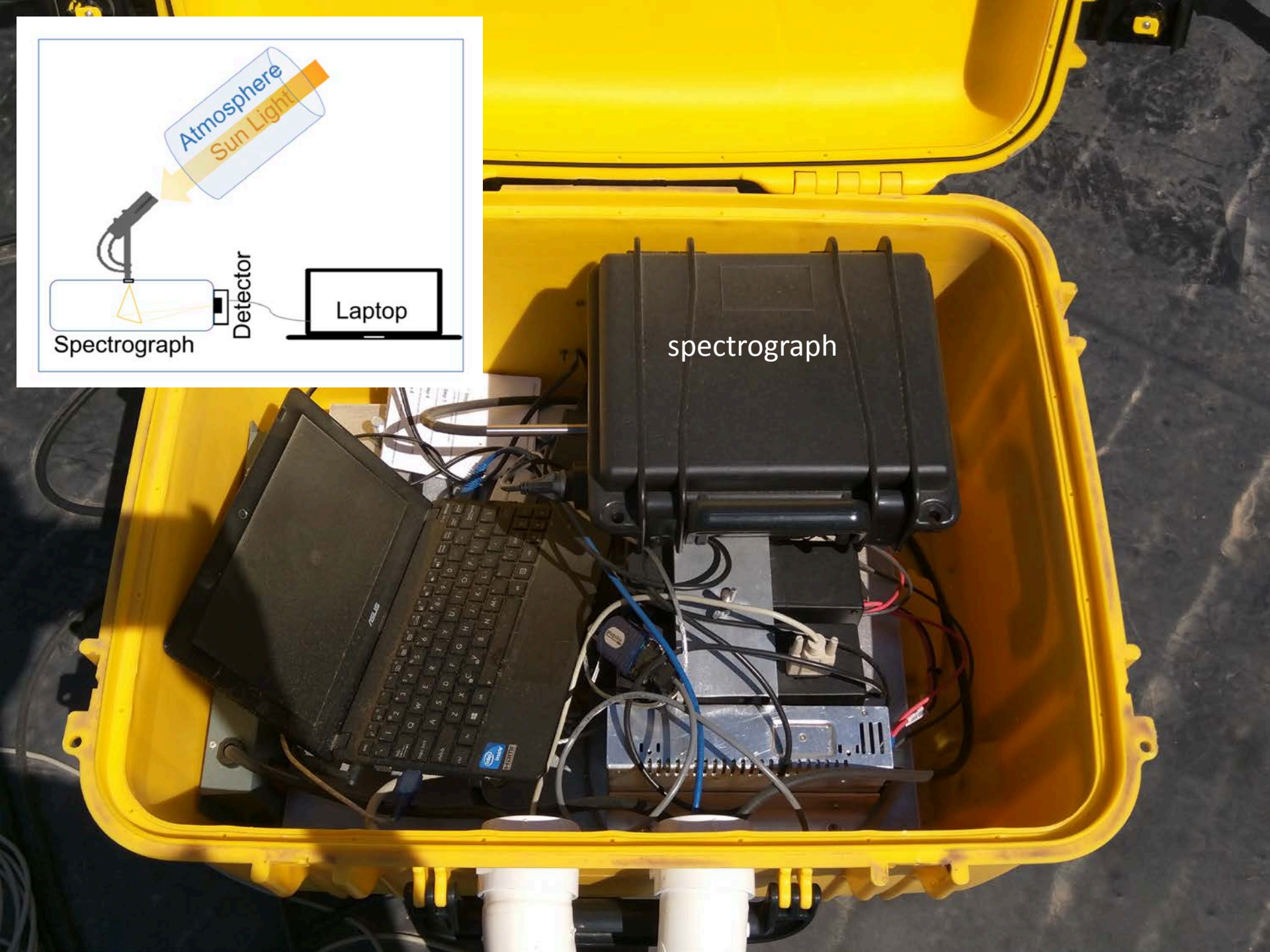
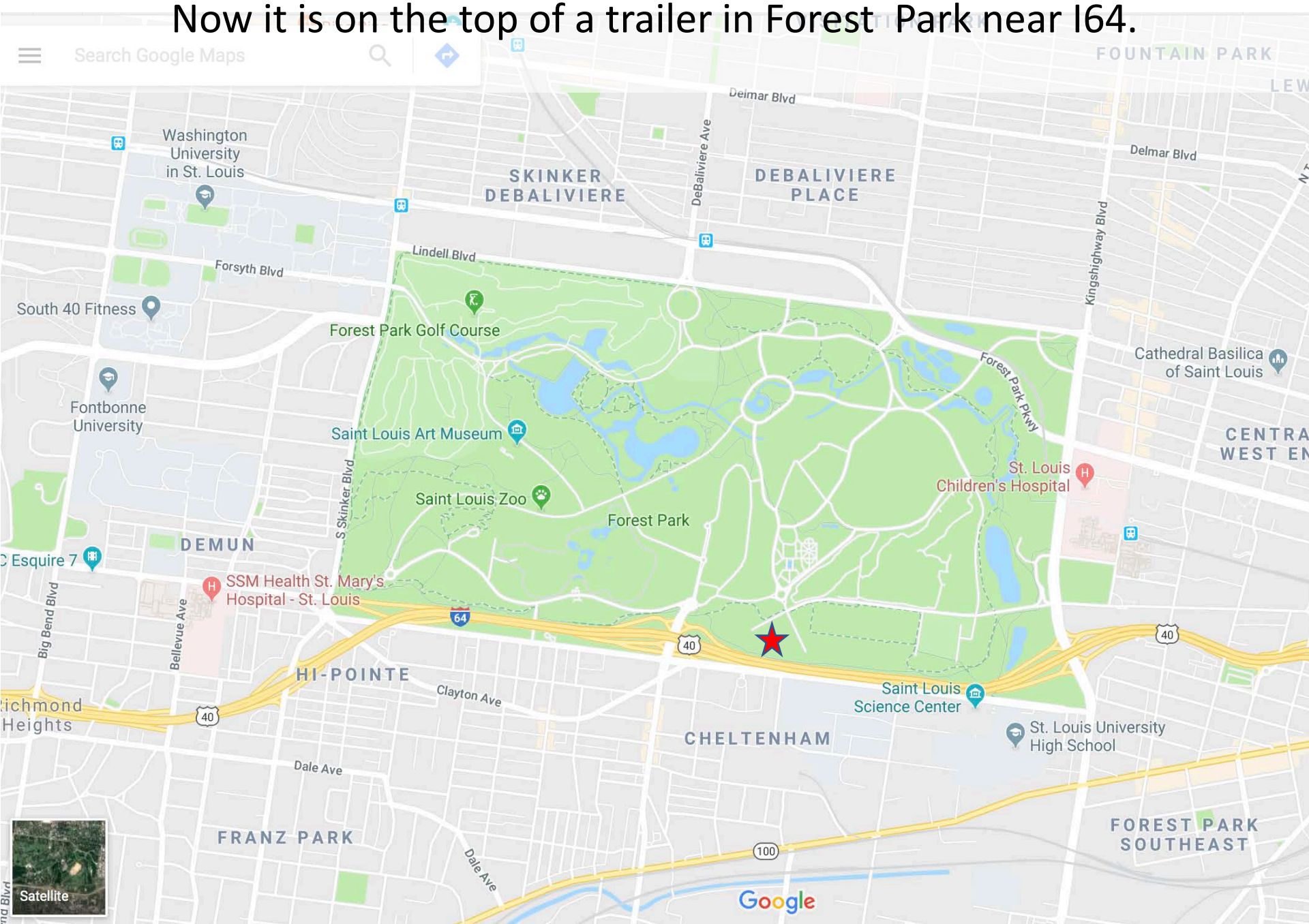
Overview of the SLU Pandora Instrument and Preliminary Results

Chuan Feng


Atmosphere
Sun Light
Detector
Laptop
Spectrograph
spectrograph

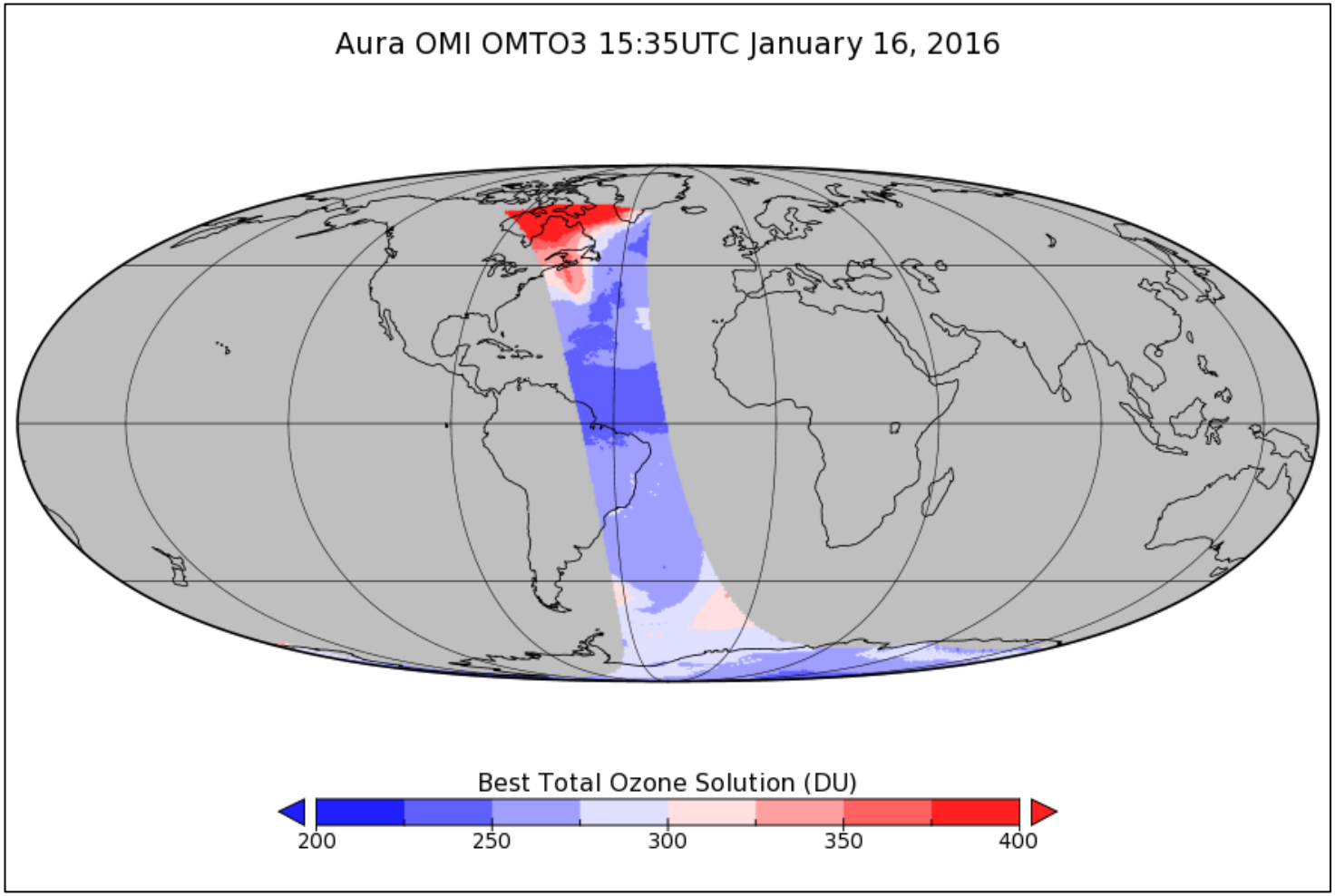
Pandora was set on the roof of Ritter Hall, SLU
from Dec. 2016 to Oct. 2017

Now it is on the top of a trailer in Forest Park near I64.

