Report of Wildfire WG activity
Wildfire Monitoring System Development

2018-01-23
Wildfire WG,
Koji Nakau (JAXA/SAOC)

Topics of Today

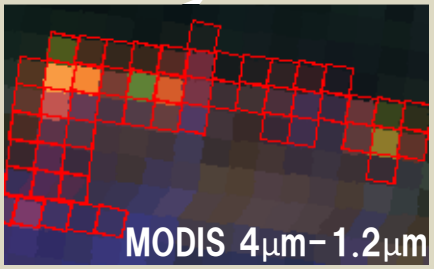
- **Wildfire monitoring system**
  - Feature
    - Multiple satellite dataset will be combined into one system.
      - Existing wildfire monitoring system utilize each satellites separately.
  - Status
    - This system is under development. To be released on March.
- **Available satellite sensors for wildfire monitoring**
  - Japanese satellites sensors
    - Himawari-8/AHI
    - CIRC (ALOS-2 and ISS/JEM)
    - **GCOM-C**
  - Other sensors
    - GOES-R/ABI
    - MODIS
    - VIIRS

Volcano and Wildfire Monitoring System

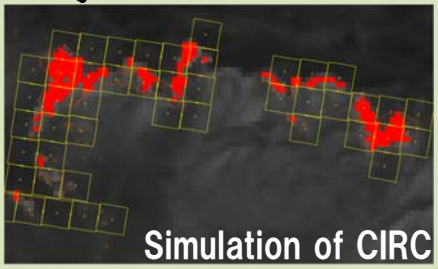
Japanese Infrared Sensors available for wildfire

	MODIS(NASA)	CIRC	GCOM-C	Himawari 8
Agency(launch)	NASA(1998～)	JAXA(2014～)	JAXA(2017～)	JMA(2016～)
空間分解能	1km	210m, 130m	250m	2km
観測波長	36bands	1 band(8-12μm)	19 bands	16 bands
更新頻度	4times a day	2times/14days	40times/34days	Every 10minutes

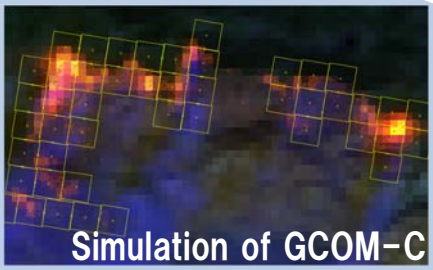
Resolution ← → Frequent



We can detect wildfire as red rectangle pixels, however, we do not know exact place.



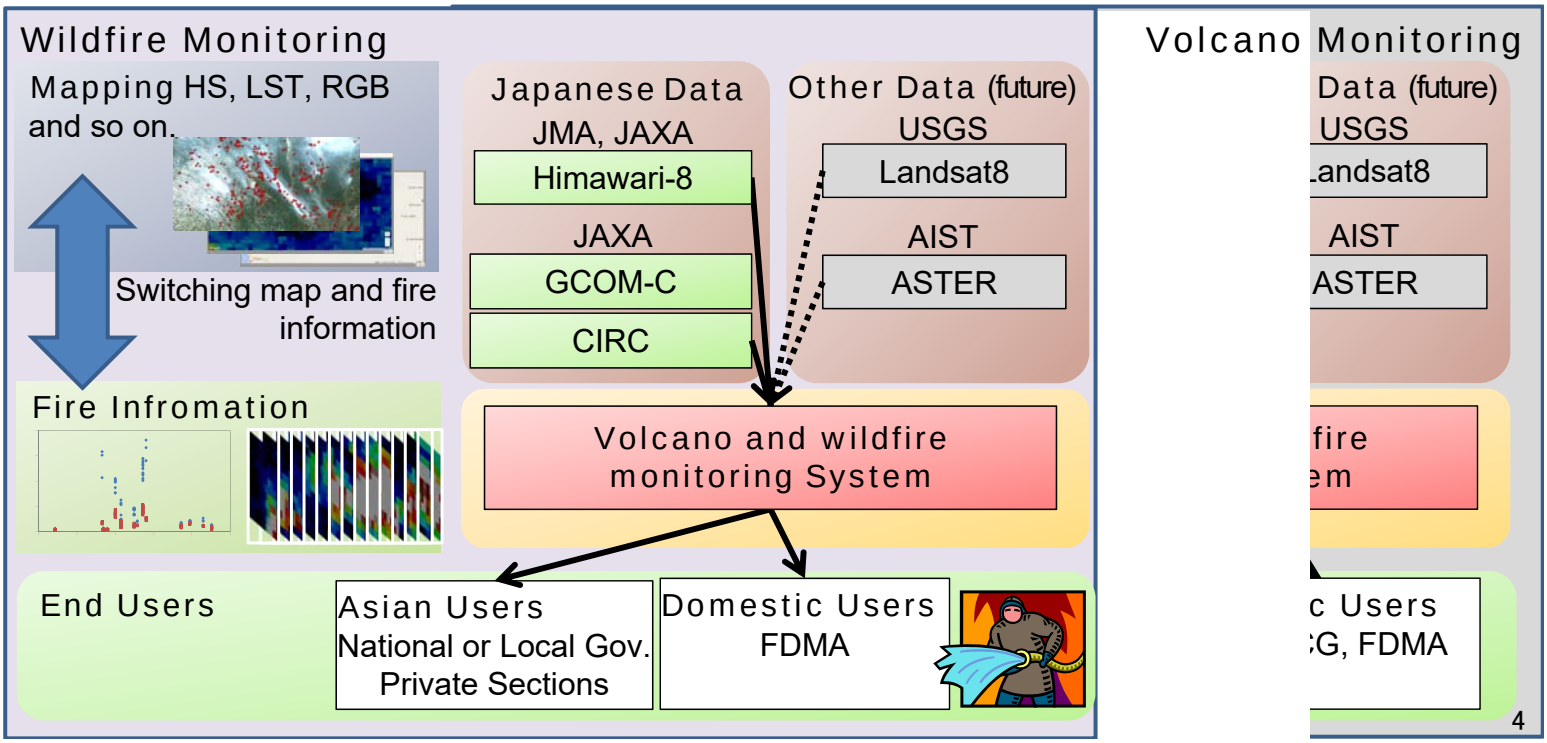
Sensitivity is same as MODIS, However, pixel size is small (210m), we can find exact place of wildfire.



