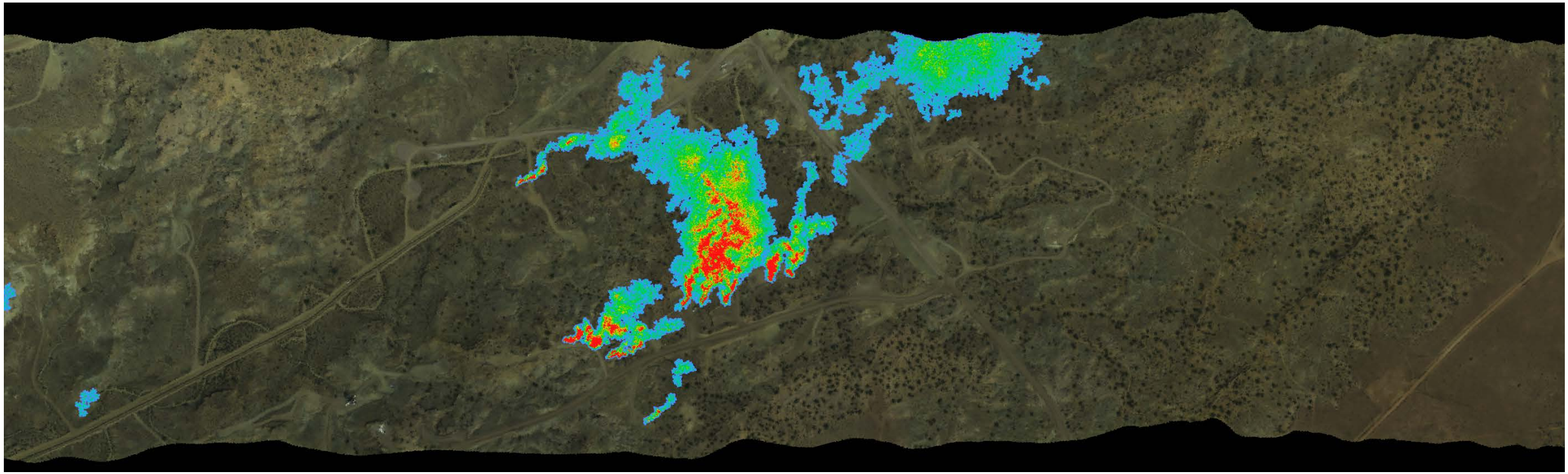
Mapping methane emissions using the airborne imaging spectrometer AVIRIS-NG

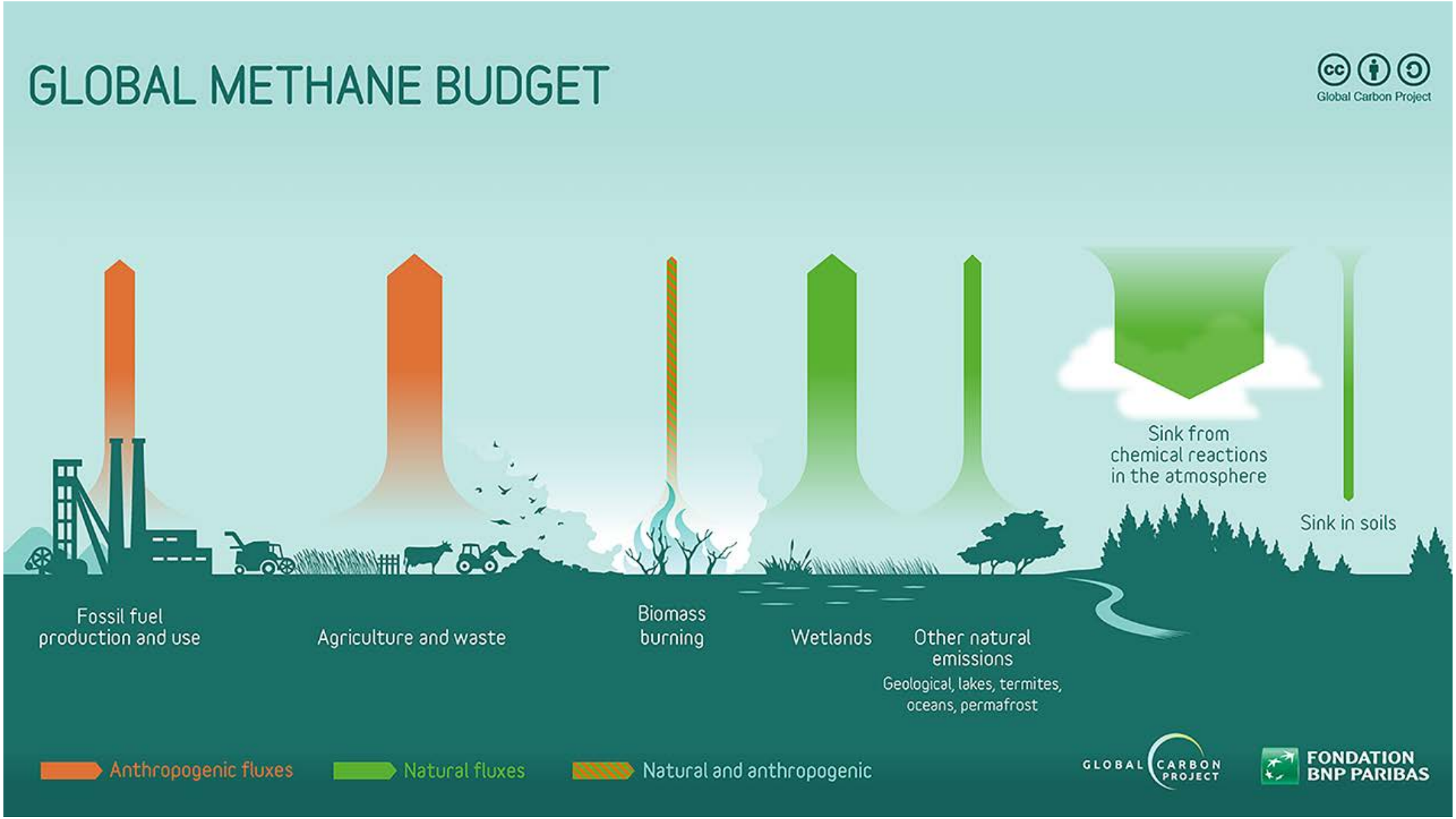


Andrew K. Thorpe[1], Christian Frankenberg[2,1], David R. Thompson[1], Riley M. Duren[1], Brian D. Bue[1], Robert O. Green[1]

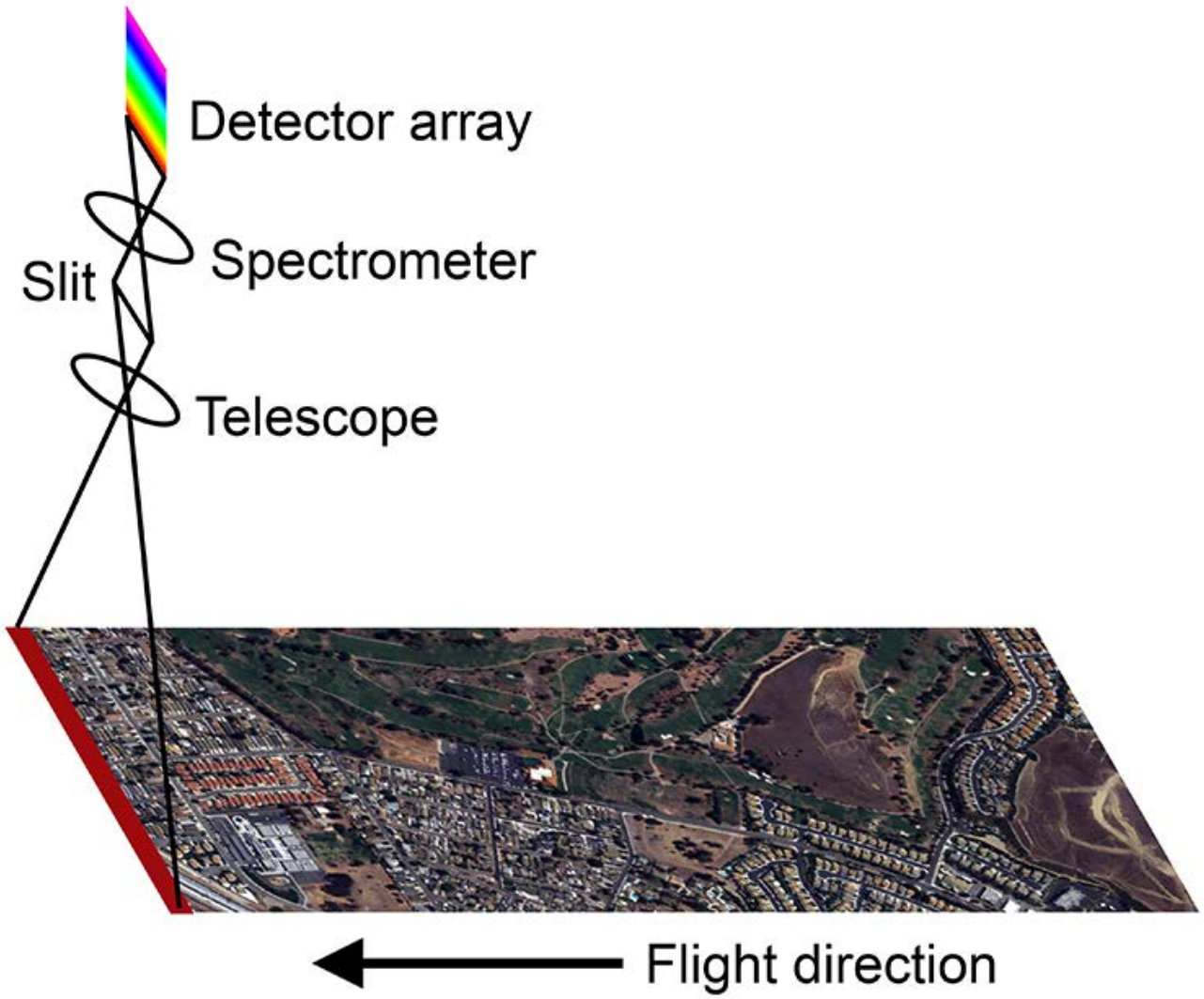
[1]NASA Jet Propulsion Laboratory, California Institute of Technology

