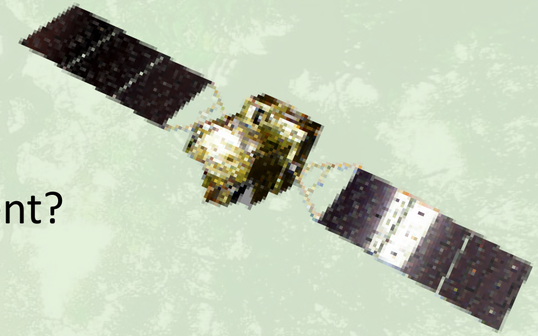
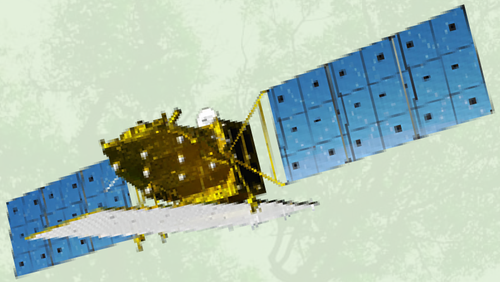
UNFCCC COP 27 Japan Pavilion Seminar
How can satellites improve Forest Monitoring and Management?



Keynote Presentation



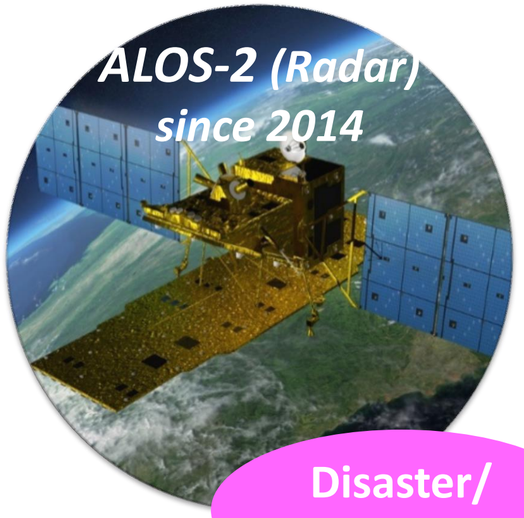
How can satellites improve Forest Monitoring and Management?

Hiroshi SUTO

Japan Aerospace Exploration Agency

November 10,2022

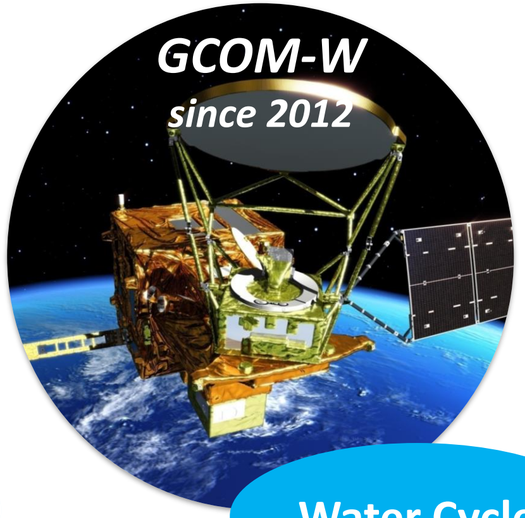
JAXA Earth Observation Missions Addressing Global Challenges



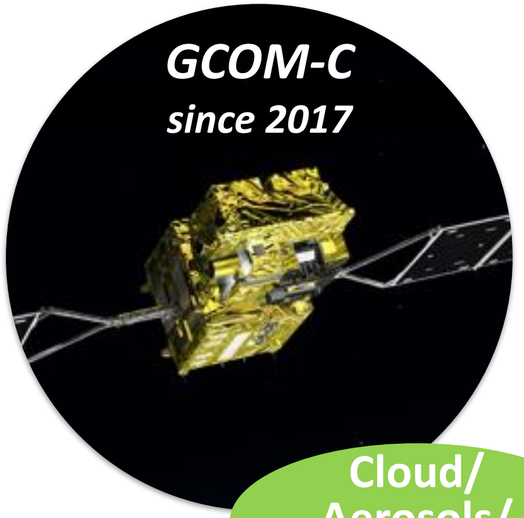
Disaster/ Forest

(NASA-JAXA joint mission)