Small pixel (250m) and 2.2μm SW allow us to find exact place of wildfire.

Volcano and Wildfire Monitoring System

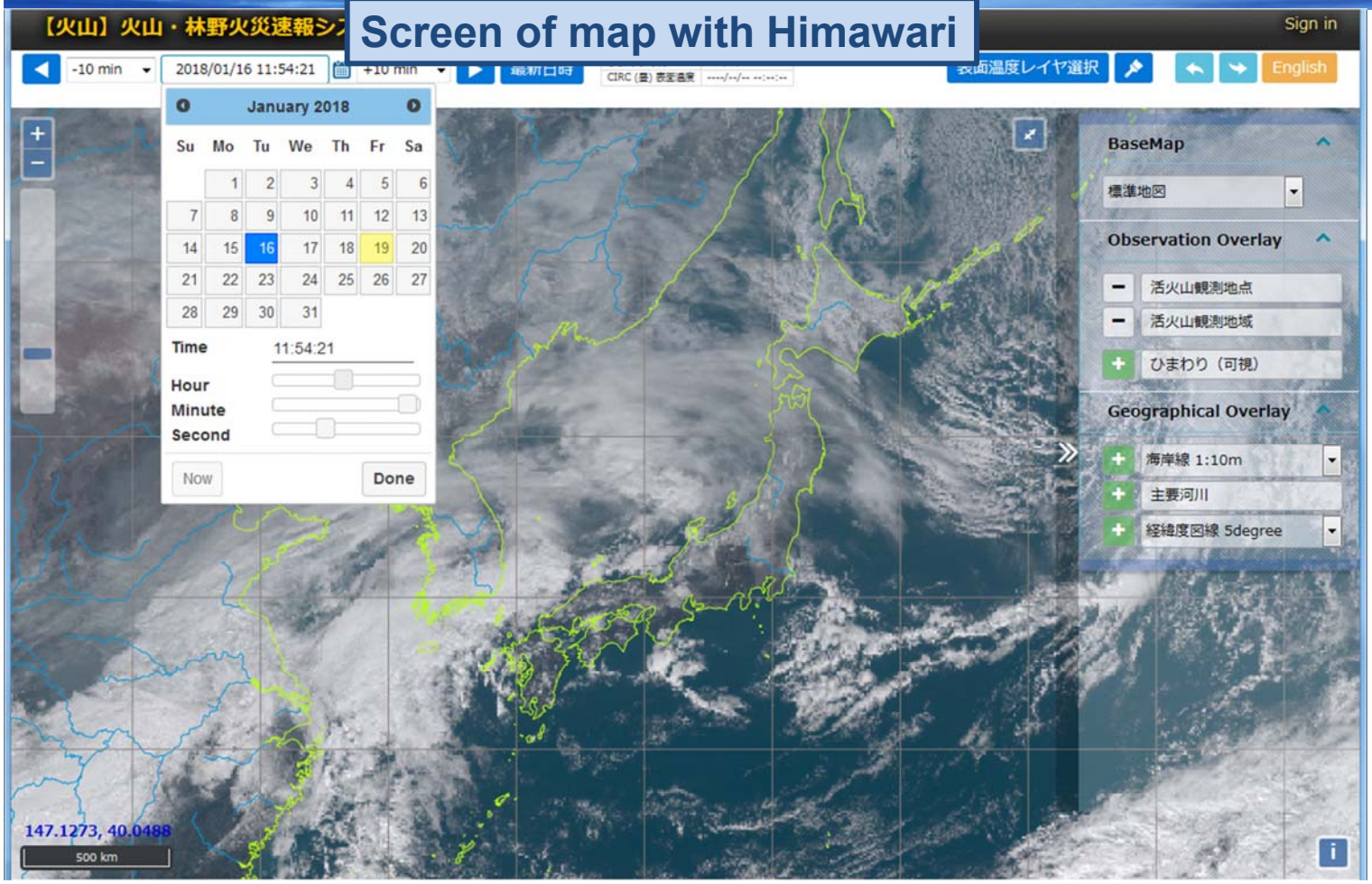
- ✓ A system to monitor wildfire and volcano activity.
- ✓ One stop service combining Himawari, GCOM-C and CIRC
  - – Currently, discussion with JMA, JCG, FDMA held, we need further discussion with Asian agencies for improvement.