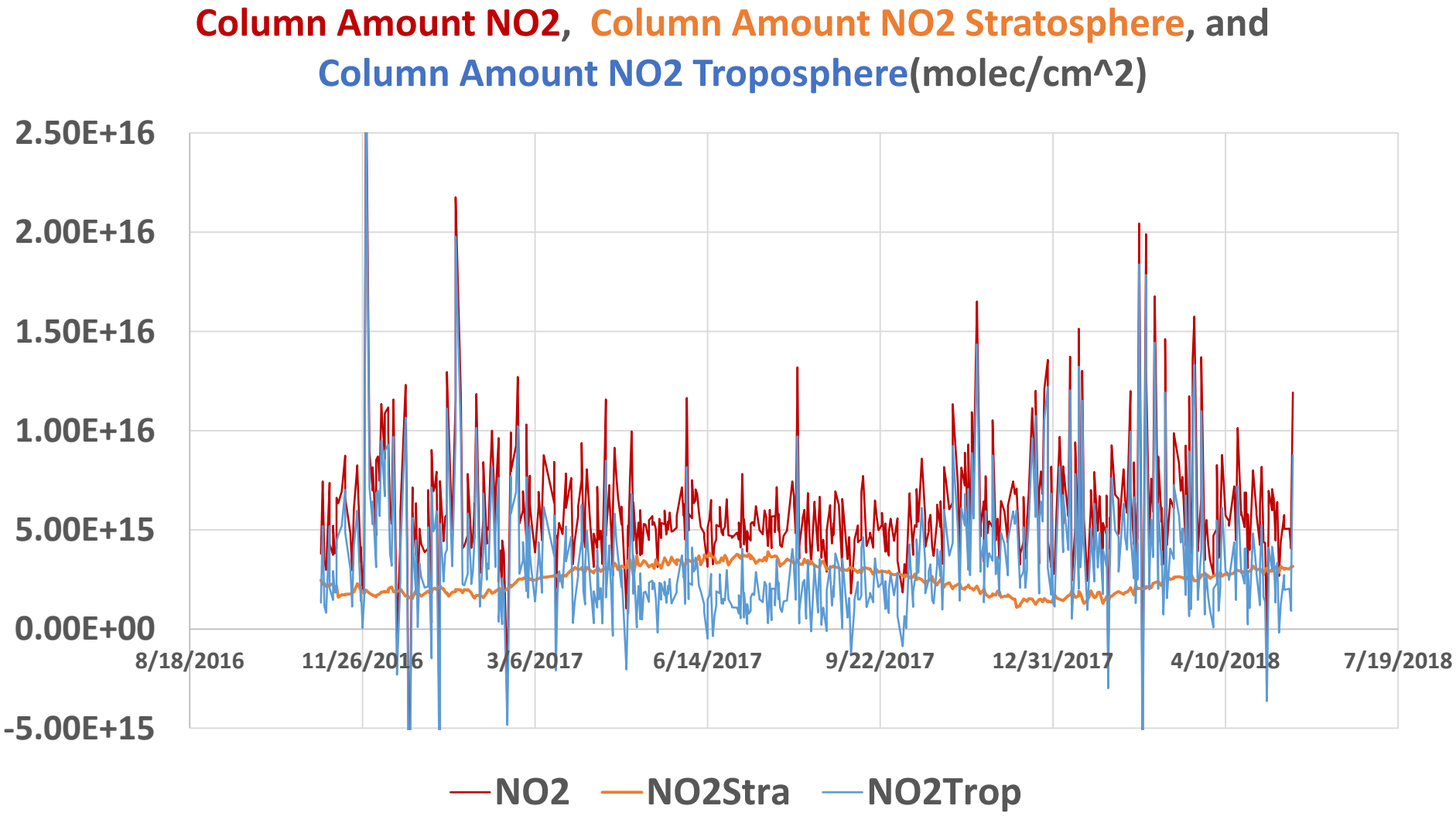


OMI and OMI Data

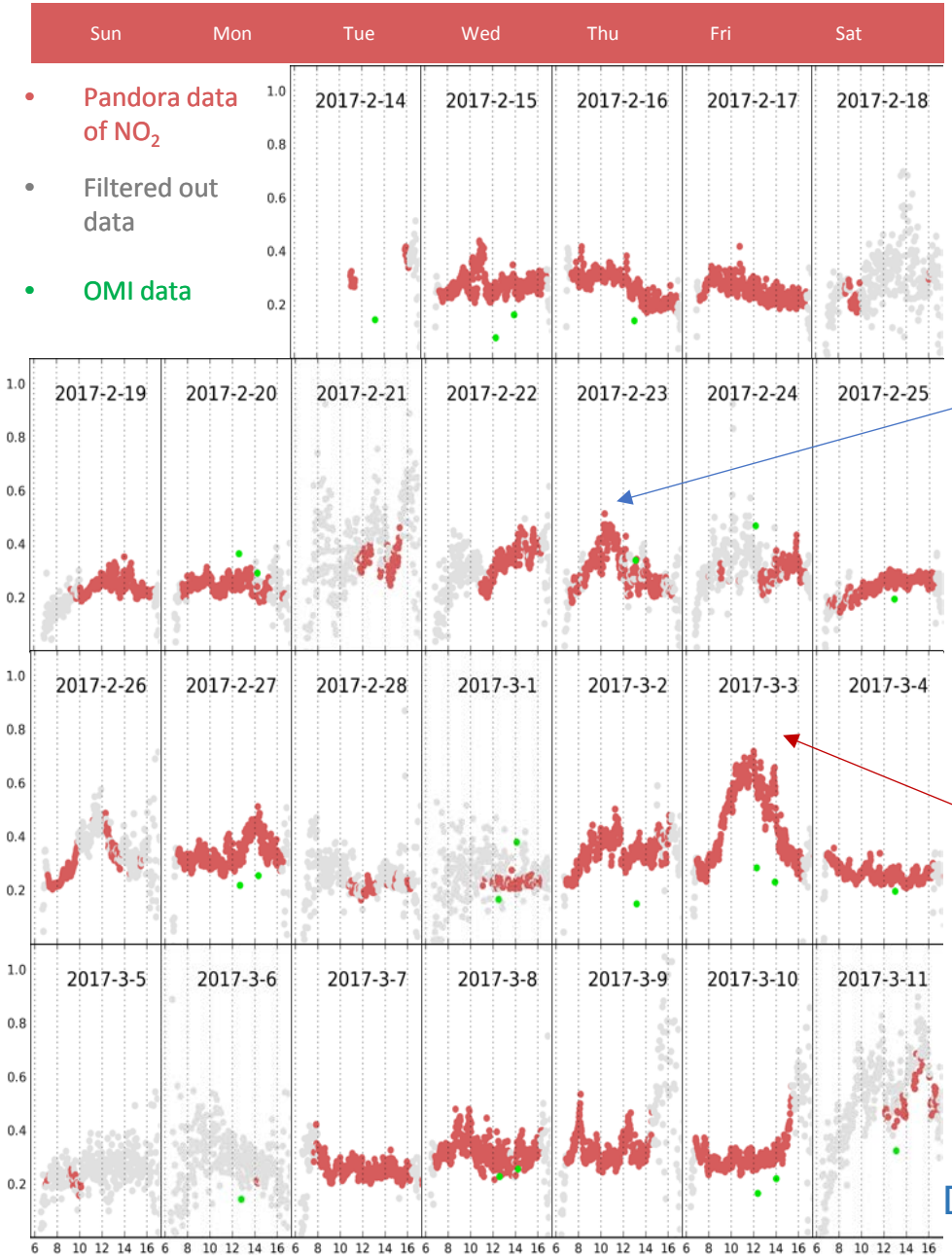
The limitation: low temporal resolution.