Precipitation



Water Cycle



Cloud/ Aerosols/ Vegetation

Greenhouse gases

Greenhouse gases

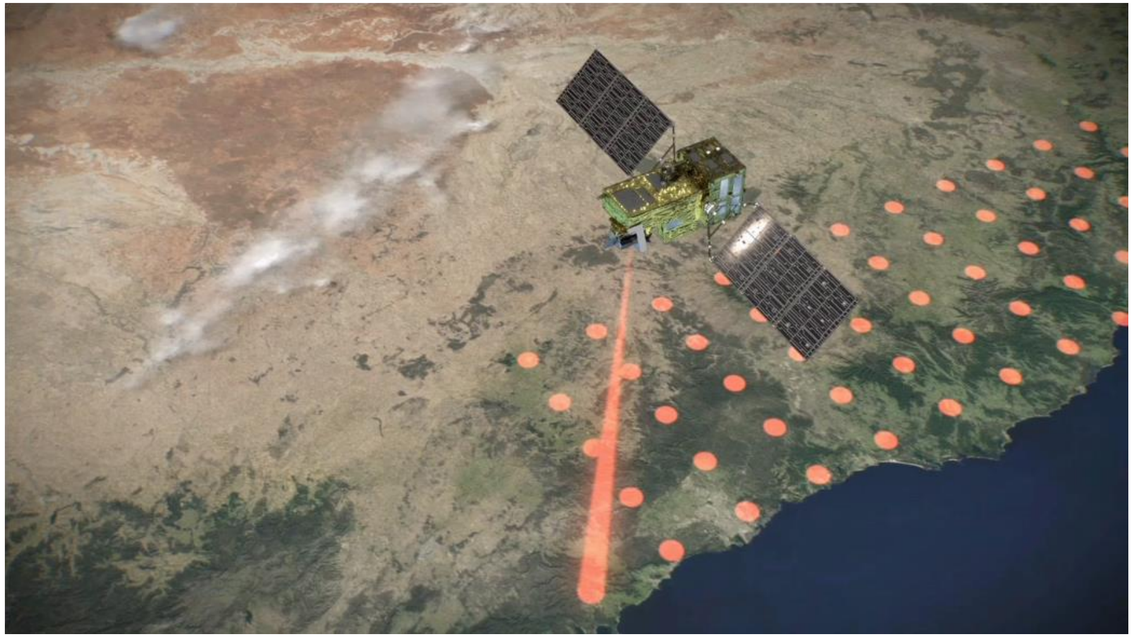
UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

SDGs

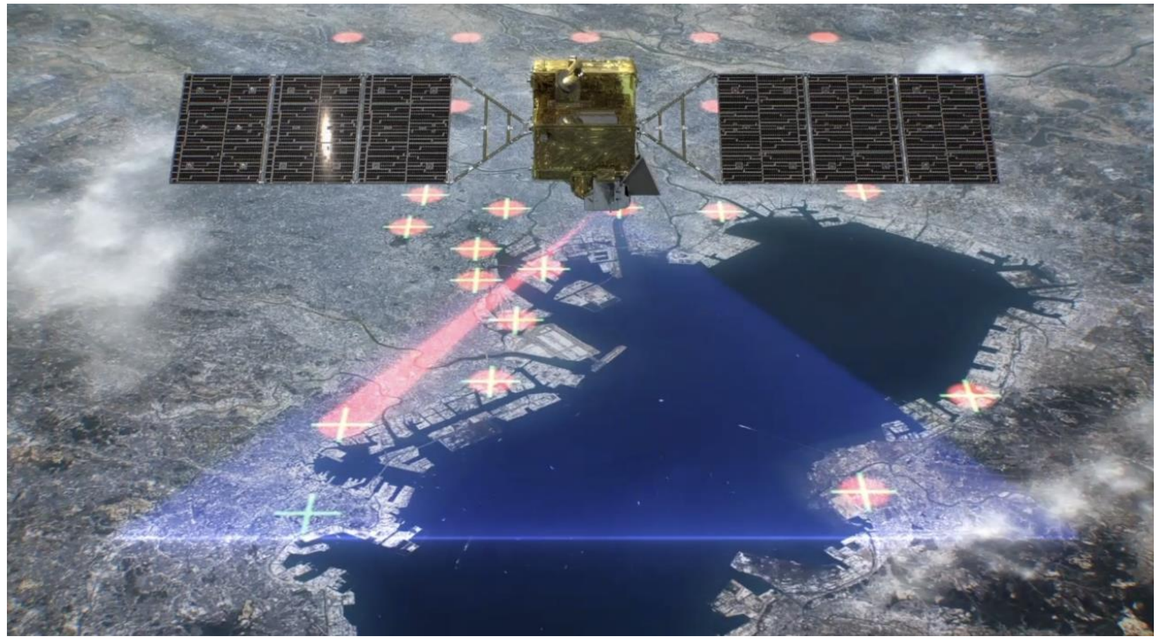
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Japanese Greenhouses observation