[2]California Institute of Technology

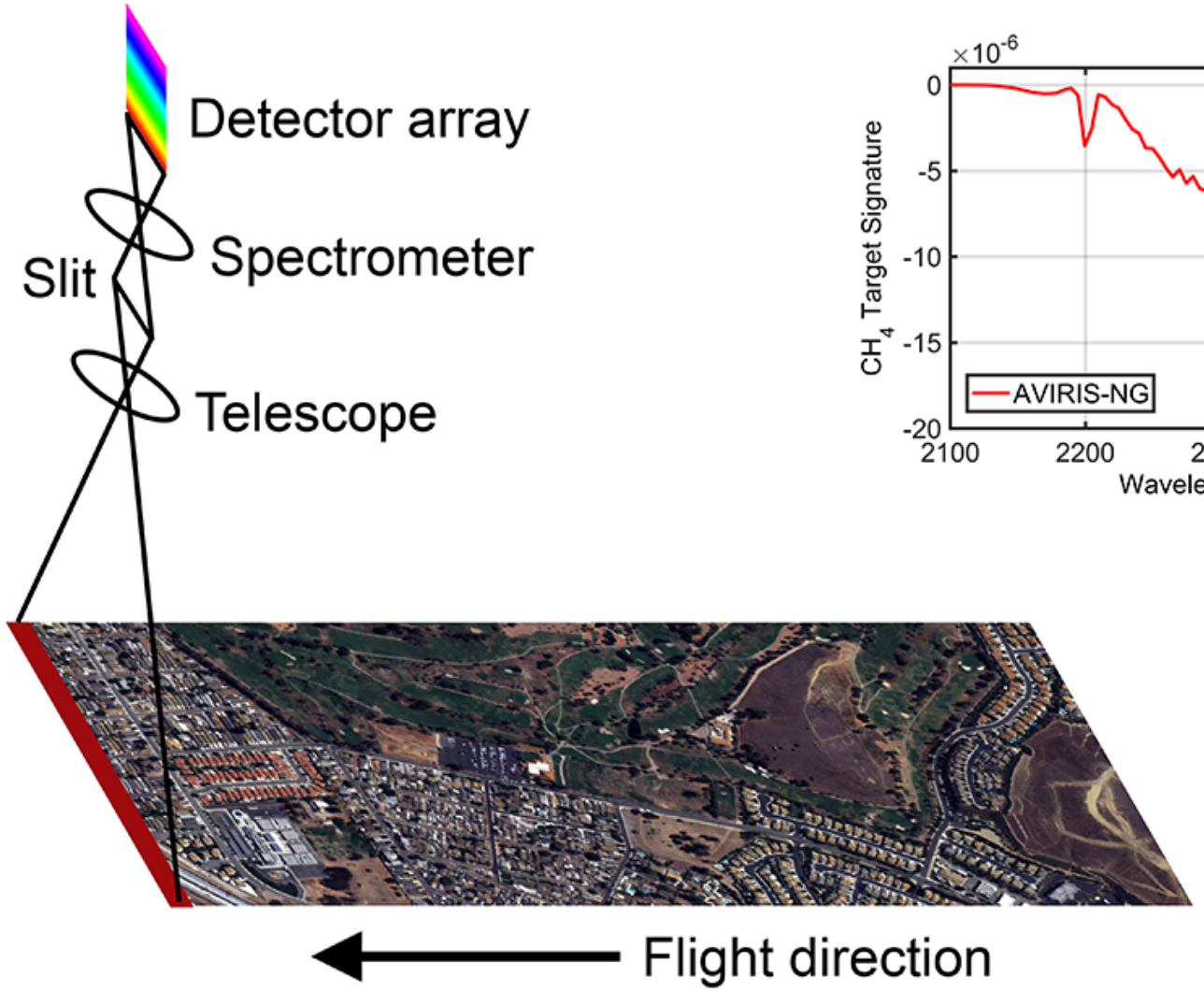
A potent greenhouse gas

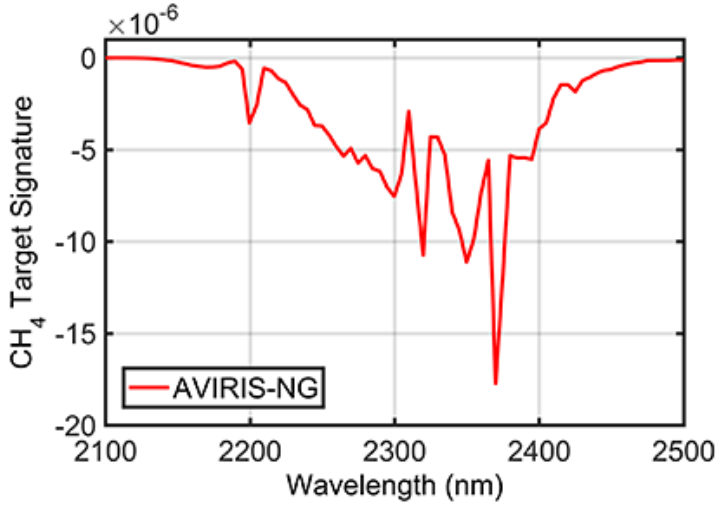


Imaging spectrometer AVIRIS-NG

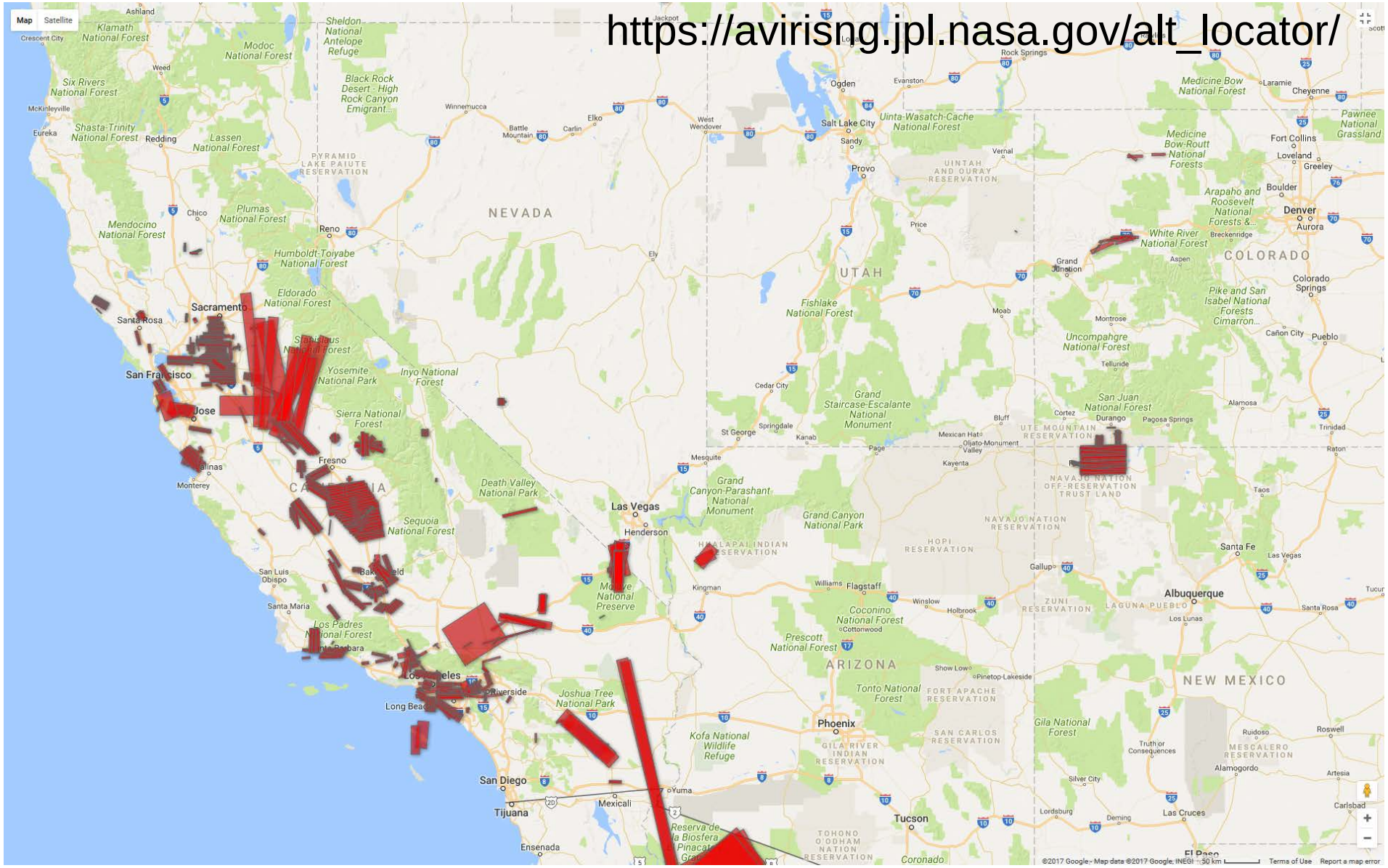


Imaging spectrometer AVIRIS-NG





Study sites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NEVADA
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ARIZONA
NEW MEXICO
Sacramento
San Francisco
San Jose
Fresno
Las Vegas
Phoenix
Tucson
San Diego
Tijuana
Denver
Albuquerque
Salt Lake City
Reno
Yosemite National Park
Death Valley National Park
Grand Canyon National Park
Joshua Tree National Park
Sequoia National Forest
Sierra National Forest
Inyo National Forest
Eldorado National Forest
Humboldt-Toiyabe National Forest
Uinta-Wasatch-Cache National Forest
White River National Forest
Uncompahgre National Forest
San Juan National Forest
Fishlake National Forest
Grand Staircase-Escalante National Monument
Grand Canyon-Parashant National Monument
Coconino National Forest
Prescott National Forest
Tonto National Forest
Kofa National Wildlife Refuge
Gila National Forest
Pike and San Isabel National Forests Cimarron...
Arapaho and Roosevelt National Forests &...
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Medicine Bow National Forest
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Six Rivers National Forest
Klamath National Forest
Modoc National Forest
Lassen National Forest
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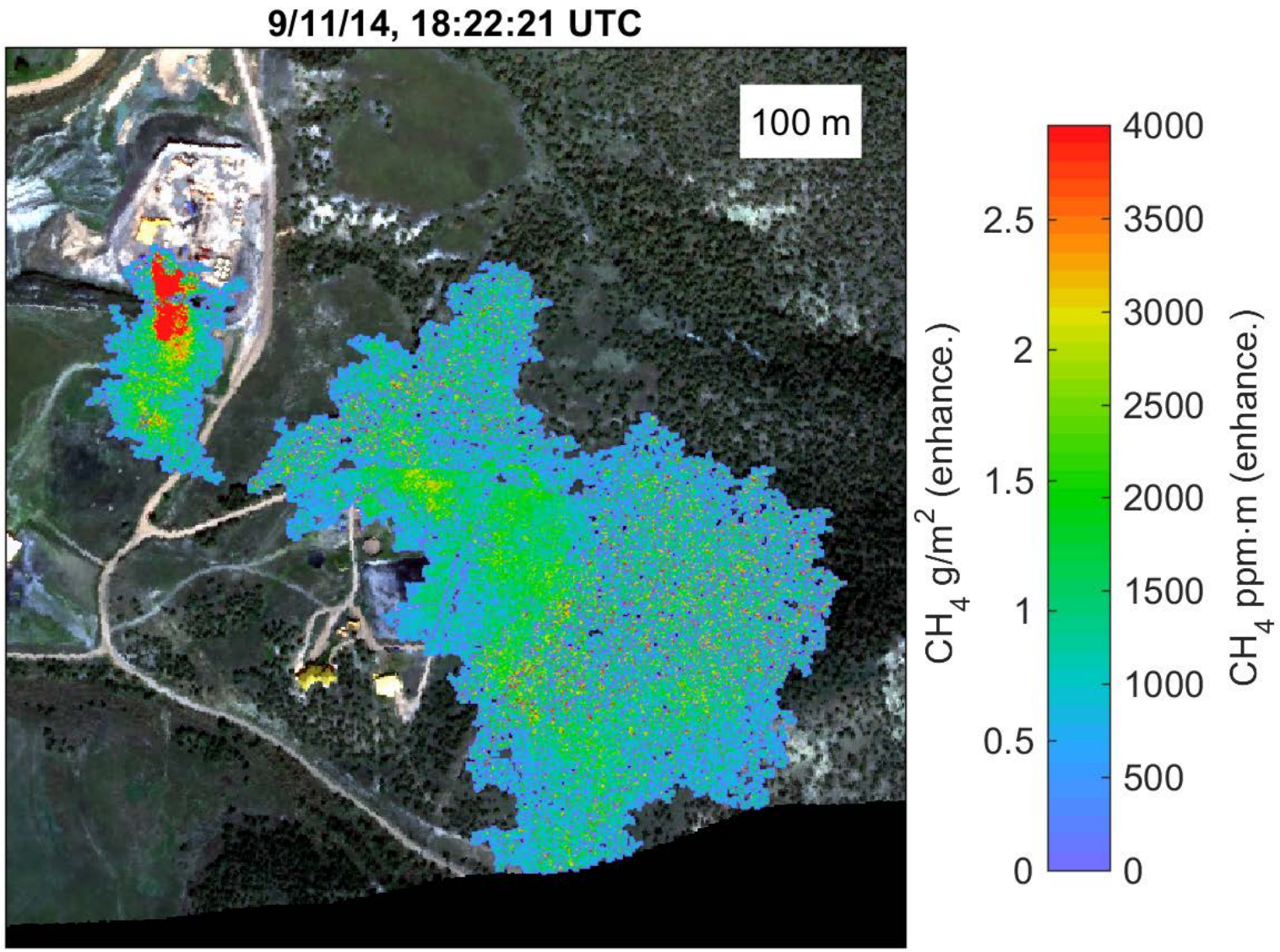
Real time methane mapping

