Jet Propulsion Laboratory
California Institute of Technology

OCO-3 Snapshot Area Mapping Mode: Early Results

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AGU Fall Meeting, 13 December 2019 – San Francisco, California, USA

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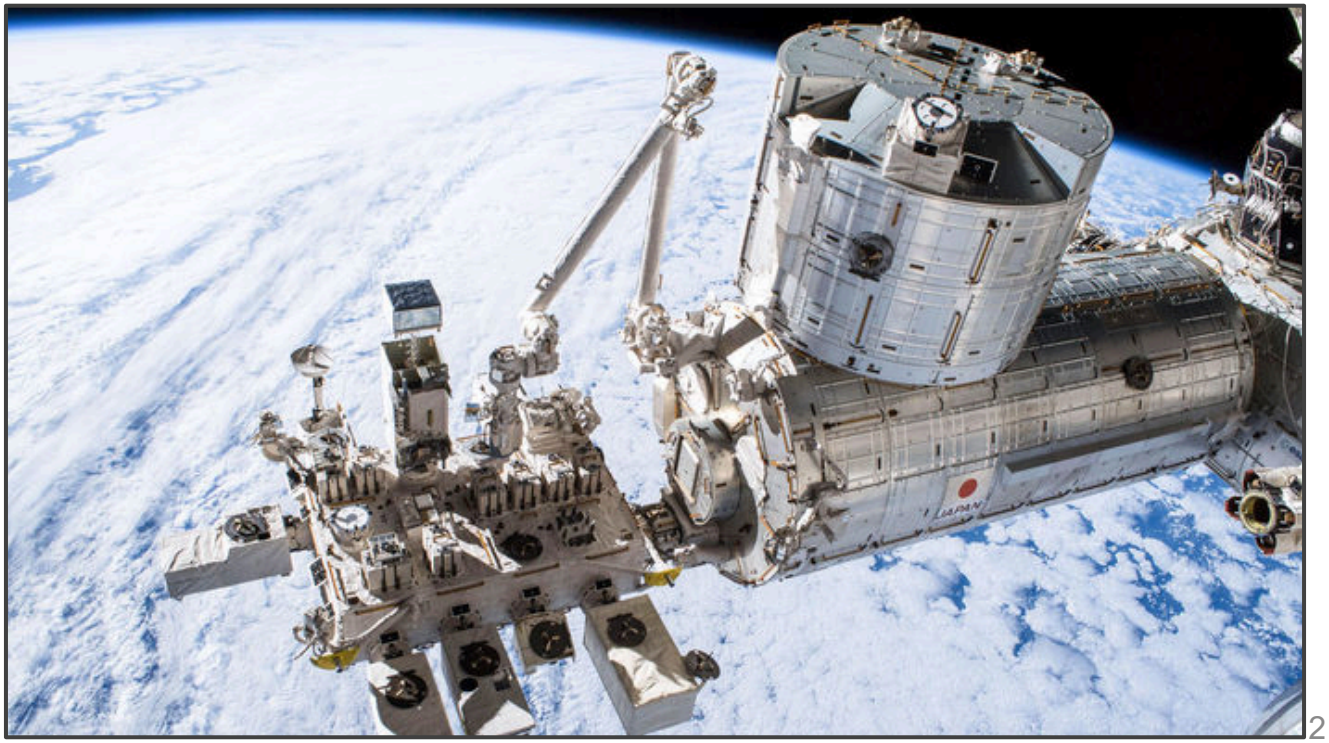
Introduction

- The Orbiting Carbon Observatory-3 (OCO-3) makes measurements of column-mean CO_2 (XCO_2) using reflected sunlight in three near-infrared bands

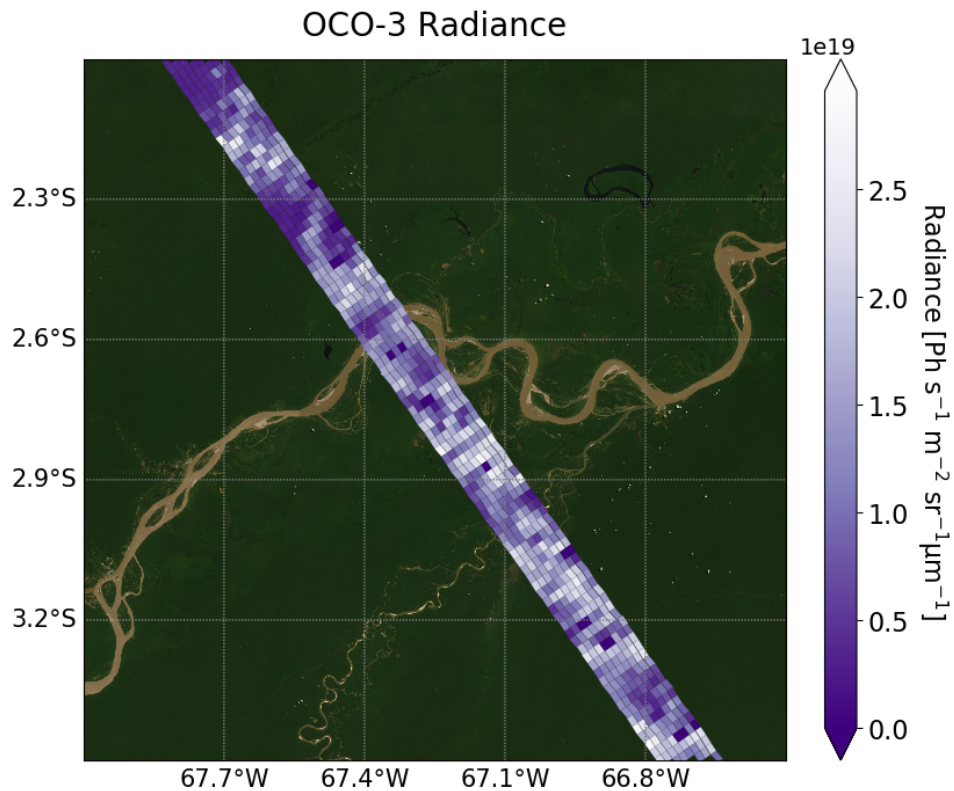
- Sent to the International Space Station on May 4, 2019 for a ~3 year mission

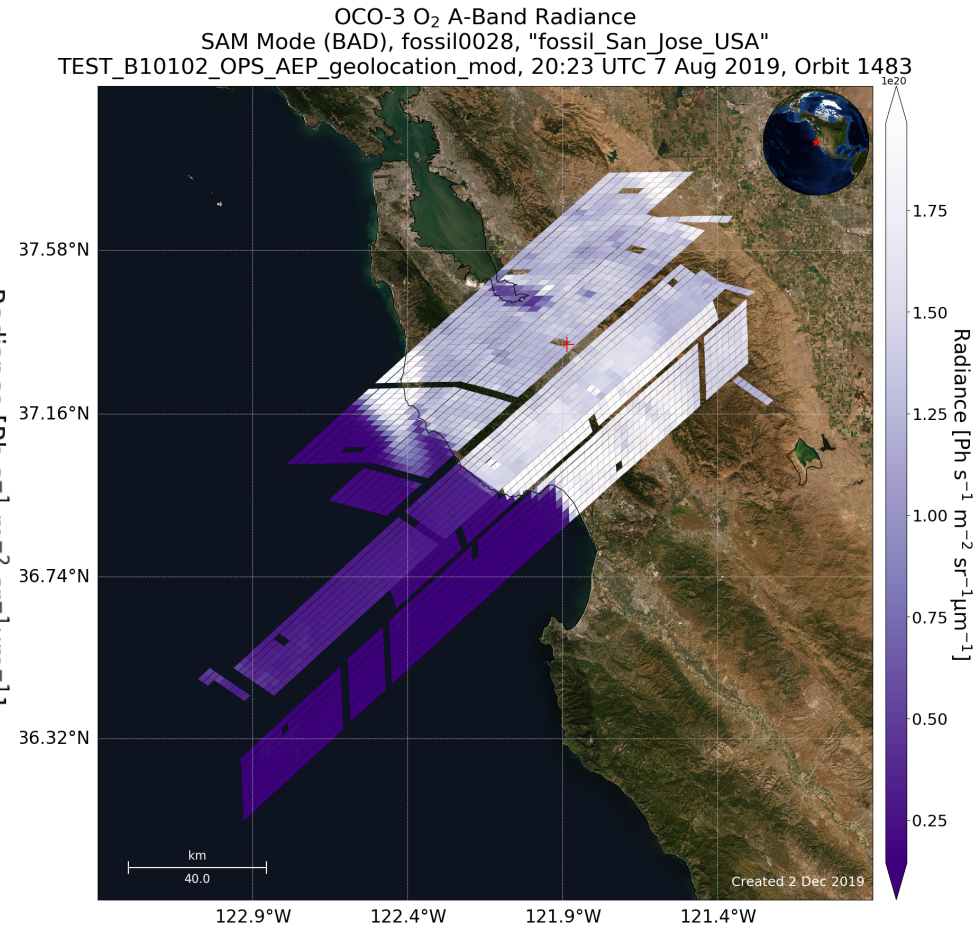


Introduction

- OCO-3 can take Snapshot Area Mapping (SAM) mode measurements
  - On the order of 80 km x 80 km

Figures and results are preliminary





Introduction

- OCO-3 can take Snapshot Area Mapping (SAM) mode measurements
  - Multiple SAMs/Targets possible each orbit

