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MYSTERY SIGHTINGS

Examining explanations for the strange phenomena encountered by U.S. Navy pilots. PAGE 26

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Targeting methane sources from space

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Raising cattle and collecting and processing oil and natural gas are messy affairs. About 75 million metric tons of methane gas escape into the atmosphere each year worldwide, according to the U.S.-based Environmental Defense Fund. That's a problem for Earth's climate, because methane could be responsible for as much as a quarter of the warming seen in recent years.

Historically, finding specific sources of methane emissions has required businesses and regulators in the U.S. and abroad to travel to scattered sites to take measurements with hand-held spectrometers.

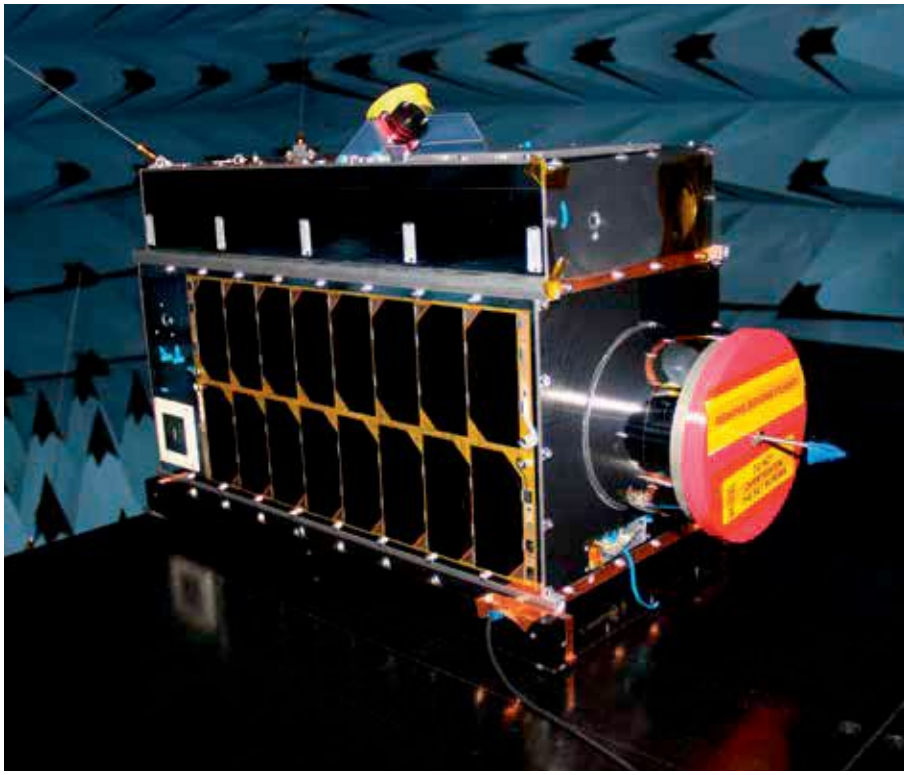
That is changing, in part because of work by GHGSat Inc., a satellite startup in Montreal that in 2016 launched its Greenhouse Gas demonstration satellite, which has been measuring methane emissions from oil and gas facilities, coal mines, animal feedlots and other sources in the U.S. and Canada since shortly after its launch.

Next year, the company's two GHGSat C1 and C2 nanosatellites (they're about the size of microwave ovens) are set to join the demonstration satellite, known as GHGSat-D and nicknamed Claire, after a team member's daughter to symbolize that it was built with future generations in mind.

With a telescope on one end, Claire collects sunlight reflected from Earth's surface and directs the light to an internal spectrometer that measures the brightness of various wavelengths. Because methane blocks certain wavelengths, Claire can determine how much methane is present in the atmosphere over specific sites along each 90-minute orbit. Because the instrument is not attempting to measure global emissions, the spectrometer can be small, capturing a 12-kilometer-by-12-kilometer swath, with each pixel representing a 25-meter-by-25-meter square.

By contrast, the European Space Agency's TROPOspheric Monitoring Instrument or Tropomi, for short, measures methane and other greenhouse gases, but on a broader scale. It has a field of view that's approximately 2,600 km wide, and each pixel represents a 7-km-by-3.5-km rectangle, so it needs a larger spectrometer. Tropomi rides on the Sentinel-5 Precursor satellite and weighs 200 kilograms compared to 15 kg for Claire.

GHGSat's mission is "a similar problem, but we're designing to a different requirement," says GHGSat President Stéphane Germain.



▲ **GHGSat Inc. plans** to launch its second methane-monitoring microsatellite, GHGSat-C1, next year. The pink cap covers the aperature where light enters the telescope.
GHGSat

Others in the private sector are planning to measure methane emissions too. In September, MethaneSAT LLC, a California subsidiary of the Environmental Defense Fund, chose Ball Aerospace to build the dual-spectrometer instrument for its first 350-kg satellite.

"Existing satellites can either map methane emissions across large areas or measure them at predetermined spots," the MethaneSAT company said in a press release. "MethaneSAT will do both."

The findings will be shared free as open-source public data.

Another startup, Bluefield Technologies, plans to launch a methane-monitoring microsatellite in late 2020 or 2021. Meanwhile, California Gov. Gavin Newsom and billionaire Michael Bloomberg announced a partnership with the Earth-imaging company Planet to monitor greenhouse gases including methane over the state.

Germain says he's not worried. "When there's competitors coming in that means everybody sees it as a real market, and that means things are looking good for us," he says. ★