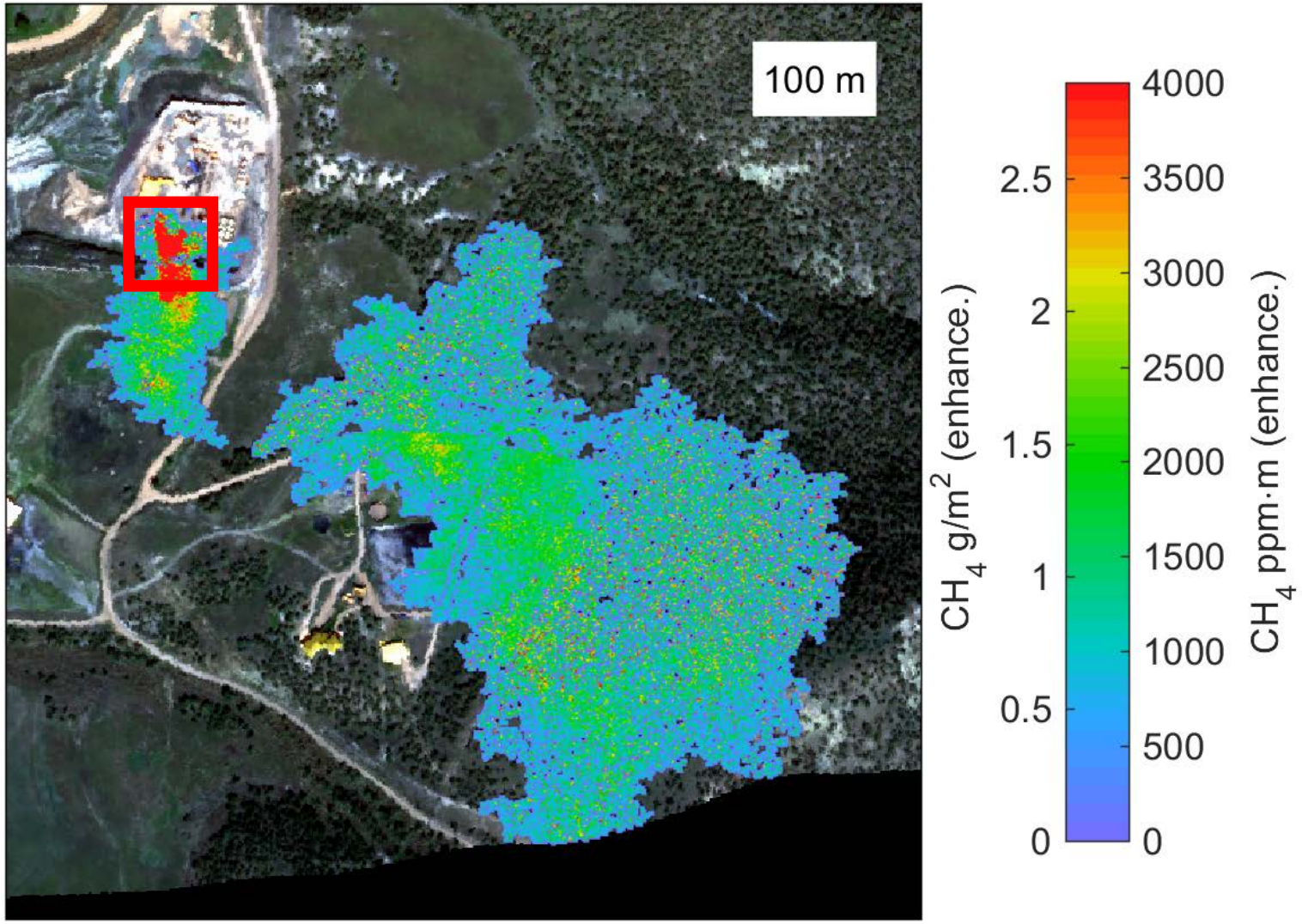
CH_4: Hydraulic fracturing (Colorado)



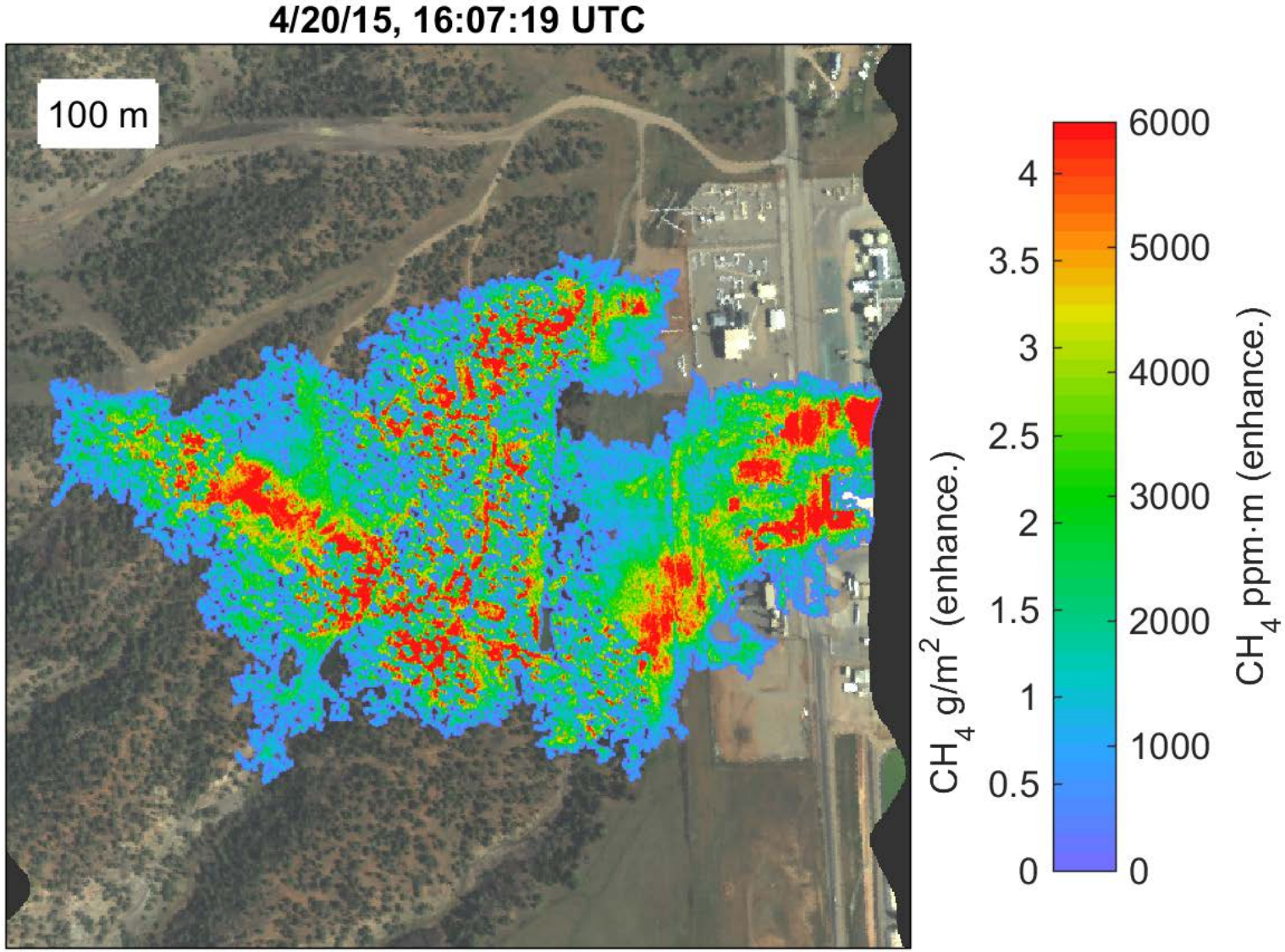
CH_4: Hydraulic fracturing (Colorado)

Google Earth, 6/3/14

9/11/14, 18:22:21 UTC

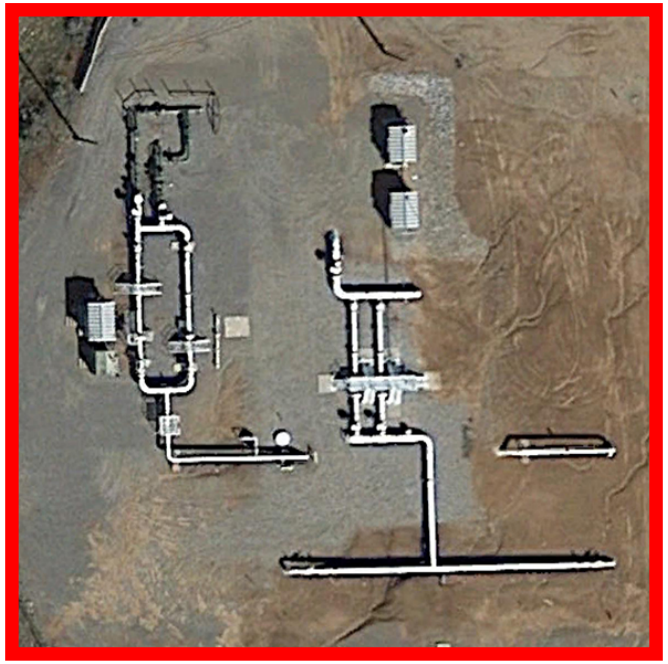


CH_4: Gas processing plant (Colorado)



CH_4: Gas processing plant (Colorado)

