Bubble N107

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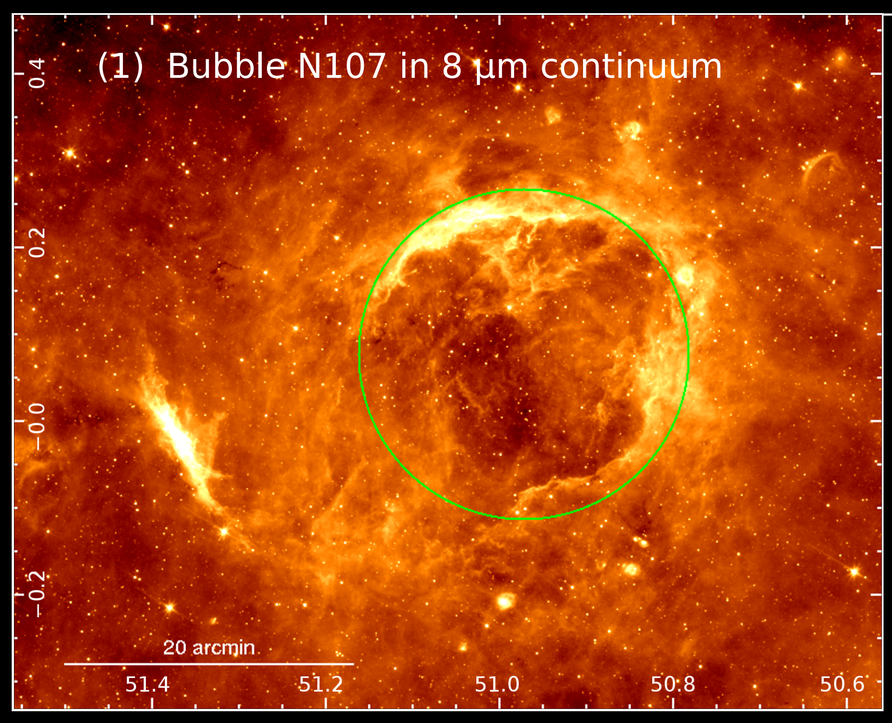
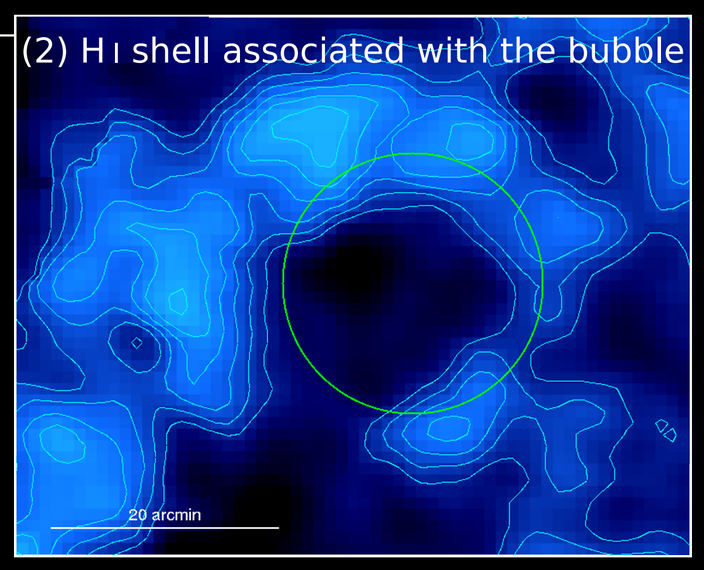


(1) Introduction – What bubble N107 is

Pictured to the left is N107 – a bubble in the interstellar medium that has been discovered by Churchwell et al. (2006) in the 8 µm dust emission. At this wavelength the emission is dominated by very special dust grains – polycyclic aromatic hydrocarbons (PAHs). These are believed to trace the photodissociation regions (PDRs), which represent a transition between regions of the ionized hydrogen and molecular clouds.

In our research we explore the morphology and nature of the bubble N107, using observations at different wavelengths. Each wavelength tells us about different component of the bubble – like dust, H I gas, molecular clouds – which further allows us to derive the bubble's properties like its distance or mass.

