

TanSAT validation and measurement

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新华网
WWW.NEWS.CN

Monitoring Greenhouse Gases from Space (ID: 32301)

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INSTITUTE

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Sub-projects and themes:

- Id. 32301_1
- Monitoring greenhouse gases from space: retrieval algorithm development and CO₂ and CH₄ flux inversion
- Id. 32301_2
- Monitoring greenhouse gases from space: validation and uncertainties with focus in China and high latitudes

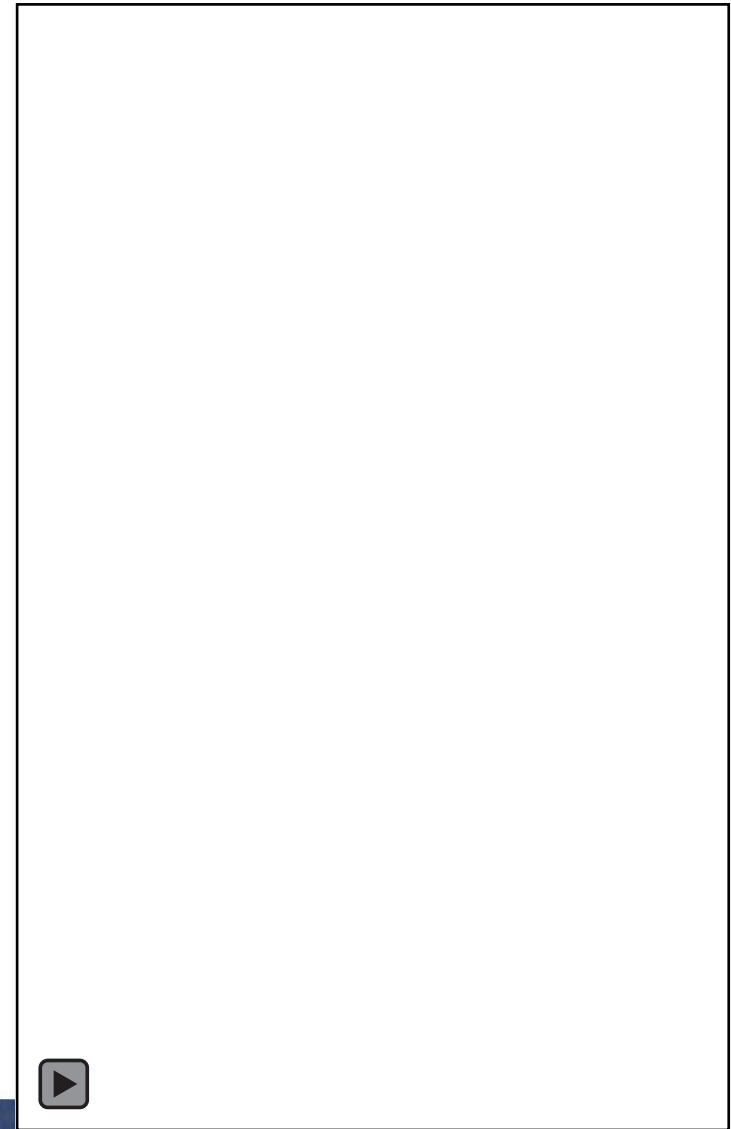
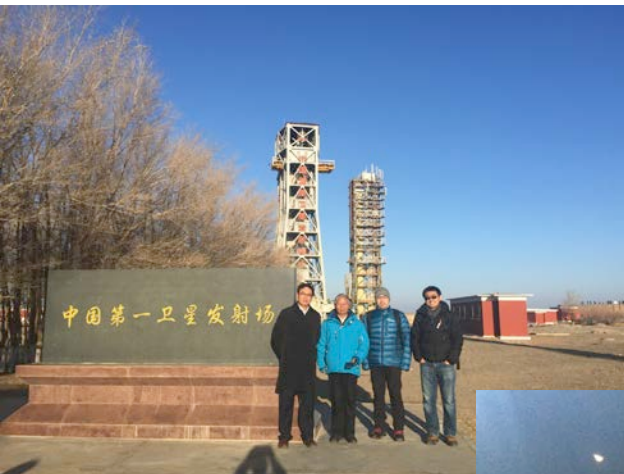
First observation of TanSat

Validation and test retrieval

TanSat validation plan

TanSat Launching

TanSat was successfully launched on December 22 in JiuQuan Satellite launching center by CZ-2D Launch Vehicle










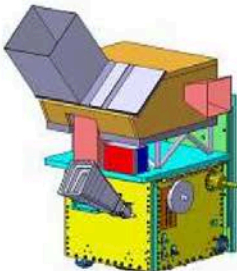
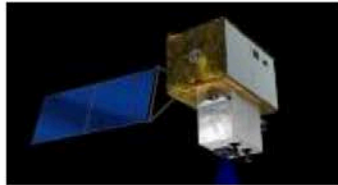
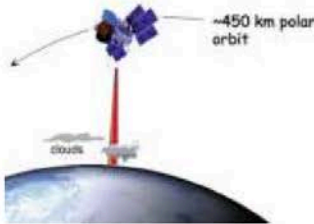
More Satellite data are needed

-TanSat will fill the gape



Space-based GHG observations



<p>Envisat (ESA) 2003-2012 CO₂, CH₄</p> 	<p>GOSAT (Japan) 2009-present CO₂, CH₄</p> 	<p>OCO-2 (NASA) 2014-present CO₂</p> 	<p>TanSat (China) 2016- CO₂</p> 	<p>OCO-3 (NASA) 2016- CO₂</p> 
<p>GOSAT-2 (Japan) 2018- CO₂, CH₄</p> 	<p>MERLIN (CNES/DLR) 2019- CH₄</p> 	<p>MicroCarb (CNES) 2019- CO₂</p> 	<p>CarbonSat (ESA) later than 2020 CO₂, CH₄</p> 	<p>ASCENDS (NASA) later than 2020 CO₂</p> 