Google Earth, 3/15/15



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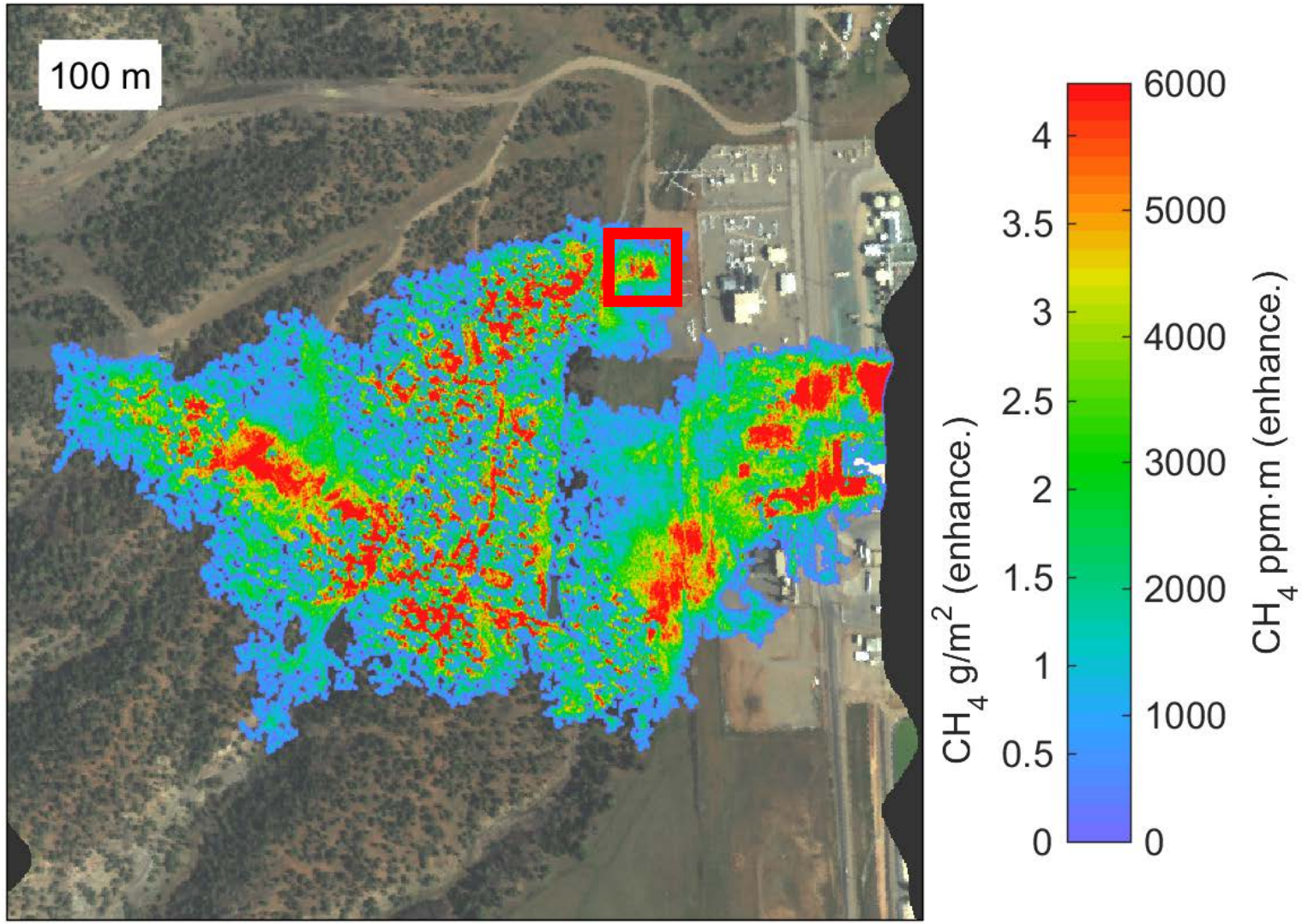
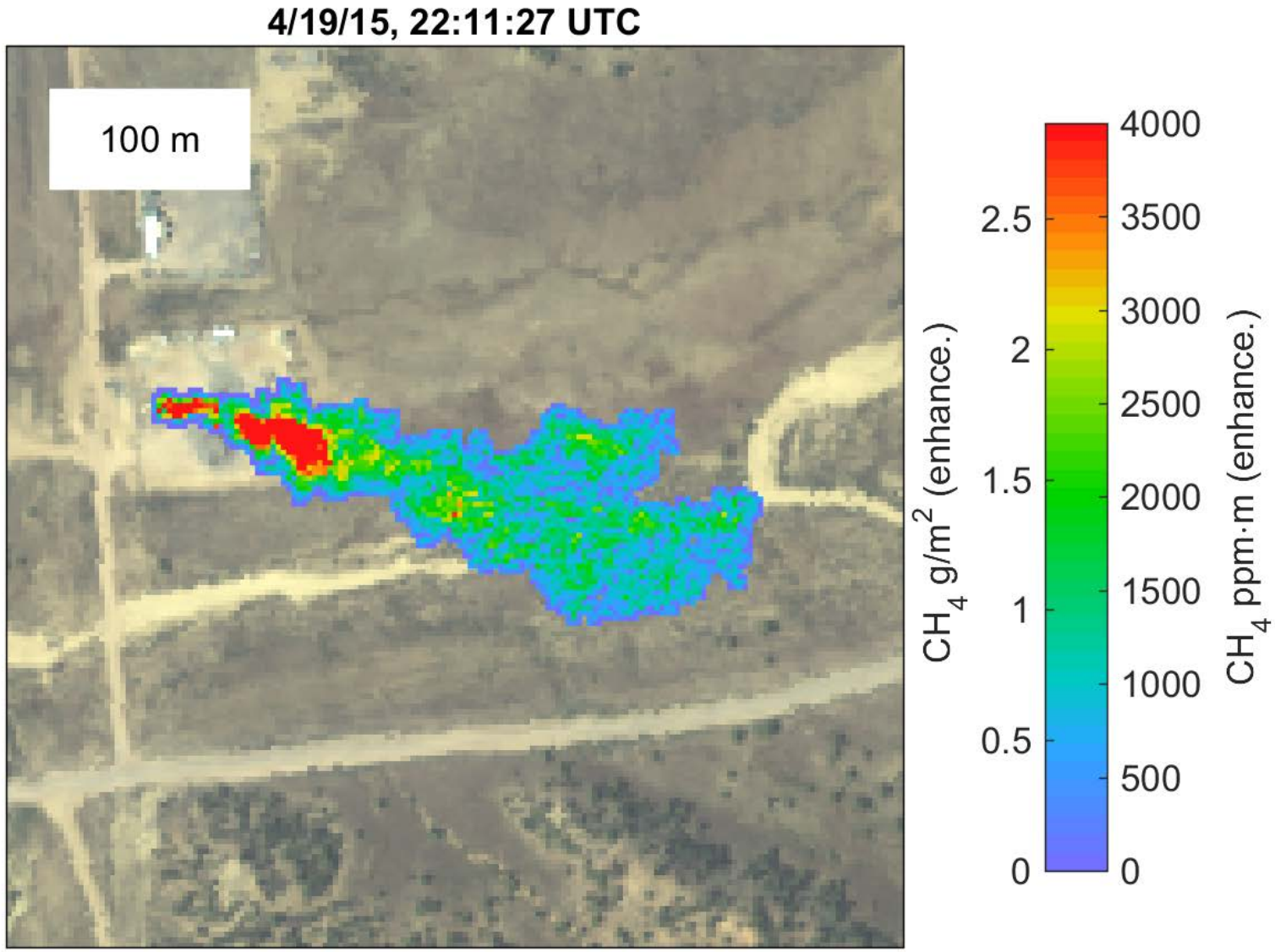


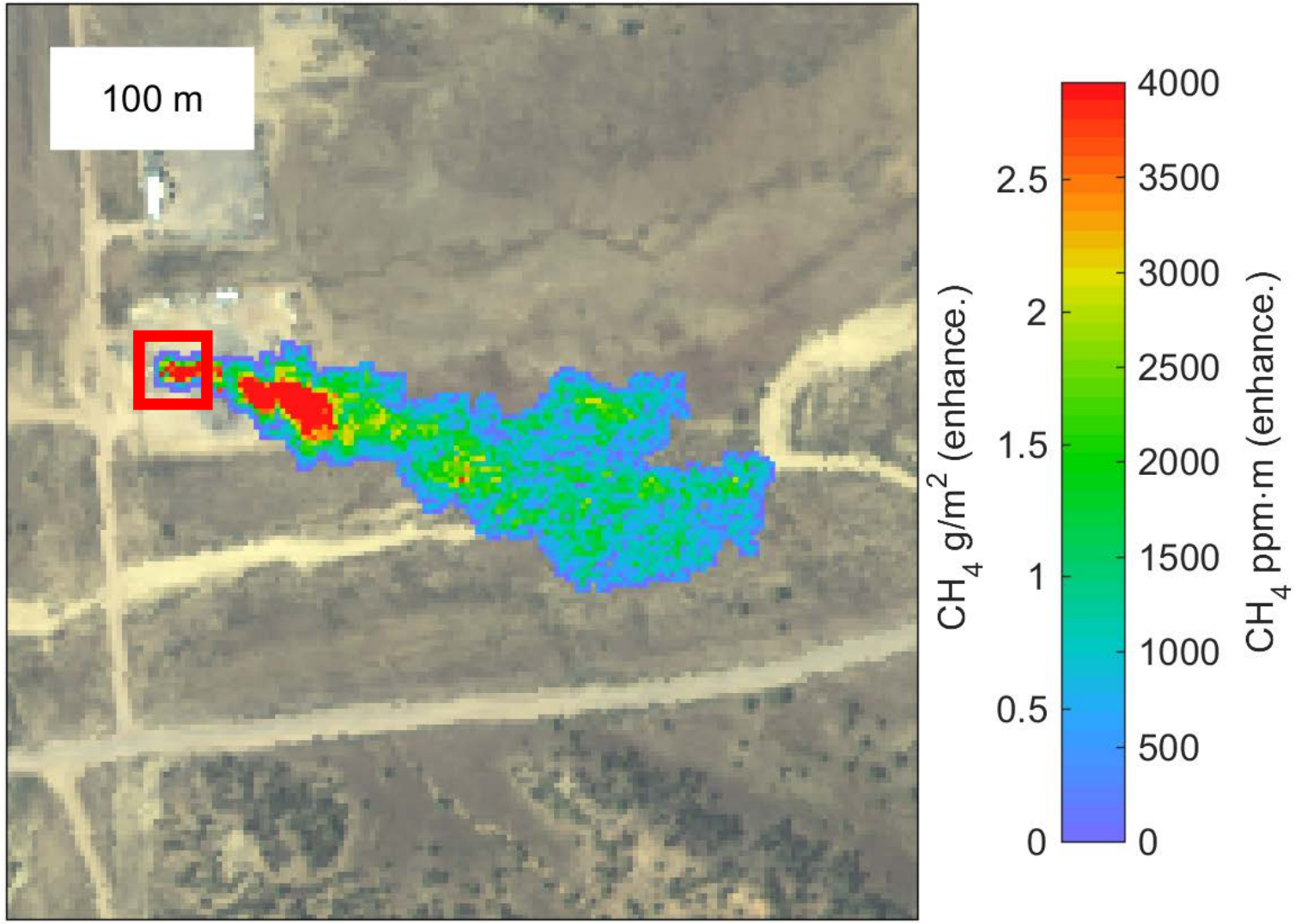
CH_4: Tank (New Mexico)



CH_4: Tank (New Mexico)

