

## COMETS

### A blue visitor from far away

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Credit: Michael Jäger

Long-period comet C/2016 R2 (PanSTARRS) has attracted some attention since its discovery, owing to the complex structure of its tail and especially its unusual blue colour (pictured), caused by its high abundance of ionized carbon monoxide ( $\text{CO}^+$ ). Nicolas Biver and colleagues perform a thorough study of the comet's composition using data collected from the IRAM 30-m radio telescope, the Nançay radio telescope and amateur astronomers.

The observations confirm the peculiar composition of C/2016 R2. Its CO production rate ( $\sim 5$  tonnes per second) is exceptional considering the overall small luminosity of the comet. Nitrogen is also especially abundant, at around 8% the CO concentration. Likewise, the ion component is dominated by  $\text{CO}^+$  and  $\text{N}_2^+$ . In contrast, all other molecules commonly seen in comets, such as water, HCN and sulfur

compounds, appear strongly depleted or are not detected. The comet is also quite devoid of dust.

This very unusual composition profile can be explained in two ways: either C/2016 R2 is made by grains formed at very low temperature so they could trap  $\text{N}_2$  in gaseous and icy form or, more suggestively, the comet is actually a fragment from the superficial layers of a Kuiper belt object that broke off after a collision. Biver et al. favour this second hypothesis, because the few other comets we know of that have been formed beyond the  $\text{N}_2$ -ice line, unlike C/2016 R2, have high quantities of dust.

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Luca Maltagliati

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