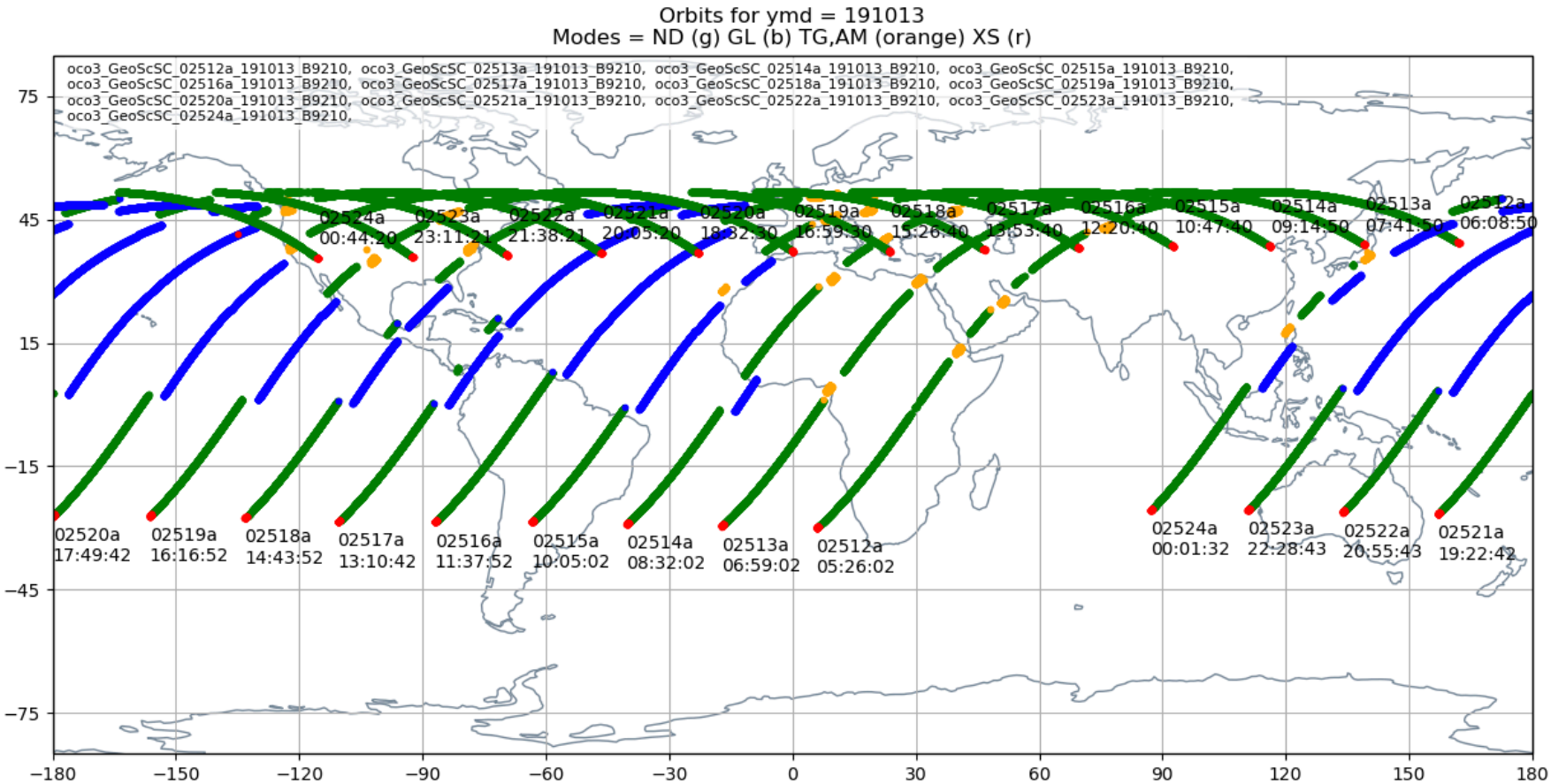


Figure courtesy of Aronne Merrelli

Introduction

- OCO-3 can take Snapshot Area Mapping (SAM) mode measurements
  - Hundreds collected so far

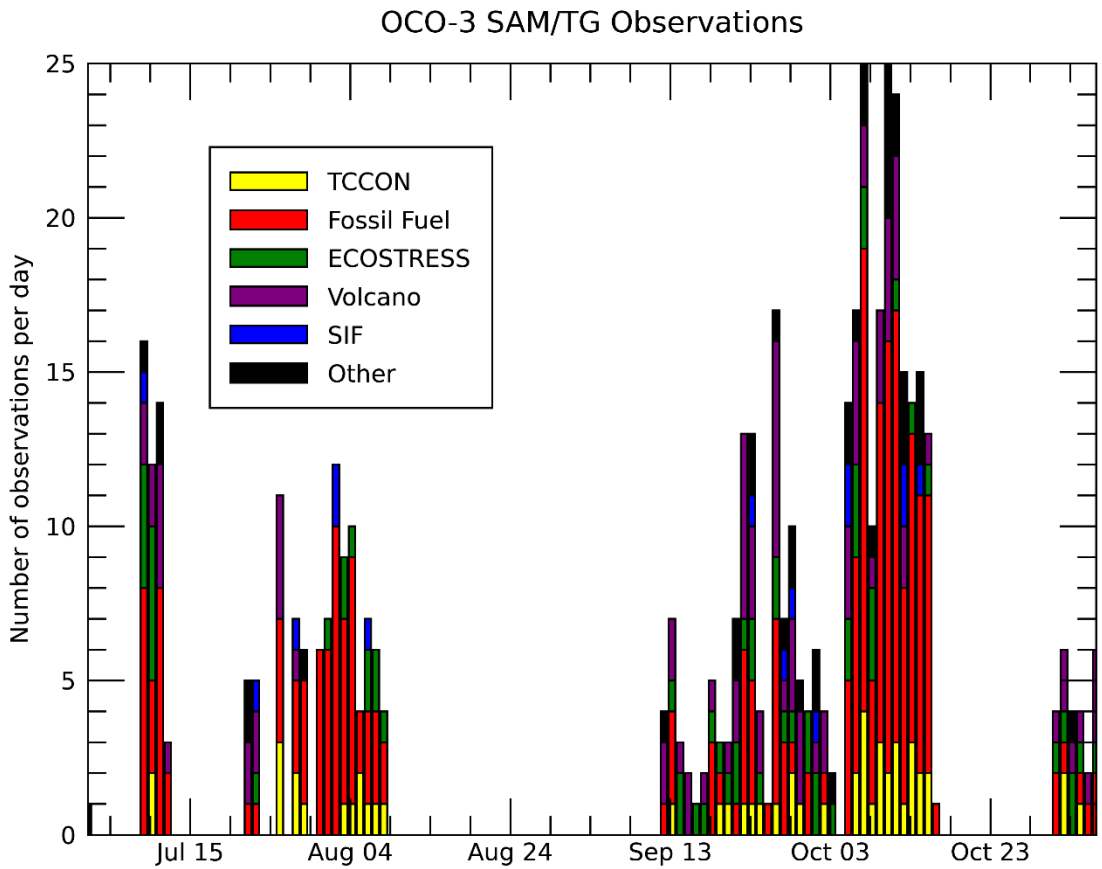
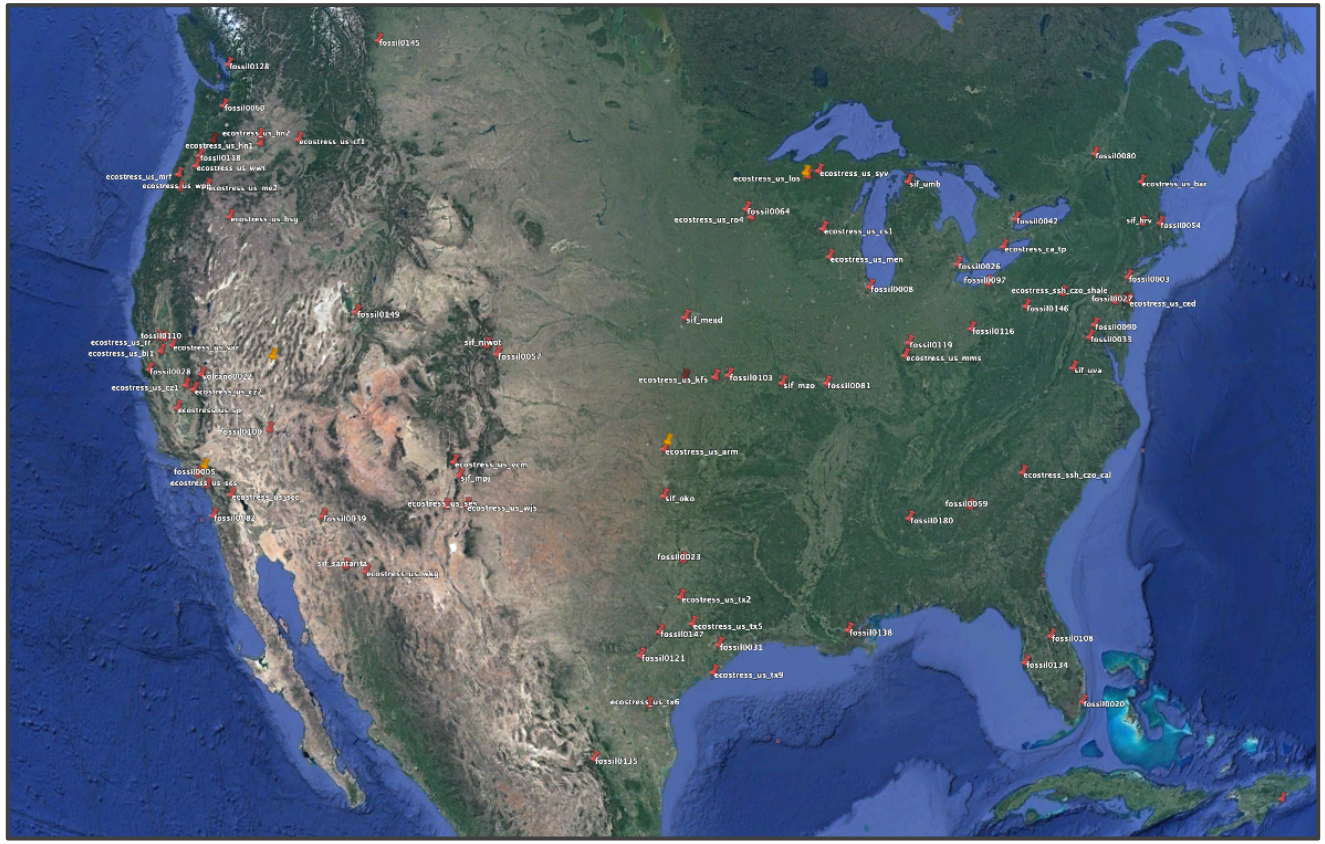