Institute of Atmospheric Physics, Chinese Academy of Sciences



IAP Carbon Dioxide Retrieval Algorithm for Satellite Observation – IAPCAS

Application

TanSat algorithm

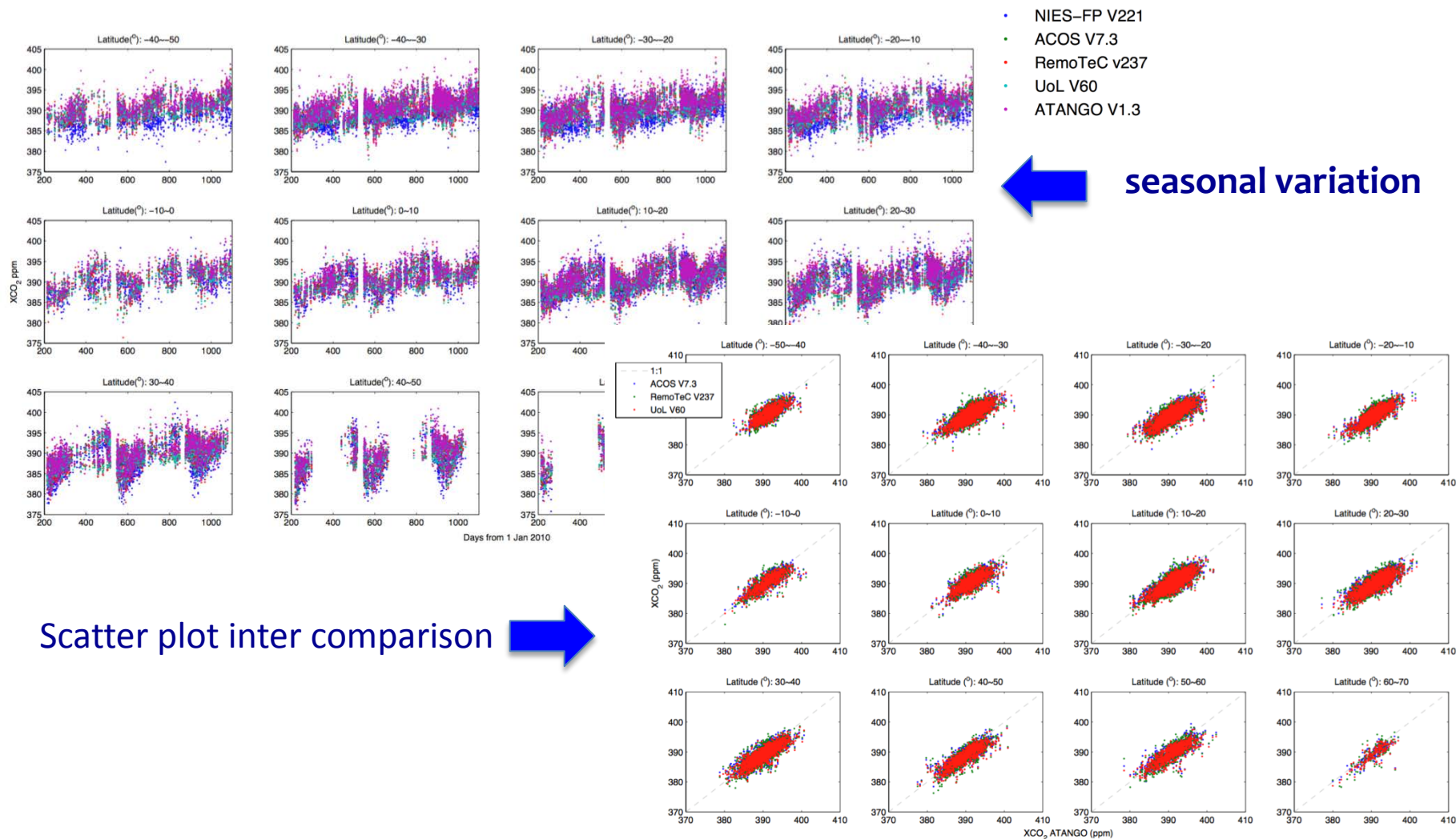
Similar observation characters

aTanGO
Application of TanSat algorithm on GOSAT Observation

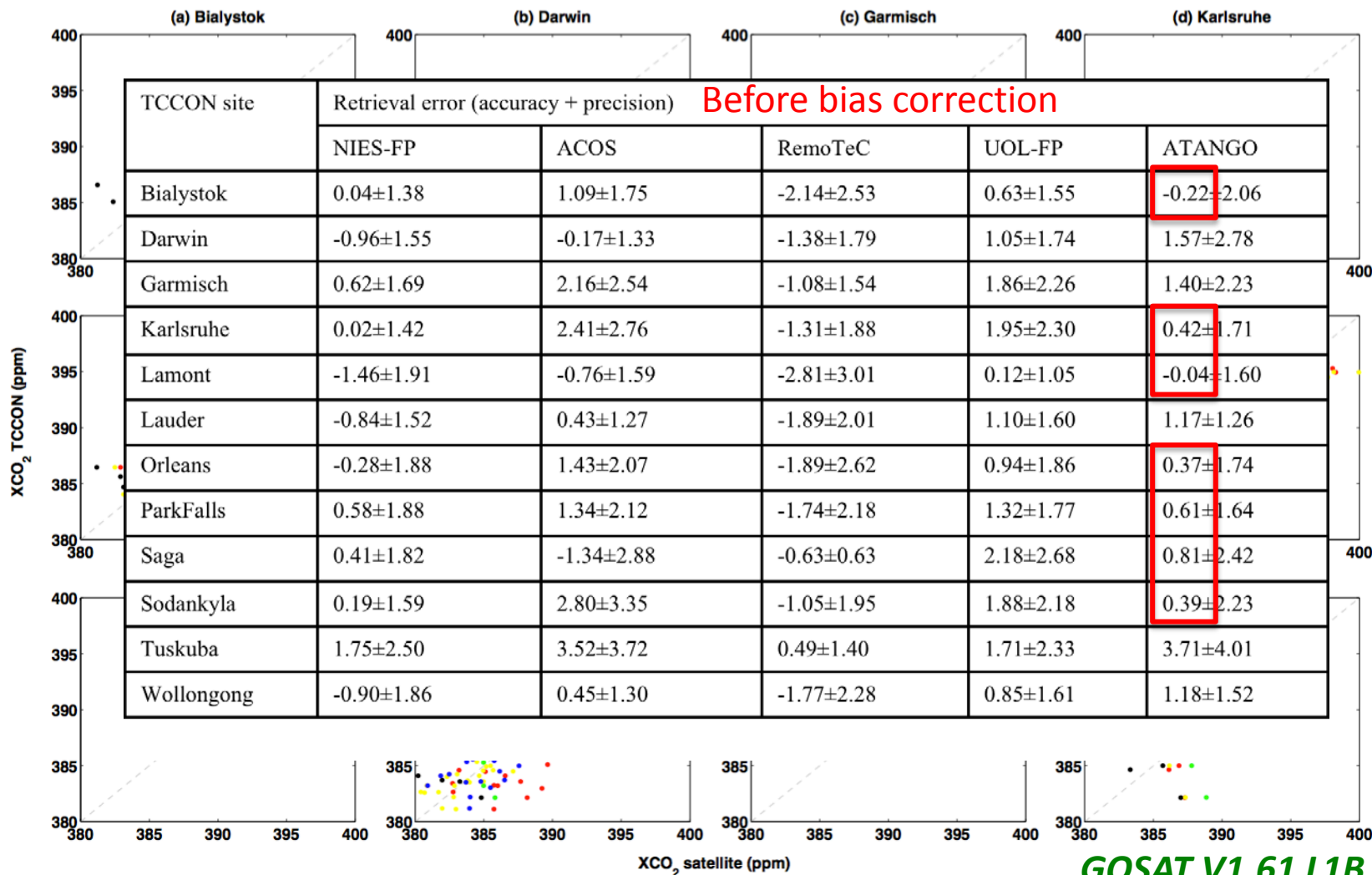
Other observation

OCO-2

Inter comparison: GOSAT retrieval



