Wall Divides East and West Sides of Cosmic Metropolis

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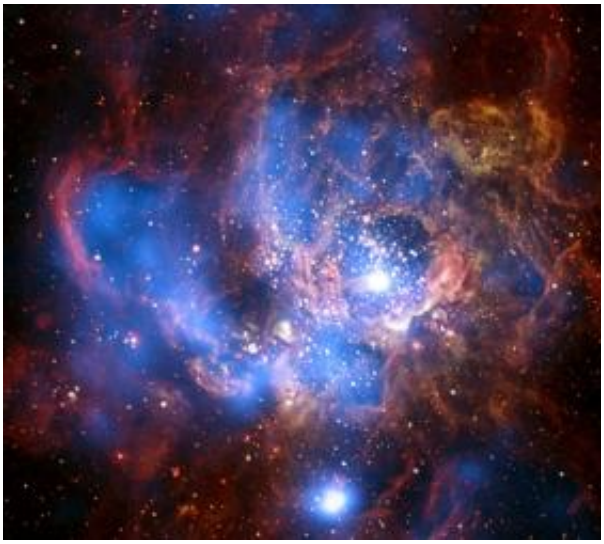

Credits: X-ray: NASA/CXC/CfA/R. Tuellmann et al.; Optical: NASA/AURA/STScI

(PhysOrg.com) -- A new study unveils NGC 604, the largest region of star formation in the nearby galaxy M33, in its first deep, high-resolution view in X- rays. This composite image from Chandra X-ray Observatory data (colored blue), combined with optical light data from the Hubble Space Telescope (red and green), shows a divided neighborhood where some 200 hot, young, massive stars reside.

Throughout the cosmic metropolis, giant bubbles in the cool dust and warm gas are filled with diffuse, multi-million degree gas that emits X-

rays. Scientists think these bubbles are generated and heated to X- ray temperatures when powerful stellar winds from the young massive stars collide and push aside the surrounding gas and dust. So, the vacated areas are immediately repopulated with the hotter material seen by Chandra.

However, there is a difference between the two sides of this bifurcated stellar city. (See annotated image for the location of the "wall".) On the western (right) side, the amount of hot gas found in the bubbles corresponds to about 4300 times the mass of the sun. This value and the brightness of the gas in X-rays imply that the western part of NGC 604 is entirely powered by winds from the 200 hot massive stars.

This result is interesting because previous modeling of other bubbles usually predicted them to be fainter than observed, so that additional heating from supernova remnants is required. The implication is that in this area of NGC 604, none or very few of the massive stars must have exploded as supernovas.

The situation is different on the eastern (left) side of NGC 604. On this side, the X-ray gas contains 1750 times the mass of the sun and winds from young stars cannot explain the brightness of the X-ray emission. The bubbles on this side appear to be much older and were likely created and powered by young stars and supernovas in the past.

A similar separation between east and west is seen in the optical results. This implies that a massive wall of gas shields the relatively quiet region in the east from the active star formation in the west.

This study was led by Ralph Tuellmann of the Harvard Smithsonian Center for Astrophysics and was part of a very deep, 16-day long observation of M33 called the Chandra ACIS Survey of M33, or ChASeM33.

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