

Seeing the invisible

By Mark Whalen

Environmental disaster tracked by methane detectors

JPL is playing a key role in tracking a major methane leak at the Aliso Canyon natural gas storage facility north of Los Angeles.

Using infrared cameras, the Environmental Defense Fund determined the leak has released 150 million pounds of methane into the environment since its discovery in October. Methane, a greenhouse gas, can be 25 times more powerful than carbon dioxide at trapping heat in the Earth's atmosphere.

NASA aircraft toting JPL's Airborne Visible Infrared Imaging Spectrometer (AVIRIS) and Hyper Spectral Thermal Emission Spectrometer (HyTES) have been studying the leak. "Methane is invisible but these instruments are able to see the concentrated plumes of strong emission sources," said JPL researcher Riley Duren.



JPL airborne instruments have measured a methane leak at Aliso Canyon.

"The aircraft provide a snapshot of what methane gas plumes look like at a given moment in time," said Duren. "But to interpret these observations, we employ computer models to re-

construct how the Earth's atmosphere moves in four dimensions."

Answers aren't straightforward. Is there a single plume of methane being

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Ocean satellite working well

Two JPL instruments are onboard Jason 3

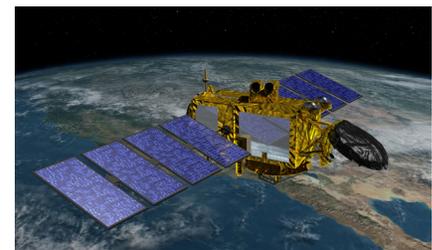
Several weeks into their orbital mission, the two JPL instruments on the Jason 3 satellite have quickly begun producing valuable data on sea levels around the globe.

"Initial results look very good," said Project Manager Parag Vaze, who added that the mission team is tuning calibrations before the satellite transitions into an operational mode, which is planned for this spring.

JPL manages Jason 3 and has provided a microwave radiometer and GPS receiver for the mission, which will begin full science operations after a six-month checkout phase. Jason 3 launched Jan. 17 from Vandenberg Air Force Base.

Jason 3 will precisely measure the height of 95 percent of the world's ice-free ocean every 10 days. The mission will improve weather, climate

By Mark Whalen



and ocean forecasts, including helping NOAA's National Weather Service and other global weather and environmental forecast agencies more accurately

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METHANE LEAK *Continued from page 1*

released by the damaged well? Are there smaller plumes from other areas around the facility? How much methane is being trapped in the soil and then slowly released?

“The imagery we’re getting from the aircraft is primarily used to help evaluate the models, and also to understand the processes that control the methane release,” said Duren. “So understanding what the source looks like close-up is where the imaging instruments are important.”

Data produced by JPL will support decision making by local, state and national agencies and other stakeholders that are concerned about mitigating greenhouse gas emissions, he said.

Duren has been actively involved in a larger emissions study in Southern California. He is principal investigator for the Los Angeles Megacities Carbon Project, an international, interagency project which for two years has overseen 14 monitoring stations from Victorville to San Clemente Island.

Southern California has numerous

methane sources—gas pipelines, landfills, oil fields, wastewater treatment facilities, refineries, natural seeps and dairies. It turns out that there is a large landfill and oil field right next to Aliso Canyon, so Duren’s team disentangled the methane emissions of the landfill and the oil field from those of the gas storage facility by mapping out an area of about 120 square kilometers around Aliso Canyon.

The Megacities project is funded through 2017. From its post on Mount Wilson, another JPL instrument, the California Laboratory for Atmospheric Remote Sensing, or CLARS, has been scanning the L.A. Basin several times a day since 2011 to measure carbon dioxide, carbon monoxide and methane, simulating an imaging greenhouse gas instrument on a geostationary satellite. This instrument has also been instrumental in the Aliso Canyon study.

“The sustained measurements from the tower network and the CLARS measurements on Mount Wilson provide us with a near-continuous history of when the leak started and how it’s evolved over time,” said Duren. He added that special observations by

the Japanese Space Agency’s GOSAT satellite and the EO-1 Hyperion satellite were also arranged to study this unprecedented methane source. Data processing, quality control, modeling and interpretation are complex and time-consuming. “Ultimately,” said Duren, “the analysis of how much methane was released and validating those results will likely take several months.”