Inter comparison: GOSAT retrieval



Characters	CAPI				
Bands (nm)	365-408	660-685	862-877	1360-1390	1628-1654
Polarization angle	0°/60°/120°			0°/60°/120°	
SNR	260	160	400	180	110
Spatial resolution	1 km × 1 km				
Scanning range	-16° ~ 16°				
Swath	400 km				
Well mixed					

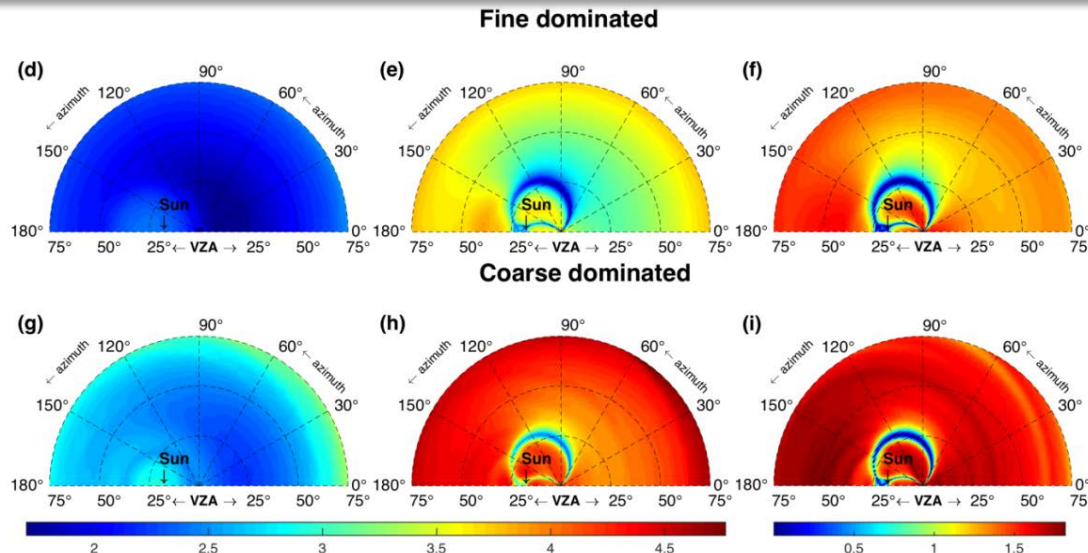
Forward model



Optimal estimation

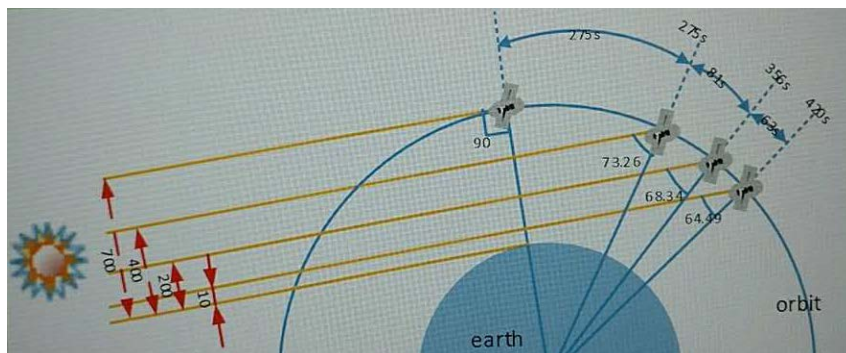
Averaging kernel (DFS)