Figure courtesy of Brendan Fisher

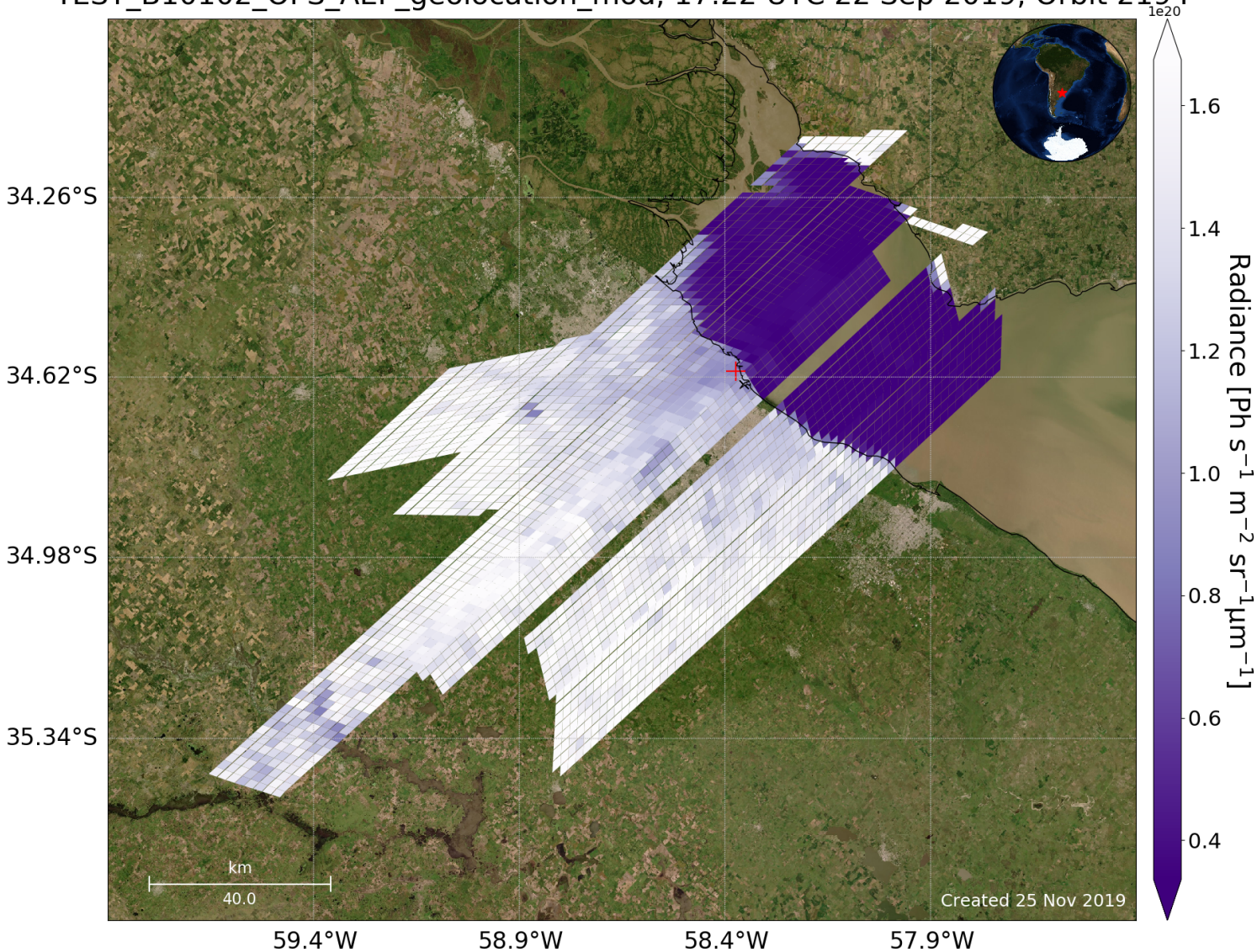
Introduction

- Large list of targets including cities, power plants, volcanoes, TCCON sites, SIF sites, and field campaigns
  - Additional locations can be added and prioritized!

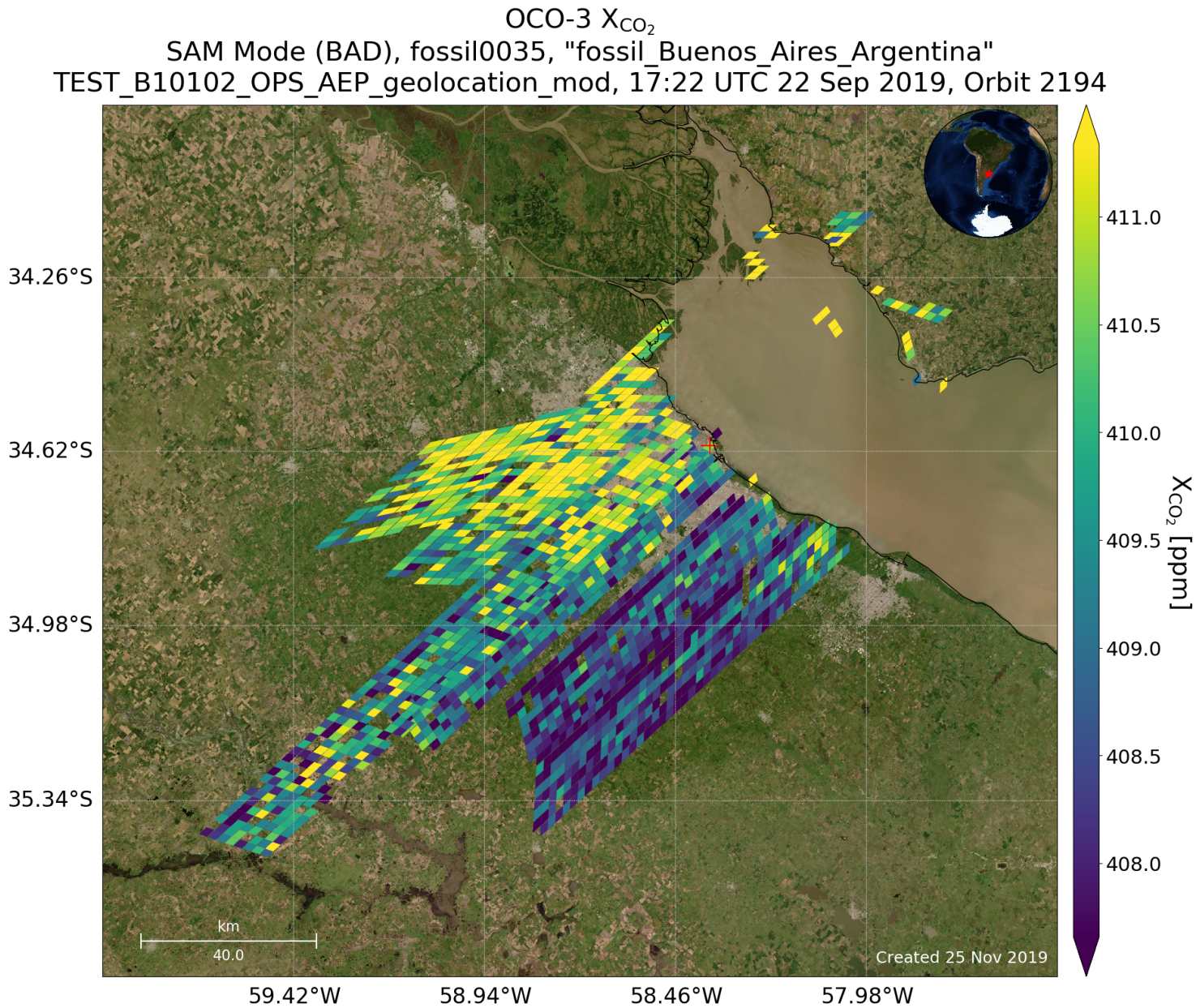


Buenos Aires, Argentina

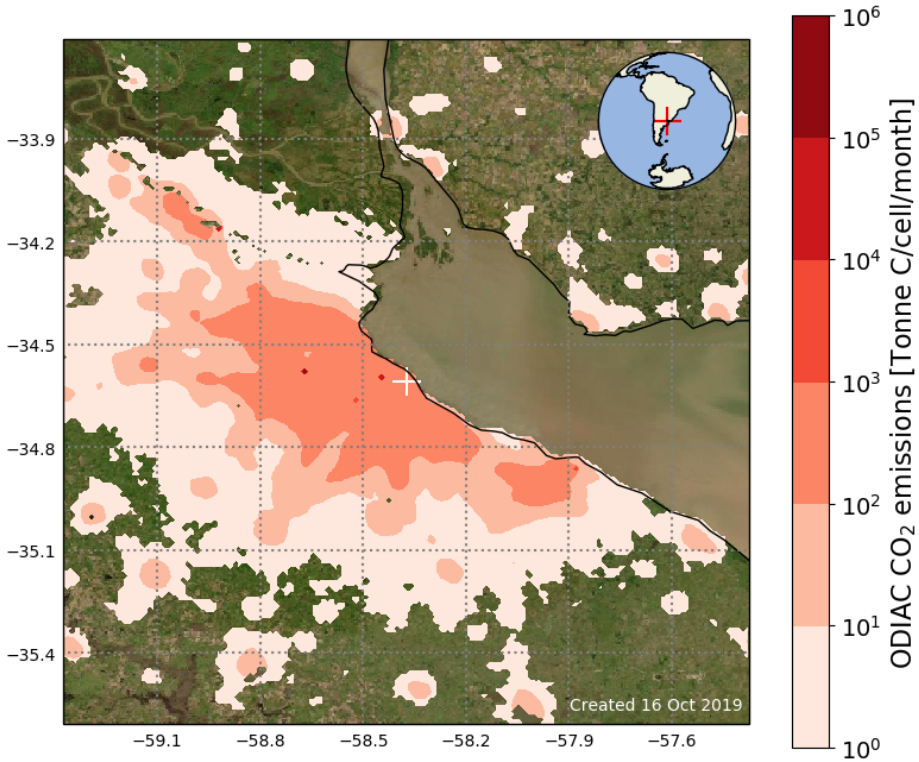
OCO-3 O_2 A-Band Radiance
SAM Mode (BAD), fossil0035, "fossil_Buenos_Aires_Argentina"
TEST_B10102_OPS_AEP_geolocation_mod, 17:22 UTC 22 Sep 2019, Orbit 2194

