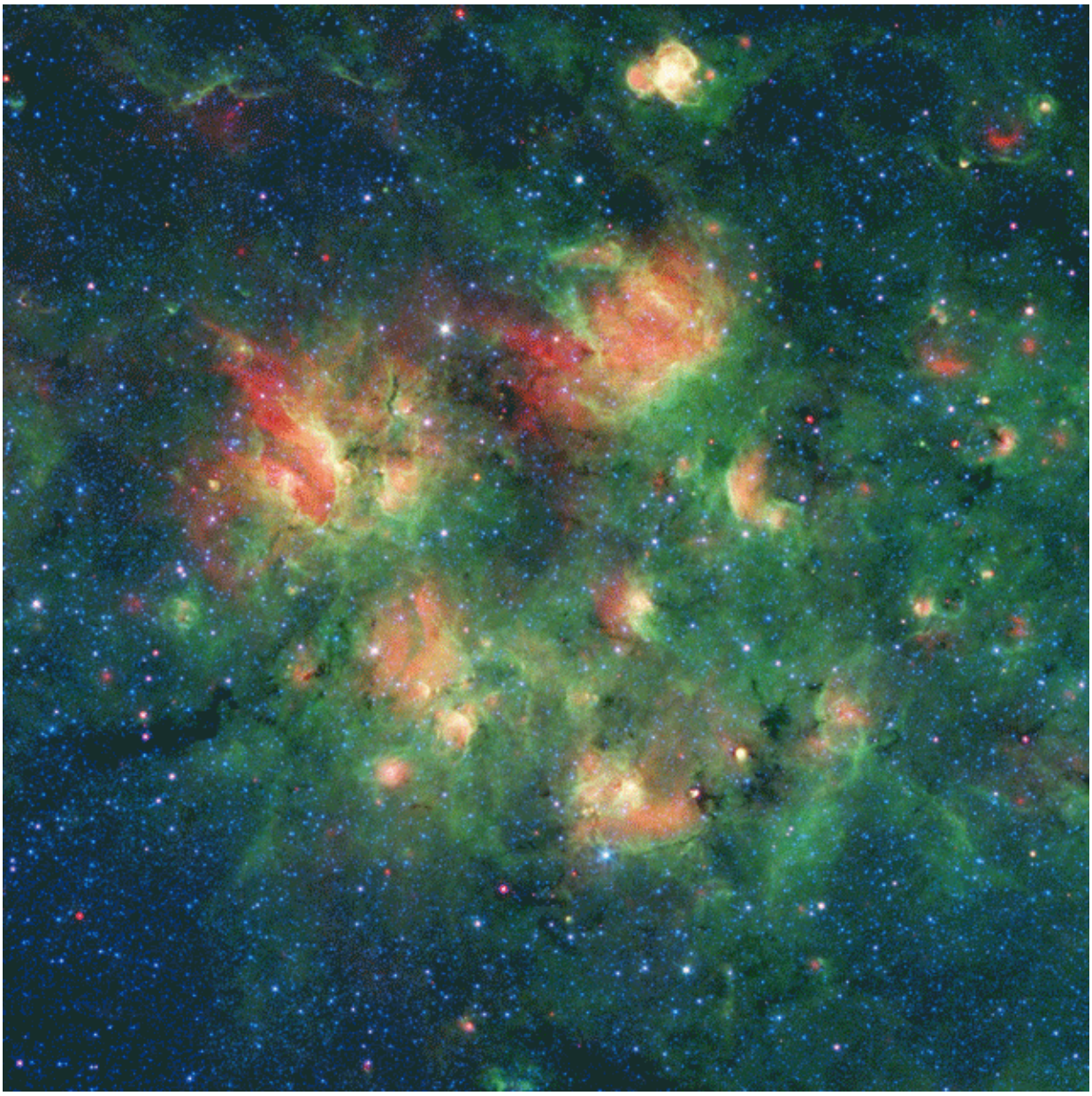
The bubbles are estimated to be 10 to 30 light-years across, based on what astronomers know about them and other cosmic bubbles. However, determining the exact sizes of individual bubbles can be difficult, because their distance from Earth is challenging to measure and objects appear smaller the farther away they are.