- TANSO (Thermal And Near-infrared Sensor for carbon Observation) on GOSAT are equipped the Fourier transform spectrometer both SWIR and TIR bands to observe CO_2 and CH_4.
- GOSAT are accommodated two observation modes: grid mode and target mode with 2-axis agile pointing system.
- Cities are responsible for more than 70% of the global total GHG emissions.
- Intense target observation over megacities has been continuously performed since 2015.



Grid observation

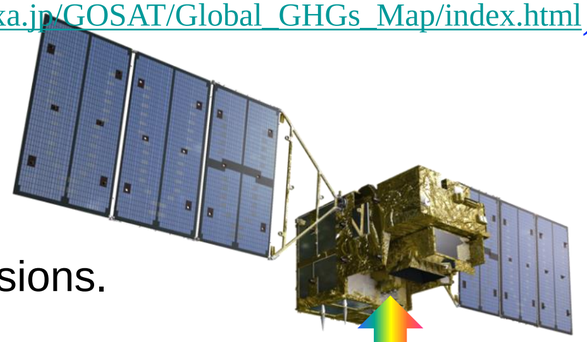


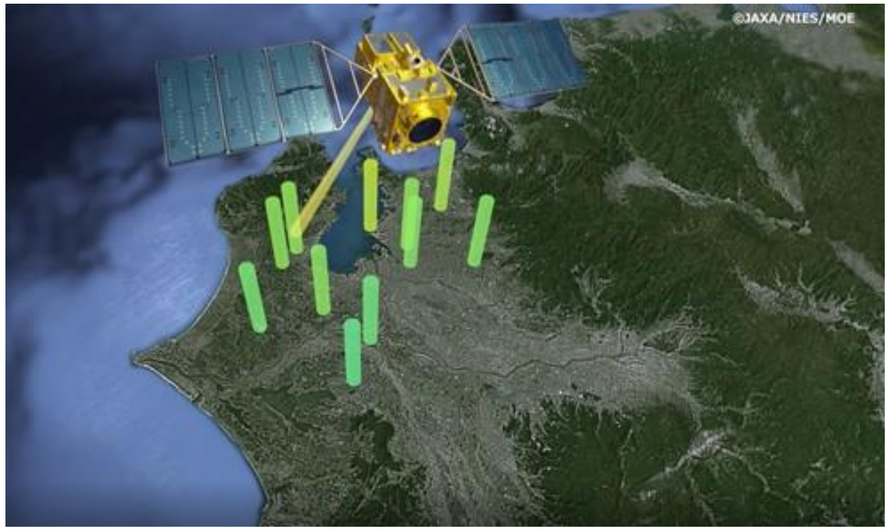
Target observation

JAXA patrial column GHG & H_2O product

- JAXA developed a new retrieval algorithm to derive the partial column.
- GOSAT observes both solar reflected light and thermal emission.
- Products are free available (https://www.eorc.jaxa.jp/GOSAT/Global_GHGs_Map/index.html).