OMI NO_2 data for Saint Louis



Example of Comparison between Pandora and OMI NO_2 Measurement

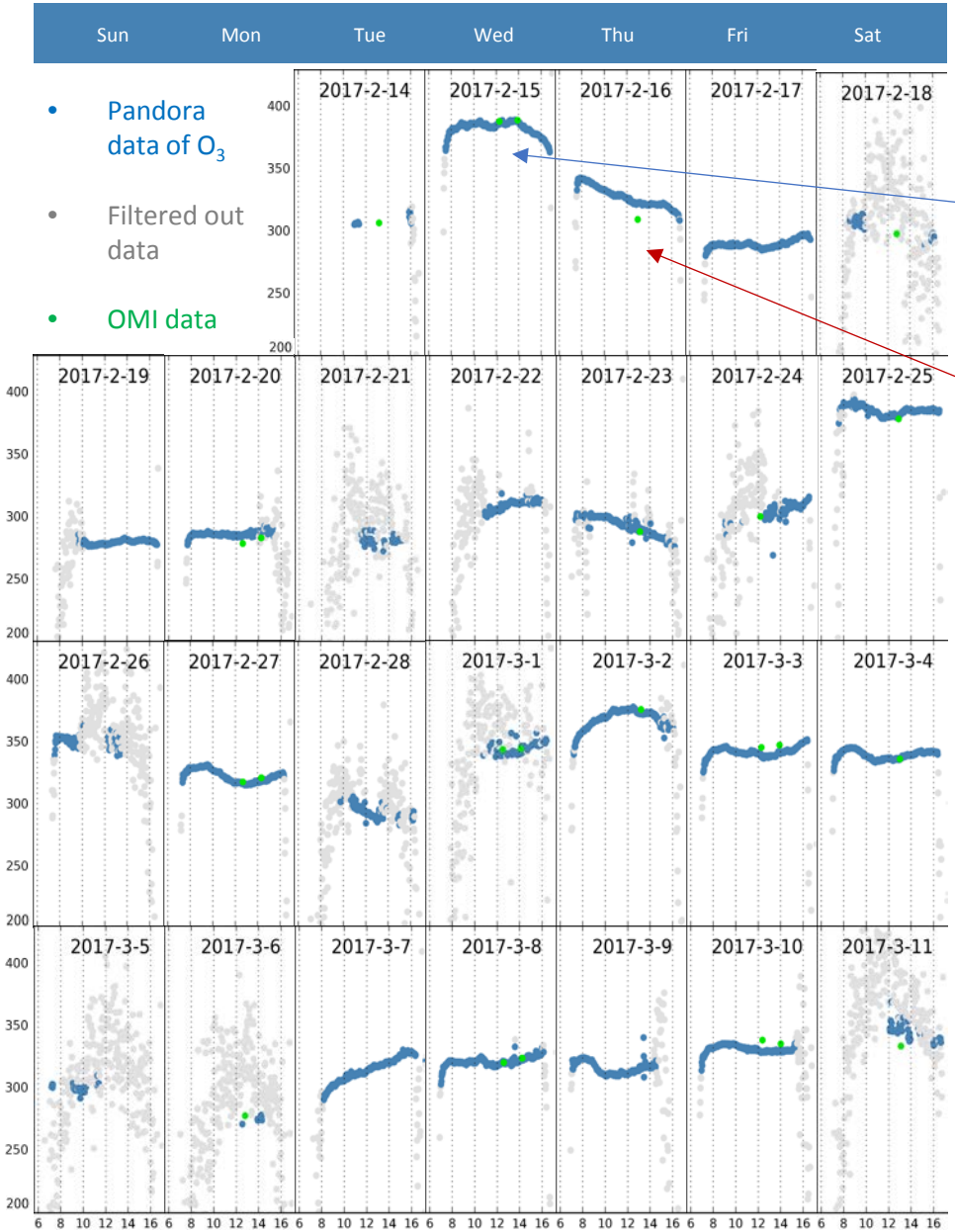


Good agreement

Poor agreement

Dobson Unit (1 DU=2.687×10^{16} molec/ cm^2)

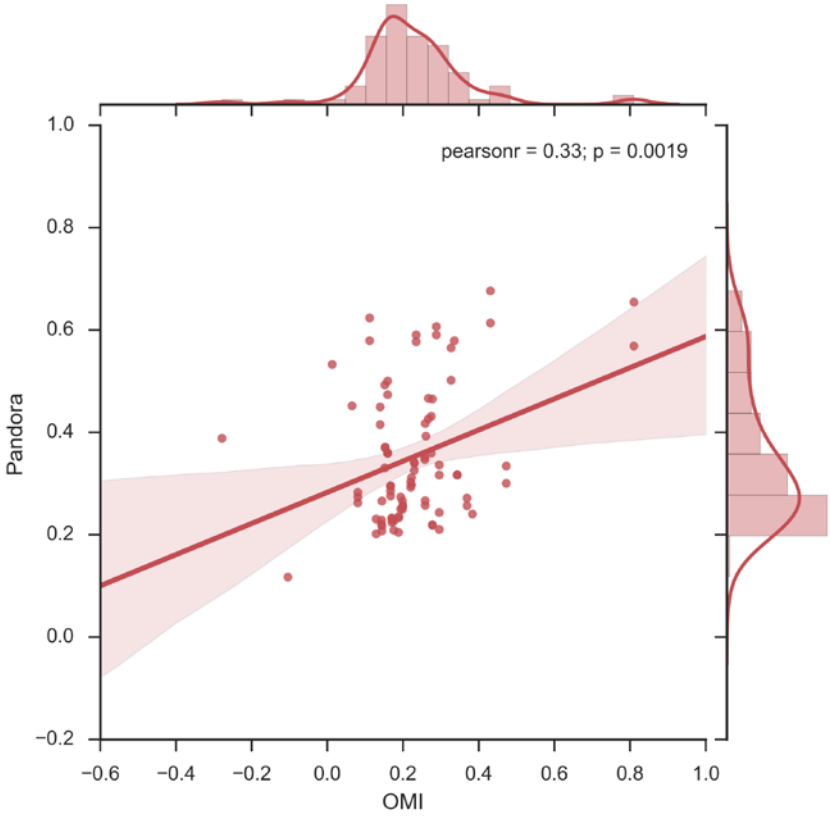
Example of Comparison between Pandora and OMI O_3 Measurement