Polarized measurements of CAPI can provide additional 1~1.8 aerosol DFS, mainly improve the information of aerosol total volume and fine mode fraction (fmf_v)



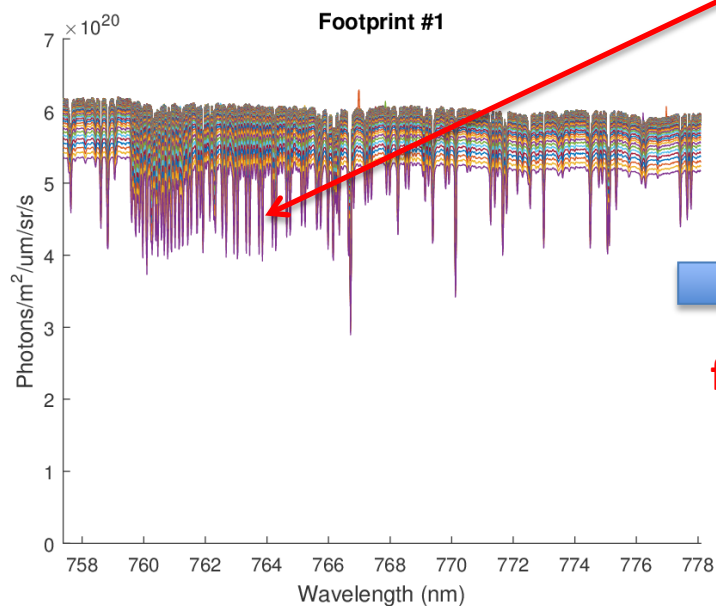
Published in *RSE 2017*
and *Remote Sensing 2016*