Volcano and Wildfire Monitoring System

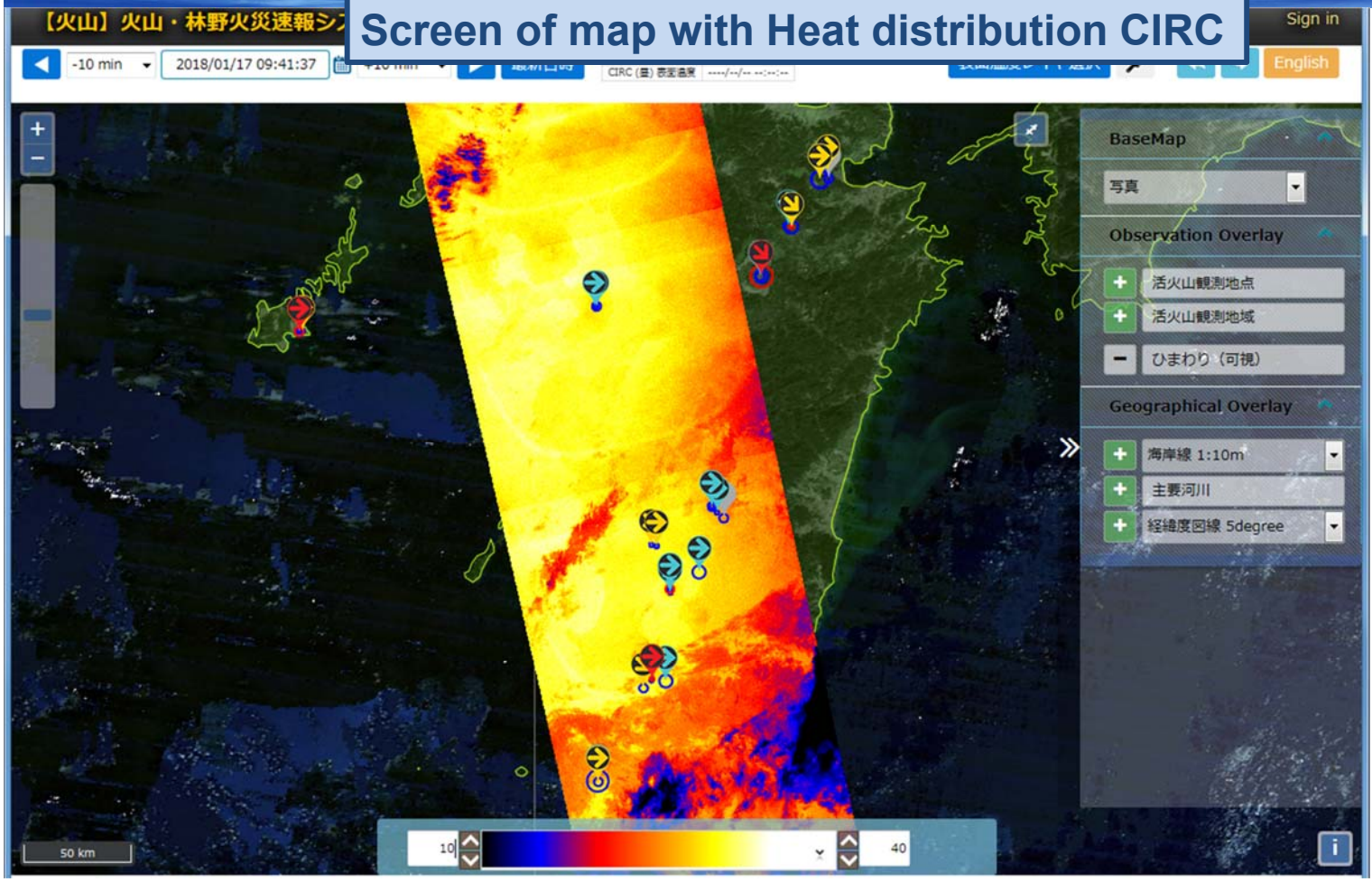
Volcano and Wildfire Monitoring System

Screen of map with Himawari

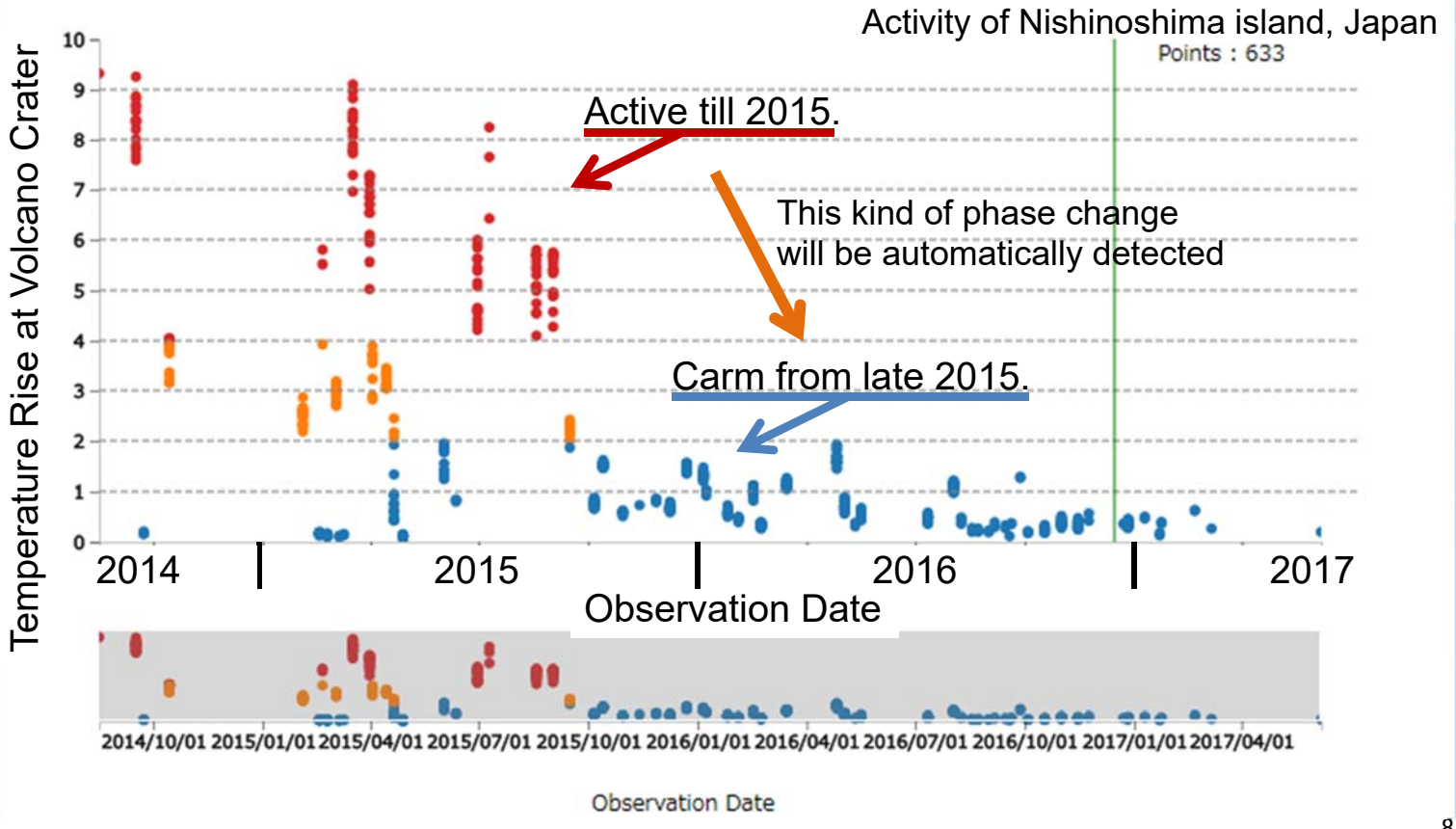


Volcano and Wildfire Monitoring System

Screen of map with Heat distribution CIRC