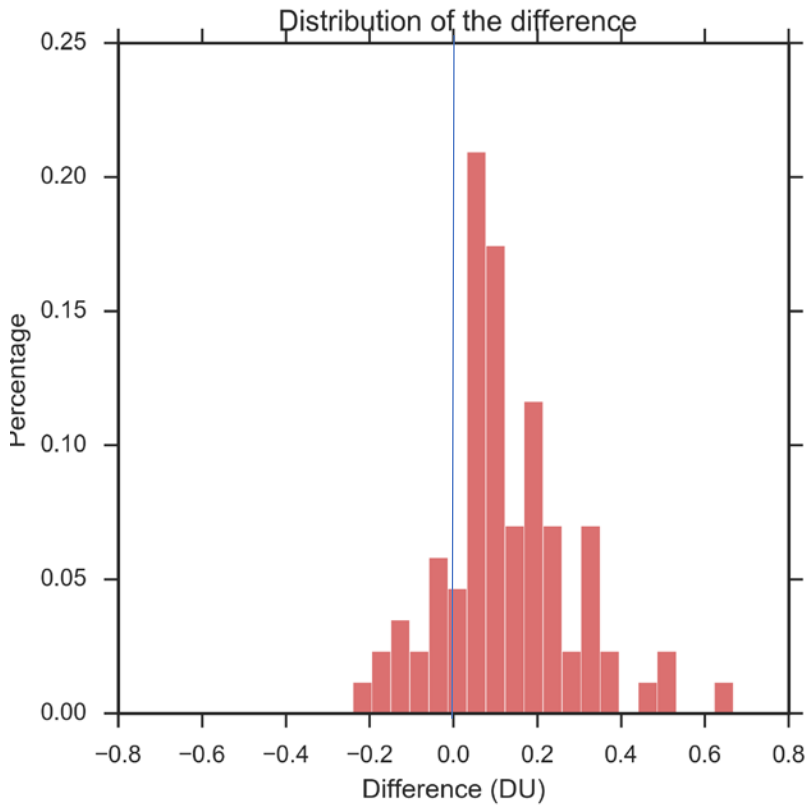


Good agreement

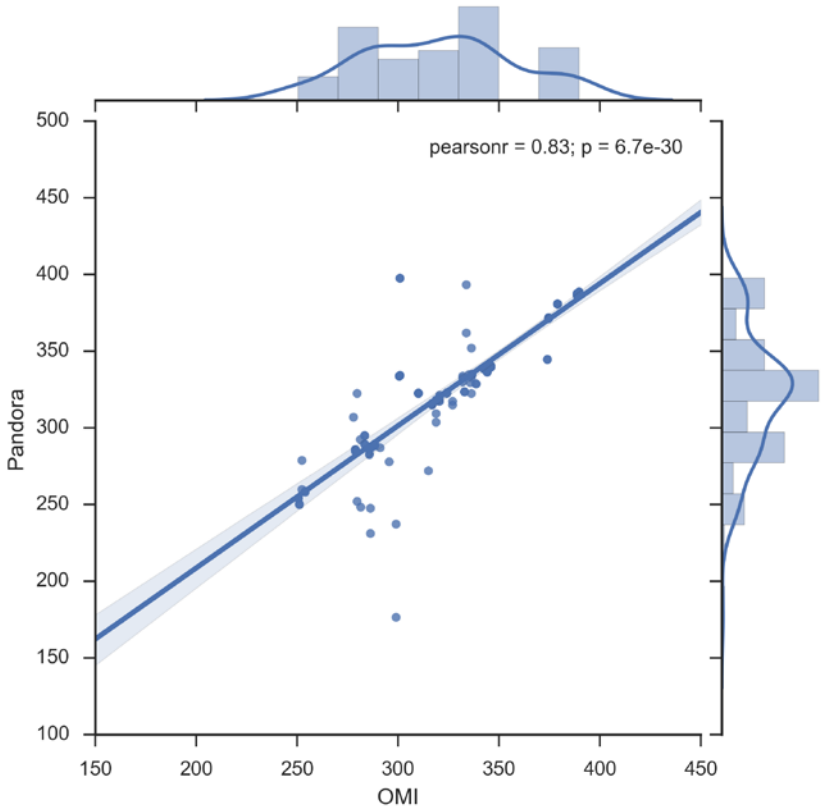
Poor agreement

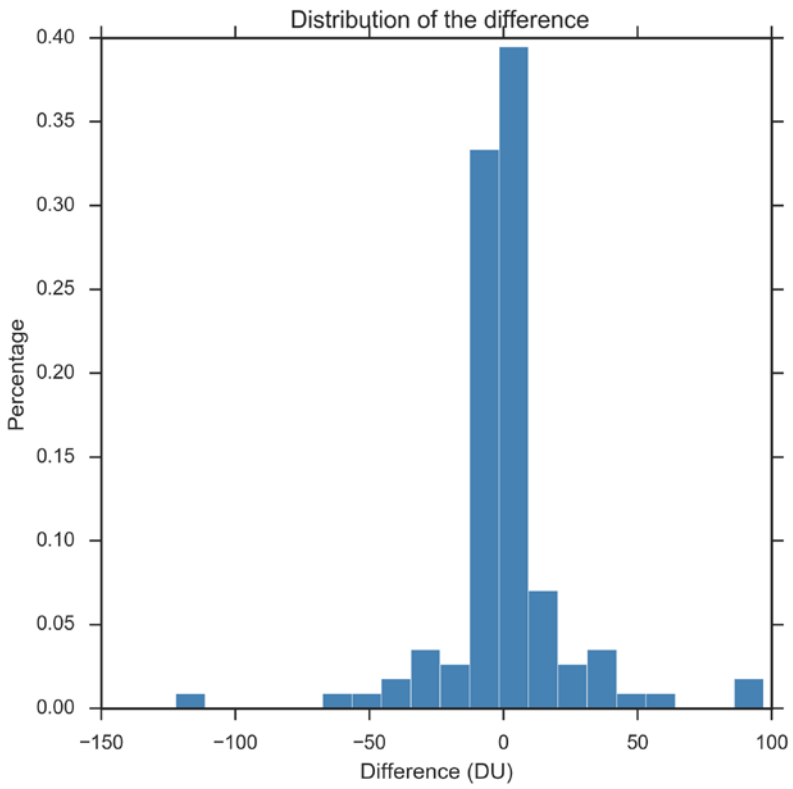
Statistical Analysis





Statistical Analysis

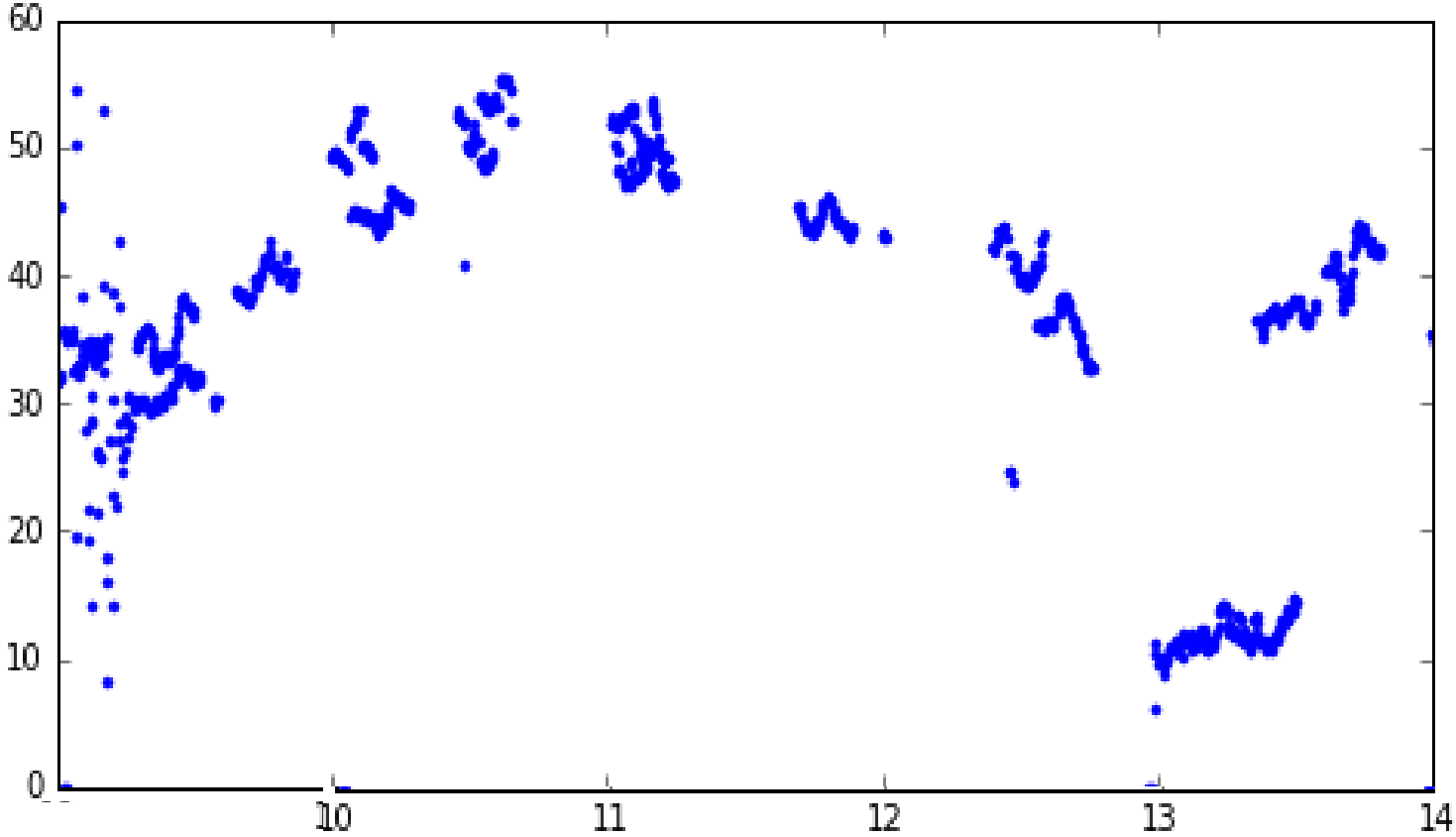




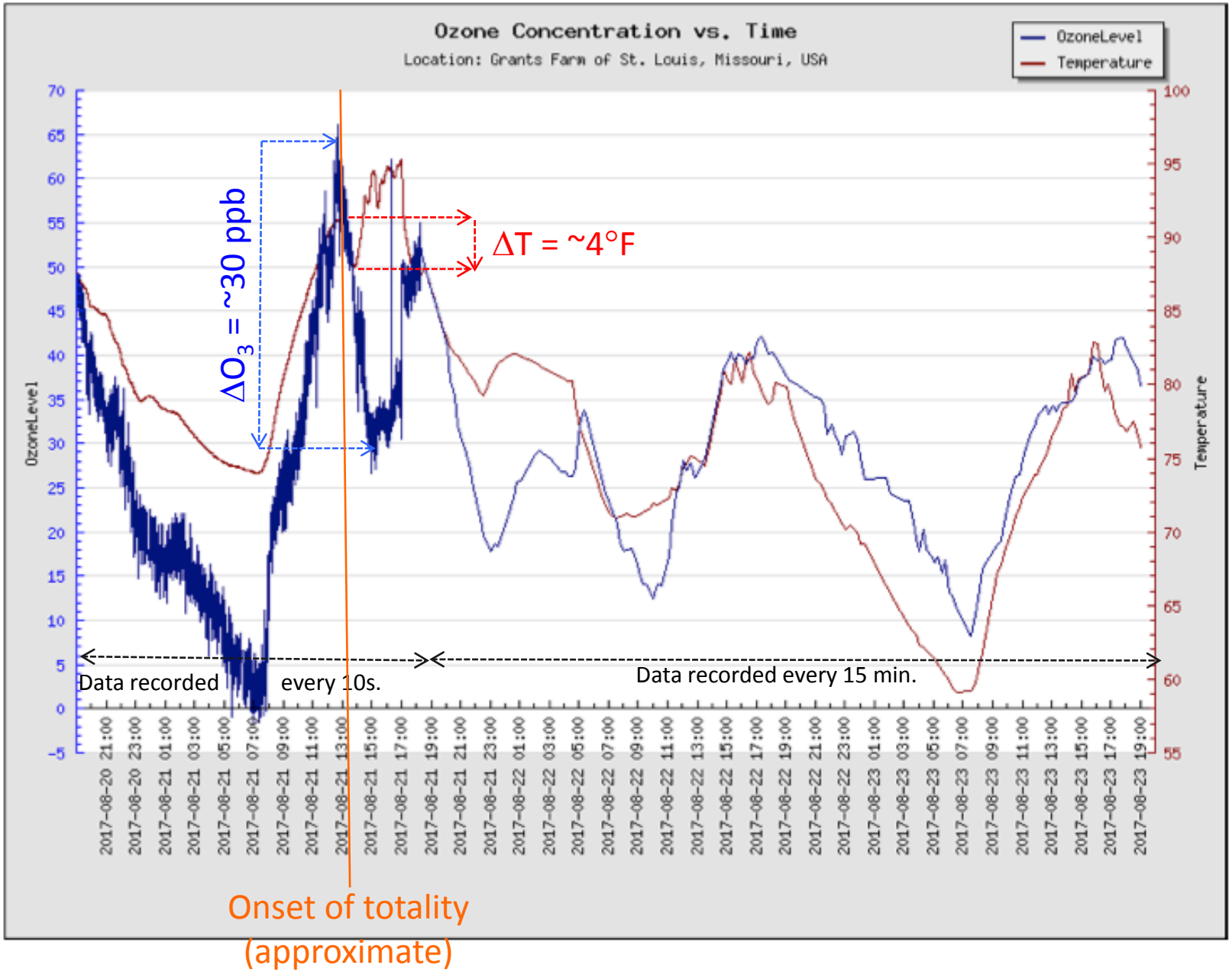
The Solar Eclipse in August 21st, 2017

POM, Personal Ozone Monitor by 2B Tech.

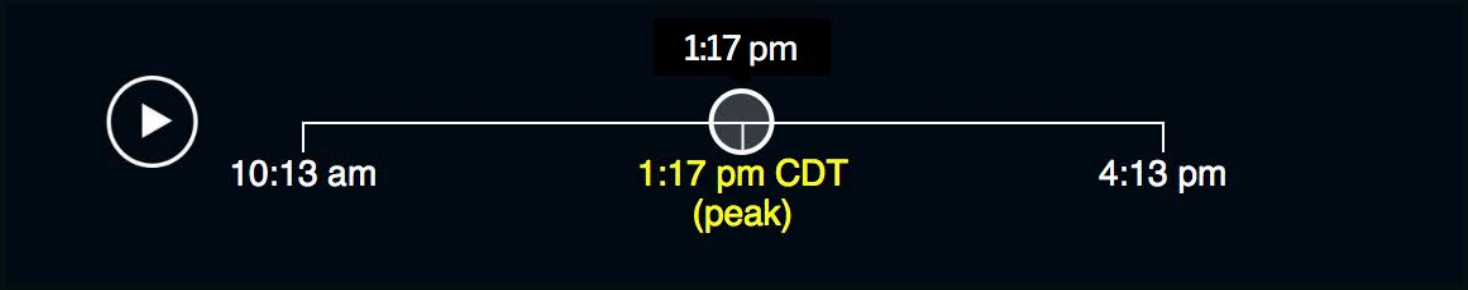
POM measurement at SLU during the eclipse