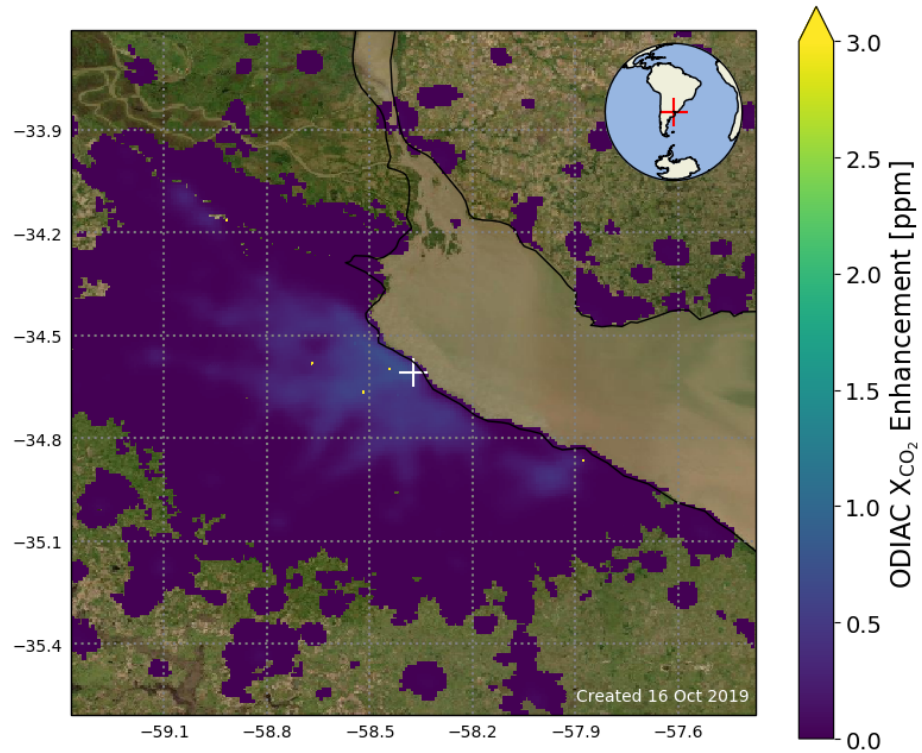


Buenos Aires, Argentina



Buenos Aires, Argentina

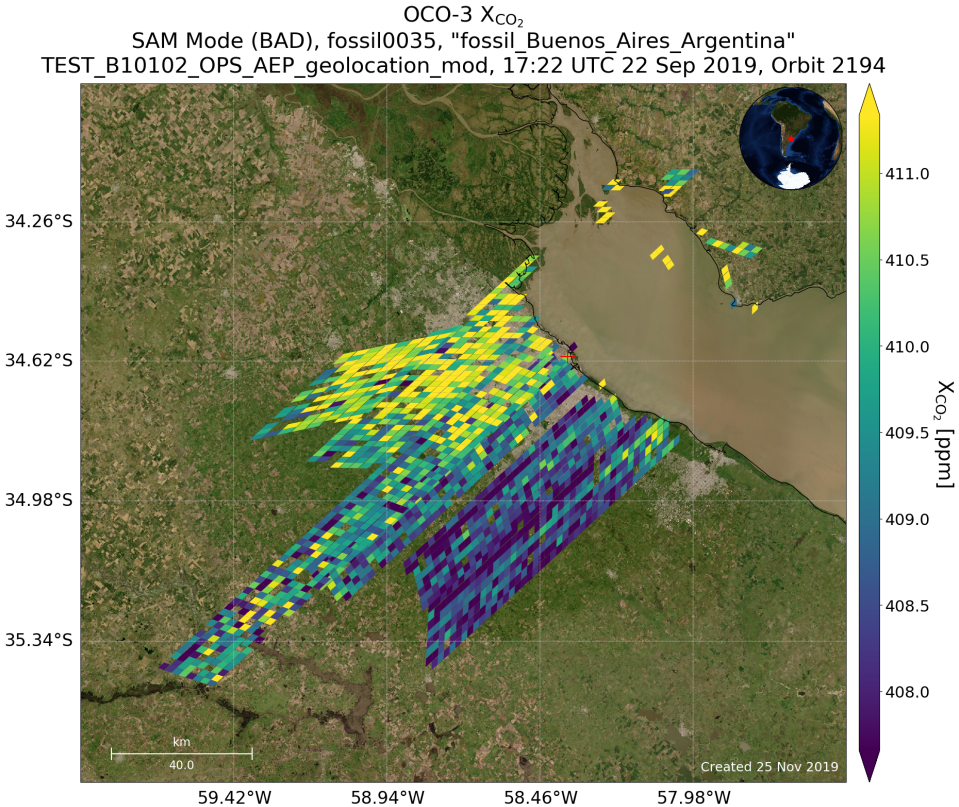


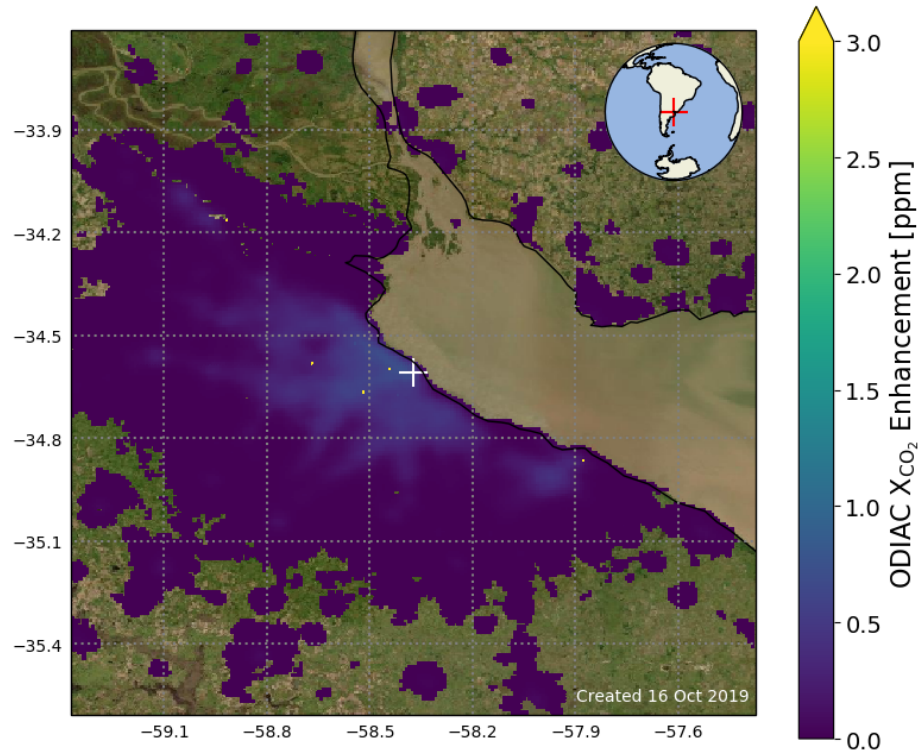


- ODIAC CO_2 emissions*
- ~1 ppm XCO_2 plume possible, making several assumptions