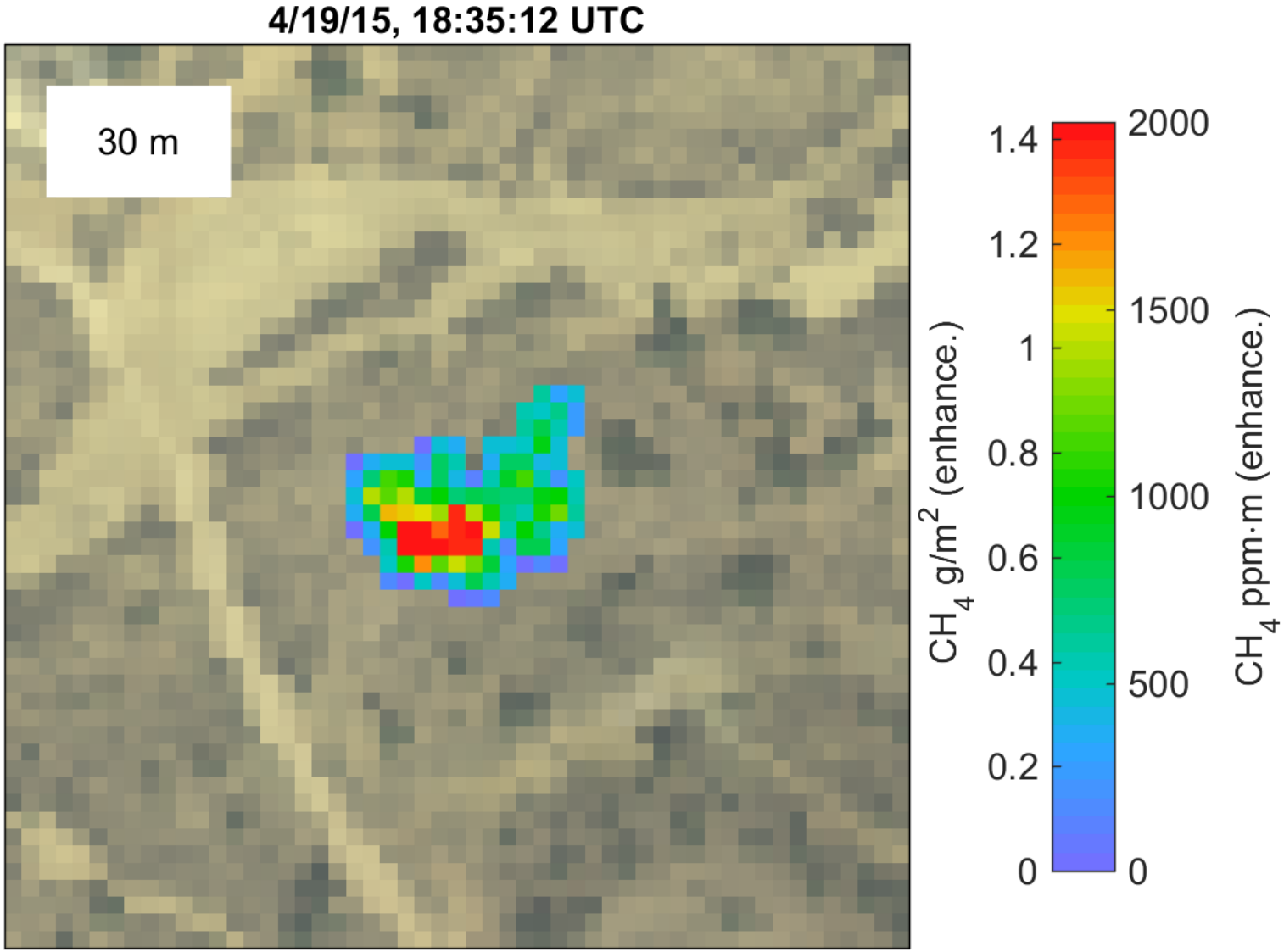
Google Earth, 3/15/15

4/19/15, 22:11:27 UTC



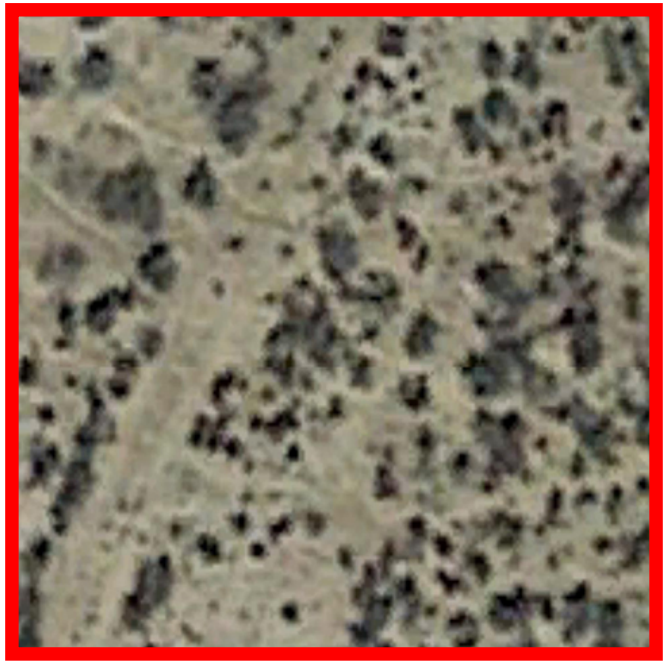
CH_4: Tank (New Mexico)

CH_4: Pipeline leak (New Mexico)



CH_4: Pipeline leak (New Mexico)

Google Earth, 3/15/15



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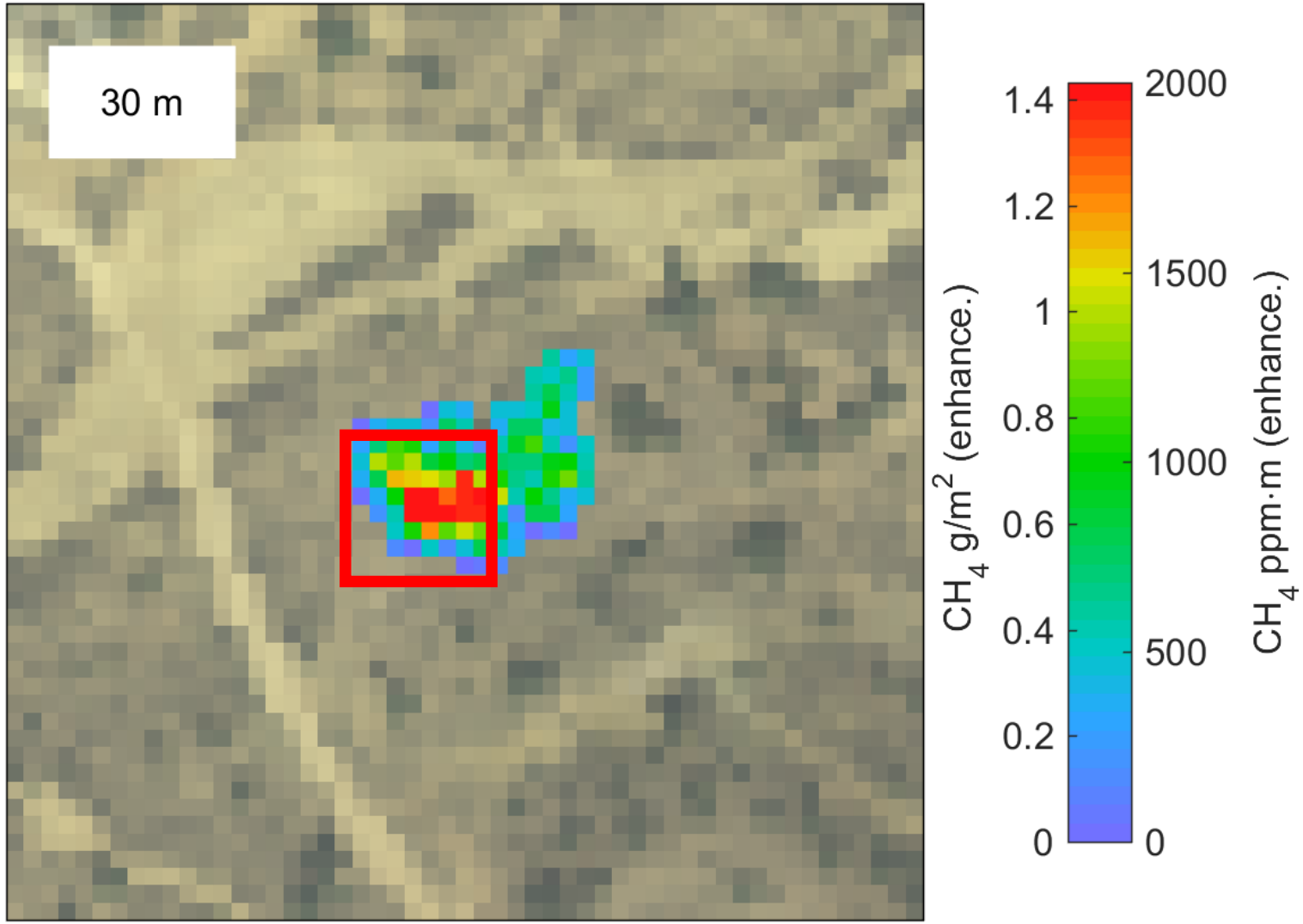
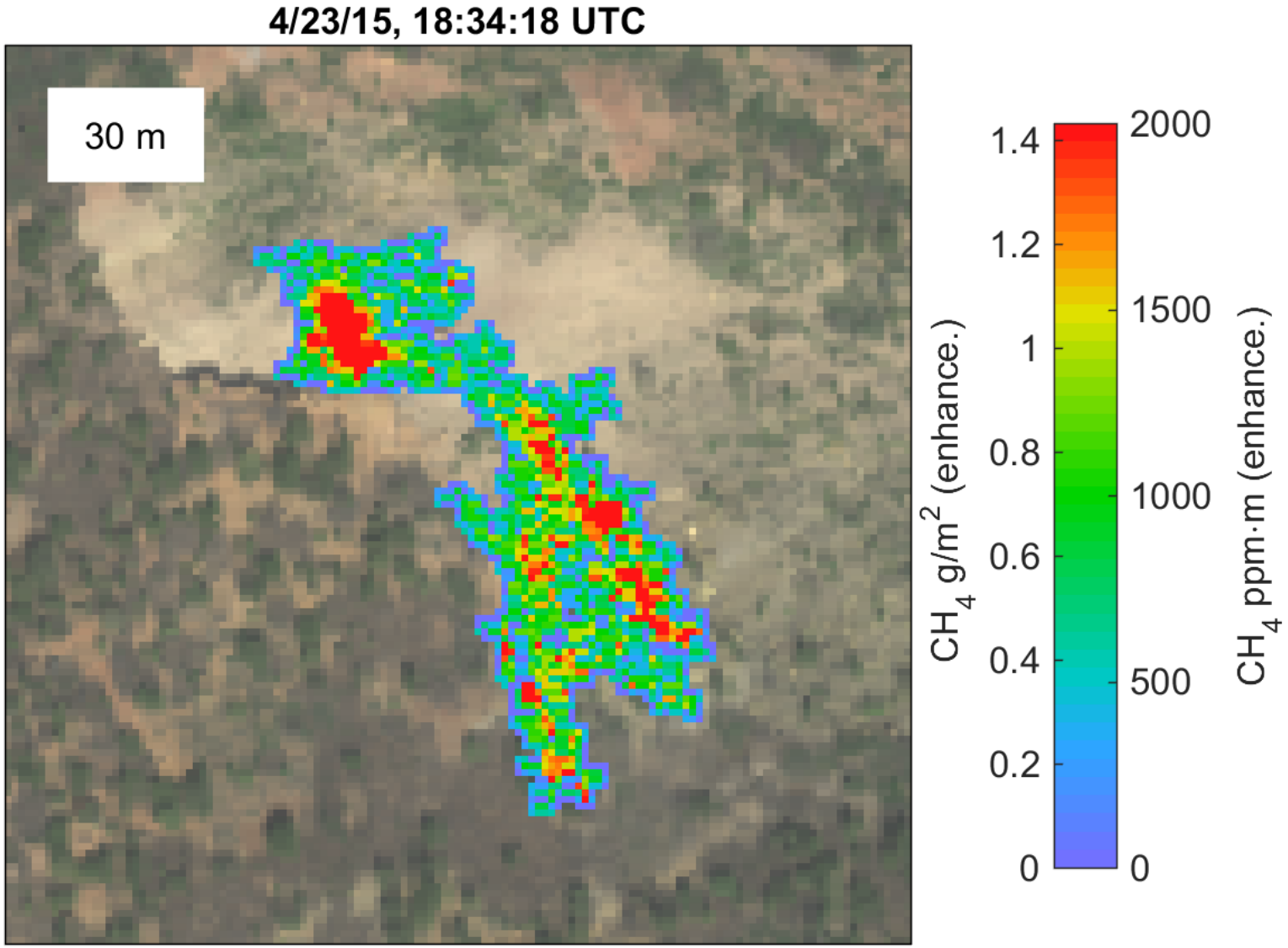


CH_4: Pipeline leak (New Mexico)