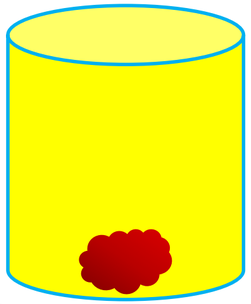
Upper troposphere:
Serves as a new reference (background) CO_2 concertation for local analysis.
Lower troposphere:
Better reflects CO_2 changes due to local emissions.





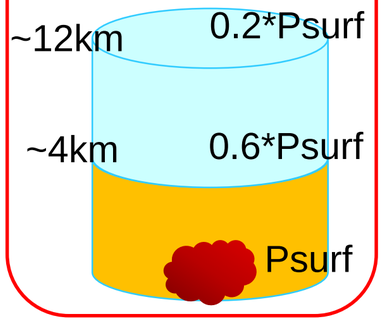
Conventional Method

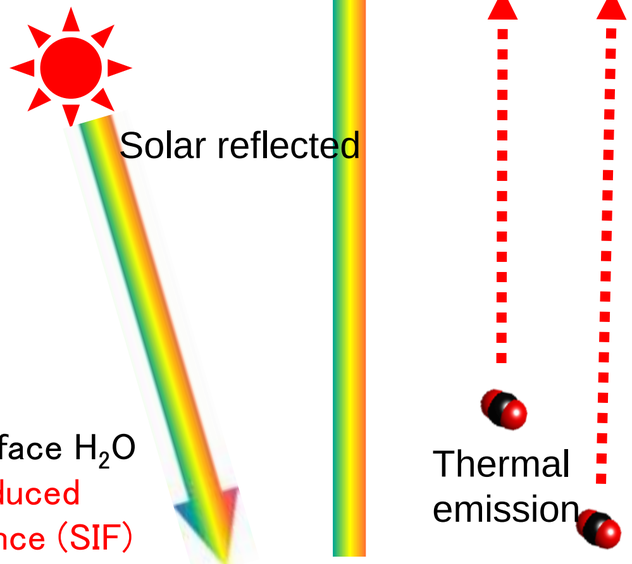
Use only solar reflected light

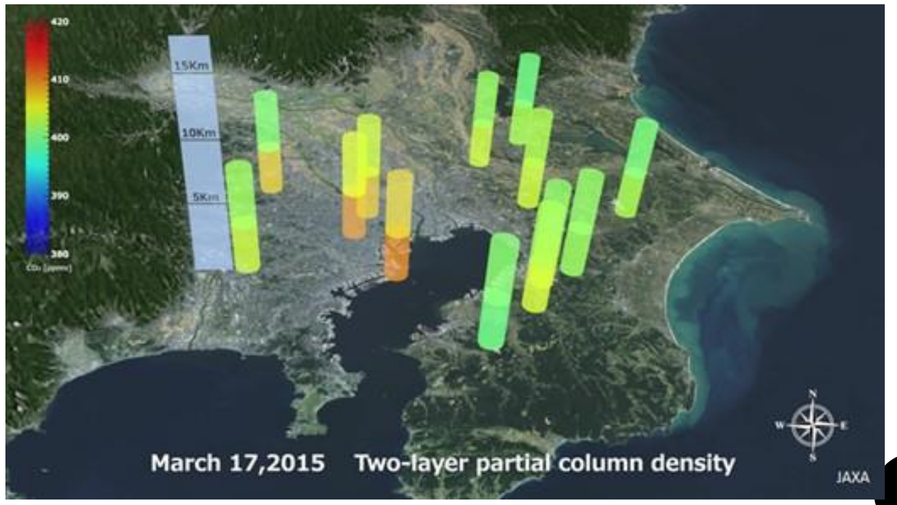


JAXA/EORC new Method

Use both solar reflected light & thermal