Inter-comparison of solar measurements between TanSat, OCO-2 and solar model

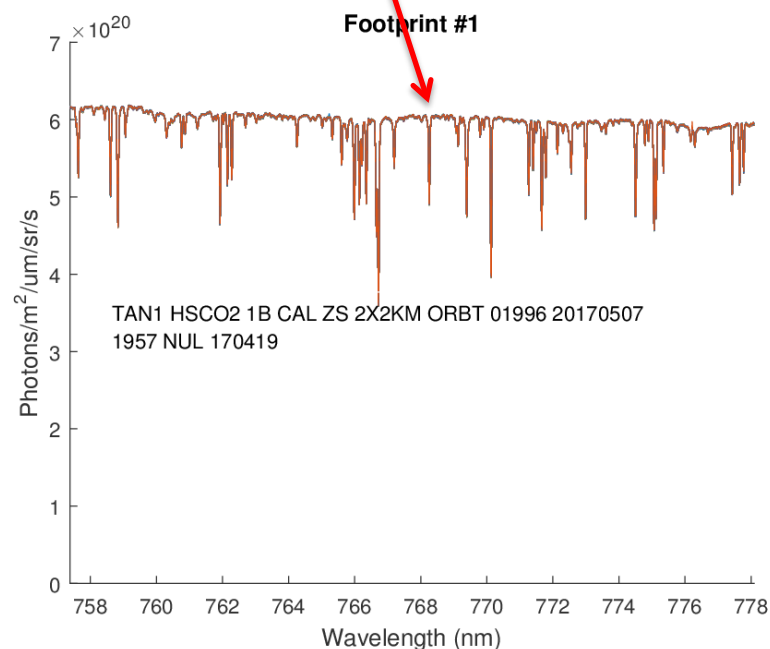


TanSat solar mode

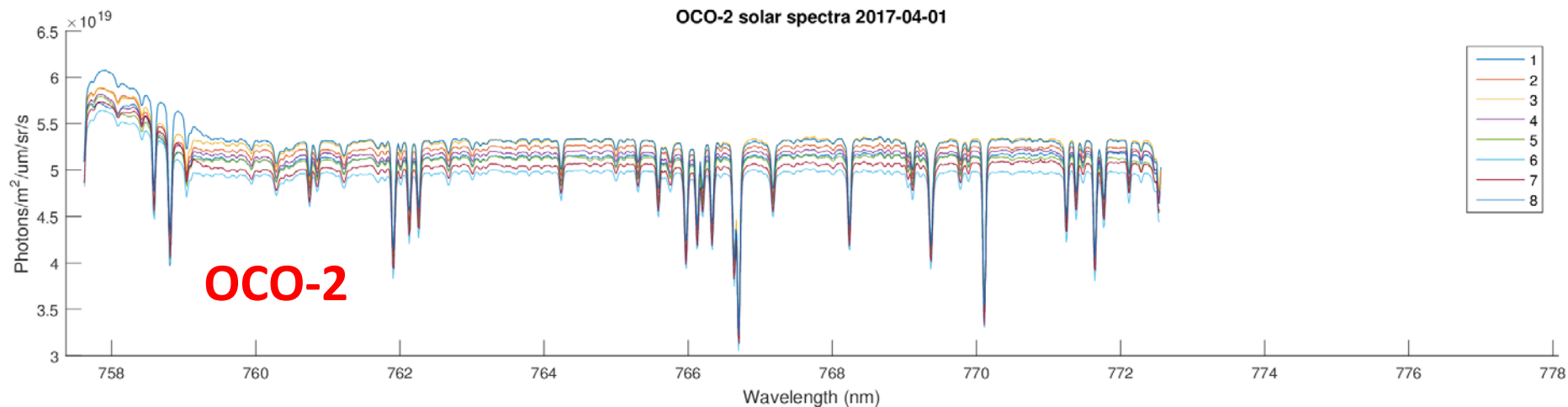
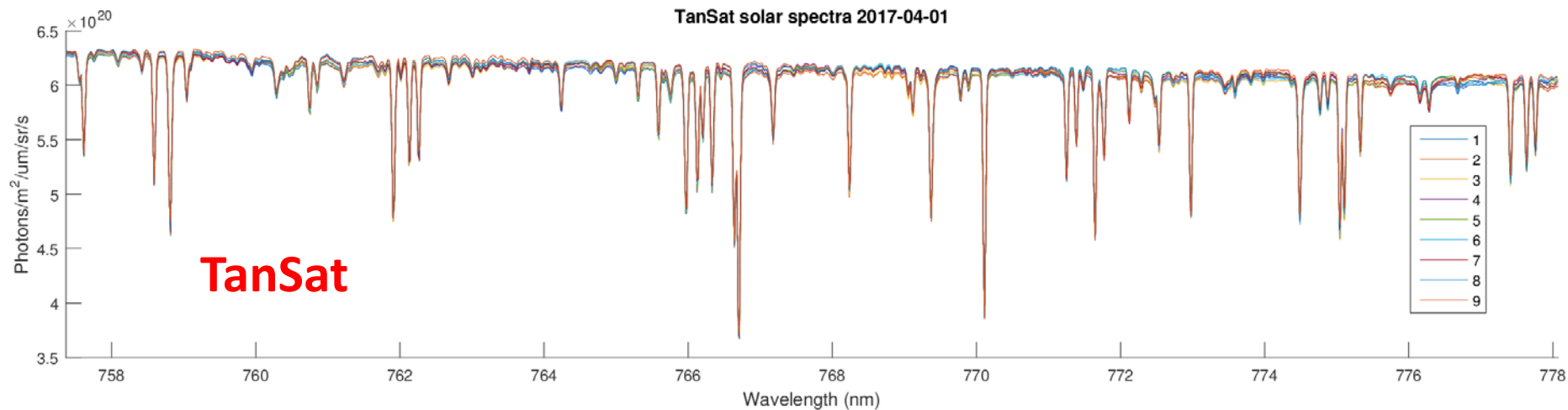
- Typically acquired once per orbit now once per day later.
- Typically last 8 min.



filtered

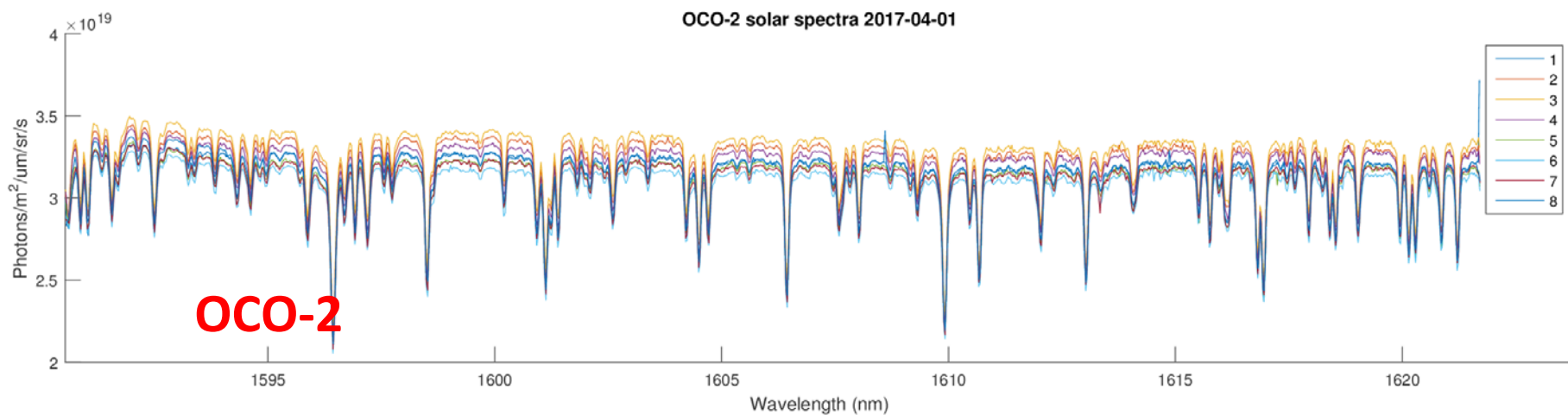
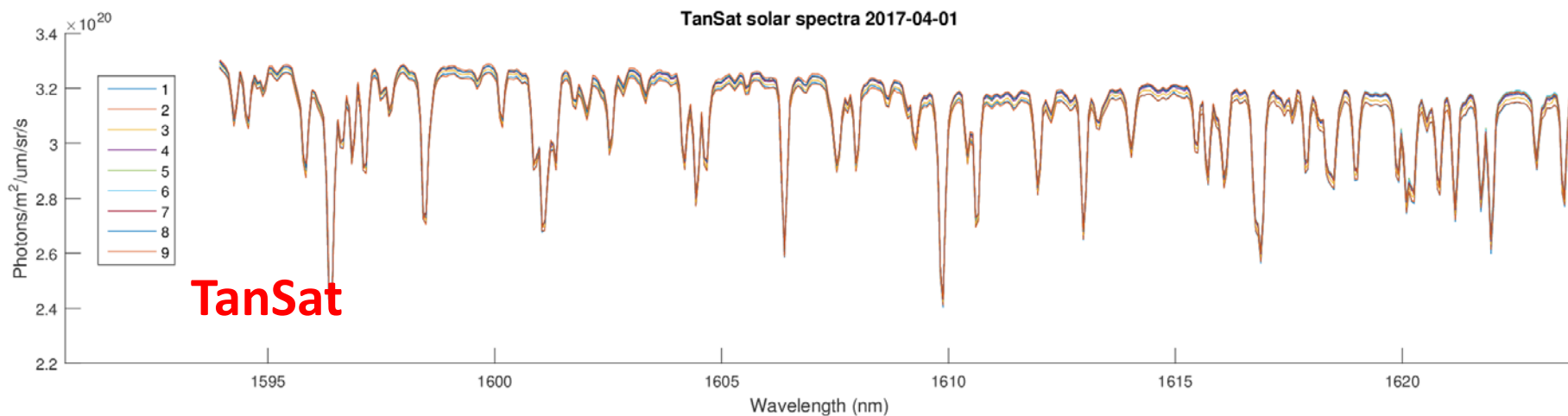