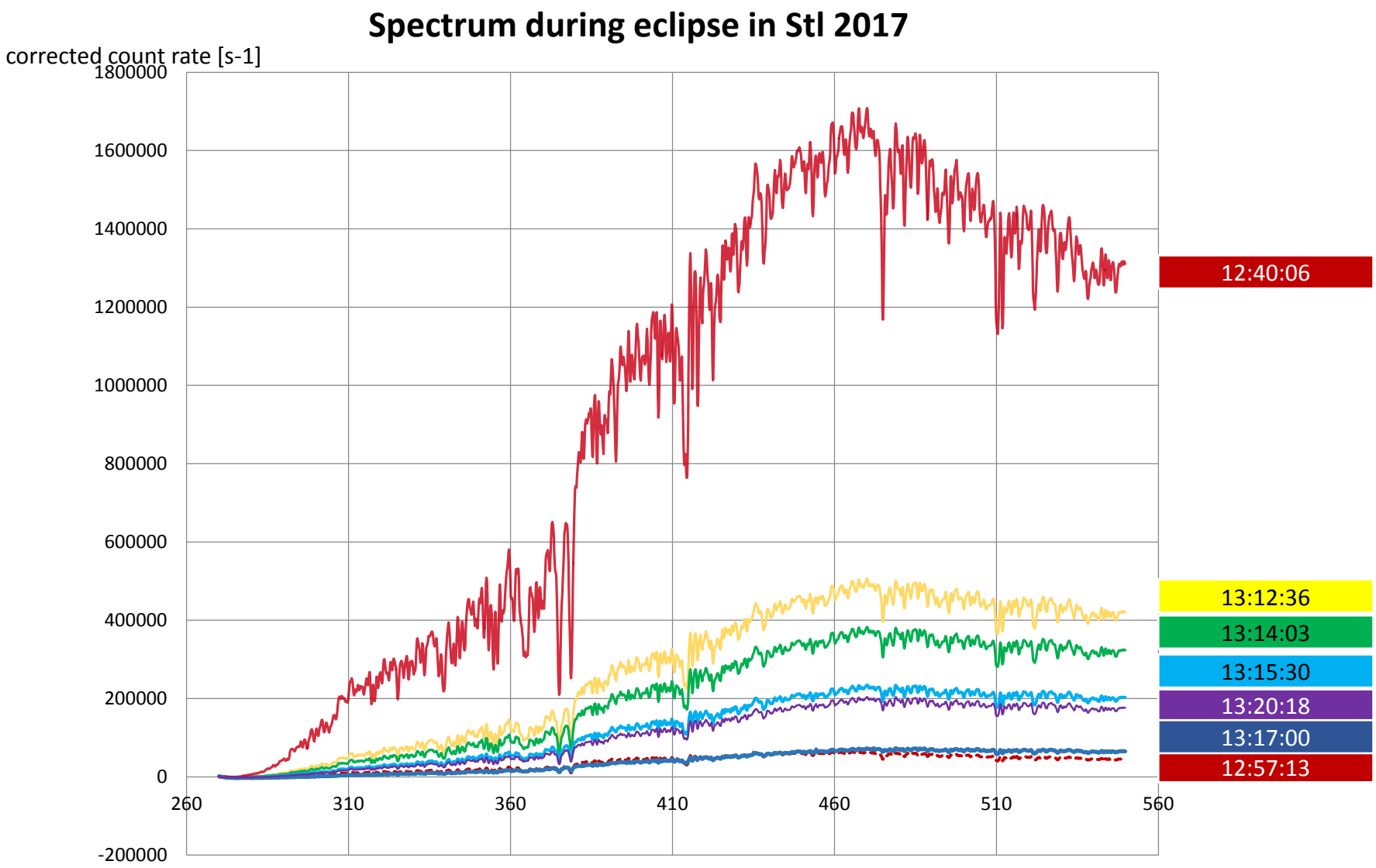


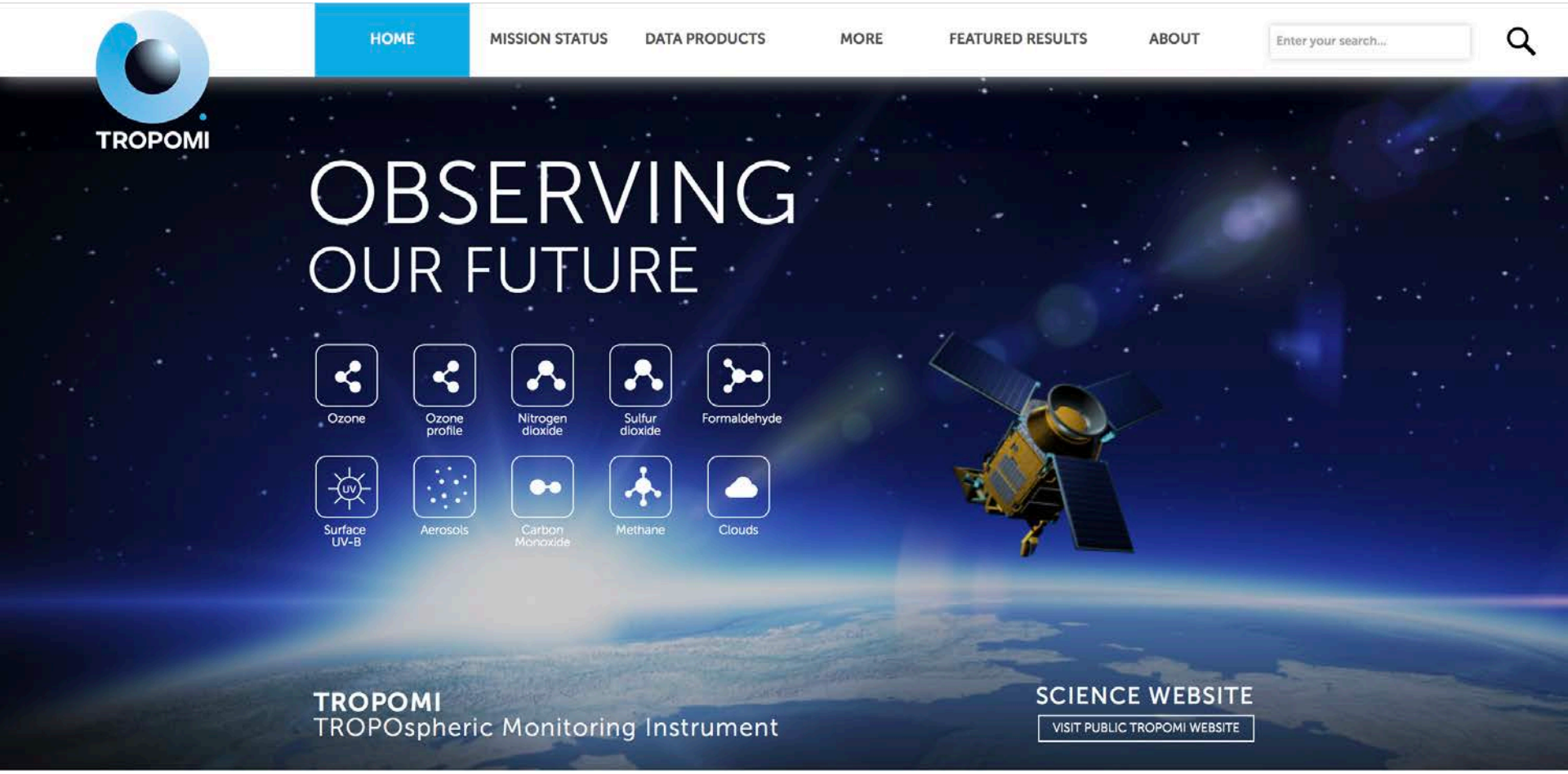
Ozone and Temperature during Eclipse – Aug. 21, 2017



12:40 pm
10:13 am
1:17 pm
4:13 pm

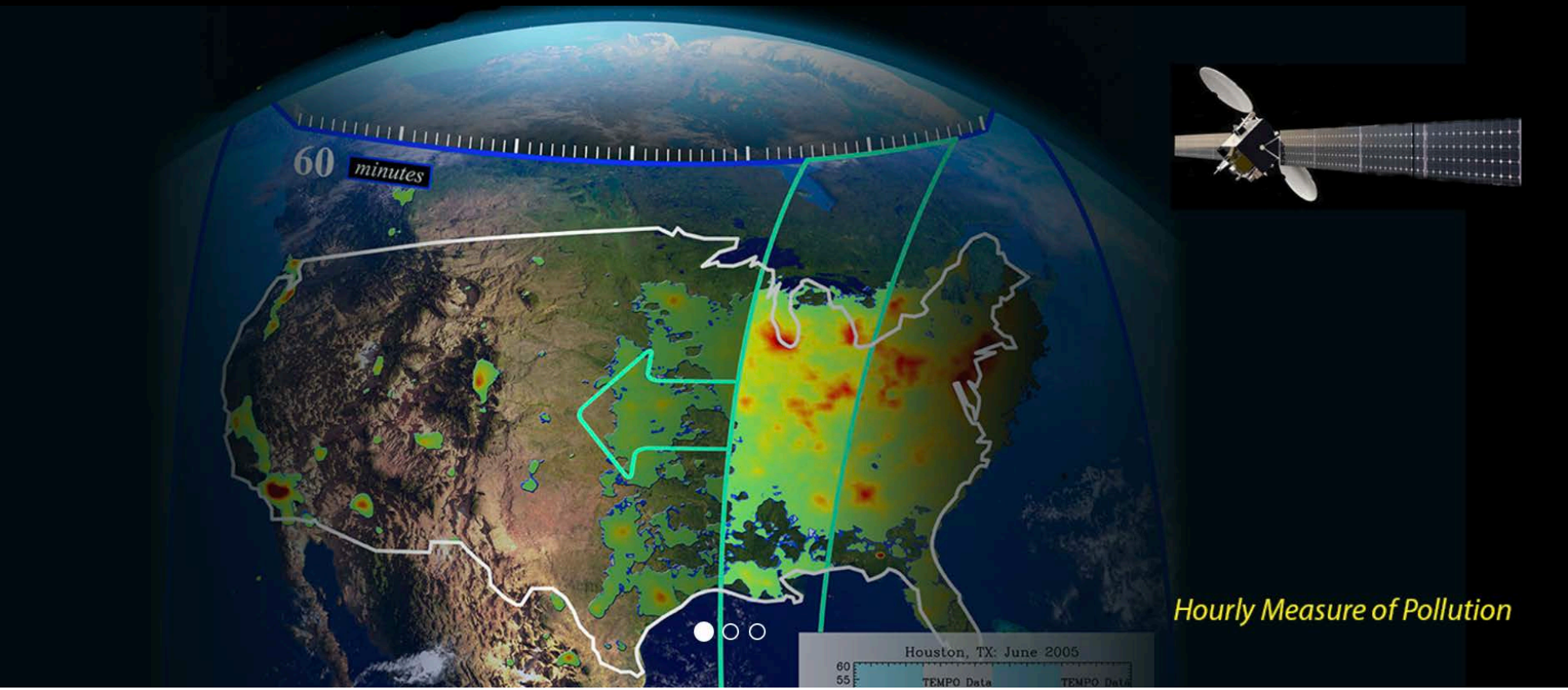

1:17 pm
10:13 am
1:17 pm CDT
(peak)
4:13 pm


Spectrum during eclipse in Stl 2017
corrected count rate [s-1]
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
-200000
260
310
360
410
460
510
560
12:40:06
13:12:36
13:14:03
13:15:30
13:20:18
13:17:00
12:57:13



The TROPOspheric Monitoring Instrument (**TROPOMI**) is the satellite instrument on board of the Copernicus Sentinel-5 Precursor satellite launched in 2017 for a mission of seven years.

