

Near earth asteroids

WSU student helps predict future collisions

Tina Hilding
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Washington State University
Asteroids can provide future resources, and can also be on collision courses with Earth

Modeling the shape and movement of near-Earth asteroids is now up to 25 times faster thanks to new Washington State University research.

The WSU scientists improved the software used to track thousands of near-Earth asteroids and comets, which are defined as being within 121 million miles or about 1.3 times the distance to the sun.

Their work provides a valuable new tool for studying asteroids and determining which of them might be on a collision course with Earth.

Matt Engels, a PhD student who has been working with Professor Scott Hudson in the School of Engineering and Applied Sciences at WSU Tri-Cities, is lead author of a paper on the research in the July issue of *Astronomy and Computing*.

Researchers would like to have better information on asteroids, including which of them might crash into earth. The rocks also can provide valuable scientific information, answering fundamental questions about the creation of our solar system and providing a glimpse into our planetary past. Knowing more about individual asteroid composition also could open up new opportuni-

ties for possible asteroid mining.

NASA maintains a catalog that includes information on more than 20,000 near-earth asteroids and comets. In the mid-1990s scientists knew of less than 200 of such outer space rocks, but with better telescopes and more efforts at surveying, the numbers of known asteroids has grown dramatically.

In the mid-1990s, Hudson, who has an asteroid named after him, wrote the primary modeling software tool that researchers use to describe asteroids and their behavior. Using ground-based radar and optics data, the software helps researchers learn important information, such as an asteroid's possible mineral make-up, current and future orbit, shape, and how it spins in space. In fact, Hudson co-authored a paper published in *Science* that determined that at least one asteroid, 1950 DA, has a very tiny chance of hitting earth during a precise 20-minute period in March of 2880.

"The software was written for a super computer, so it's really, really slow," said Engels, who jumped

It's not just cows anymore

Sid Perkins
AAAS

Natural gas, long touted as a cleaner burning alternative to coal, has a leakage problem. A new study has found that leaks of methane, the main ingredient in natural gas and itself a potent greenhouse gas, are twice as big as official tallies suggest in major cities along the U.S. eastern seaboard. The study suggests many of these fugitive leaks come from homes and businesses—and could represent a far bigger problem than leaks from the industrial extraction of the fossil fuel itself.

"This is an issue that people tend to ignore when trying to estimate methane emissions," says Kathryn McKain, an atmospheric scientist with the National Oceanic and Atmospheric Administration's Earth System Research Laboratory in Boulder, Colorado, who wasn't involved in the new research. When compared with the global amount of natural and human-driven methane emissions, she notes, "These emissions are small, but they're preventable."

When burned for heat or power, methane emits less carbon dioxide (CO₂) than fossil fuels such as coal. But when leaked directly into the atmosphere, its warming effect can be dozens of times stronger than CO₂, depending on the time scale over which the warming is measured.

The new findings come courtesy of data gathered by aircraft over six U.S. cities: Washington, D.C.; Baltimore, Maryland; Philadelphia, Pennsylvania; New York City; Providence; and Boston. In 2018, researchers flew at altitudes between 300 and 800 meters and measured concentrations of



Ellen Morris Bishop

Cows are not alone as producers of the greenhouse gas methane. Researchers have discovered that many major U.S. cities release methane from faulty and aging natural gas and propane infrastructure.

methane, ethane, CO₂, and carbon monoxide, among other gases.

The ethane measurements were clues to likely sources of the methane leaks, says Eric Kort, an atmospheric scientist at the University of Michigan in Ann Arbor and co-author of the new study. There aren't any large natural sources of ethane, but it does appear in small amounts in the natural gas supplied to homes and businesses. Kort and his colleagues could, therefore, use detected ethane levels to distinguish leaked methane from other sources.

The team's analyses suggest the five biggest urban areas studied—which together include about 12% of the nation's population—emit about 890,000 tons

of methane each year, the researchers report this week in *Geophysical Research Letters*. The vast majority of that, at least 750,000 tons, comes from methane leaks from homes, businesses, and gas distribution infrastructure, rather than natural sources and other human-driven sources such as landfills. For comparison, the team notes, that's well over triple the amount emitted by gas production in the Bakken shale formation in the U.S. Midwest.