**Oda et al., 2015; code courtesy of Paul Palmer*

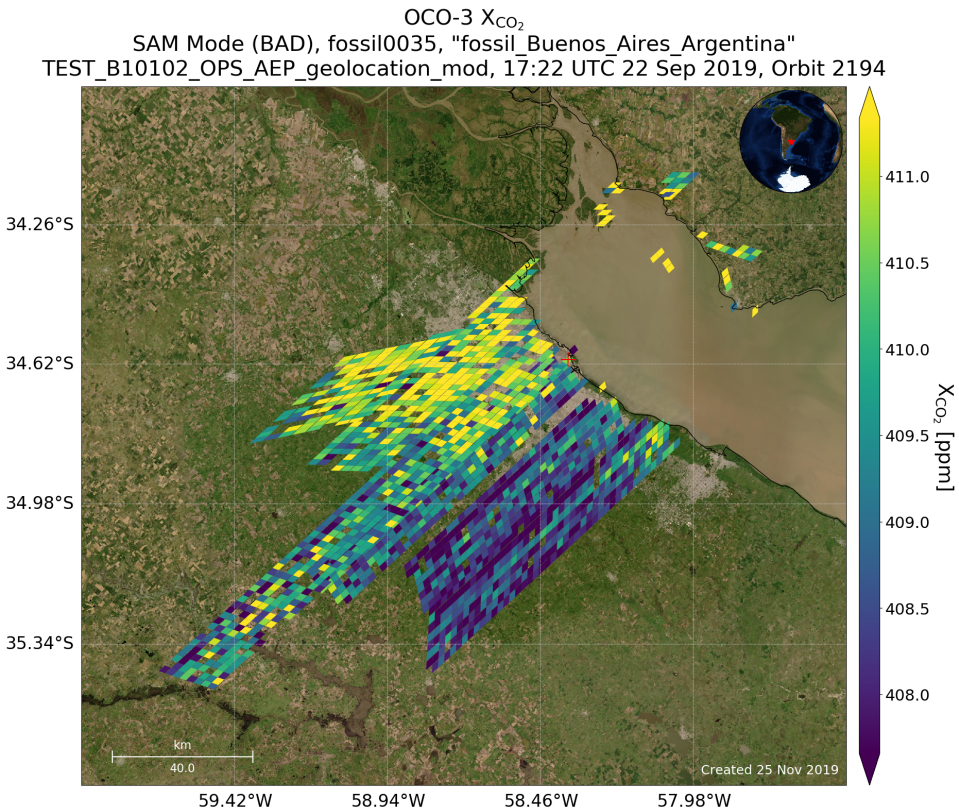
Buenos Aires, Argentina

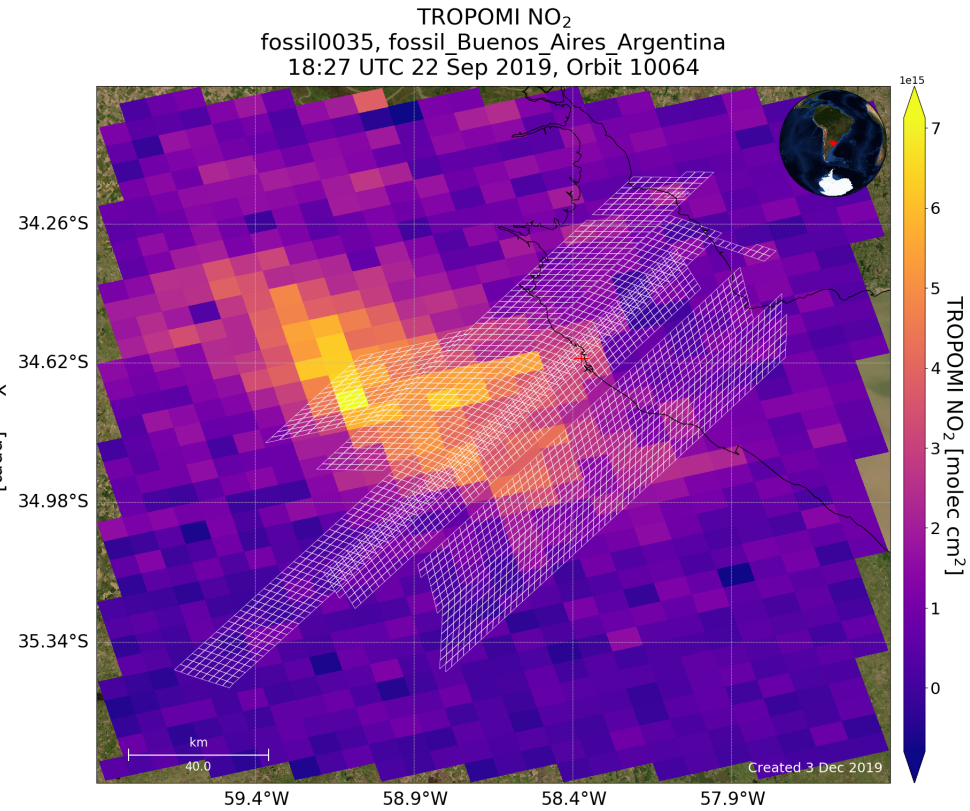




- OCO-3's 3 ppm XCO_2 enhancement likely too large
- ~1 ppm XCO_2 plume possible (with several assumptions)