Same swath with but higher spatial resolution than OMI.
Synchronous orbit, one or two measurement for a fixed location per day

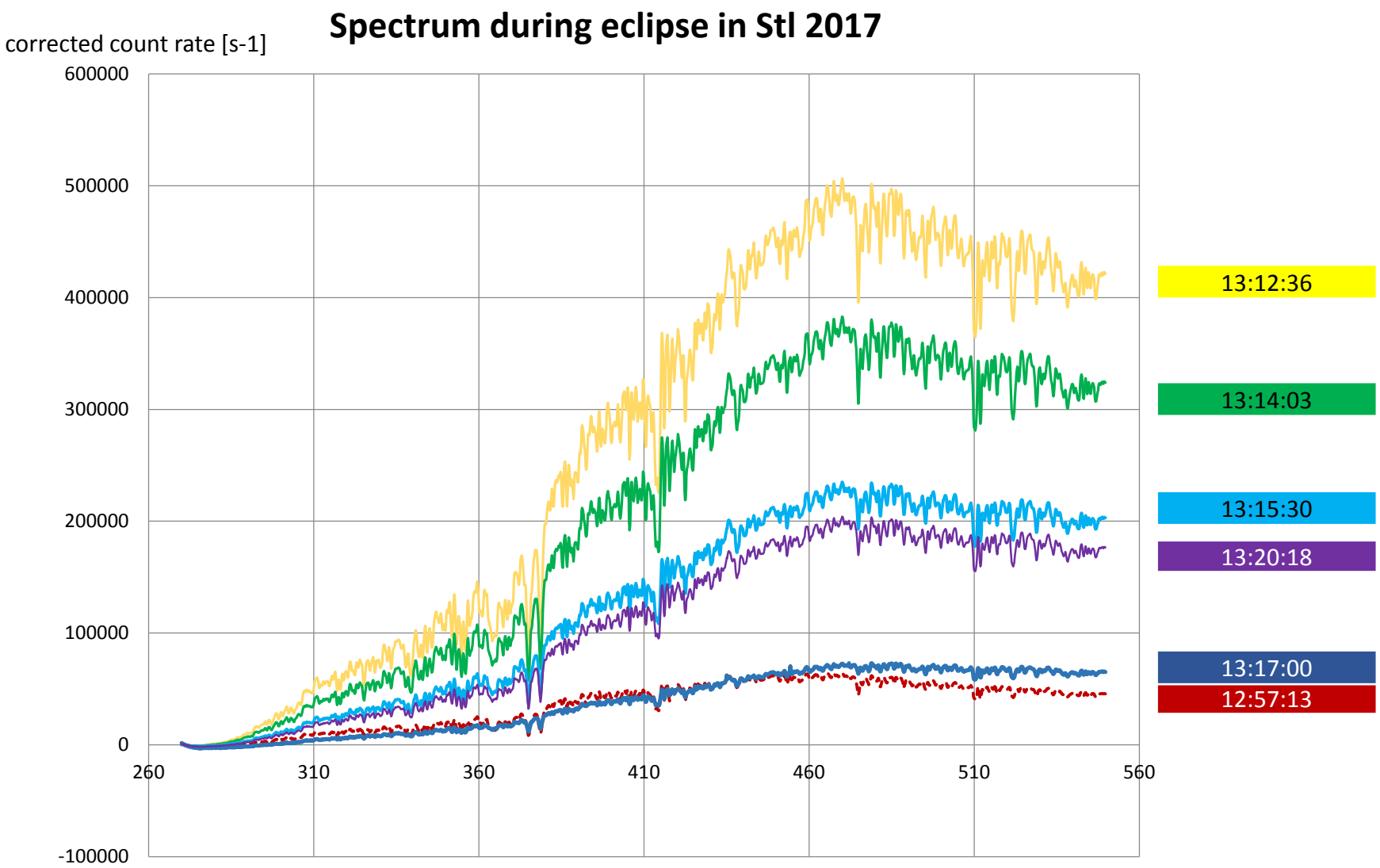


The TEMPO instrument is attached to a commercial telecommunications satellite (to be selected) in geostationary orbit. Not launched yet.

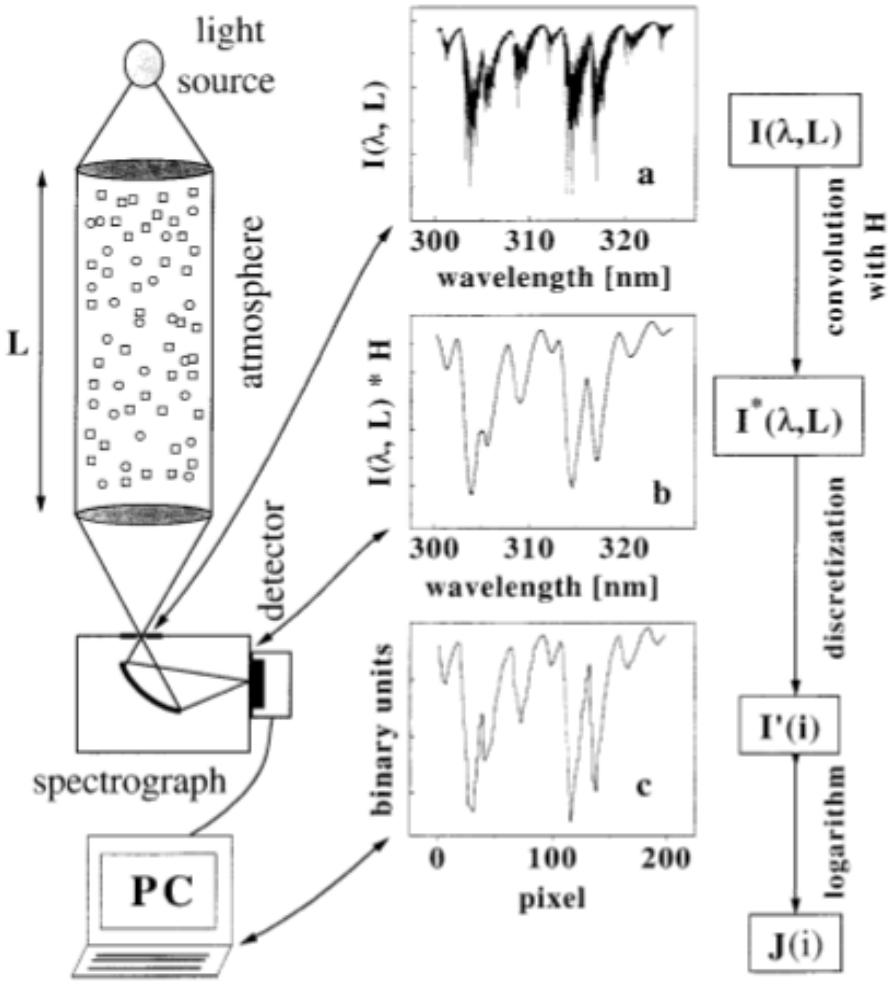
Measures by UV and VIS

Higher Resolution: 2km*4.5 km

can make a complete East to West scan of the "Field of Regard" each and every hour of the day.


Spectrum during eclipse in Stl 2017
corrected count rate [s-1]
600000
500000
400000
300000
200000
100000
0
-100000
260
310
360
410
460
510
560
13:12:36
13:14:03
13:15:30
13:20:18
13:17:00
12:57:13

How does Pandora work



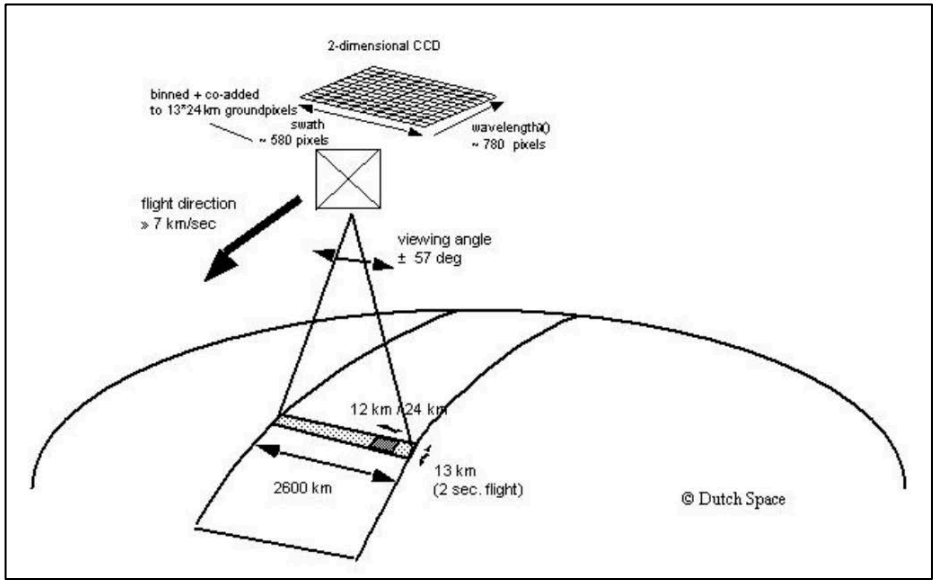
The atmosphere absorbs radiation and leaves vibrational structure on the absorption bands.

Through the spectrograph, the signal carried by the light is mapped to the pixels on the detector.