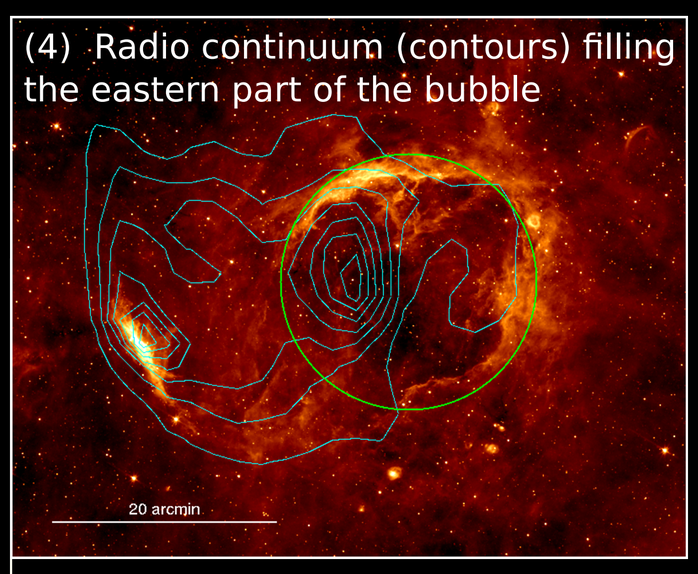


(2) Neutral hydrogen shell

We have found an H I shell with morphology very similar to that of the bubble. The most prominent feature is the opening in the southeastern part (bottom left).

To the right is shown the line emission of the neutral hydrogen (H I) at the radial velocity of 42 km/s. The radial velocity information allows us to derive the kinematical distance: 3.6 or 7.1 kpc depending on whether the bubble lies at the near or far point.

We also estimate the total mass of the atomic hydrogen in the shell to 4 000/14 000 $M_\odot$ for the near or far kinematical distance, respectively.



(4) Radio continuum

To the top are shown contours of the radio continuum at 327 MHz overlaid on the 8 µm background. The radio continuum is a good tracer of the ionized hydrogen (H II) and in this case suggests an H II region is partially filling the bubble interior.

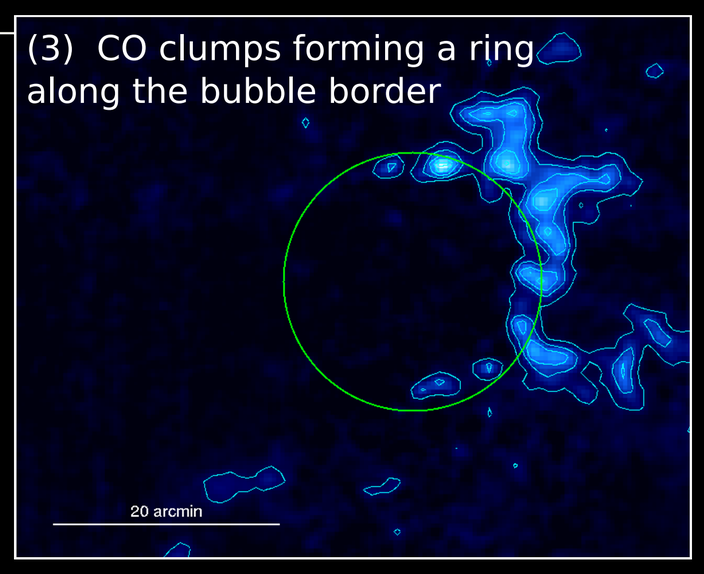
Using radio continuum observations at several different frequencies we have derived the radio spectral index of the bubble of −0.4. This value suggests that a non-thermal radiation source – e.g. a supernova – is located in the direction of the bubble. However, it is not yet clear whether this source is associated with the bubble.