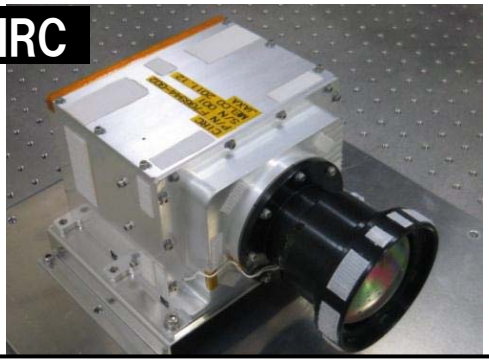
Screen for volcano activity monitoring using ALOS-2/CIRC



CIRC

地球観測用小型赤外カメラ(CIRC)の概要

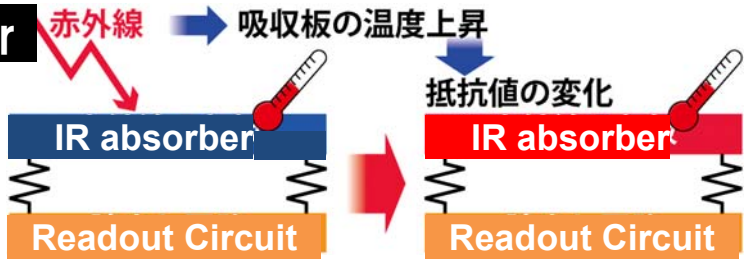
CIRC



Specs

Size, Mass	11×18×23 cm ～3 kg
Wavelength	8 – 12 μm (Thermal IR)
Format	640pixel×480lines