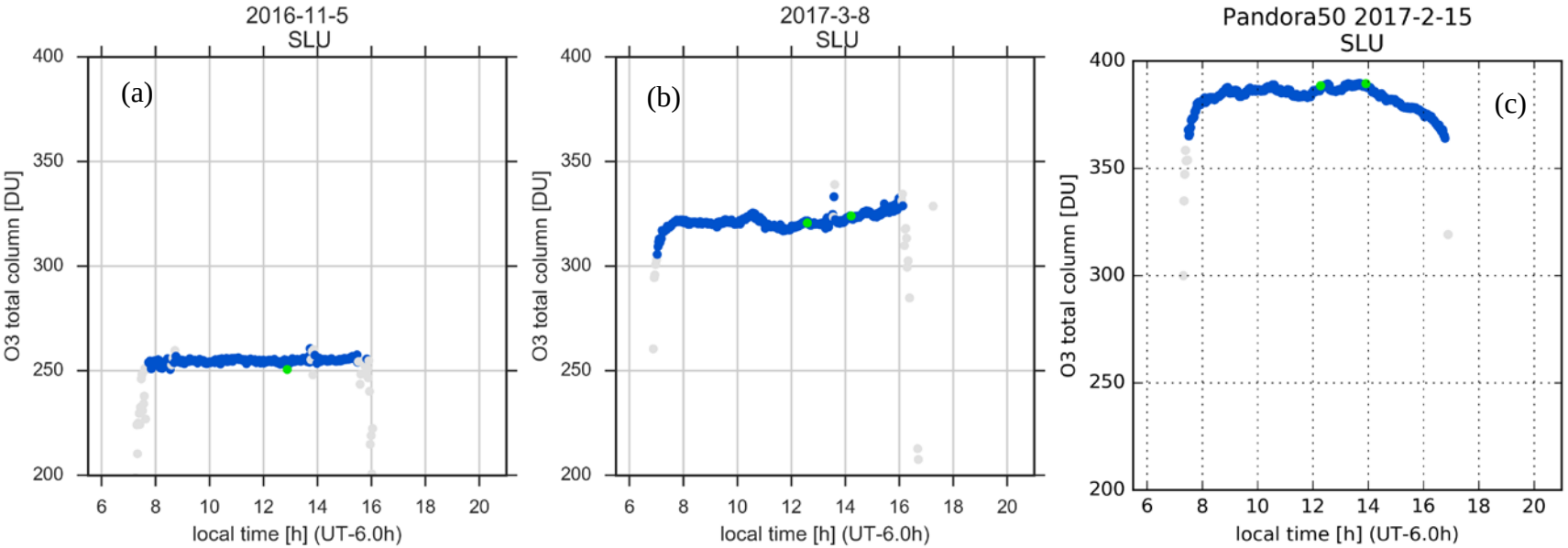
The detector transfers the radiation signal into digital signals and they are recorded by the computer.

OMI and OMI Data

OMI is one of the four instruments carried by the Aura satellite, which was launched in 2004. This spectrometer measures pollutants such as Total Column O_3, NO_2, SO_2, and aerosols.