O2-A

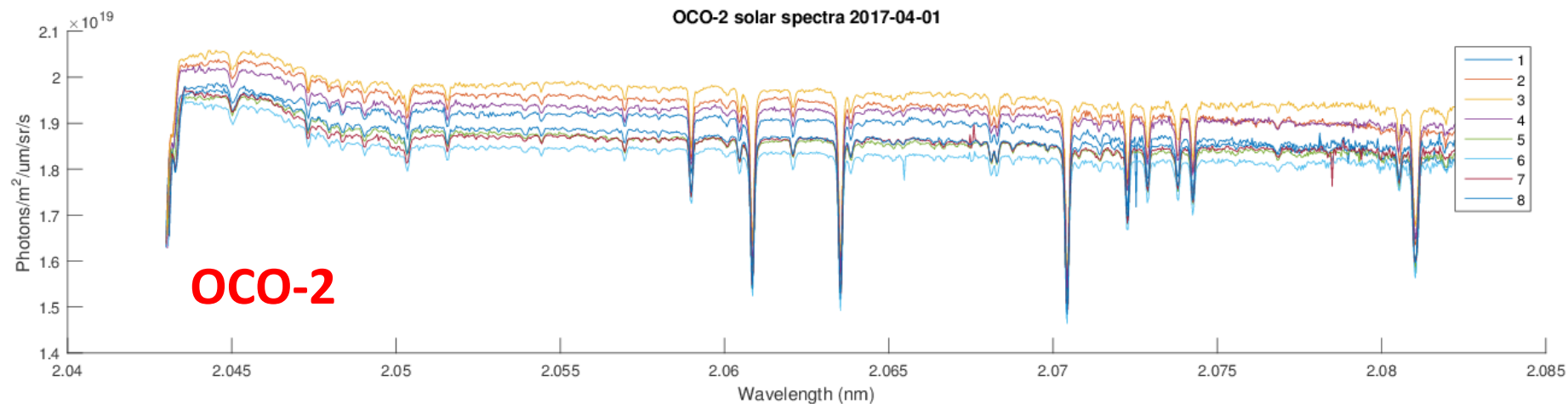
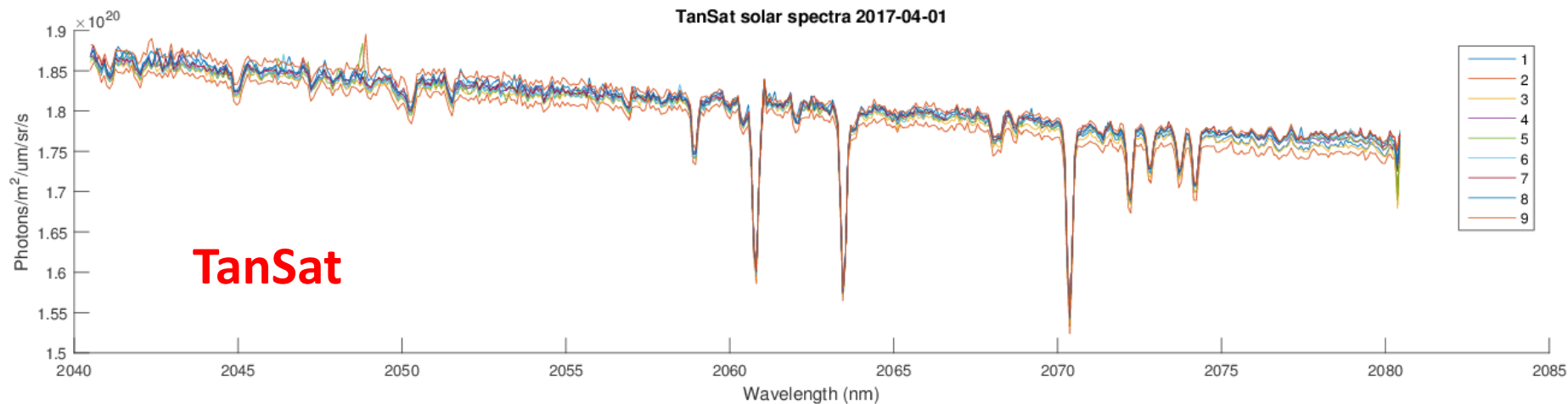