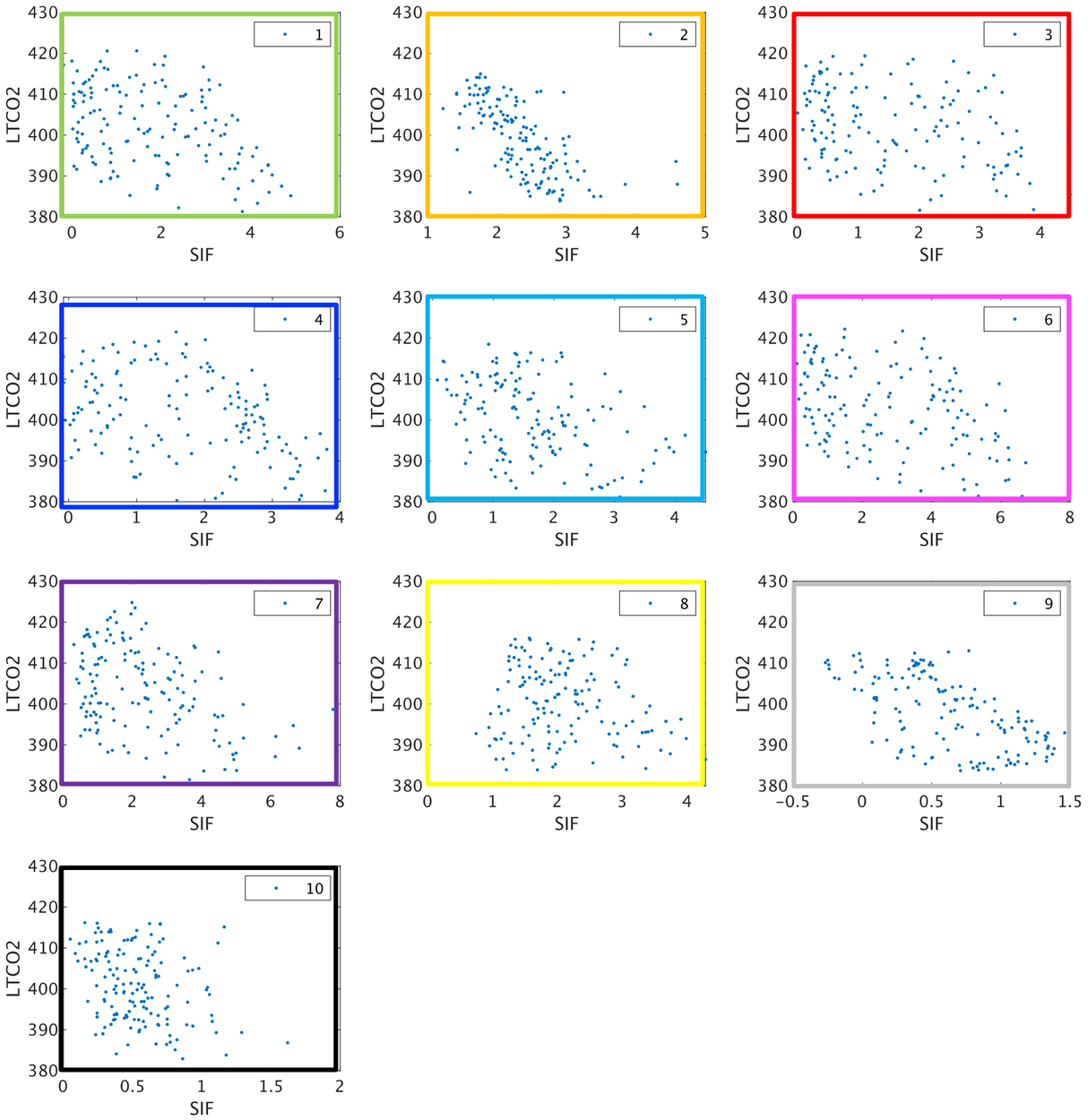


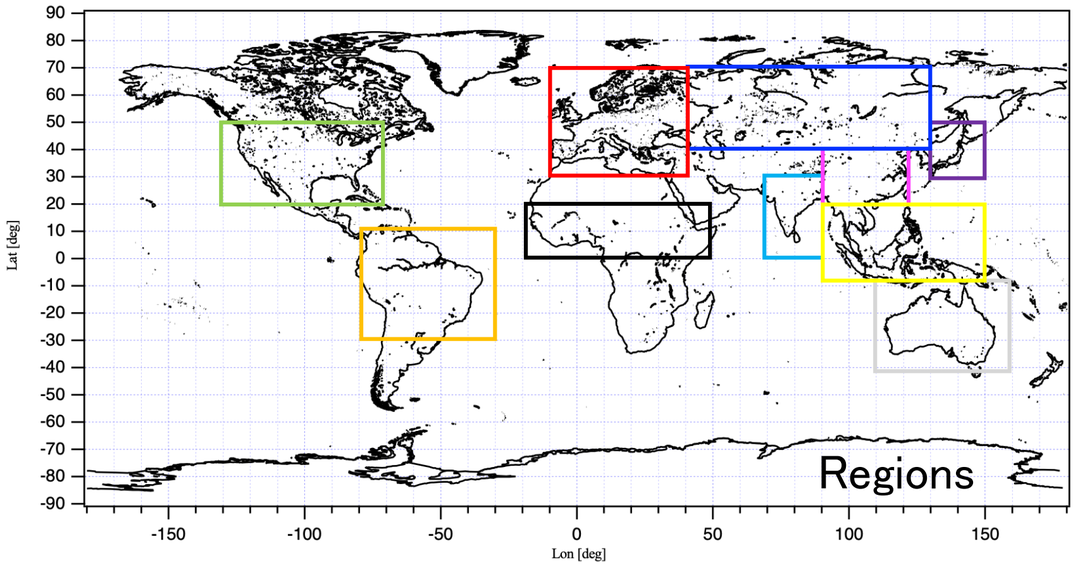




CO_2 emission and enhanced density of the lower troposphere

SIF: Near-surface CO_2 removal maker





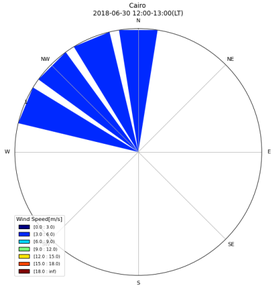
- During photosynthesis process, the plants are emitting the Solar Induced Fluorescence (SIF)
- Low CO_2 levels are correlated with high Solar Induced Fluorescence (SIF)
- SIF signal can assist as near-surface CO_2 removal maker