Duren also noted that planning was already underway, before the leak was reported, for JPL to conduct a statewide methane survey this summer with the AVIRIS and HyTES instruments for the California Air Resources Board and Energy Commission. “We were busy working on the task plan when this Aliso Canyon event started,” he said.

“To the extent that we can assist with remote sensing and apply an integrated systems approach to detect and quantify greenhouse gas emissions across Los Angeles, California, and someday globally, that’s what JPL is contributing to the broader endeavor,” said Duren.

Note: The Southern California Gas Company on Feb. 11 said the well was no longer leaking.

JASON 3 *Continued from page 1*

forecast the strength of tropical cyclones.

More than 100 JPLers worked on Jason 3, said Vaze. “All of their contributions were important to our success,” he said. “Team members brought expertise from many disciplines at JPL including instrument engineering, science, systems engineering, mission assurance, ground data systems and business management.”

Measurements of sea-surface height, or ocean-surface topography, reveal the speed and direction of ocean currents and tell scientists how much of the sun’s energy is stored by the ocean. Combining ocean current

and heat storage data is key to understanding global climate changes.

Data from Jason 3 will be used for other scientific, commercial and operational applications, including modeling of deep-ocean waves; forecasts of tides and currents for commercial shipping and ship routing; coastal forecasts to respond to environmental challenges such as oil spills; coastal modeling crucial for marine mammal and coral reef research; and forecasts of El Niño and La Niña events.

Jason 3 is led by the National Oceanic and Atmospheric Administration (NOAA) in partnership with NASA, the French space agency and the European Organisation for the Exploitation of

Meteorological Satellites.

Original plans called for Jason 3 to launch in 2013, said Vaze, but the mission endured a number of delays to work through various programmatic, launch vehicle procurement and development challenges.

“I’m very pleased that our JPL team was never distracted by the external factors and did a great job delivering excellent instruments on plan,” he said. “The launch of Jason 3 is very important to JPL and the team since many of them are continuing forward toward working on the upcoming Jason-CS/Sentinel-6 and Surface Water Ocean Topography missions.”

For more information, visit <http://www.nesdis.noaa.gov/jason-3>.

JPL's future: efficiency, innovation are key

How the Lab does its work is just as important as what it produces

During the development of JPL's 2025 strategy, it was recognized that "how" the Lab accomplishes its work was just as important as "what" it produces. Lab leadership wants to ensure that JPL is world class and leading edge in its processes and procedures for getting work done.

Deputy Director Larry James emphasized the importance of focusing on this area.

"Over the last two years, we've stood up the Lab Management Council to broadly look at processes and innovations across the Lab," said James. "There was no one entity doing that, ensuring that we continually improve our productivity, efficiencies and working conditions."

To move forward in this effort, JPL recently consolidated the Operations Management Council, responsible for funding JPL initiatives, with the Laboratory Management Council, the strategic arm for JPL operations oversight. It made sense to combine the two functions, said James.

"We will now have one council that strategically looks at how we accomplish our work," he said. "This will be more efficient and allow us to prioritize and focus on areas that deserve more support. It is one example of reducing overhead to get important things done more quickly."

One way to achieve best business practices is to share information on innovative initiatives across the Lab. "Right now, we have no simple way

of showing the great, innovative ideas that are being implemented across the Lab," said James. "We're now capturing that. If there are multiple efforts along the same lines, we would like to align them, or at the very least provide opportunities to benefit from each other."

Management heard from JPLers in several surveys that they found it difficult to find other innovative people or innovative efforts at JPL. James said this would be addressed by allowing employees to create "communities of practice" to spark innovative ideas focused on how to get their job done most effectively.



JPL Deputy Director Larry James

"If you've got a great idea of how we do things, first you can see whether or not somebody is already looking at this. If not, here's the chance to post your idea for action."

JPL Deputy Director Larry James

A "ProcessGuru" portal site, which will debut in the spring, will provide new avenues to discover innovative processes and, in turn, work smarter. The site will direct users to subject-matter experts to help develop ideas and connect like-minded JPLers at brainstorming meetups, similar to what's done in industry and by startups.