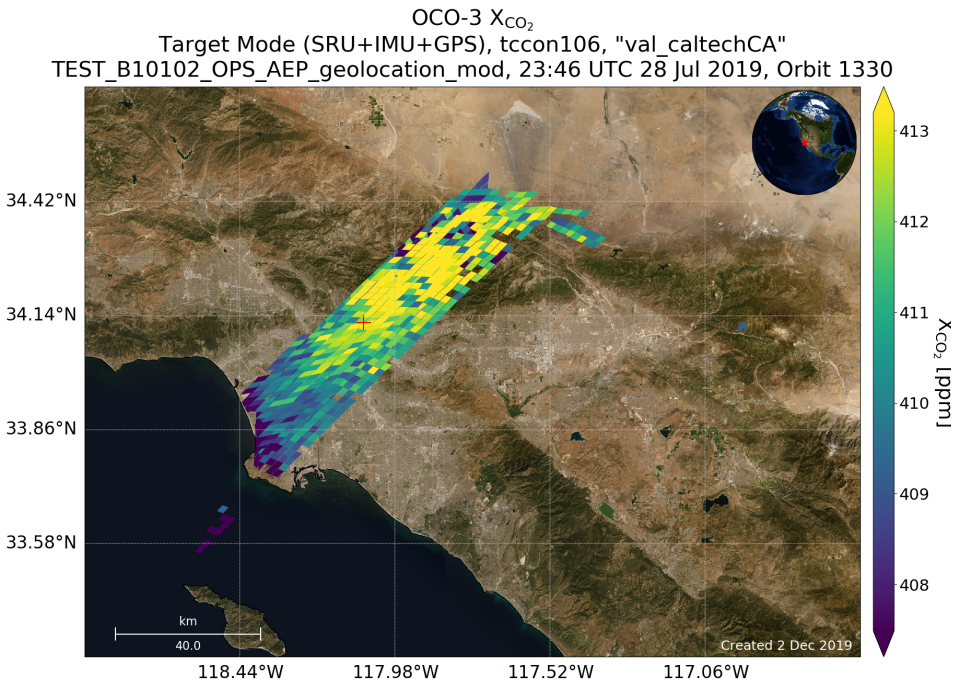
Buenos Aires, Argentina

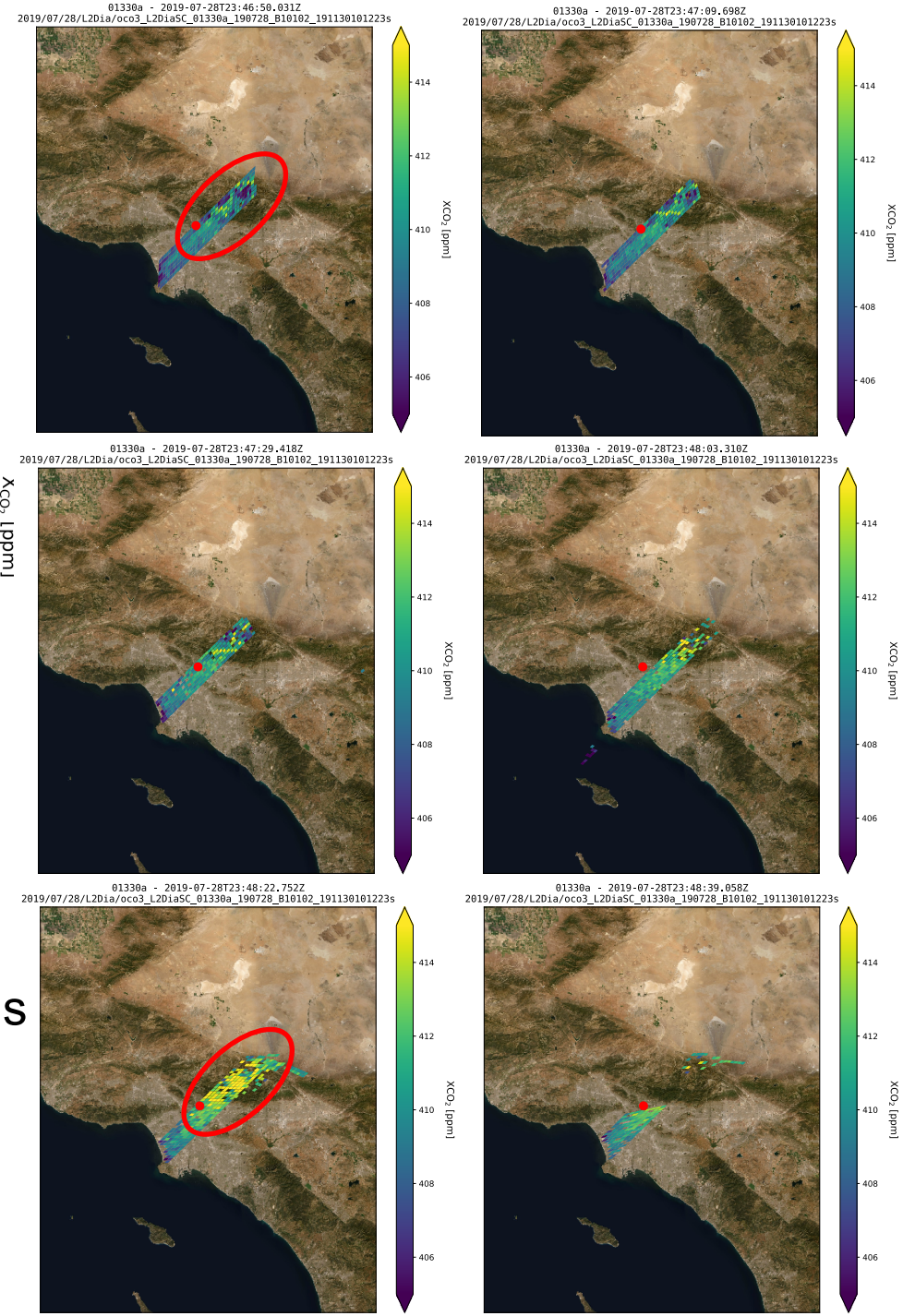




- General structure of plume is correct, according to TROPOMI NO_2

Los Angeles, USA

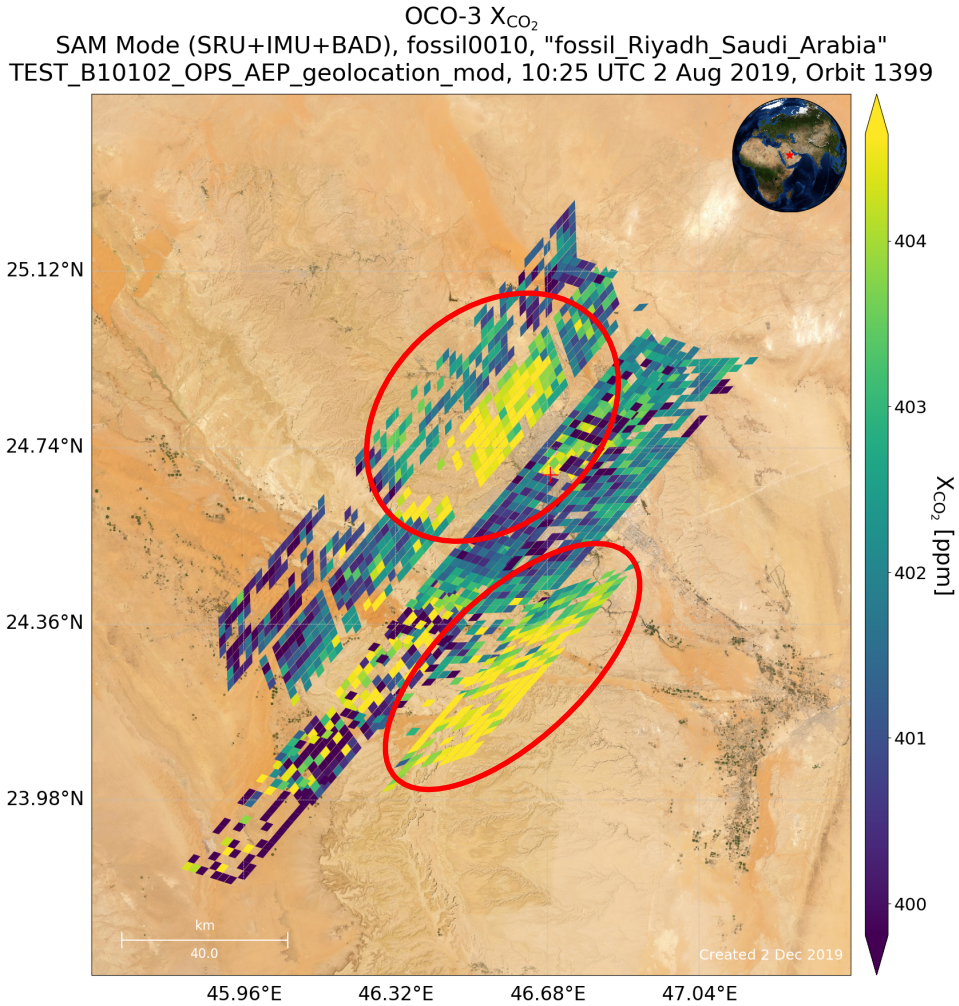


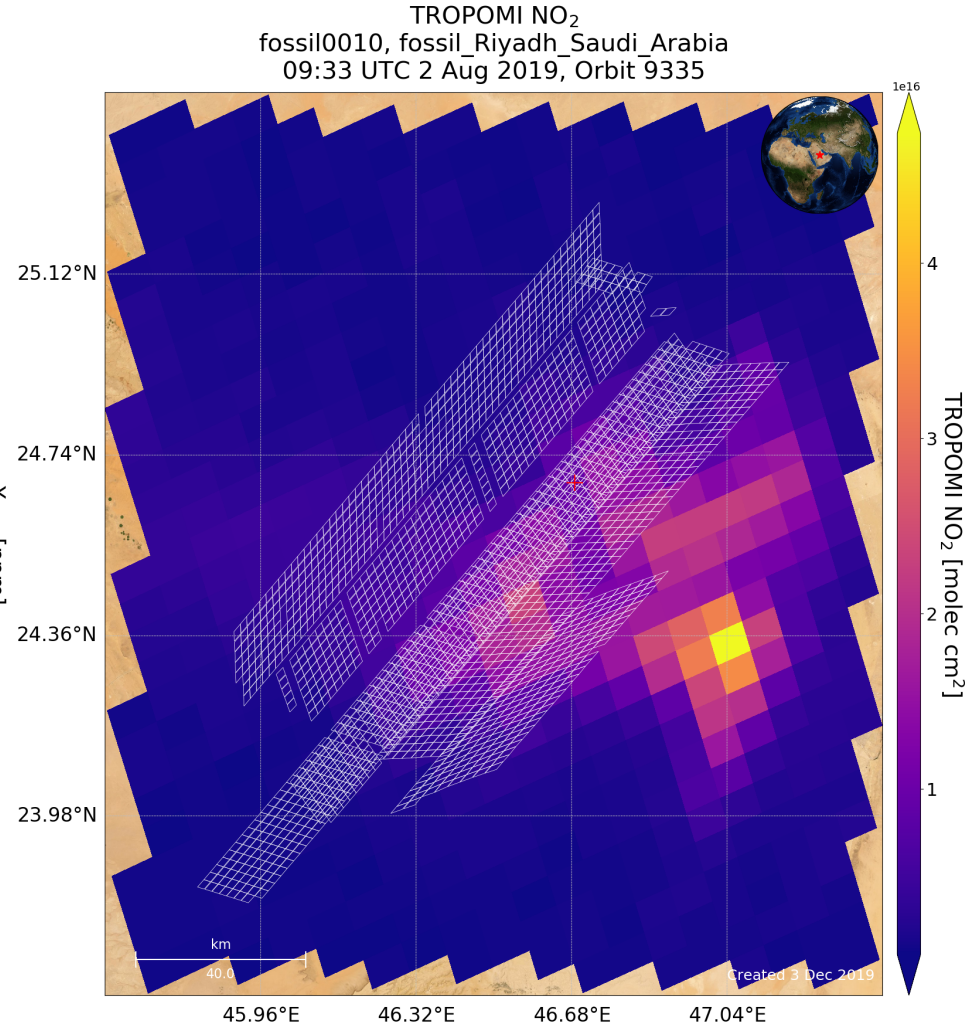


- Target mode example
  - XCO_2 differences between swaths
  - Custom filtering planned!