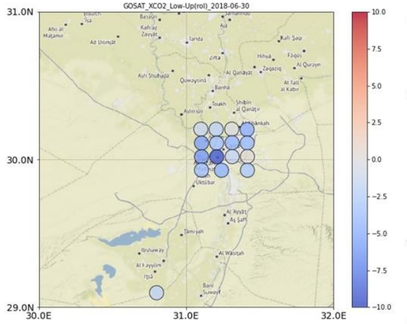
Crops consume Cairo's Carbon Dioxide (CO_2)

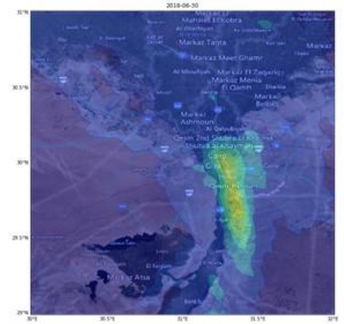
- Low CO_2 levels over Cairo, correlated with high SIF
- The results highlight that the surrounding farmland will partially assist to decrease the atmospheric CO_2

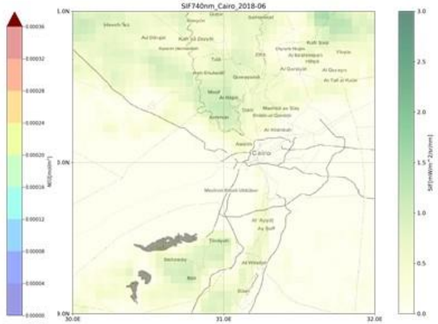
2018-06-30

negative XCO_2^{LT} enhancement over Cairo
Wind from north
high SIF over Nile Delta



