

NASA carbon sleuth will sniff out 'missing' emissions

- 17:10 02 July 2014 by [Lisa Grossman](#)
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Second time lucky, the OCO-2 probe hits its 30-second launch window (*Image: NASA*)

The original spacecraft fell from the skies. But now, after a slight technical glitch, NASA's most sensitive carbon-sniffing satellite is finally orbiting Earth.

The [Orbiting Carbon Observatory-2](#), or OCO-2, lifted off at 0256 local time from Vandenberg Air Force Base in California (pictured, right). The spacecraft safely separated from the rocket about an hour later and settled into orbit.

The probe's main goal is [to find Earth's "missing" carbon](#). Human activity releases 8.5 billion tonnes of carbon into the air every year, mostly in the form of carbon dioxide. Only about 40 per cent of that stays in the atmosphere. The other 60 per cent is absorbed into the oceans or by plants. However, nearly half of that 60 per cent cannot be accounted for by the known carbon sinks.

OCO-2 will be the first satellite to monitor precisely when and where carbon dioxide is emitted and absorbed, helping us figure out, say, just how much carbon from the air gets sucked into the oceans.

Mission managers say the probe will have such detailed resolution that it may even be able to measure the carbon emissions from individual cities. "Right now, we in the carbon-cycle community have traditionally not observed cities – as strange as that sounds," says team member [Kevin Gurney](#) at Arizona State University in Tempe. "They are where all the action is, frankly," he says. "If you want to pass policy on climate change emissions, it has to work in cities – period."

Take the A train

OCO-2 is essentially a clone of the original OCO, which NASA attempted to launch in 2009. But the part of the rocket that protected the probe during launch failed to detach before the satellite reached orbit, and the craft [splashed into the Pacific Ocean](#). NASA authorised the construction of an exact copy of the satellite for launch in 2011, but the mission was put on hold when the same problem [downed another climate satellite called, ironically, Glory](#).

OCO-2 lifted off on a pricier but more reliable Delta II rocket. "It was pretty reassuring," says project scientist Michael Gunson at NASA's Jet Propulsion Laboratory in Pasadena, California. "This is one of the most reliable launch vehicles that NASA has ever used."

OCO-2 had to launch within a tight 30-second window so that it could join the "Afternoon Train", a constellation of five other Earth-observing satellites. The spacecraft all cross Earth's equator at about 1330 solar time each day, to make sure their observations can easily be compared with one another. OCO-2 missed this window yesterday after a last-minute failure in a system designed to protect the launch pad from the energy of the rocket, so the launch was scrubbed and rerun today.

City sniffer

OCO-2 will use a single spectrometer to measure the intensity of sunlight reflected off Earth. Different molecules in the air, including carbon dioxide, absorb light at particular wavelengths, so scientists can use OCO-2 to look for CO₂'s molecular fingerprints.

Most of the current data on CO₂ in the atmosphere is collected from aircraft and land-based towers, which cannot cover the whole planet. A Japanese spacecraft called [GOSAT](#) that launched in January 2009 makes similar measurements to OCO-2, but at lower spatial resolution.

OCO-2's field of view will encompass about 3 square kilometres. That means it might be able to focus on large cities like Los Angeles, Beijing or Paris, says Gurney. Coincidentally, in the past five years climate scientists have started to take more ground measurements of carbon emissions in cities and build models to predict how that carbon moves around in the air.

OCO-2 will provide an opportunity to test those models faster and more deliberately than with the original OCO mission. "It's a silver lining around what was a pretty sad event in 2009," says Gurney.