Flows of particles emitted by the stars, called stellar winds, as well as the pressure of the light the stars produce, can push the surrounding material outward, sometimes creating a distinct perimeter.

In the annotated image below, the yellow circles and ovals outline more than 30 bubbles.

This active region of star formation is located within the Milky Way galaxy, in the constellation Aquila (also known as the Eagle).Black veins running throughout the cloud are regions of especially dense cold dust and gas where even more new stars are likely to form.

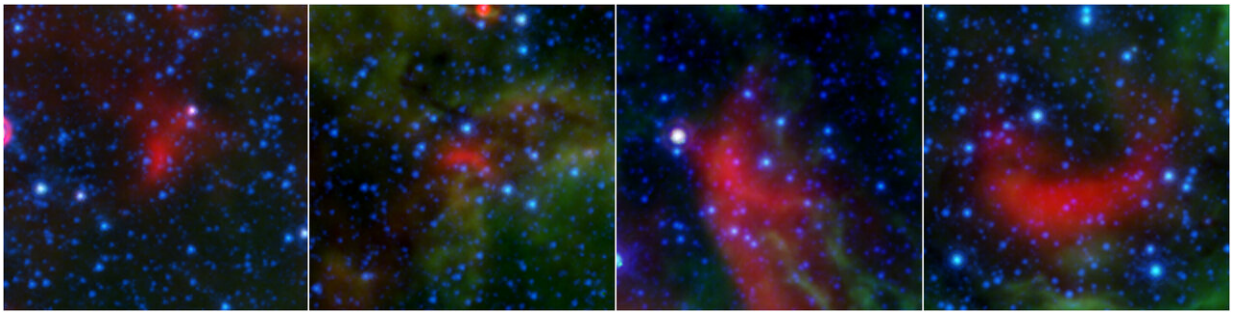
Spitzer sees infrared light, which isn't visible to the human eye. Many interstellar nebulas (clouds of gas and dust in space) like this one are best observed in infrared light because infrared wavelengths can pass through intervening layers of dust in the Milky Way galaxy. Visible light, however, tends to be blocked more by dust.



This cloud of gas and dust is full of bubbles, which are inflated by wind and radiation from massive young stars. Yellow circles and ovals show the locations of more than 30 bubbles. Squares indicate bow shocks, red arcs of warm dust formed as winds from fast-moving stars push aside dust grains. Image Credit: NASA/JPL-Caltech

The colors in this image represent different wavelengths of infrared light . Blue represents a wavelength of light primarily emitted by stars; dust and organic molecules called hydrocarbons appear green, and warm dust that's been heated by stars appears red.

Also visible are four bow shocks—red arcs of warm dust formed as winds from fast-moving stars push aside dust grains scattered sparsely through most of the nebula. The locations of the bow shocks are indicated by squares in the annotated image above and shown close up in the images below.



These four images show bow shocks, or arcs of warm dust formed as winds from fast-moving stars push aside dust grains scattered sparsely through most of the nebula. Credit: NASA/JPL-Caltech

The bubbles and bow shocks in these images were identified as part of The Milky Way Project, a citizen science initiative on Zooniverse.org that seeks to map star formation throughout the galaxy. Participating citizen scientists looked through images from Spitzer's public data archive and identified as many bubbles as they could. More than 78,000 unique user accounts contributed. Astronomers running this program recently published a catalog of the bubble candidates that multiple

citizen scientists had identified. The full Milky Way Project catalogs, which list a total of 2,600 bubbles and 599 bow shocks, are described in a paper published recently in *Monthly Notices of the Royal Astronomical Society*.

More information: Tharindu Jayasinghe et al. The Milky Way Project second data release: bubbles and bow shocks, *Monthly Notices of the Royal Astronomical Society* (2019). DOI: 10.1093/mnras/stz1738

Provided by Jet Propulsion Laboratory