"If you've got a great idea of how we do things, first you can look to

see whether or not somebody is already looking at this," said James. "If not, here's the chance to post your idea for action."

"We want everyone to be continuously thinking: 'How can I do this better?' or 'Do I have a better idea?'," said James. "We want to capture and benefit from the creative ideas that JPLers generate every day, regardless of how small they may seem to the idea originator. Many incremental improvements can lead to major benefits in reducing complexity and improving the effectiveness of what we do. It's also important from a strategic perspective. What we do at JPL is incredible and further enabling our creativity and innovation across the Lab will be key to us reaching new frontiers of exploration."

Energy from on high

One JPL building now has something in common with the Opportunity rover on Mars—both are graced with solar panels.

The Project Formulation Building (301) was recently equipped with a grid of 864 solar photovoltaic panels on its roof.

The effort helps JPL meet mandated standards for federally owned facilities to increase their use of renewable energy.

Facilities Energy Manager Steve Rigdon, who said the panels should generate about 285 kilowatts, expects the array installation to be completed by the end of February. This effort could also save the Lab more than \$60,000 annually on electricity.

Based on JPL's typical power usage, the array is expected to deliver a total of about 487,000 kilowatt-hours per year. "To put that in perspective," Rigdon said, "that's the equivalent of the annual average amount of electricity consumed by 45 homes."

These figures are for Building 301 alone. But soon, the Lab plans to expand the energy and cost windfall by placing solar panel arrays on other JPL buildings. The bigger the building, the bigger the savings. The largest available space, the



Photo courtesy of Steve Rigdon

Installation of solar panels on Building 301's roof is expected to be completed by the end of February.

new parking structure, is the next target.

Rigdon said the structure was designed "solar ready," with pillars already in place. Once installed, the array on the building will generate about 1 megawatt of power. Rigdon expects construction to begin in fiscal year 2017 pending approval of construction of facilities funding and could take a year to complete.

Solar provider SunEdison will maintain and operate the new array on Building 301. Through a web-based platform, JPL Facilities will monitor the system's functionality and production, said Rigdon.

The work on 301 adds to JPL's only other solar photovoltaic system, a 30-kilowatt array atop Building 302, installed in 2007.

News Briefs



Adam Steltzner

Steltzner named to National Academy

In recognition of his development of the Mars Curiosity entry, descent and landing system and for contributions to control of parachute dynamics, JPL engineer Adam Steltzner has been elected to the National Academy of Engineering.

Steltzner, an engineering Fellow in the Systems Engineering and Formulation Division, is chief engineer for the Mars 2020 project and is also the manager of the Planetary Entry, Descent and Landing and Small Body Access Office.

Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer.

Lab will contribute to six cubesat missions

The first flight of NASA's new rocket, the Space Launch System, will carry 13 low-cost cubesats to test innovative ideas along with an uncrewed Orion spacecraft in 2018. Six of these cubesat missions have contributions from JPL.

JPL is providing telecommunications and Deep Space Network support for Lunar IceCube,

which will search for water ice and other resources from 62 miles above the surface of the moon. The principal investigator is also based at JPL.

Near-Earth Asteroid Scout will perform reconnaissance of an asteroid, take pictures and observe its position in space. JPL will build and deliver the spacecraft, and the principal investigator is based at JPL.

JPL will provide telecommunications and DSN support for BioSentinel, which will use yeast to detect, measure and compare the impact of deep-space radiation on living organisms over long durations in deep space.

JPL will manage Lunar Flashlight, which will look for ice deposits and identify locations where resources may be extracted from the lunar surface. The project manager is based at JPL.

The Lab will provide telecommunications and DSN support for CubeSat to study Solar Particles, or CuSP, a "space weather station" to measure particles and magnetic fields in space, and LunaH-Map, which will map hydrogen within craters and other permanently shadowed regions throughout the moon's south pole.

Happy birthday, Ed!



Thom Wynne / JPL Photo Lab

In January, JPLers gathered in Pickering Auditorium to observe the 30th anniversary of Voyager 2's flyby of Uranus while bidding a happy 80th birthday to Voyager project scientist and former JPL Director Ed Stone.