Resolution	210m(ALOS-2),130m(CALET)
Temperature	180K～400K

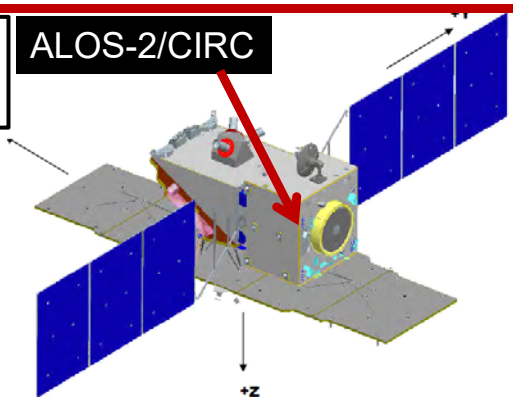
Detector



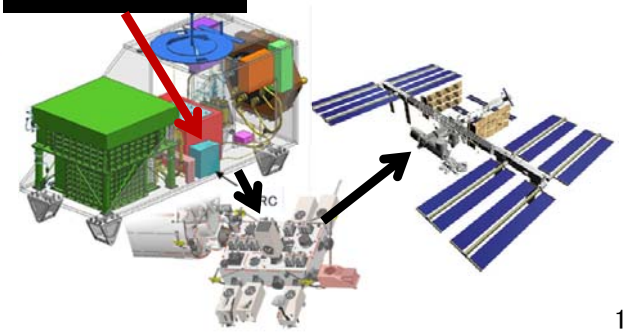
Largest number of pixels and highest resolution among micro bolometer on the orbit. Small, light weight, low power