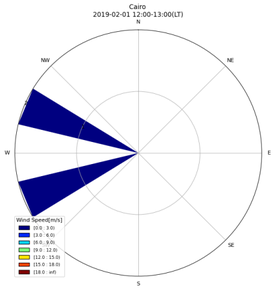


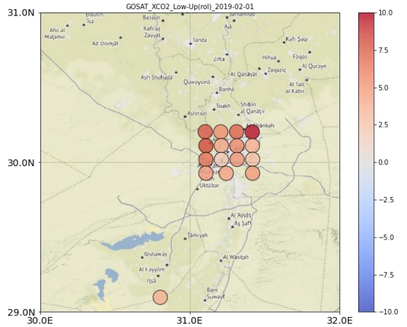


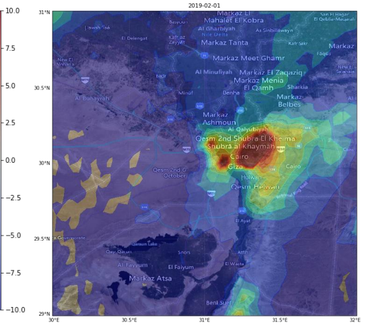


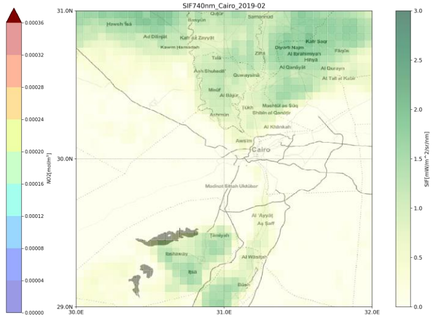
2019-02-01

XCO_2^{LT} enhancement
Wind from east
very high SIF



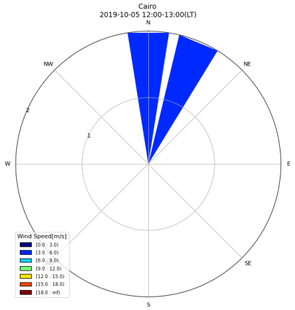


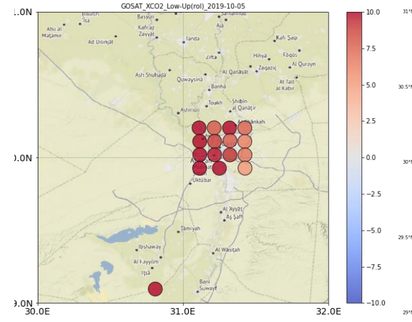


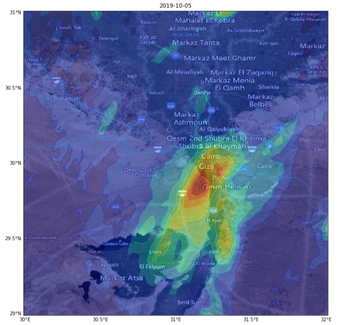


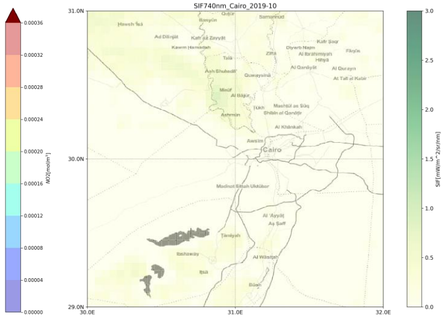
2019-10-05

XCO_2^{LT} enhancement
Wind from north
low SIF