Passings

William "Billy Joe" Rowe, 86, a retired photographer, died Jan. 13.

Rowe joined JPL in 1952 and worked as a motion-picture editor and photographer for every JPL project from Corporal to Galileo as well as the Deep Space Network. Rowe also documented and archived JPL's early motion picture collection. He retired in 1991.

Rowe is survived by his daughter, Dana Spooner; son Scott; grandsons Tyler and Casey; and great-grandson Ryder.

A memorial will be held March 12 at 3 p.m. at Matt Denny's Ale House in Arcadia. Those wishing to attend are asked to contact his daughter Dana at dspoonerow@gmail.com.



William Rowe

Richard McKay, 88, a retired technologist, died Dec. 6.

McKay joined JPL in 1959 and retired in 1992. His work led to improved propellant for the space shuttle's solid rocket motor boosters and the Delta rockets that powered the Spirit and Opportunity rovers to Mars. He also earned a NASA Inventions and Contributions Award for an efficient multi-load temperature control system.

McKay is survived by brothers Nevin, Lawrence and Paul, and sister Eleanor Corley.

George Born, 76, a retired engineer and manager, died Jan. 21.

Born, who worked at JPL in the 1970s and early 1980s, was instrumental in JPL's early ocean altimetry missions, serving as geophysical evaluation manager for Seasat. He also contributed to Topex/Poseidon, Mariner 9 and Viking, and supervised the Precision Orbit Determination Group.

Born is survived by his wife, Carol, and son Brett. A memorial was held Jan. 24 in Boulder.

Letters

My family and I would like to thank my JPL colleagues and friends for their kind words and thoughts over the passing of my 98-year-old father. Your condolences, good wishes and flowers bought us great peace and comfort, and are greatly appreciated.

Steven Bard

My family and I would like to thank my co-workers and the JPL community for their support over the long months of illness and subsequent death of my wife, Cathy Ryne. Your compassion, thoughts, condolences and generous support have brought us comfort and are greatly appreciated.

Mark Ryne

I would like to thank my JPL coworkers for their support during the recent passing of my mother. Thank you for the lovely plant and your support during this difficult time.

Michael Sierchio

Classifieds

Ads submitted Jan. 30 to Feb. 5. To submit an ad, e-mail universe@jpl.nasa.gov.

For Sale

MISC.: Pedometer, mini steam iron, Rollerblades (men's 8), head/neck/shoulder massager, soft-sided cooler, bloody Mary set, stemless decanter set, woman's M "Galileo Flt. Team Mbr" LS red turtle-neck and white roller rink skates (sz. 7); prices upon request. 818-272-3262.

SCUBA equipment: all in excellent condition; Scubapro MK25/s550 BC, Scubapro Ultra Console w/ compass, Aqualung regulator bag, Scubapro Razor fins, wet suit vest w/hood sz. XL, 2 dive bags, weights, Nikon Coolpix L5 dive camera w/water-proof case, misc. other items. 626-303-6317.

WINTER SPORTS ITEMS, everything from boots to helmets, M/F sizes M-XL. 818-272-3262.

Lost and Found

"FOUND: DKNY prescription sunglasses, found about 2+ months ago in the 301-169 conference room. Please call Cathy at ext. 4-1198 to identify and pick-up.

Vehicles / Accessories

'09 HARLEY-DAVIDSON Street Glide touring bike, low mileage (5,000), Screaming Eagle pipes, customized seat, saddlebags, fairing with LED lights across front, custom paint, flat black and beautiful; financing if you need it. \$15,500. 626-482-1444.

'06 HONDA Accord EX-V6 sedan, excellent condition, original owner, clean title, maintenance completed and documented per Honda specs, graphite pearl exterior, gray interior; 244 hp, 3.0 liter SOHC 24-valve VTEC V6 engine, 5-speed automatic, a/c, AM/FM, CD player, Honda nav system with voice recognition, leather-trimmed seats, power moon-roof w/tilt feature, 105K miles, everything works, runs great; \$7,600/obo. 818-790-5902, crl8686@yahoo.com, Carol.