We have two CIRCs are on orbit

ALOS-2/CIRC



CALET/CIRC



CIRC Fire Detection

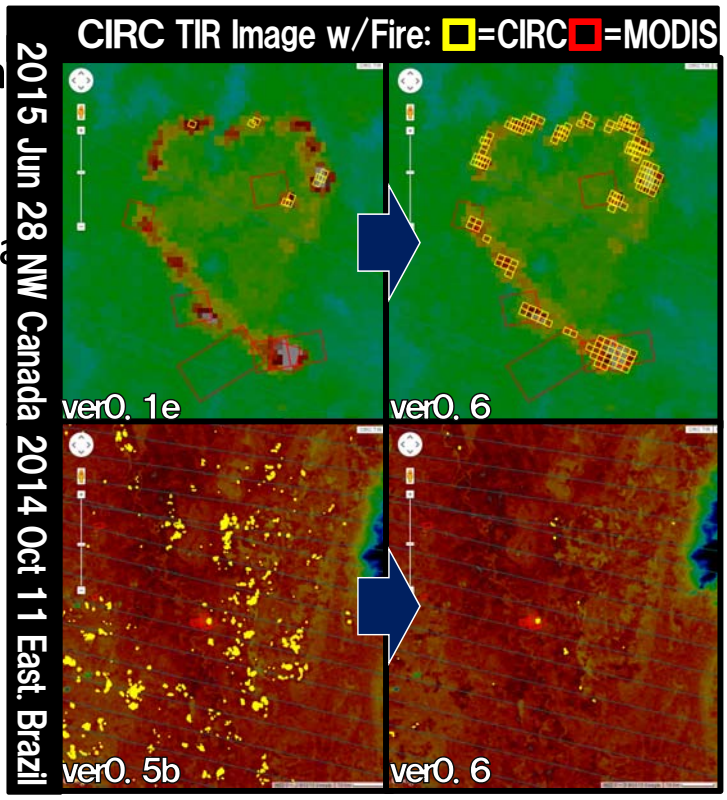
Improvement of Algorithm

limitation of at launch algorithm
- Limited number of fire pixels
- False alarms by ununiform sensitivity

Improvement using on orbit data
- Atomospheric correction
- More pixels to estimate average BG temperature

Reduction of false alarm
- Cloud mask, BG fire pixel by 30 yr avg temp.
- Land/Water mask by map
- Utilization of daily temprature change

Much Improved sensitivity.
- Additional property in fire product
- Area of active flame



Himawari

Example of Himawari HS
Prescribed burning on 2017-03-18

At Watarase lake, prescribed burning of grassland held on March 18.
This fire has been detected frequently by JAXA Himawari monitor.

From Twitter photo @yasyukukumo
http://pic.twitter.com/dgzHdOCpgS

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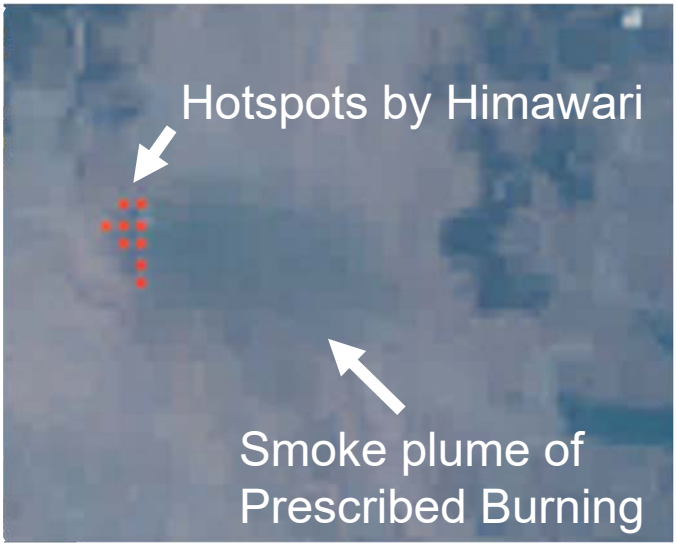


This example is HS at 10AM Mar 18.
Fire is detected frequently till noon.

GCOM-C

GCOM-C Satellite

◆ Global Change Observation Mission – Climate (GCOM-C)

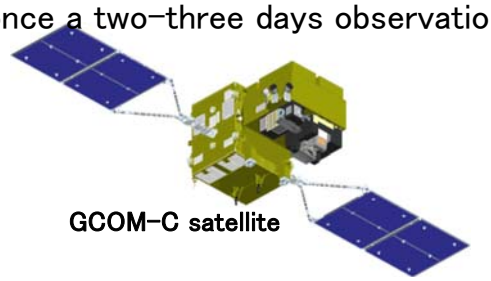
- ■ Targets of GCOM-C is observations of many physical properties; Cloud, Aerosols, Ocean colors, Sea and Land surface temperature, Vegetation, Biomass, Snow and Ice, Radiation Budget of the Earth, and Carbon Cycles.
- ■ Our goal is to contribute for more accurate estimation of variety of climate change or temperature rise of the future Earth, including social impacts on fishery (red tide, et. al.), agriculture (crop estimation).