Airport wind at GOSAT overpass

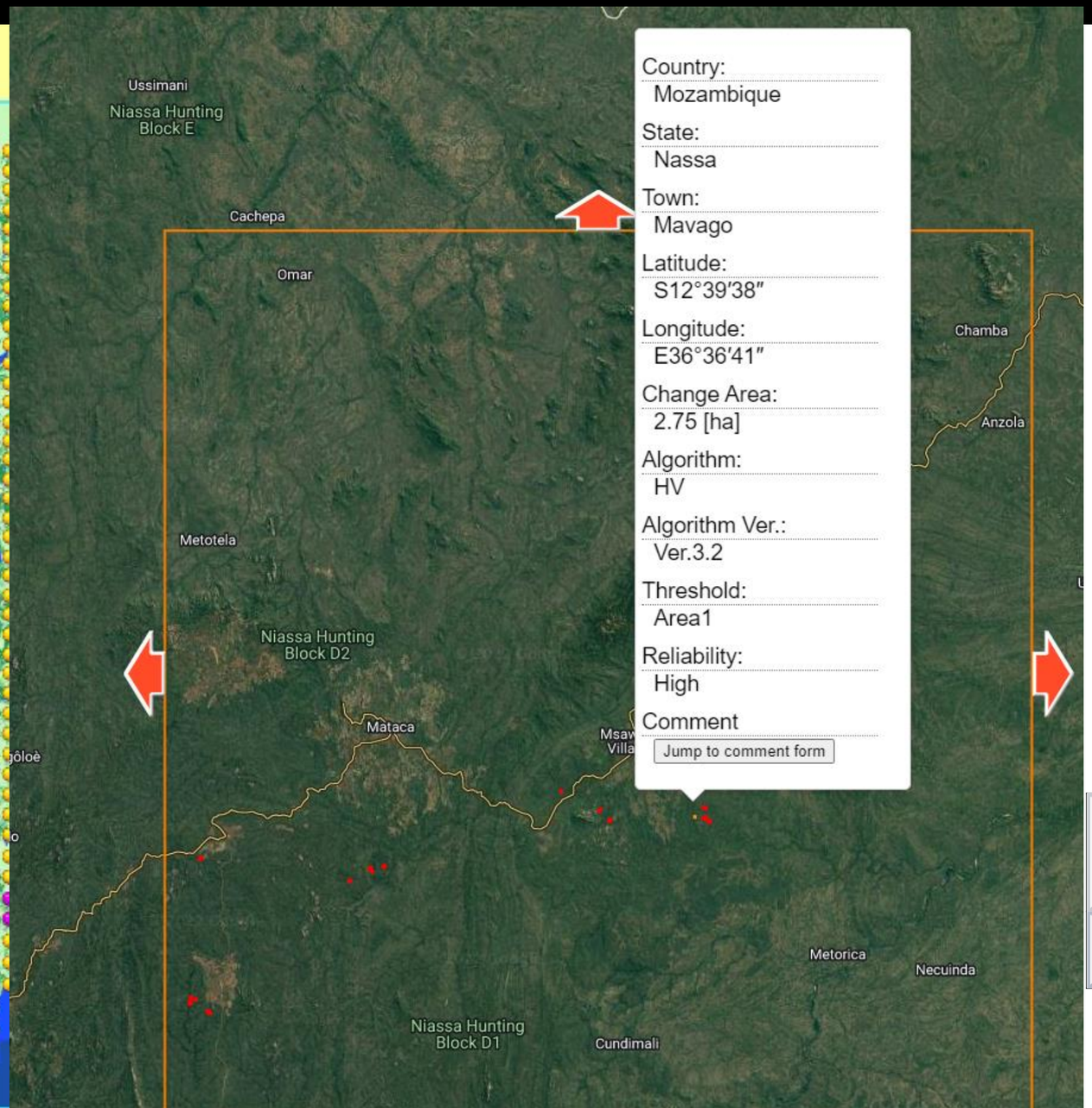
Delta CO_2 (XCO_2^{LT}-$XCO_2^{UT}{}_{average}$)

Daily TROPOMI NO_2

Monthly TROPOMI SIF

Deforestation Monitoring by ALOS-2

JICA-JAXA Forest Early Warning System in the Tropics



JJ-FAST

JICA-JAXA Forest Early Warning System in the Tropics

Contribute to the conservation of the world's tropical forests.

Target area	78 countries
Update	Every 1.5 months


Thank you for your attention.