Figure courtesy of Matthäus Kiel

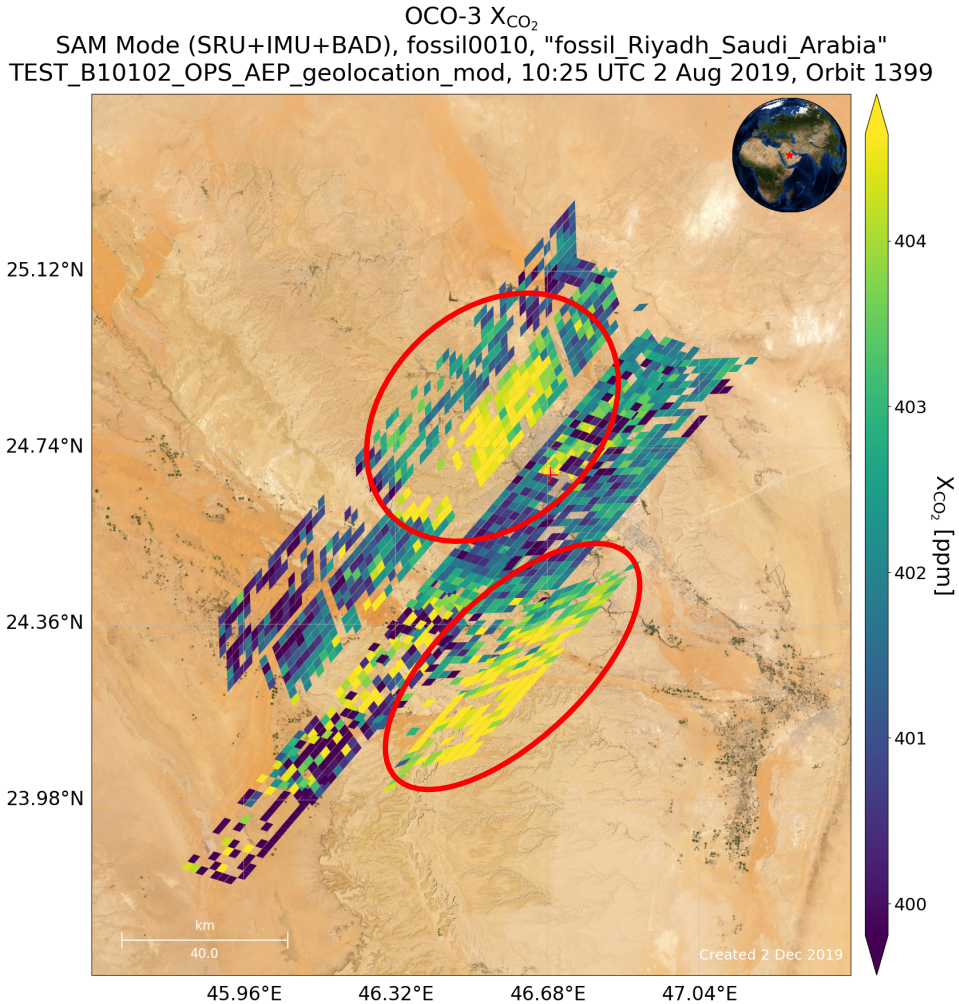
Riyadh, Saudi Arabia

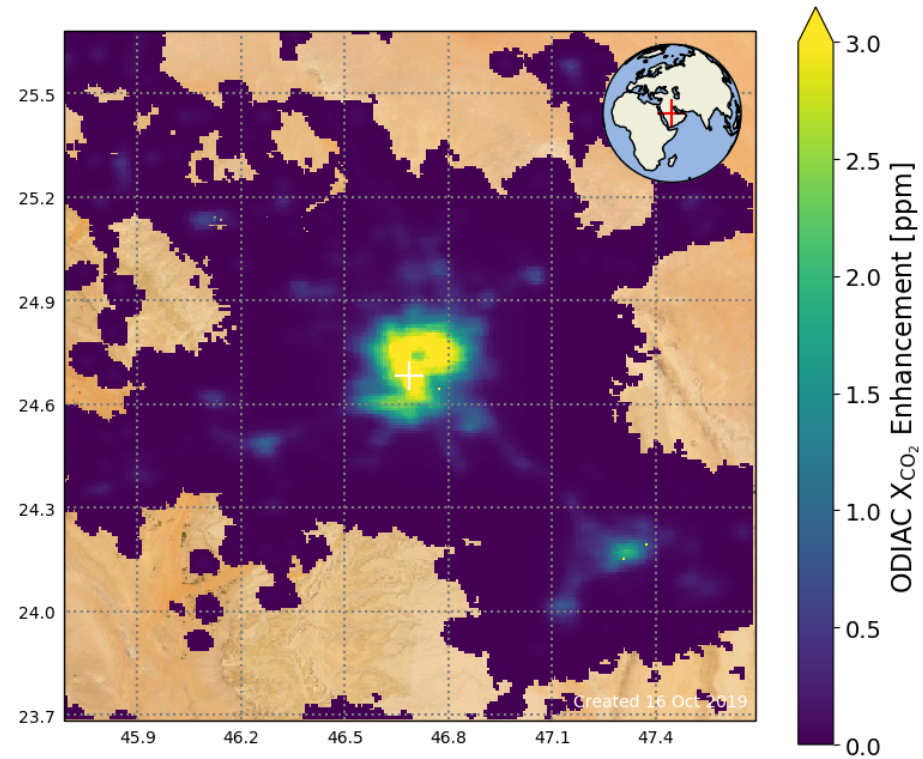




- Spurious features not aligned with TROPOMI NO_2

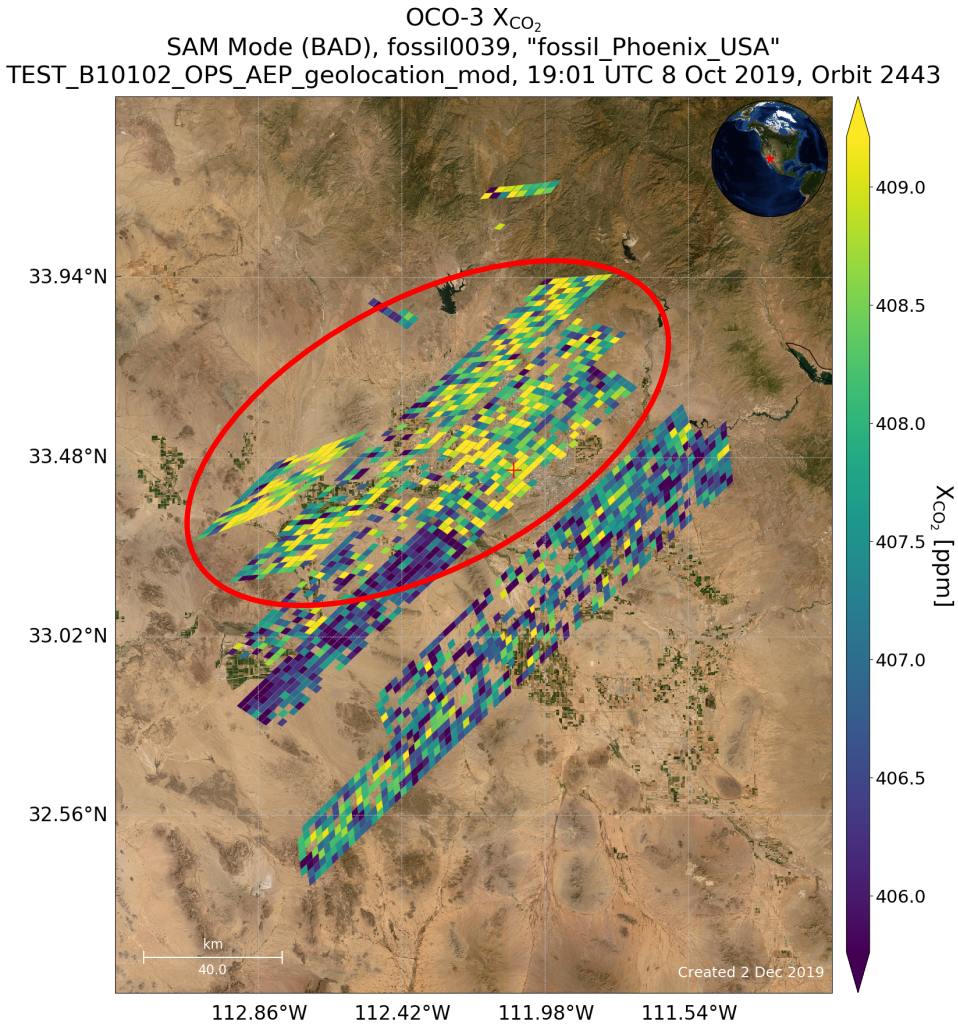
Riyadh, Saudi Arabia

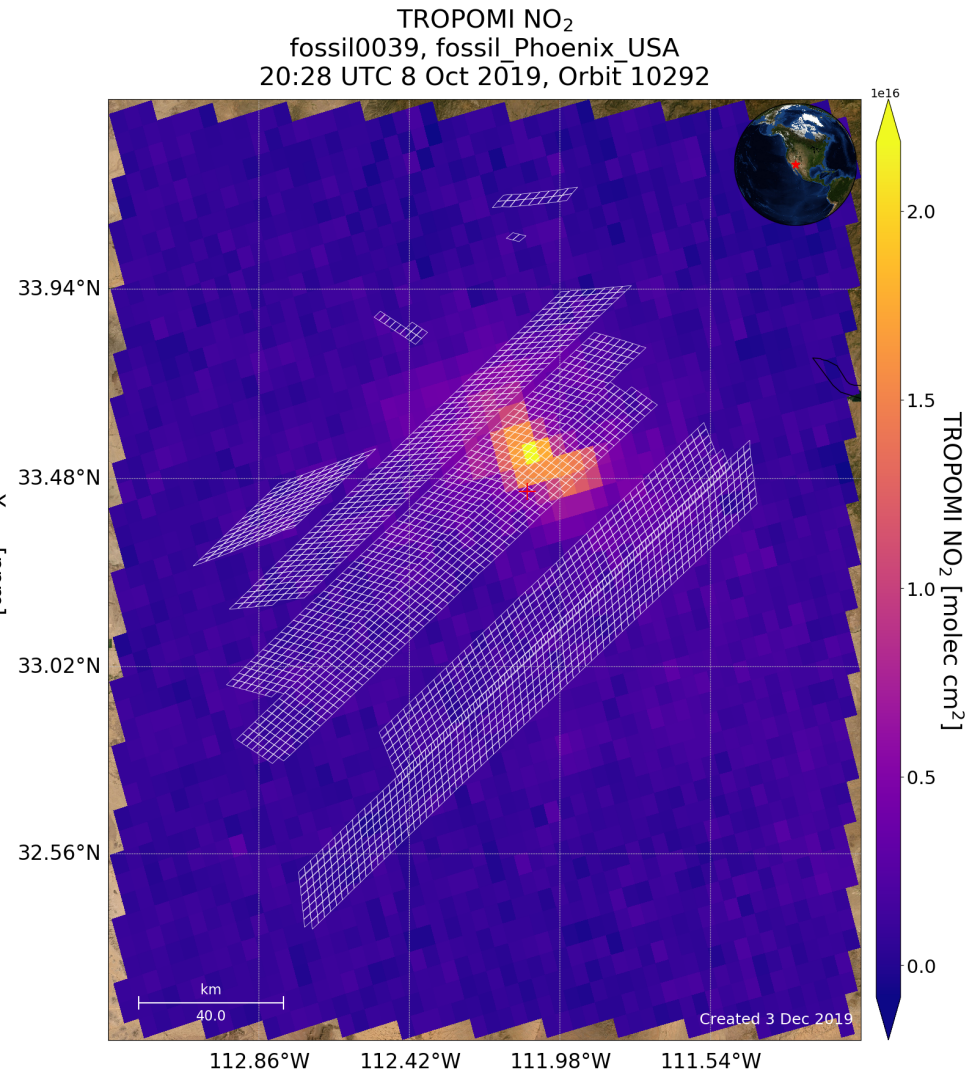




- Spurious features not aligned with TROPOMI NO_2
  - But large enhancements are plausible