Wanted

SPACE INFO/memorabilia from U.S. & other countries, past & present, for personal use (see <http://www.youtube.com/watch?v=S7PvjGp7mCU>). mrayman@alumni.princeton.edu, 818-790-8523, Marc Rayman.

For Rent

ALTADENA (91001), a bedroom and bath in a 2-bed, 2-bath house close to JPL; very clean and bright, already furn., cable and Internet included, will split water/gas/power by 1/3; great location near a 24 Hour Fitness, close to 210/134/110; must be able to live w/dogs, will accept a well-mannered dog w/small deposit; will do month-to-month or longer leases, \$800 + \$800 deposit. 858-361-7749.

ALTADENA, furnished rm. and loft w/awesome view for lease; non-smoker to share a beautiful 4-bdrm., 3-bath house across from community garden; close to local colleges, Pasadena schools, Caltech, walk to JPL; utilities included, central air/heat, In-

ternet; near 210/134/110, bus stop, shopping, banking, entertainment, restaurants; room \$740/mo., loft \$700. 818-370-0601.

CANYON COUNTRY, Lost Canyon area, 4-bedroom/2-bathroom house (~1,770 square feet) with a huge yard; ad and pictures: <http://losangeles.craigslist.org/sfv/apa/5410577724.html>; month-to-month lease (long-term preferred); \$2,700/month + deposit. 661-312-5291.

MONROVIA, 14 miles from JPL; 1 large bedrm and private bathrm, room comes furnished (queen bed, dresser room set, 35' flat screen, private closet); access to kitchen + living room area (Playstation 3&4, Xbox 360&One and PC); I have my car so travel to JPL will be provided; I have Huskies that are trained and friendly; \$875/mo. 704-606-0142.

PASADENA townhouse, 2 bedrms, 1.5 baths, master walk-in closet, 2-car garage, new washer/dryer in unit, stainless steel appliances, central air/heat; walking dist to PCC/Caltech/Gold Line/Rose Parade route; 6 miles to JPL, minutes to 210; water and trash incl.; \$2,100/mo. + security deposit, one-year lease. 626-429-6096, glor1an@aol.com.

PASADENA, two furn. rooms in a lovely 4-bd./2-bath house, big backyard, hardwd floor, big closet, shared bathrm, kitchen/laundry privileges; 2 miles to JPL, close to public transport; short- or long-term lease avail.; must like dogs and be very clean; \$800 and \$850 + \$800 deposit. 818-960-8654.

SUN VALLEY, 3-bed, 2-bath single-family house on a very quiet st. on hills above Glenoaks Blvd., living room w/fireplace with French doors to patio, nice back yard with fruit trees, 2-car garage with storage; \$2,400/mo. Call or text 818-281-3840.

Vacation Rentals

BIG BEAR lakefront, luxury townhome, 2 decks, tennis, pool/spa, beautiful master bedrm. suite. 949-786-6548.

JACKSON HOLE, WY: Luxurious bed and breakfast on 3 acres of solitude on Snake River near Jackson Hole Mountain Resort and south entrance to Grand Teton Natl. Park; see <http://www.bentwoodinn.com>; mention JPL for discount. info@bentwoodinn.com, 307-739-1411.

MAMMOTH, Snowcreek, 2 bd., 2 ba. + loft, sleeps 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount, no pets. 626-798-9222, 626-794-0455 or valeriee@caltech.edu.

MAMMOTH, Snowcreek, beautiful updated condo, 2 bd., 2 ba. + loft (sleeps 6-8), great location by pond/meadow, new appliances, TVs, DVD players, free wireless Internet and washer/dryer, no pets. 818-952-2696 or BigMtnPrettySky@gmail.com.

MAMMOTH, remodeled 2 bed/2 bath + loft, short walk to Canyon Lodge; Courchevel 6 features full kitchen, cable and Internet TV, DVD & Blu-Ray, wireless high-speed Internet, 2-car garage, Jacuzzi, summertime grill and pool; no pets. <http://Courchevel6.com>

OCEANSIDE condo, on the sand, watch the beautiful sunsets, charming, 1 bedroom, panoramic view, walk to pier or harbor, pool/spa, game room, sleeps 4 max, all amenities. 949-786-6548. ■



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