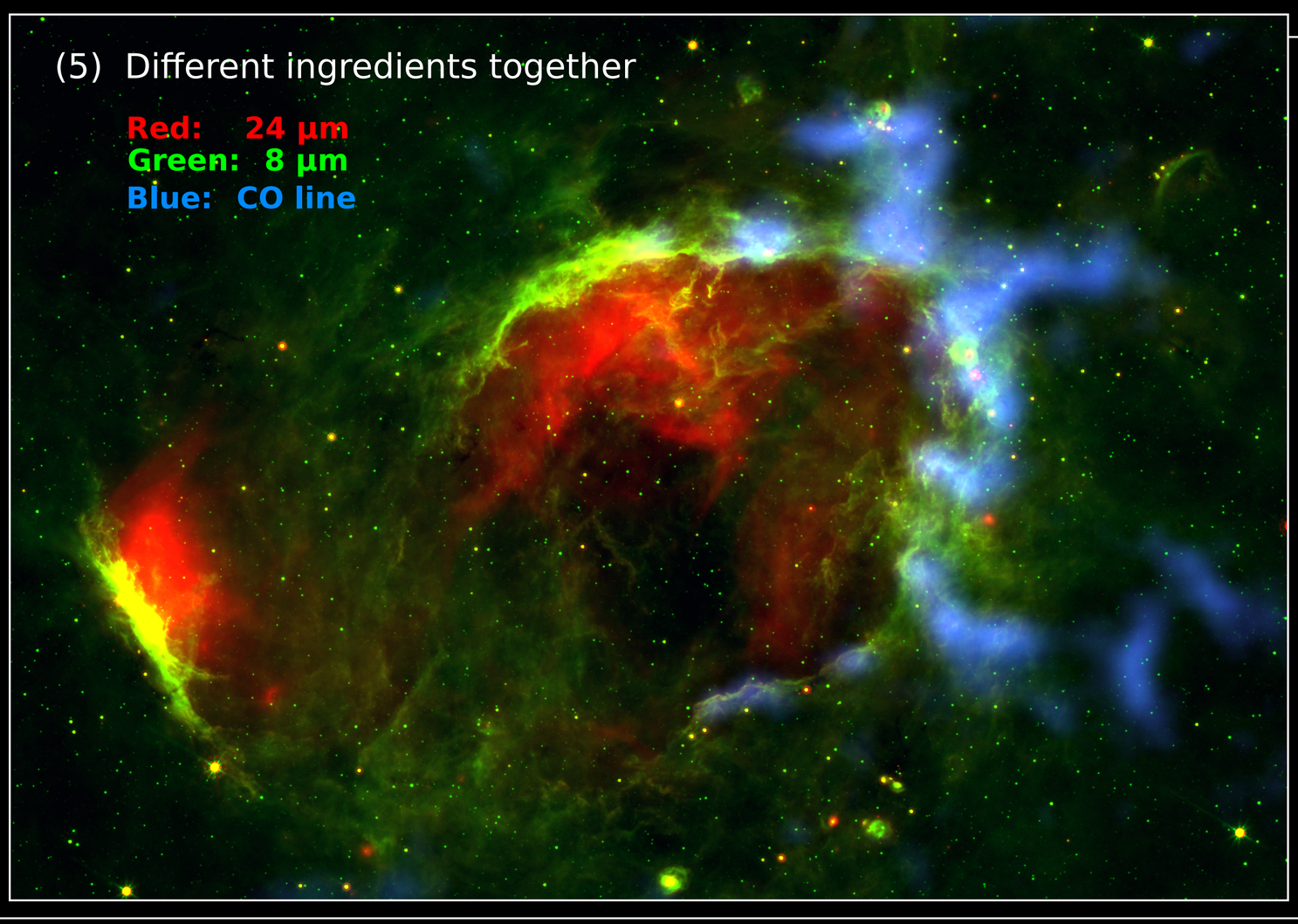
(3) Ring of molecular clumps

Picture to the right shows the CO line emission at the radial velocity of 43 km/s. A ring of molecular clumps is clearly visible along the bubble border. We believe these clumps are debris of the parental molecular cloud in which the bubble was born.

Note that we don't observe any counterpart to the bright object found eastwards off the bubble – compare to fig. 1 and 4. However, we have identified its counterpart at a higher radial velocity, which suggests that this object is not associated with the bubble.

We estimate the total molecular mass in these clumps to 33 000/127 000 $M_\odot$ for the near or far kinematical distance, respectively.





(5) The art of multiwavelength astronomy

To the left is an image of N107 composed of observations made at three different wavelengths. Each wavelength has been coloured in a different hue and then put together into a single frame.

Red is the 24 µm continuum, which is thought to be dominated by the thermal emission of hot dust grains found mainly inside H II regions.

Green is the 8 µm continuum, which is dominated by PAHs' emission and traces the PDRs – regions where molecules are dissociated by UV radiation. PDRs are usually found at the borders of molecular clouds which are illuminated by massive stars and represent a transition layer between the ionized and molecular gas.

Blue is the CO line at the radial velocity of 43 km/s, which traces the molecular gas. In this case a ring of molecular clumps is present just beyond the green PDR layer.

Credits. Poster by Vojtěch Sidorin, October 2010.
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Figures. (1) 8 µm continuum, GLIMPSE (Benjamin et al. 2003); (2) H I line at the radial velocity of 42 km/s, I-GALFA survey (Koo et al. 2009); (3) ^{13}CO (J = 1–0) line at the radial velocity of 43 km/s, GRS (Jackson et al. 2006); (4) contours: 327 MHz continuum, WSRT survey (Taylor et al. 1996), background: 8 µm continuum, GLIMPSE; (5) red: 24 µm continuum, MIPSGAL survey (Carey et al. 2009), green: 8 µm continuum, GLIMPSE, blue: ^{13}CO (J = 1–0) line at the radial velocity of 43 km/s, GRS.
References. • Churchwell, E., Povich, M. S., Allen, D., et al. 2006, ApJ, 649, 759 • Benjamin, R. A., Churchwell, E., Babler, B. L., et al. 2003, PASP, 115, 953 • Koo, B., Gibson, S. J., Kang, J., et al. 2009, ArXiv e-prints • Jackson, J. M., Rathborne, J. M., Shah, R. Y., et al. 2006, ApJS, 163, 145 • Taylor, A. R., Goss, W. M., Coleman, P. H., van Leeuwen, J., & Wallace, B. J. 1996, ApJS, 107, 239 • Carey, S. J., Noriega-Crespo, A., Mizuno, D. R., et al. 2009, PASP, 121, 76 •