It's also much more than the amounts estimated by the Environmental Protection Agency (EPA). A 2016 report suggested methane emissions in the six major urban areas the researchers studied totaled only 370,000 tons. "It's easy to say that the

EPA inventory is low, but it's not as easy to say why it's low," Kort says. One possible reason for this huge discrepancy: The EPA estimate includes leaks from the natural gas distribution system, but it doesn't include leaks from homes and businesses. Those "beyond the meter" emissions could include, for example, tiny whooshes of incompletely burned methane from home appliances such as gas stoves, furnaces, and hot water heaters. Taken together over a city of millions, such emissions could be substantial.

The team's results are "a confirmation and expansion" of what was already known from smaller-scale studies in the Boston and the Washington, D.C.-Baltimore areas, says Steven Wofsy, an atmospheric chemist at Harvard University, who wasn't involved in the new analysis. The new study, conducted over six metropolitan areas, "shows this is not an isolated phenomenon," he adds.

The new findings could also incentivize researchers to study where these emissions are coming from, Wofsy says. Possibilities include leaking pipelines, pumps, and valves; water treatment systems; equipment in power plants fueled by natural gas; and leakage within homes and businesses.

Kort says it's difficult to extrapolate the new leakage estimates to other urban areas across the United States. For one thing, other cities are younger and are thus likely to have newer infrastructure that is less prone to leaks. Kort adds that, globally, the identified leaks are somewhat of a blip: Worldwide, annual methane emissions from natural and human-driven sources add up to about 550 million tons.



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Sumpter Valley Dredge a monument to area mining

Richard Hanners
Blue Mountain Eagle

Rich gold diggings in the Elkhorn Mountains of Eastern Oregon drew 5,000 residents to the town of Sumpter in the early 1900s. At its height, Sumpter claimed plank sidewalks, seven hotels, 16 saloons, three newspapers, two churches, an opera house and a red light district.

A fire in 1917 burned much of the city. Today, about 175 people call Sumpter home, but the population booms during flea market events held on Memorial Day, Fourth of July and Labor Day weekends.

The year-round daily attraction in Sumpter is the gold dredge that recovered about 128,570 troy ounces from the Powder River Valley, worth about \$180 million at current prices. The Sumpter Valley Dredge State Heritage Area covers 93 acres and sees more than 100,000 visitors each year.

The last of three dredges that traveled about 8 miles across the valley starting in 1913, Sumpter No. 3 was constructed in 1935 from pieces of the second dredge, which had sat idle for a decade. Sumpter No. 3 operated until 1954.

The dredge was added to the National Register of Historic Places in 1971. Resto-



Richard Hanners/Blue Mountain Eagle

The Sumpter No. 3 gold mining dredge operated in the Powder River Valley from 1935 to 1954. It's now on display in a state park in Sumpter.

ration work began in 1995, and the state acquired the site and associated equipment and buildings for a park after that.

The principle of dredge mining is efficiency gained through volume, but it cost

more to run Sumpter No. 3 than the gold could pay for, and the company was \$100,000 in debt when it shut down.

It took three men to operate the machinery and another 17 for maintenance,

bookkeeping, surveying, truck driving, management and other roles.

On the outside, a mining dredge resembles a boat floating on a pond of its own making. Projecting from the bow is a boom with 72 one-ton buckets that dug up the countryside at the rate of 20 buckets per minute. Another boom at the stern deposited tailings across the landscape that, seen from the air, resemble worm castings and can be seen for miles along State Route 7.

Inside the dredge, electrically powered machinery duplicated on a larger scale the same processes used by placer miners during the gold rush across the West. Large rocks and gravel were sifted, sorted and separated from fines and then washed over a series of riffles, where gold settled and was trapped.

A film crew shot footage of Sumpter No. 3 for an episode in the 2013 television series "Ghost Mine" about a phantom called Joe Bush. Dredge workers claimed to have seen wet footprints, flickering lights and doors opening and closing on their own.

The name Joe Bush does not appear in company records, but in 1918 an oiler named Chris Rowe was crushed in the gearbox of Sumpter No. 1, and the story goes his spirit may have ended up inside the third dredge along with equipment from the earlier dredges.

To reach the historic dredge from John Day, drive east on Highway 26 to Austin Junction, follow State Route 7 for 25 miles, turn left on State Route 410 and drive about 4 miles to Sumpter.

The state park is open May 1 through Oct. 31 from 8 a.m. to 7 p.m. daily. Guided tours, gold panning lessons and other programs are offered on weekends.

Admission to the park is free. For more information, call 541-894-2472 or visit historicsumpter.com.

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