Examples of Good Agreement

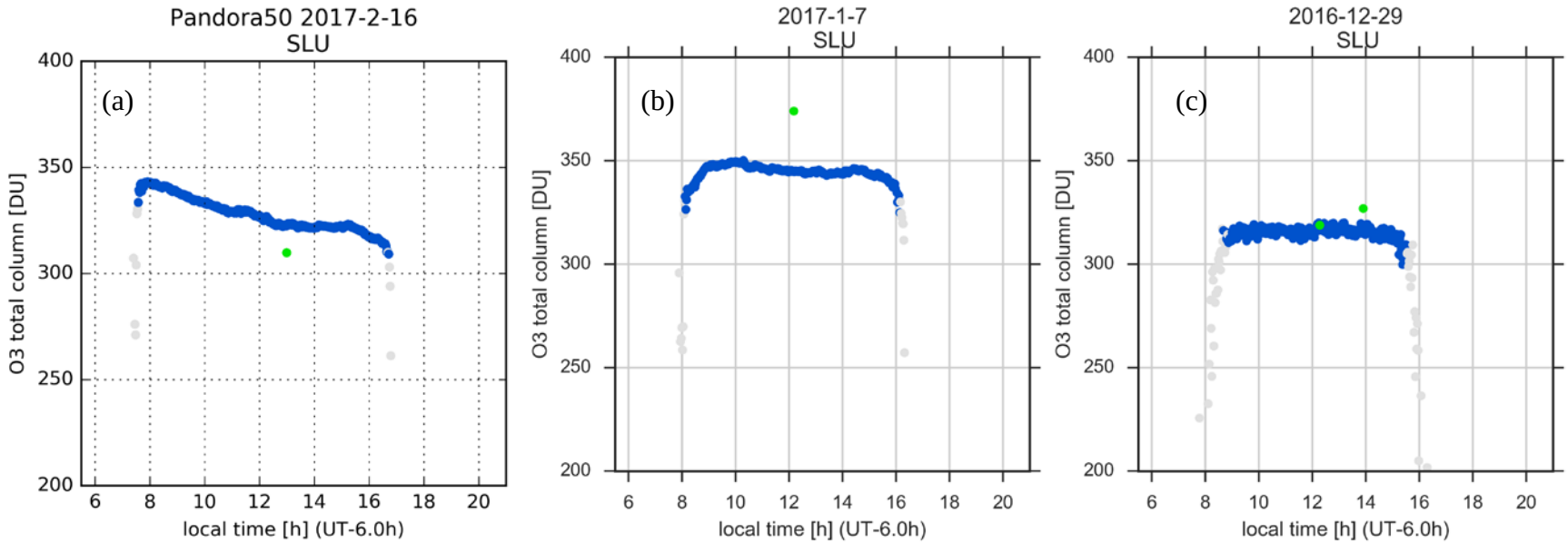


Low total ozone amount

Average total ozone amount

High total ozone amount

Examples of Poor Agreement

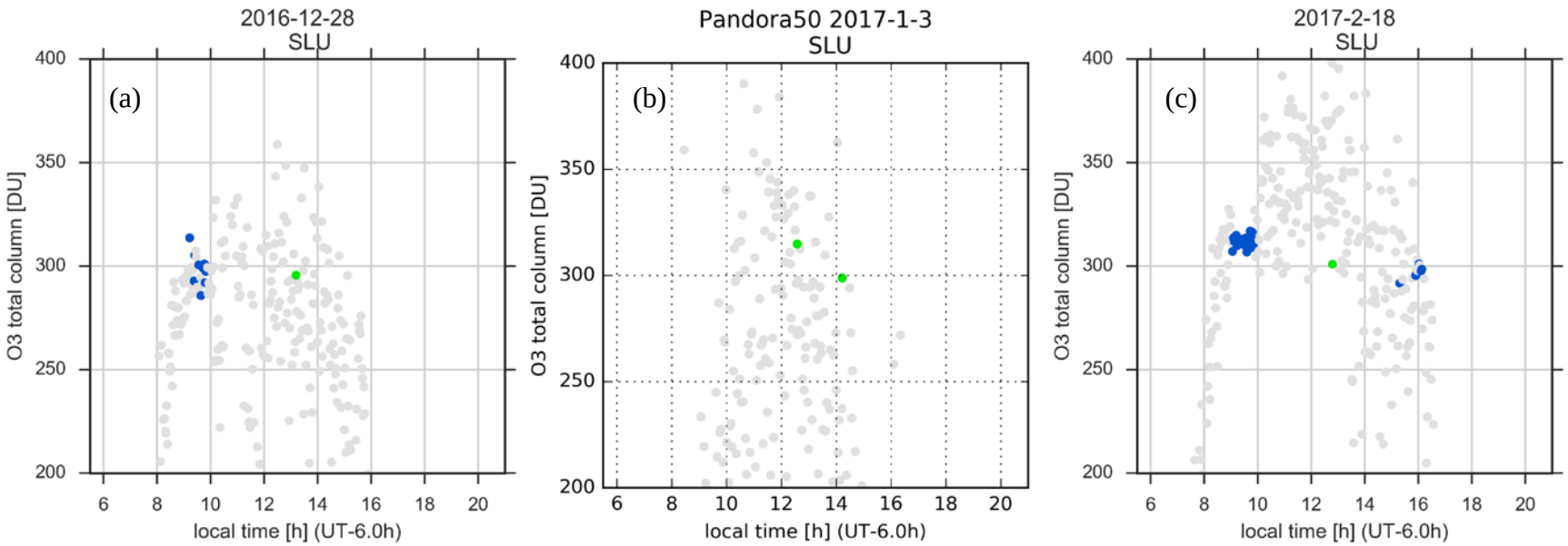


More than OMI

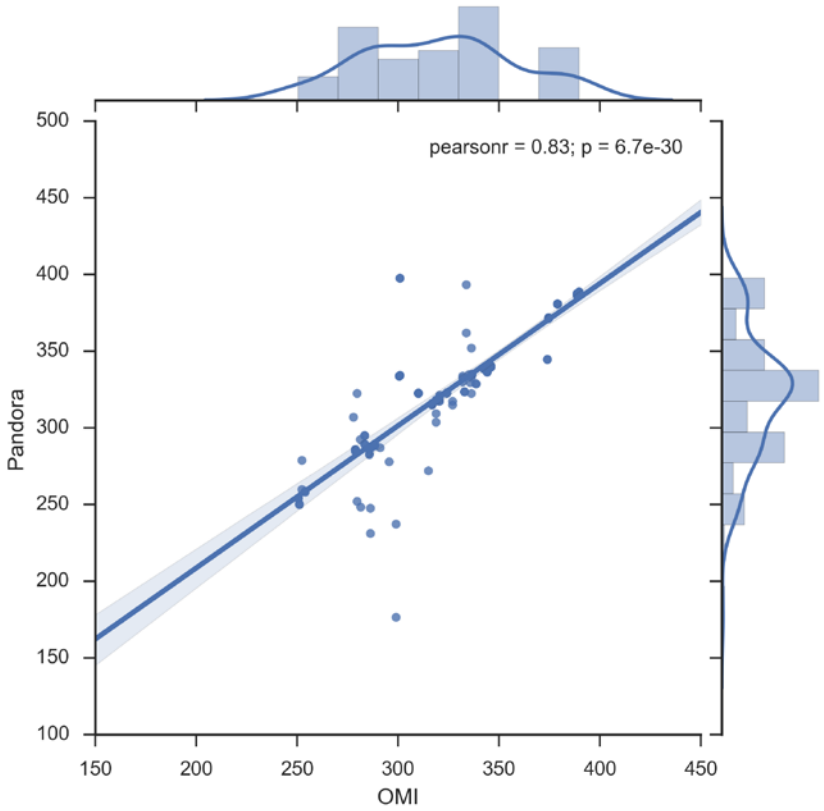
Less than OMI

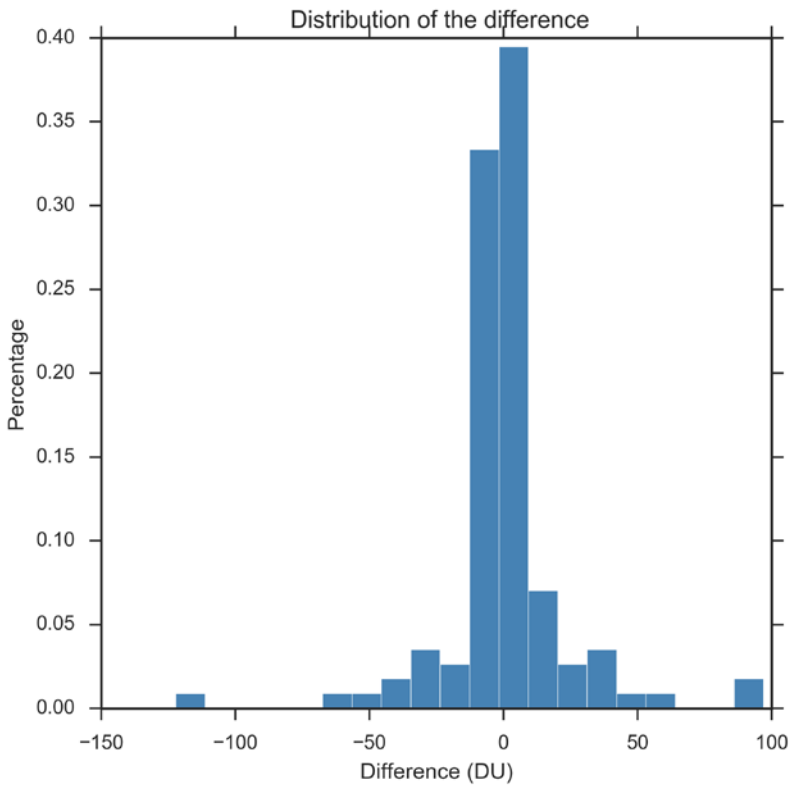
Changes in short time

Examples of Chaos



Statistical Analysis





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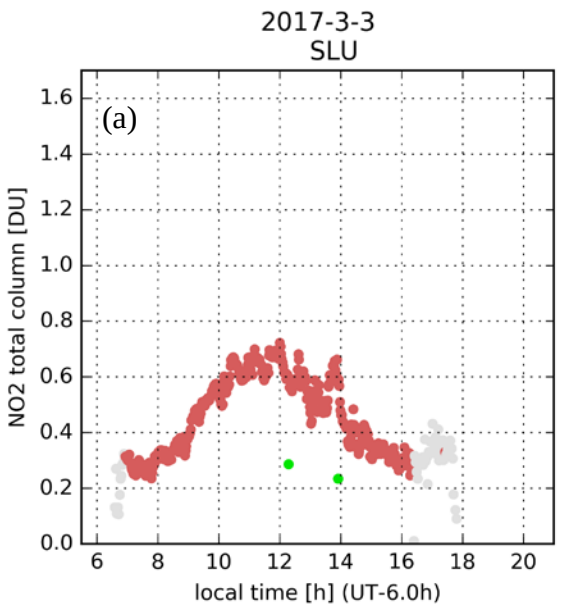
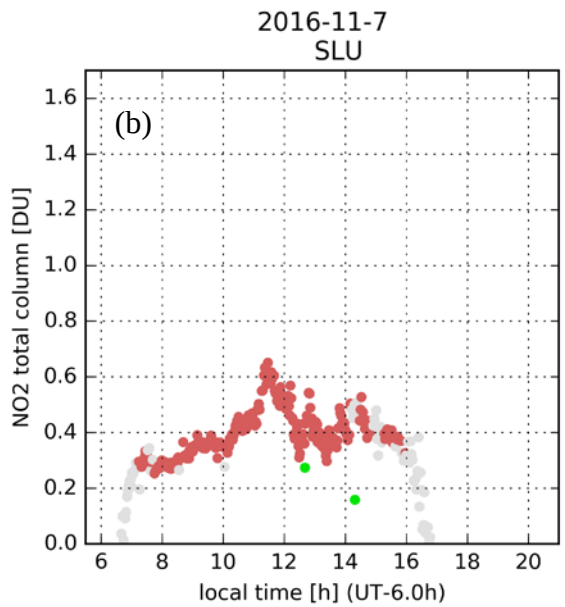
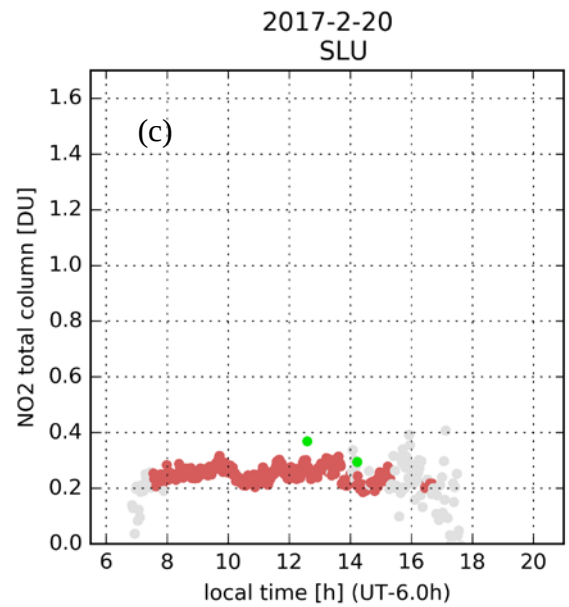
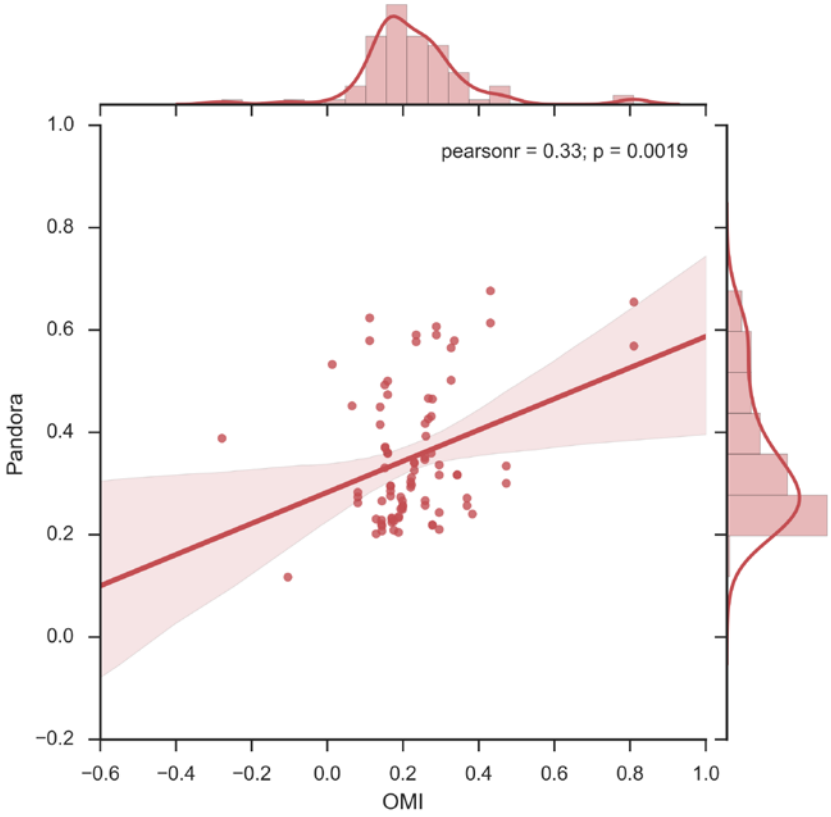
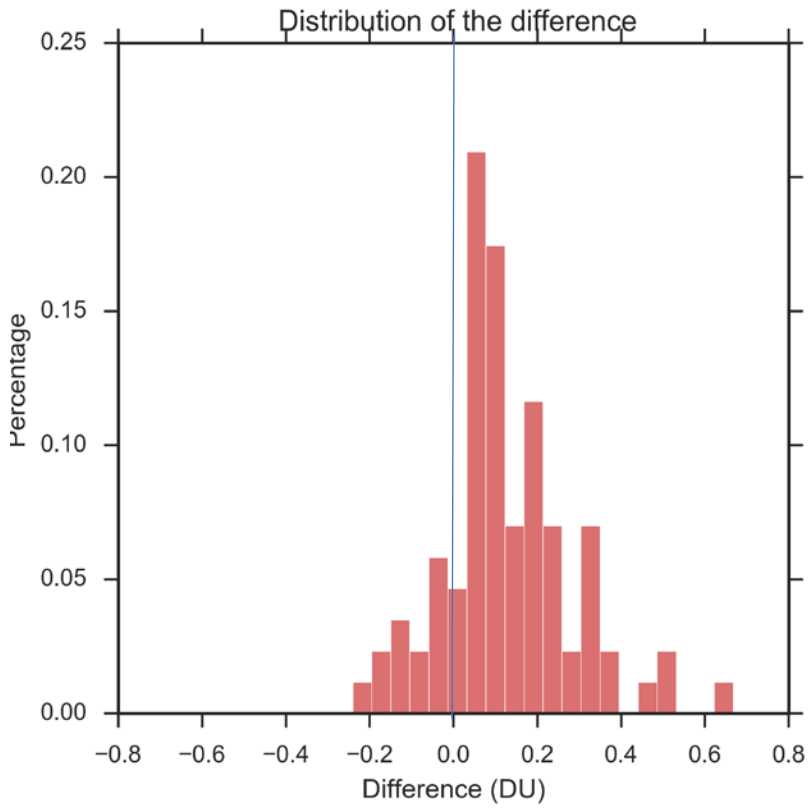






Larger than OMI

Larger than OMI

Smaller than OMI

Statistical Analysis