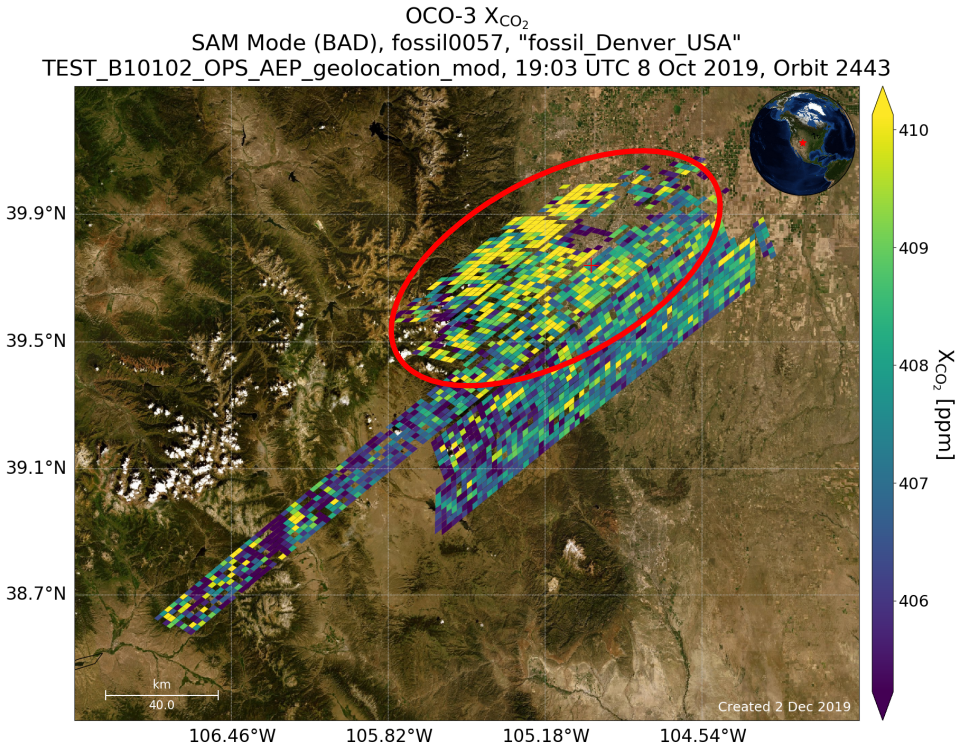
Phoenix, USA

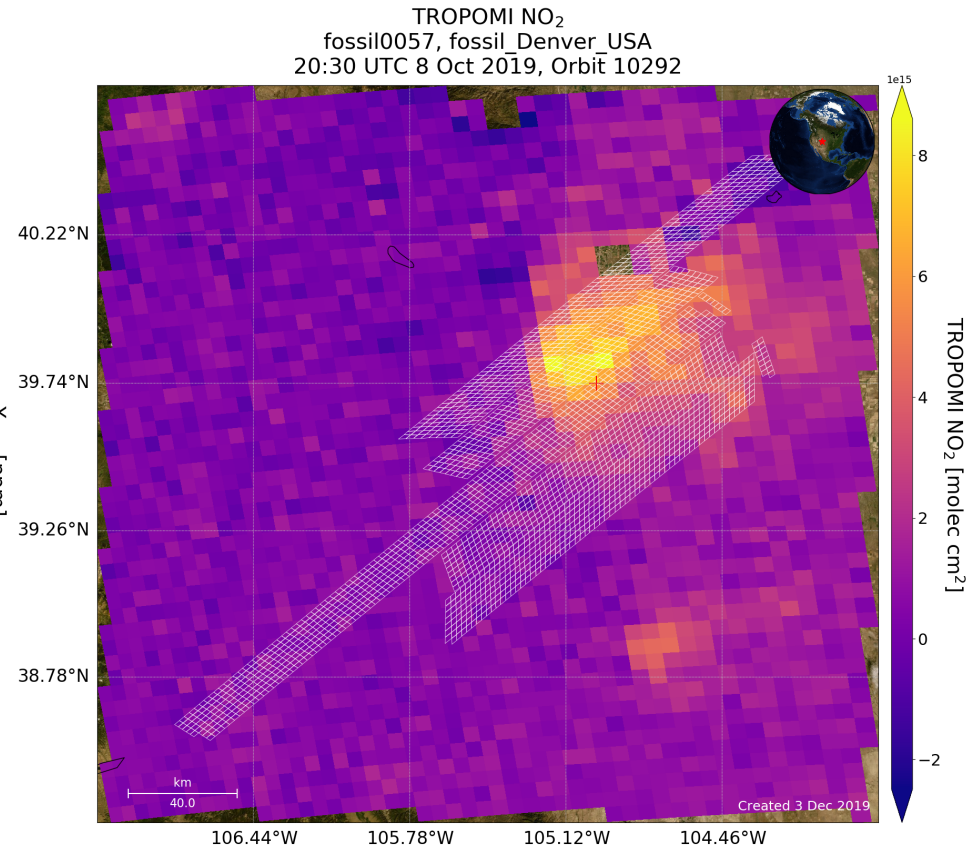




- Mix of real and spurious features?

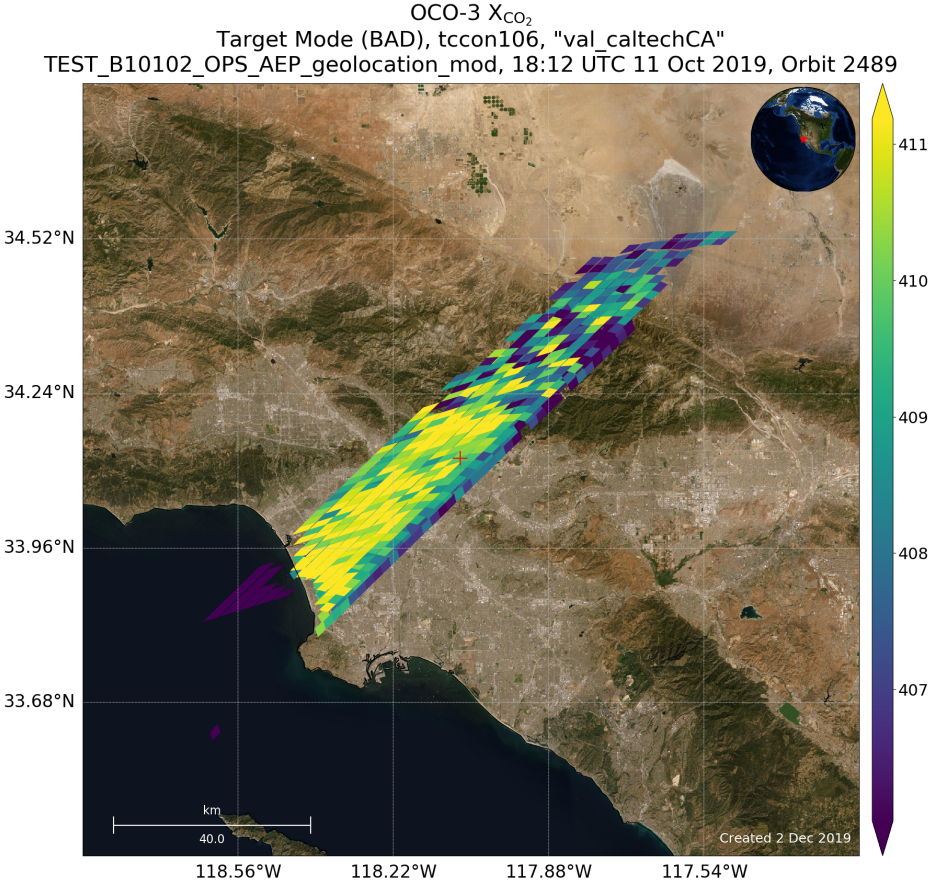
Denver, USA

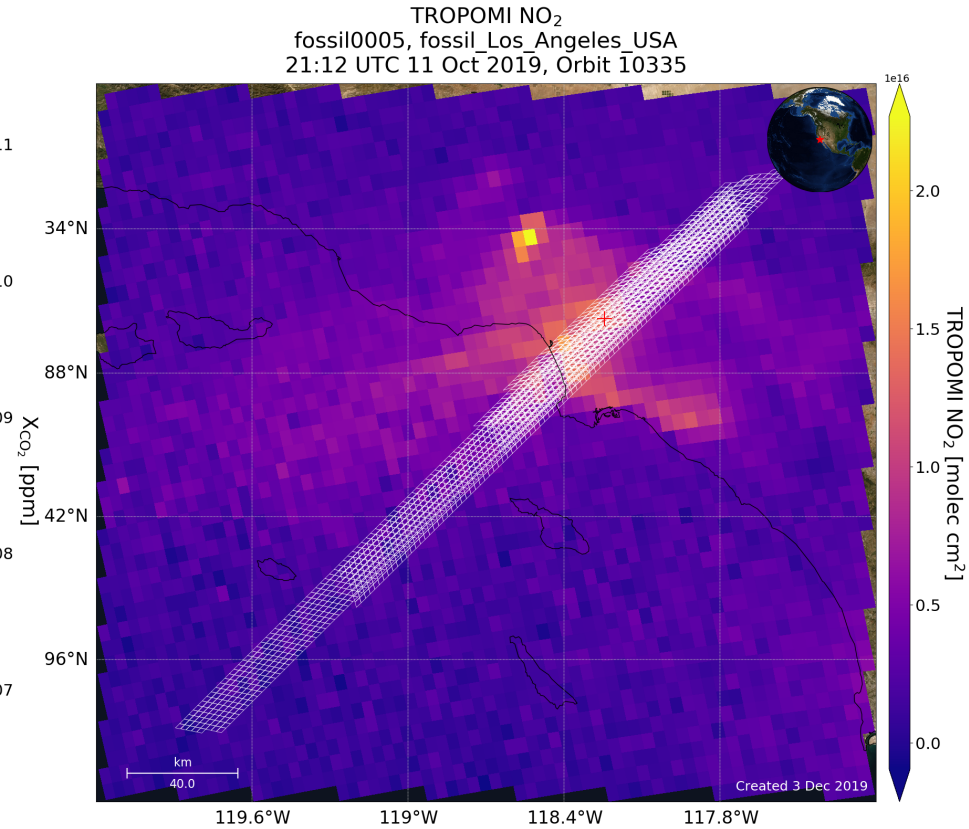




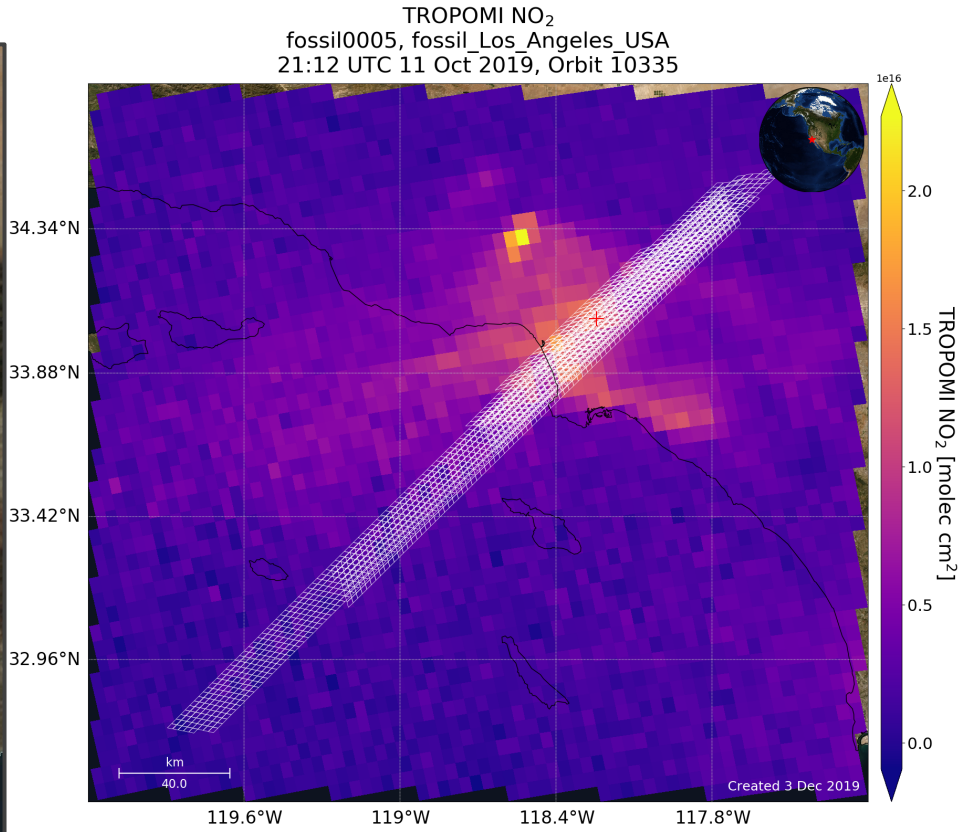
- Mix of real and spurious features?

Los Angeles, USA





Los Angeles, USA



- Saddleridge Fire!
  - Urban emissions estimate would be difficult

Conclusions & Future Plans

- Many promising OCO-3 Snapshot Area Mapping and Target mode measurements!
  - Still working on improving geolocation, calibration, L2 filtering, etc.

- Will be able to reprocess old SAMs/TGs with fixes
  - L2 delivery in approximately March 2020