

# Mystery giant Mars plumes still unexplained

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On Feb. 16, an international group of researchers proposed new hypotheses about some unusual plumes spotted by amateur astronomers on Mars in 2012. The plumes were seen rising to altitudes of over 250 km above. By comparison, similar features seen in the past have never exceeded 100 km. Now, new conclusions presented by scientists still raise more questions about the mysterious plumes, than they answer. "We tentatively explored two scenarios that might help explain the observed phenomenon: a cloud of condensed CO<sub>2</sub> or H<sub>2</sub>O, or even dust, and an aurora. After elaborating the details of these two hypotheses, we came to the conclusion that none of them provided a fully satisfactory answer," Antonio García Muñoz of ESA's European Space Research and Technology Centre (ESTEC), co-author of the paper reporting the

results in the journal *Nature*, told [astrowatch.net](http://astrowatch.net). "Therefore, we consider that the genuine nature of the phenomenon is still an open issue."

In March and April 2012, [amateur astronomers](#) across the world equipped with their high-resolution telescopes and cameras took advantage of Mars moving closer to the Earth to get detailed images of the planet. They got a surprise when they spotted the presence of a high [plume](#) on the edge of the disc emerging on the limb during the Martian dawn.

"They were first observed in March 2012 for about 10 days. The plumes vanished by the end of the month. Then, they appeared again on 6th April and were seen for 10 extra days. They were observed for nearly 20 amateur astronomers from various sites in the world, each of them observing with their own equipment - telescopes and various color filters," Muñoz revealed. "The plume appeared at the morning terminator, but not at the evening terminator. This strongly suggests variability on time scales of hours. Also, the plume's structure changed from day to day."

The plumes were spotted at a longitude of about  $195^\circ$  west, and a latitude of about  $-45^\circ$  (at Terra Cimmeria), extended about 500 to 1,000 kilometers in both the north-south and east-west directions. The day-to-day variability indicates rapid evolution in less than 10 hours and a cyclic behavior.

The researchers report in the paper that they used photometric measurements to explore two possible scenarios and investigate their nature. For particles reflecting solar radiation, clouds of  $\text{CO}_2$ -ice or  $\text{H}_2\text{O}$ -ice particles with an effective radius of 0.1 micrometers are favored over dust. Alternatively, the plume could arise from auroral emission, of brightness more than 1,000 times that of the Earth's aurora,

over a region with a strong magnetic anomaly where aurorae have previously been detected. They underline the fact that both explanations defy our current understanding of Mars' upper atmosphere.

It was also surprising to observe such phenomena on the Red Planet. "It was unexpected because at 200 km the atmosphere is very thin - i.e. the atmospheric density is very low - and the range of physical and chemical processes that can occur in those conditions is limited," Muñoz noted.

None of the spacecraft orbiting Mars saw the features because of their viewing geometries and illumination conditions at the time. "Spacecraft have to be in the right place at the right time to observe local phenomena. This didn't seem to be the case for the 2012 event," Muñoz said.

The researcher admits that there has been real interest in the community with new ideas to explore these Martian phenomena. In particular, it would be very useful to go through the data archive from various Mars spacecraft. Finding a similar event would help scientists get a feel of how rare these events may occur, which might shed new light on the physical mechanism behind.

ESA hopes that further insights should be possible following the arrival of the agency's ExoMars Trace Gas Orbiter at the Red Planet, scheduled for launch in 2016.

"To explore further the phenomenon, it would be great to have new observations with various techniques. Hopefully, if a similar [phenomenon](#) is reported in the future, there will be a quicker community response, possibly using large telescopes on the ground or even in space." Muñoz added.

He and his colleagues are still working to resolve the mystery.

Source: [Astrowatch.net](http://Astrowatch.net)

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