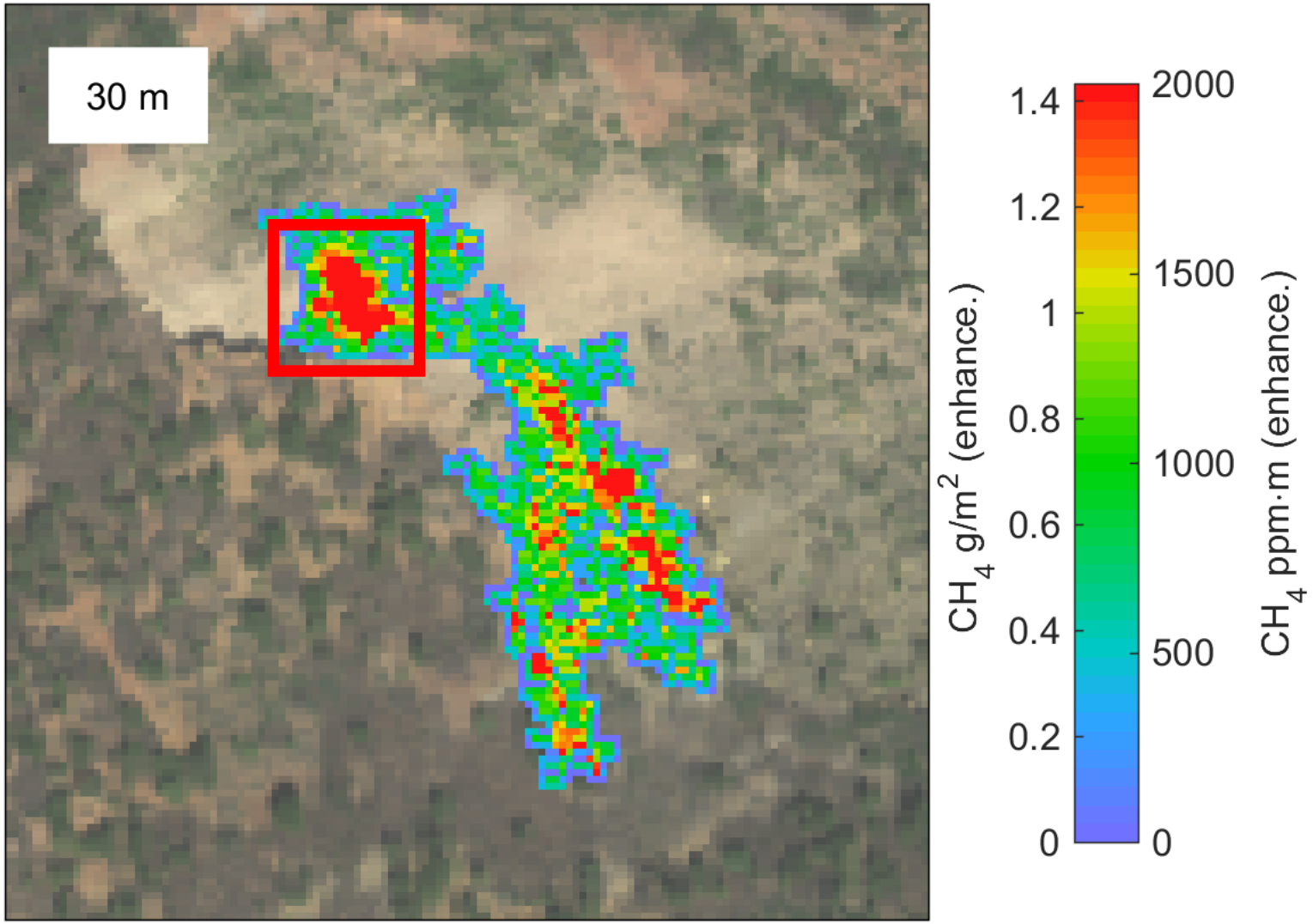
CH_4: Natural emissions (Colorado)



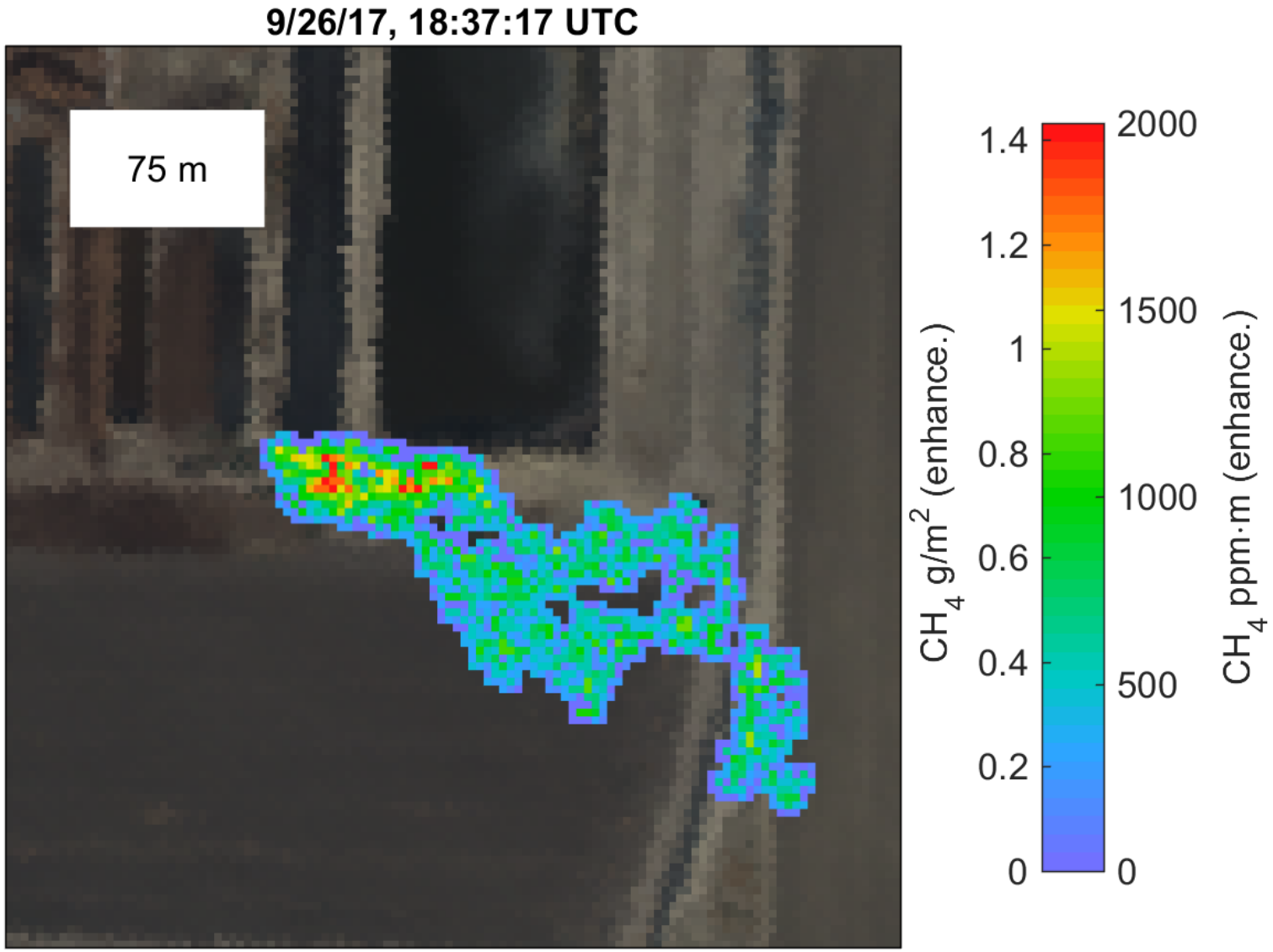
CH_4: Natural emissions (Colorado)

Google Earth, 6/27/14

4/23/15, 18:34:18 UTC



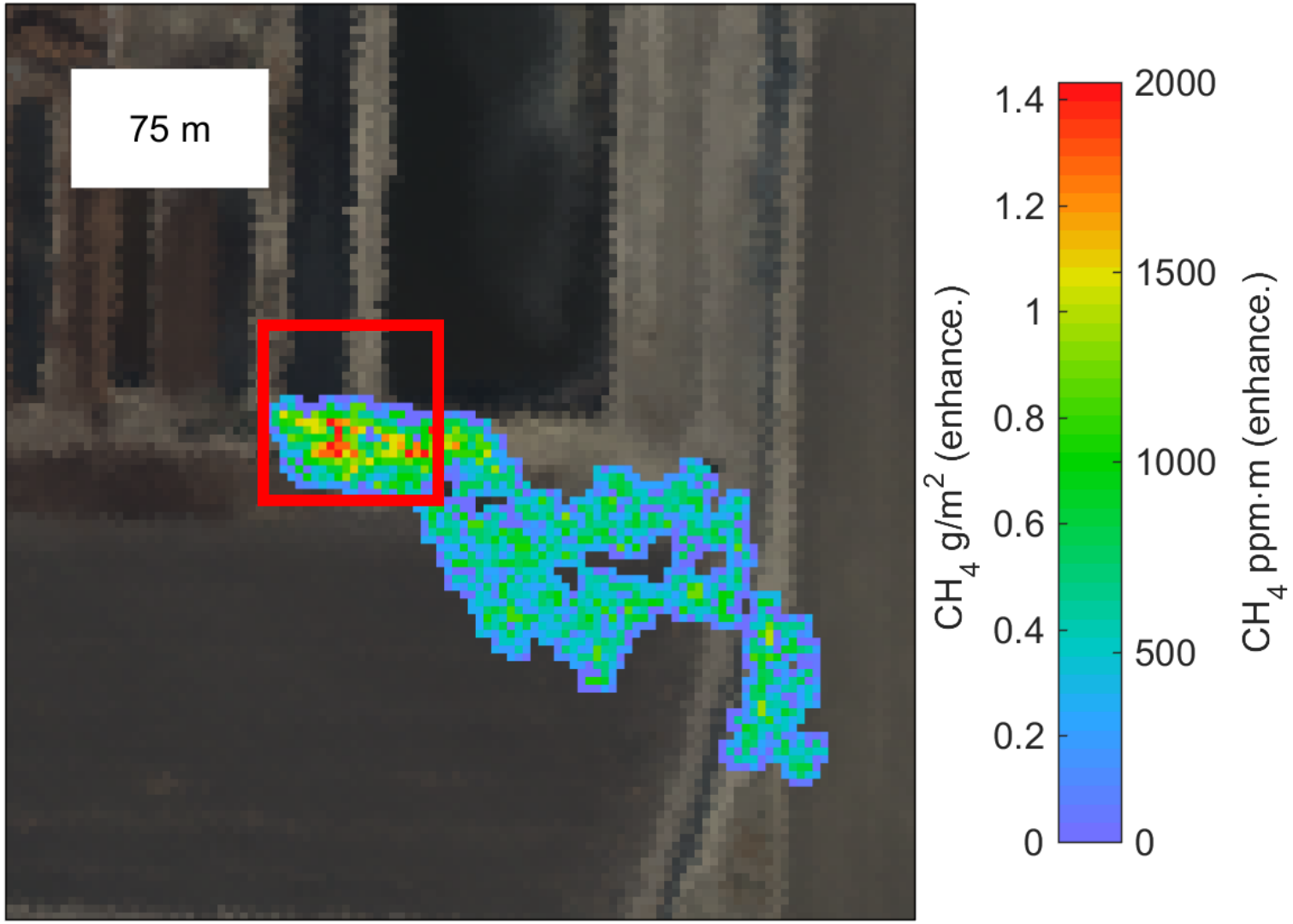
CH_4: Dairy lagoon (California)