TanSat: The irradiance of nine cross-track positions show good consistency

1.6 μm – WCO2



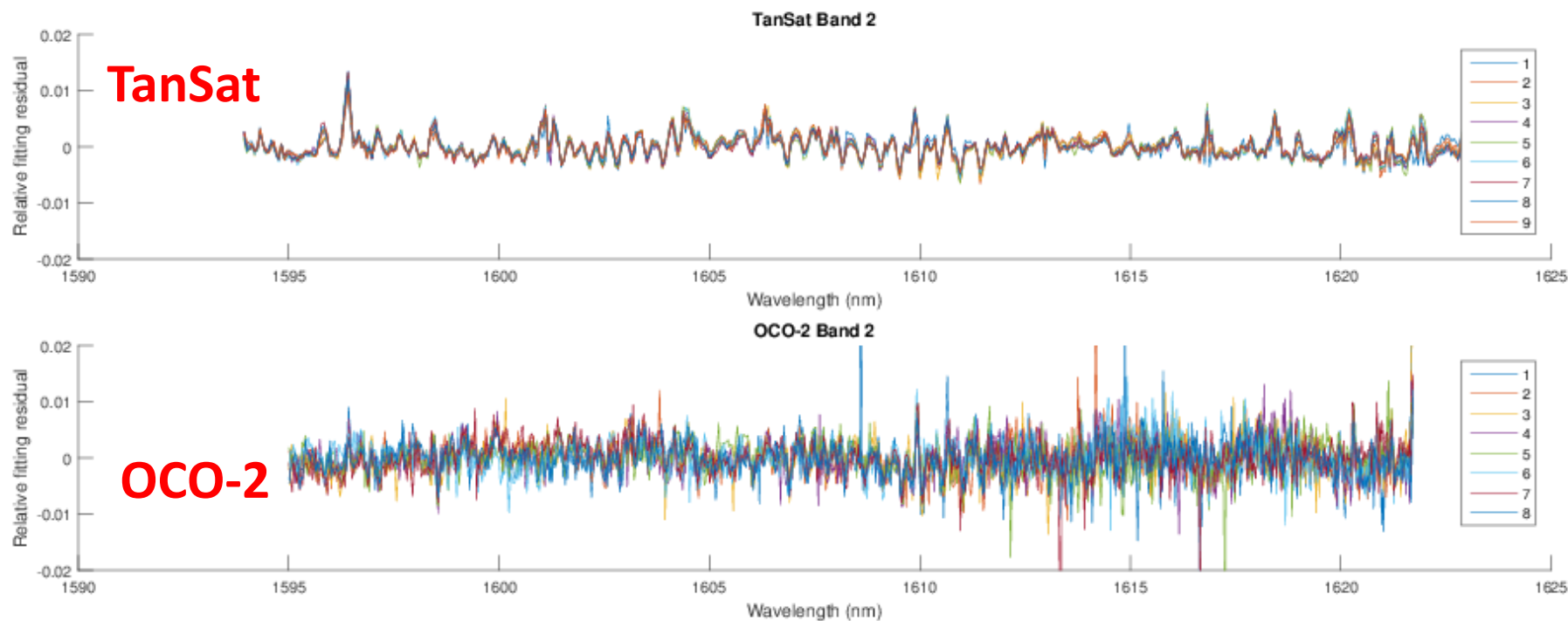
2.06 μm – SCO2



TanSat: The irradiance of nine cross-track positions show good consistency

But significant pixel-to-pixel inhomogeneity comparing to OCO-2

Fitting residual of 1.6 μm band

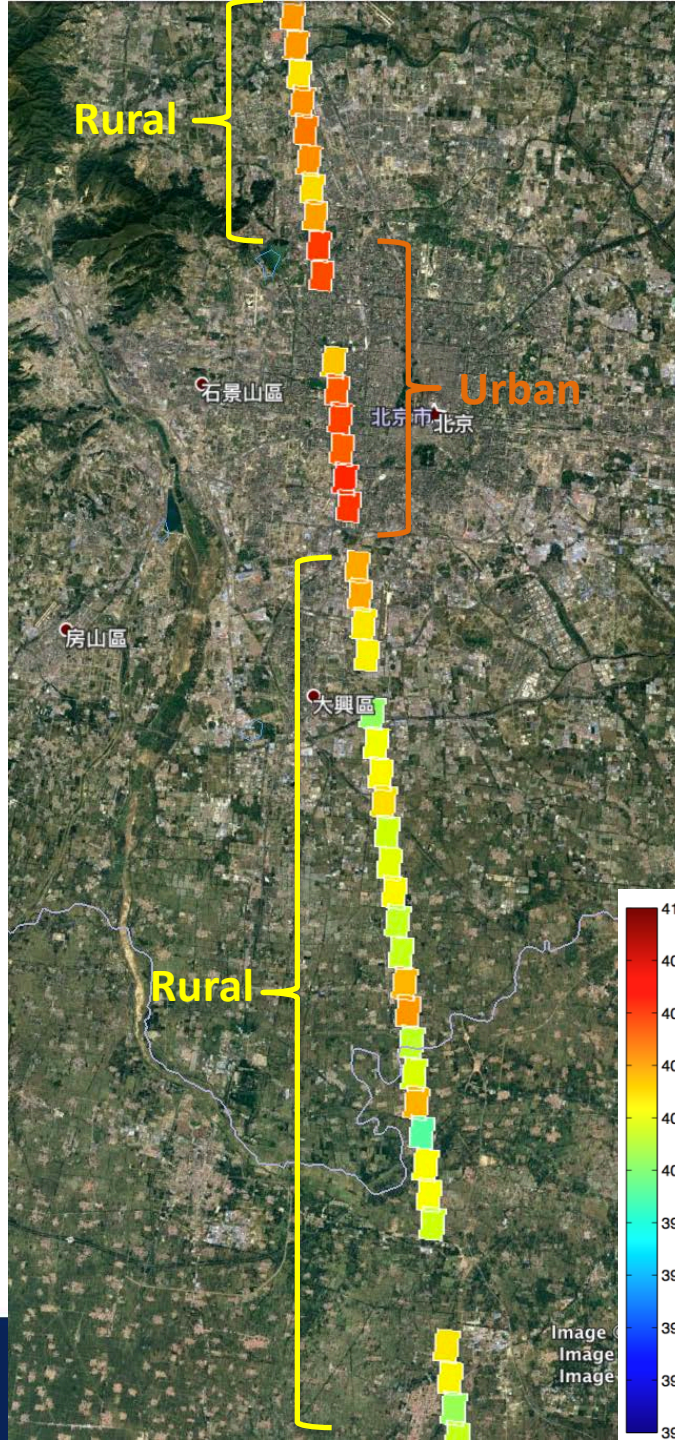


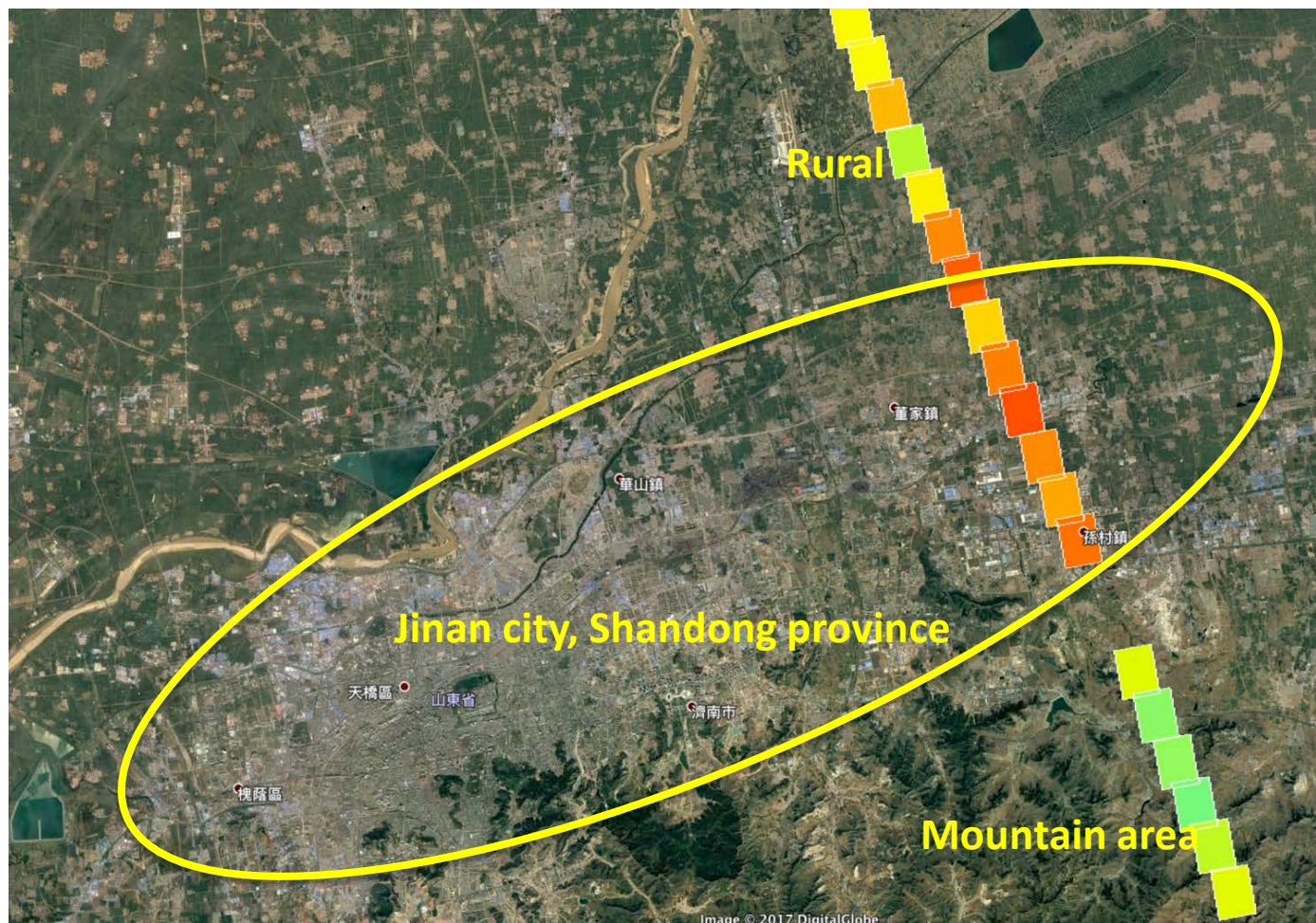
- The fitting residuals of TanSat are less noisy
- Better consistency between nine cross-track positions

Case study over Big City of China --Beijing

Preliminary retrieved
XCO₂ over Beijing
during April 23, 2017.

It show there is 3~4ppm
variations between the
urban and rural area.





It show there is
3~4ppm variations
between the urban
and rural area.

First observation of TanSat

Validation and test retrieval

TanSat validation plan

Surface CO₂ validation Stations



From **29 May to June 5**, TanSat finished target observations on Beijing and the surface IFS-125HR data in Beijing will be applied to validate XCO₂. The observed data is under investigations.

First observation of TanSat

Validation and test retrieval

TanSat validation plan

Future Plans

- TanSat L2 data validation by Nadir and Target observation on China, Finland and UK surface sites.
- Over China, IFS-125HR data of Hefei\Beijing\Xianghe stations will be applied to validation TanSat data.
- The first AirCore experiment will be conducted in China by IAP and FMI teams
- Joint European and Chinese Field campaign to validate TanSat and S5P over China?

Summary and Future outlook



1. TanSat was successfully launched on December 22 in JiuQuan Satellite launching center by CZ-2D
2. TanSat spacecraft operations are “NOMINAL”
3. On-orbit calibration has been conducted according to the plan
4. Surface Cal\Val stations have been set up and first TanSat Cal\Val experiment was conducted during April 18 to 30 in Dunhuang station.

Thank You for Your Attention

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