Feature of GCOM-C / SGLI

・Higher resolution (250m) comparing to other resemble sensors with once a two-three days observations.

Expected Impacts

・Higher resolution (250m) comparing to other resemble sensors with once a two-three days observations.



GCOM-C satellite

Specification of GCOM-C satellite

Sensor	SGLI: Second-generation GLobal Imager
Channels	19channels (UV to infrared)
Orbit	Sun synchronous orbit (800km)
Swath Resolution	1,150km (Visible), 1,400km (IR) 250m to 1km
Local sun time	10:30±15minutes
Launch	2017-12-23
Life time	5 years

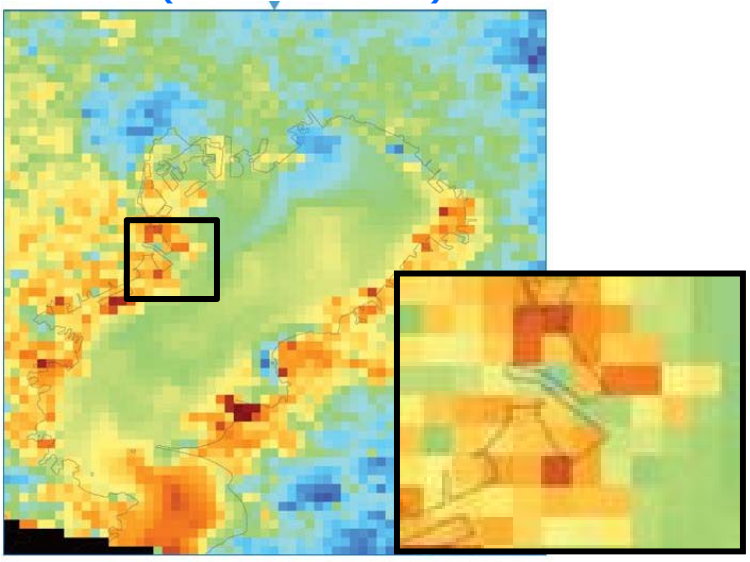
GCOM-C (Example of features)

◆250m resolution surface temperature

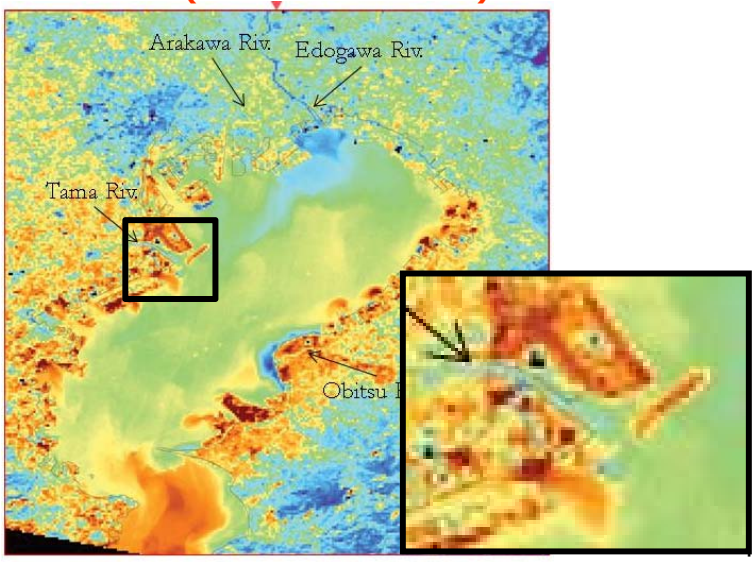
GCOM-C observes thermal infrared with 250m resolution. It is 4 times finer resolution than MODIS. This means area of each pixel becomes 1/16. Therefore small structures of temperature are visible; including temperature distribution in urban area or temperature difference between sea river water.