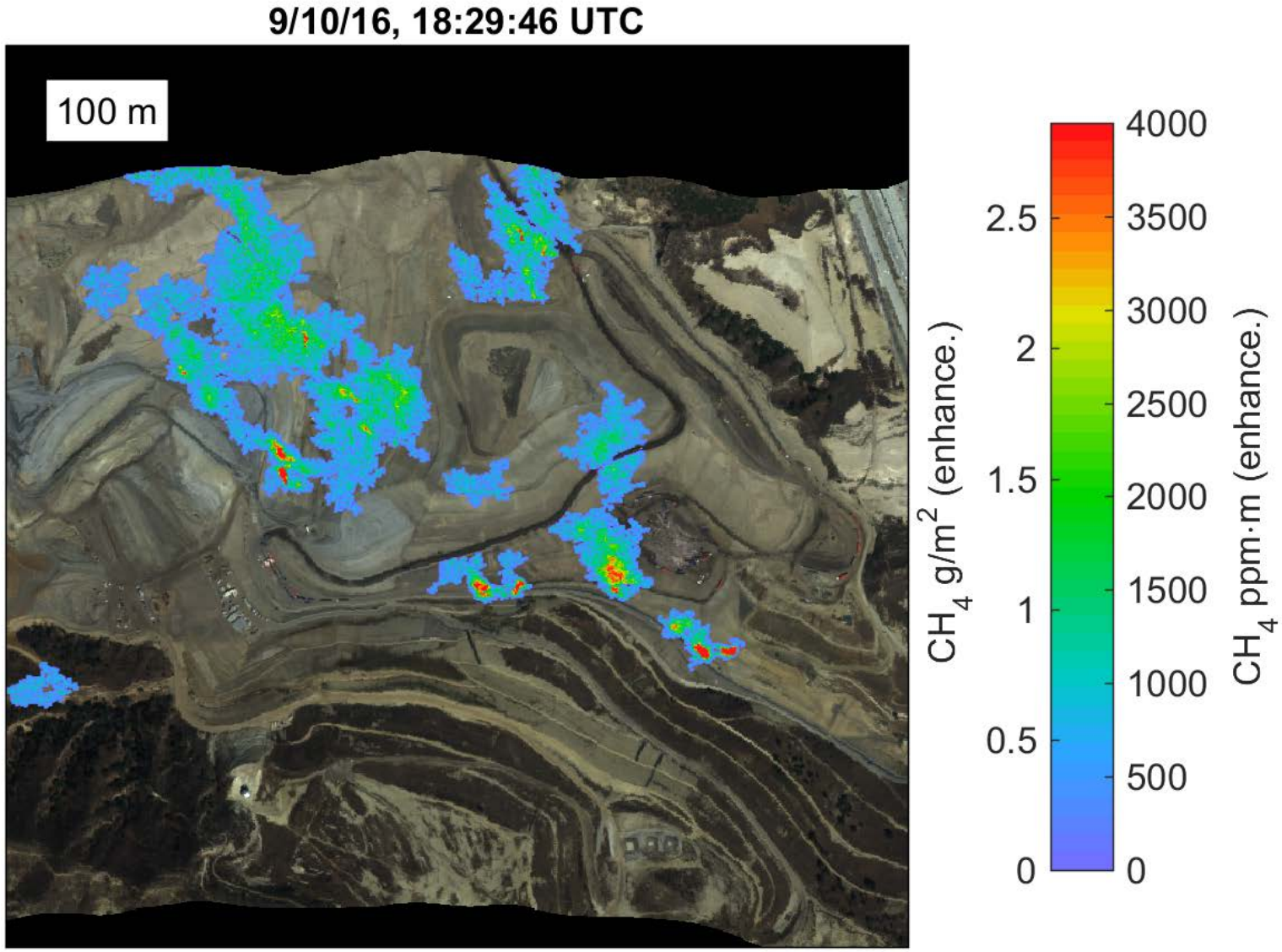
CH_4: Dairy lagoon (California)

Google Earth, 9/19/17

9/26/17, 18:37:17 UTC



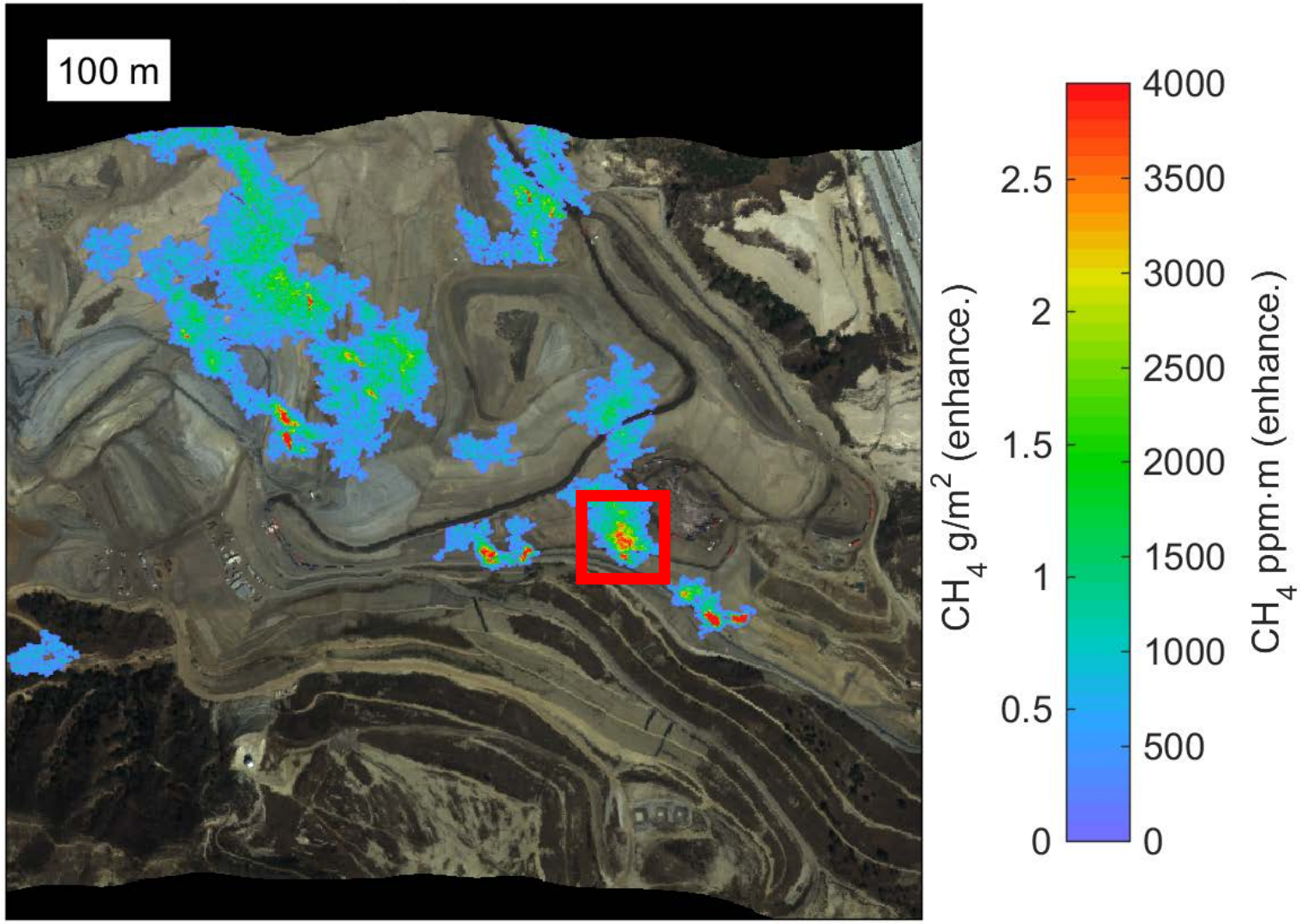
CH_4: Landfill (California)



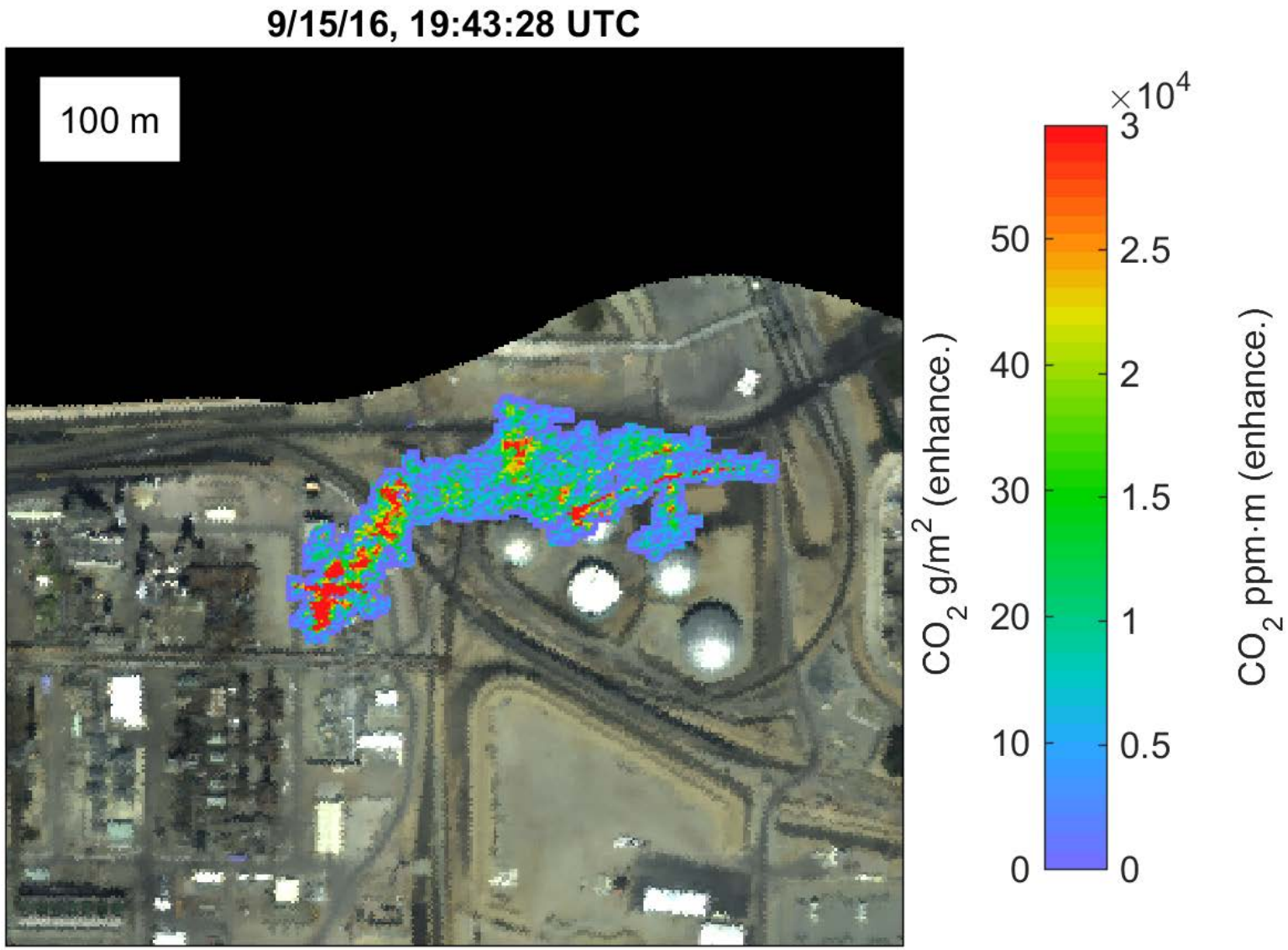
CH_4: Landfill (California)

Google Earth, 10/2/16

9/10/16, 18:29:46 UTC



CO_2 : Refinery (California)



CO_2 : Refinery (California)

Google Earth, 2/2/16

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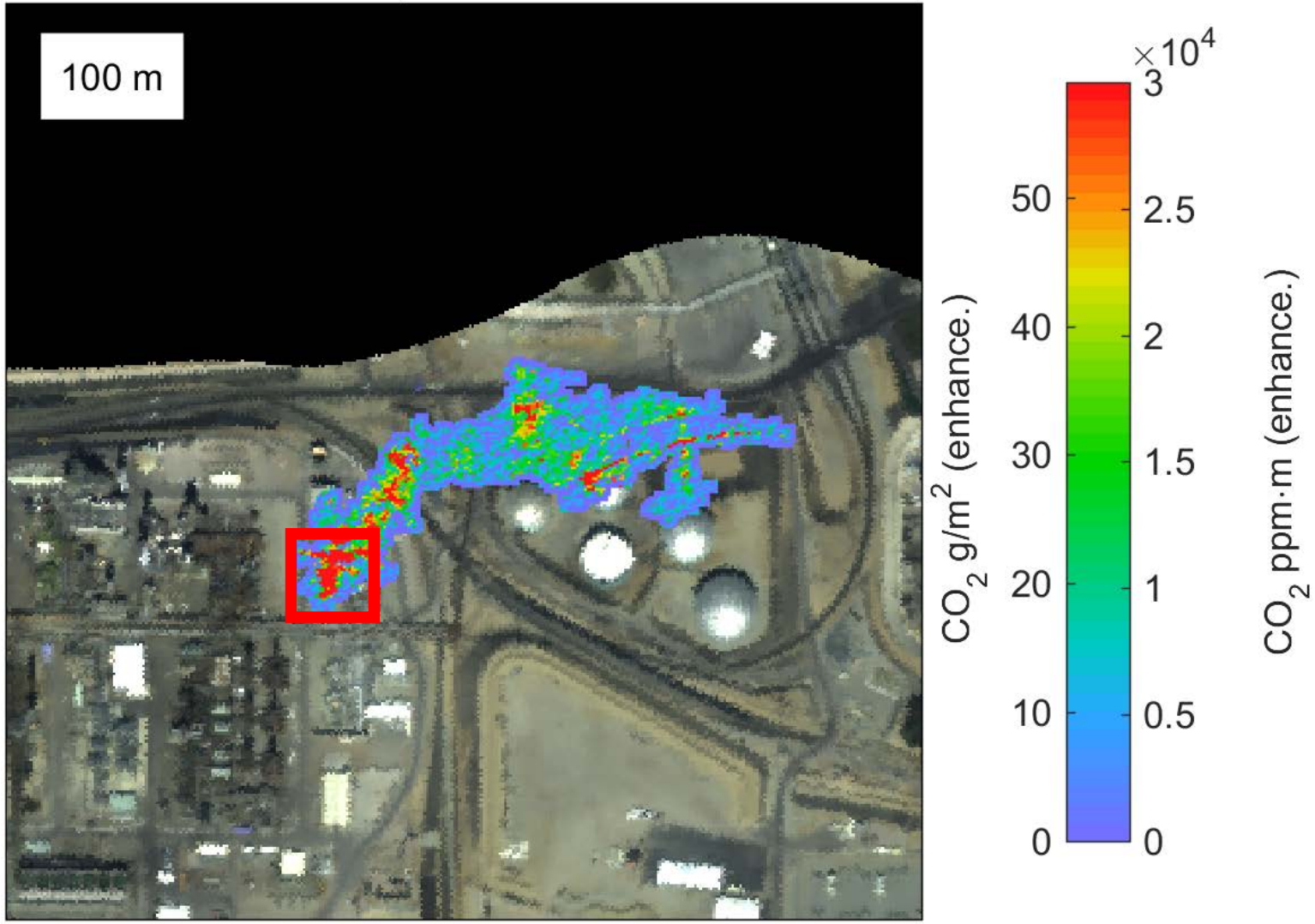
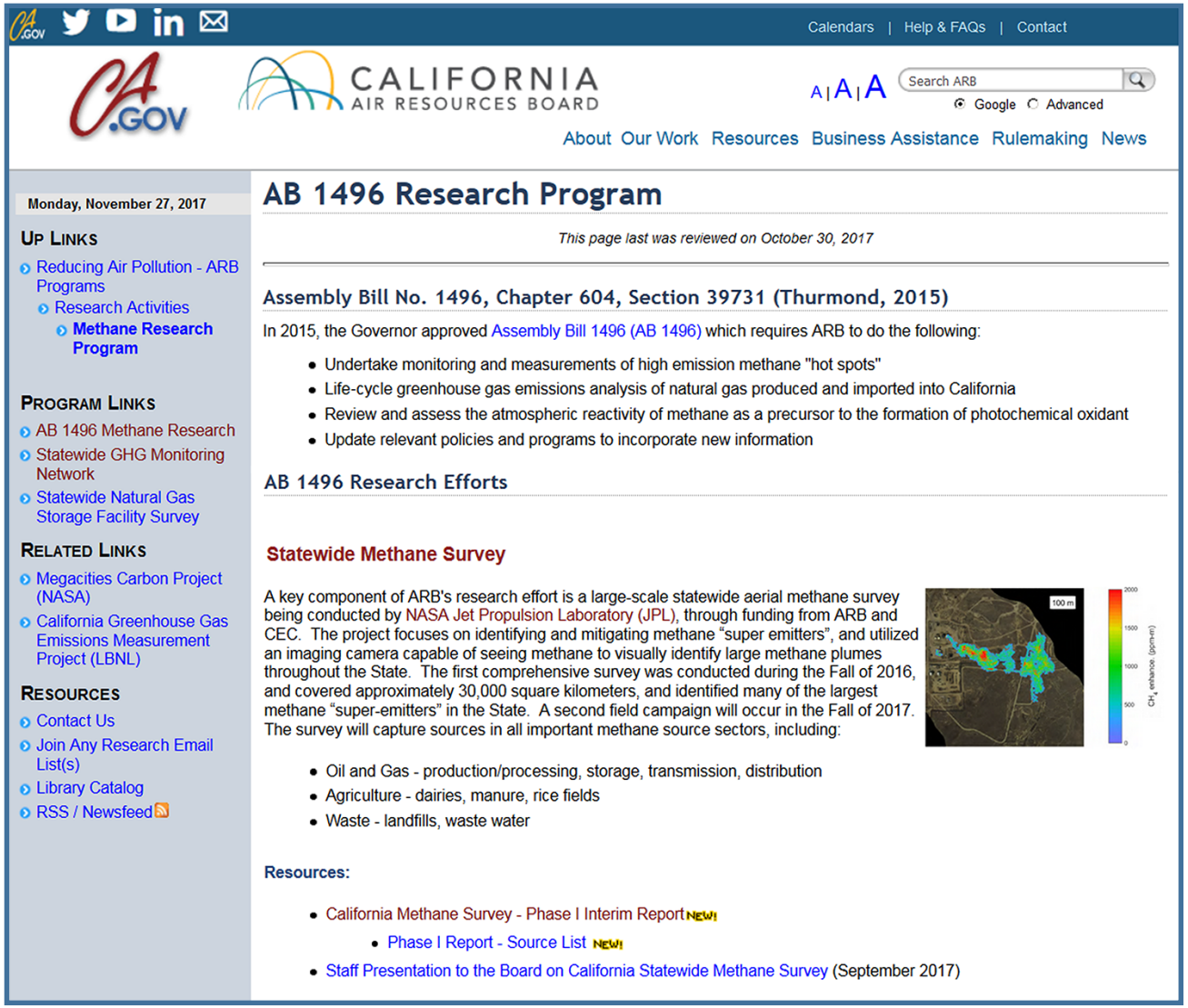


California Baseline Methane Survey

Ongoing project to identify methane emissions across California

Funded by California Air Resources Board (CARB) and California Energy Commission (CEC)

Initial report available online: https://www.arb.ca.gov/research/methane/ab1496_research.htm



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Up Links

- Reducing Air Pollution - ARB Programs
  - Research Activities
    - **Methane Research Program**

Program Links

- AB 1496 Methane Research
- Statewide GHG Monitoring Network
- Statewide Natural Gas Storage Facility Survey

Related Links

- Megacities Carbon Project (NASA)
- California Greenhouse Gas Emissions Measurement Project (LBNL)

Resources

- Contact Us
- Join Any Research Email List(s)
- Library Catalog
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AB 1496 Research Program

This page last was reviewed on October 30, 2017

Assembly Bill No. 1496, Chapter 604, Section 39731 (Thurmond, 2015)

In 2015, the Governor approved Assembly Bill 1496 (AB 1496) which requires ARB to do the following:

- Undertake monitoring and measurements of high emission methane "hot spots"
- Life-cycle greenhouse gas emissions analysis of natural gas produced and imported into California
- Review and assess the atmospheric reactivity of methane as a precursor to the formation of photochemical oxidant
- Update relevant policies and programs to incorporate new information

AB 1496 Research Efforts

Statewide Methane Survey

A key component of ARB's research effort is a large-scale statewide aerial methane survey being conducted by NASA Jet Propulsion Laboratory (JPL), through funding from ARB and CEC. The project focuses on identifying and mitigating methane "super emitters", and utilized an imaging camera capable of seeing methane to visually identify large methane plumes throughout the State. The first comprehensive survey was conducted during the Fall of 2016, and covered approximately 30,000 square kilometers, and identified many of the largest methane "super-emitters" in the State. A second field campaign will occur in the Fall of 2017. The survey will capture sources in all important methane source sectors, including:

- Oil and Gas - production/processing, storage, transmission, distribution
- Agriculture - dairies, manure, rice fields
- Waste - landfills, waste water

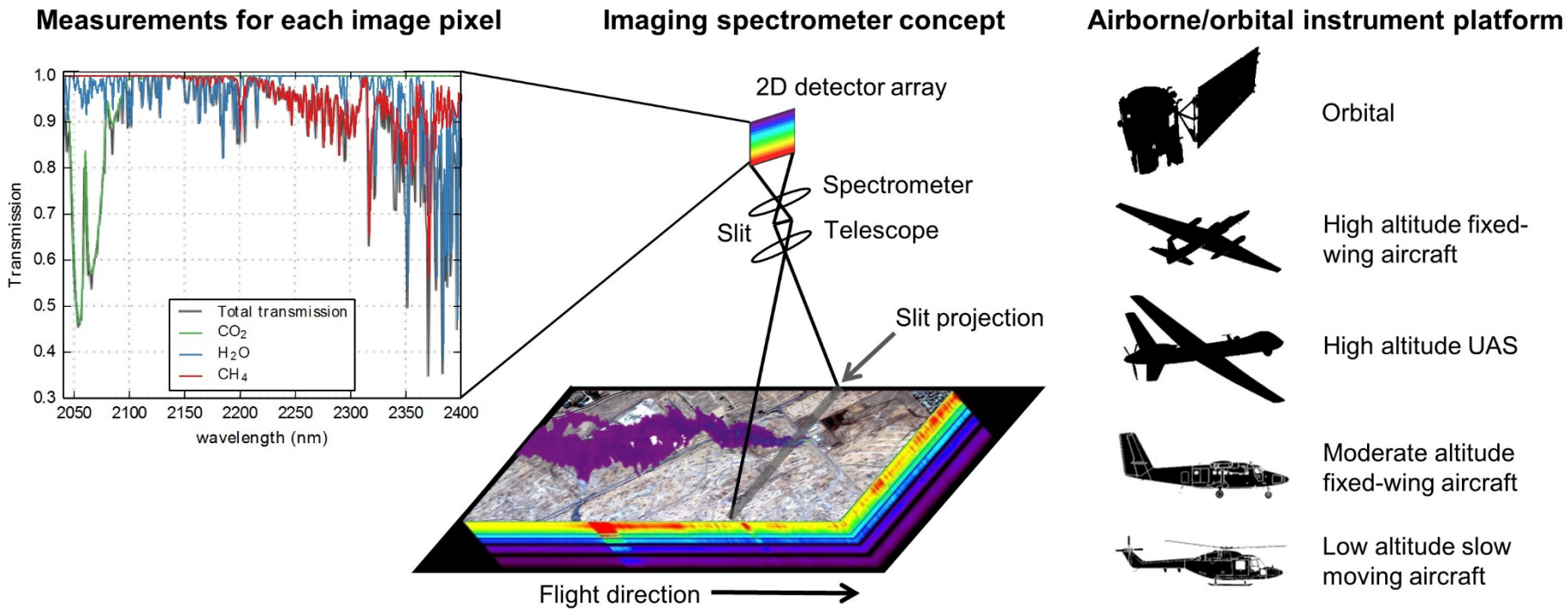
Resources:

- California Methane Survey - Phase I Interim Report NEW!
  - Phase I Report - Source List NEW!
- Staff Presentation to the Board on California Statewide Methane Survey (September 2017)

Dedicated imaging spectrometer for gas mapping

1 nm spectral resolution for improved gas sensitivity

Quantitative mapping of CH_4, CO_2, H_2O, CO, N_2O



(Thorpe et al., 2016; Duren et al., 2016)

Acknowledgments

AVIRIS team

NASA headquarters