Simulated thermal infrared image of SGLI in Tokyo Bay

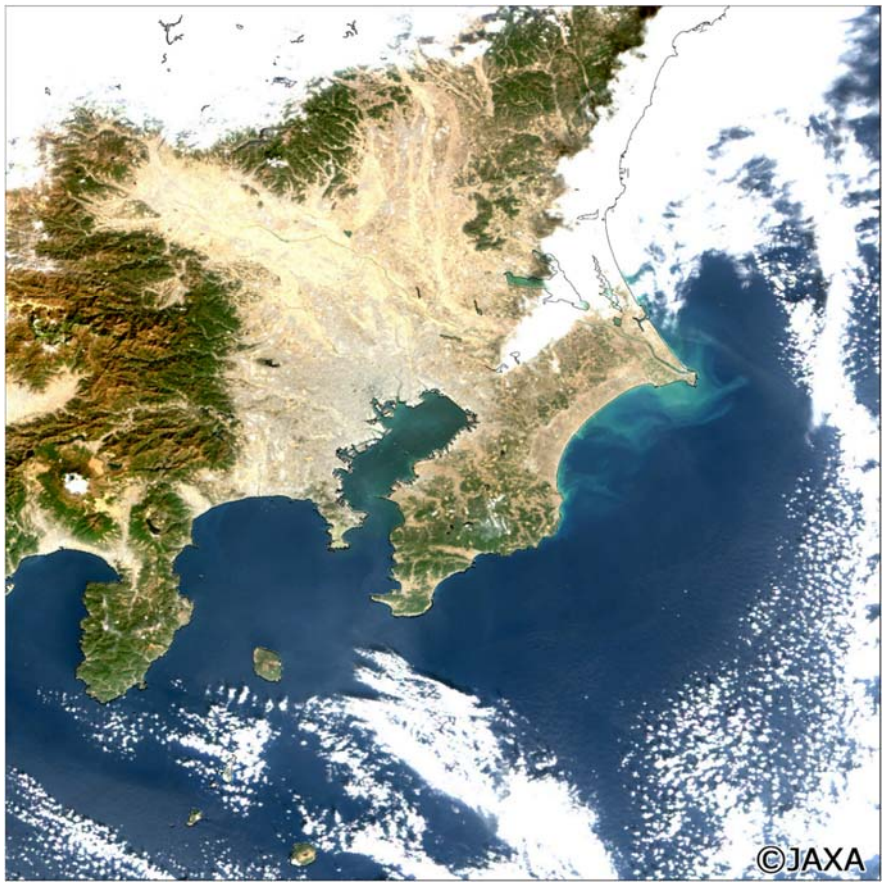
MODIS (1km resolution)

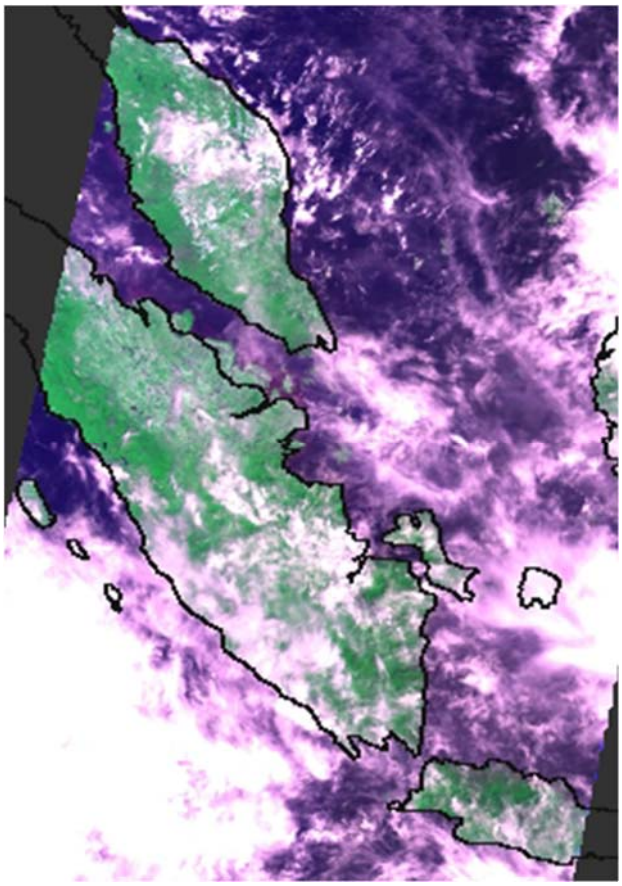


GCOM-C (250m resolution)



GCOM-C Image (First light in Tokyo and Sumatra)





http://suzaku.eorc.jaxa.jp/GCOM_C/monitor/gallery/20180112_j.html Courtesy to EORC

Future Activity

- After release of Volcano and wildfire monitoring system
  - Discussion with Asian as well as domestic users for improvement
    - Additional layers
    - Additional functions or screen
  - Ingestion of GCOM-C dataset
  - Development of algorithms
    - Activity change detection
    - Fire history dataset
    - Validation of wildfire or volcano product

Thank you