

PRESENT AND FUTURE DATA VISIBILITY AND ACCESS OF INTERNATIONAL VIRTUAL SAR CONSTELLATION

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Background of International SAR WS

- On May 30, 31 and June 1, 2018, a workshop on International Spaceborne SAR Missions Coordination and Collaboration was held at the California Institute of Technology
 - To explore the interest, advantage and the significance of a more coordinated approach between the different organizations to achieve higher value to the user community.
 - To improve data visibility and accessibility of spaceborne SAR under the international coordination.
- Working Group 1 (WG-1) was established to understand the issues related to data discovery and data access, as well as to discuss and coordinate this topic with good examples.

Accomplishment of WG-1

- Compiled information about number of satellite systems into two tables.
 - Table 1 illustrates discovery and accessibility of archived data
 - Table 2 summarized the discovery, tasking, and access to present and future data.
- Found that all agencies flying spaceborne SAR systems either provide all the data free of cost, or subsets of them for specific purpose or by entering into inter agency agreements. However, if all the data has standard geometric and radiometric formats, their value will be significantly enhanced.

Archive, Present and Future Data

| Archive | ERS | ENV | ALOS-1 | R1 | JERS | SEASAT |
|----------|-----|-----|--------|------------|------|--------|
| F&O | Y | Y | Y | N/Y by ASF | Y | Y |
| Proposal | | | | | | |

CEOS COVE

| Prentent and Future adata | CSK | TSX | R2 | S1 | ALOS-2/4 | RCM | NISAR | SAOCOM | RISAT |
|---------------------------|------------------------|-------------------------------------|-----------------|------------------------------|------------------------------|--------|--------|--------|----------|
| Discover present data | Yes | Y | Y | Y | Y | Y | Y | Y | Y |
| Discover furture data | No | No | No | Y | Y | Y | Y | ? | - |
| Task | \$(com mercial) | \$ and Proposal (science) | \$ and P | Ad hoc (e.g. disaster) | Ad hoc, \$ and P | Ad hoc | Ad hoc | P | \$ and P |
| F&O | N | N | N | Y | N/Y for Scan in future | Y? | Y | N | N |
| Science Proposal | Y | Y | Y for Canada | - | Y | - | - | Y | Y |
| \$(Commercial) | Y | Y | Y | - | Y | - | - | Y | Y |

WG-1's recommendation for further works at 1st workshop

1. Data Discovery Recommendations

- Need to increase the visibility of the diverse data discovery web sites.

2. Data Access Recommendations

- Work towards free and open access to archival data subject to license and other restrictions (e.g. low spatial resolution).

3. Coordination and Tasking Recommendations

- Need to coordinate data acquisitions for change detection (globally).
- Encourage space agencies to coordinate missions to achieve long time series

4. Analysis Ready Data Recommendation

- Work toward simplified and common ARD standards.

5. Data Distribution Efficiencies and Robustness Recommendations

- The international InSAR community should agree to make mirrors of InSAR archives to improve data utilization.

Sentinel Asia Constellation "Data Provider Node" currently contributing to Emergency Observations

International Charter



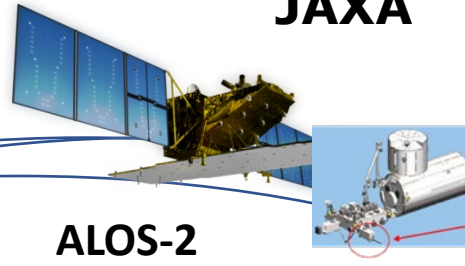
Escalation from Sentinel Asia

ISRO

RESOURCESAT-2, OCEANSAT-2/OCM
IMS-1, CARTOSAT-1&2, RISAT-1



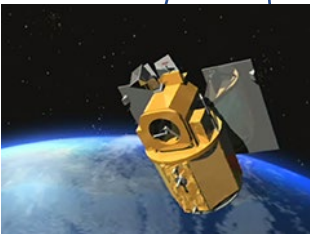
JAXA



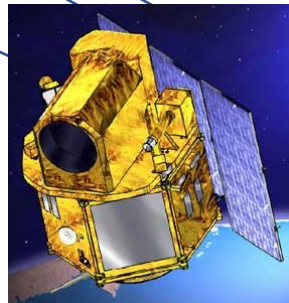
ALOS-2

KIBO HDTV-EF2

NARLabs



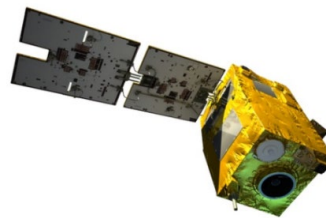
GISTDA



Taichote (THEOS)

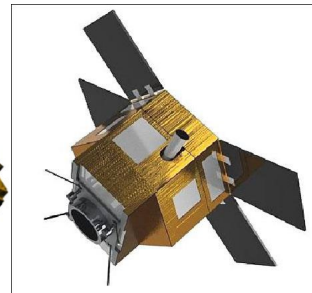
Sentinel Asia Constellation

STI/VAST



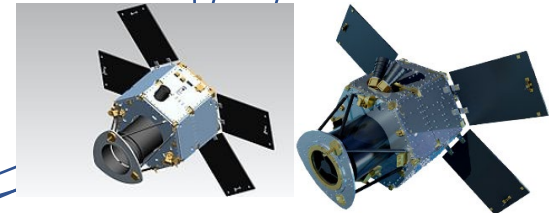
VNREDSat-1A

CRISP



TeLEOS-1

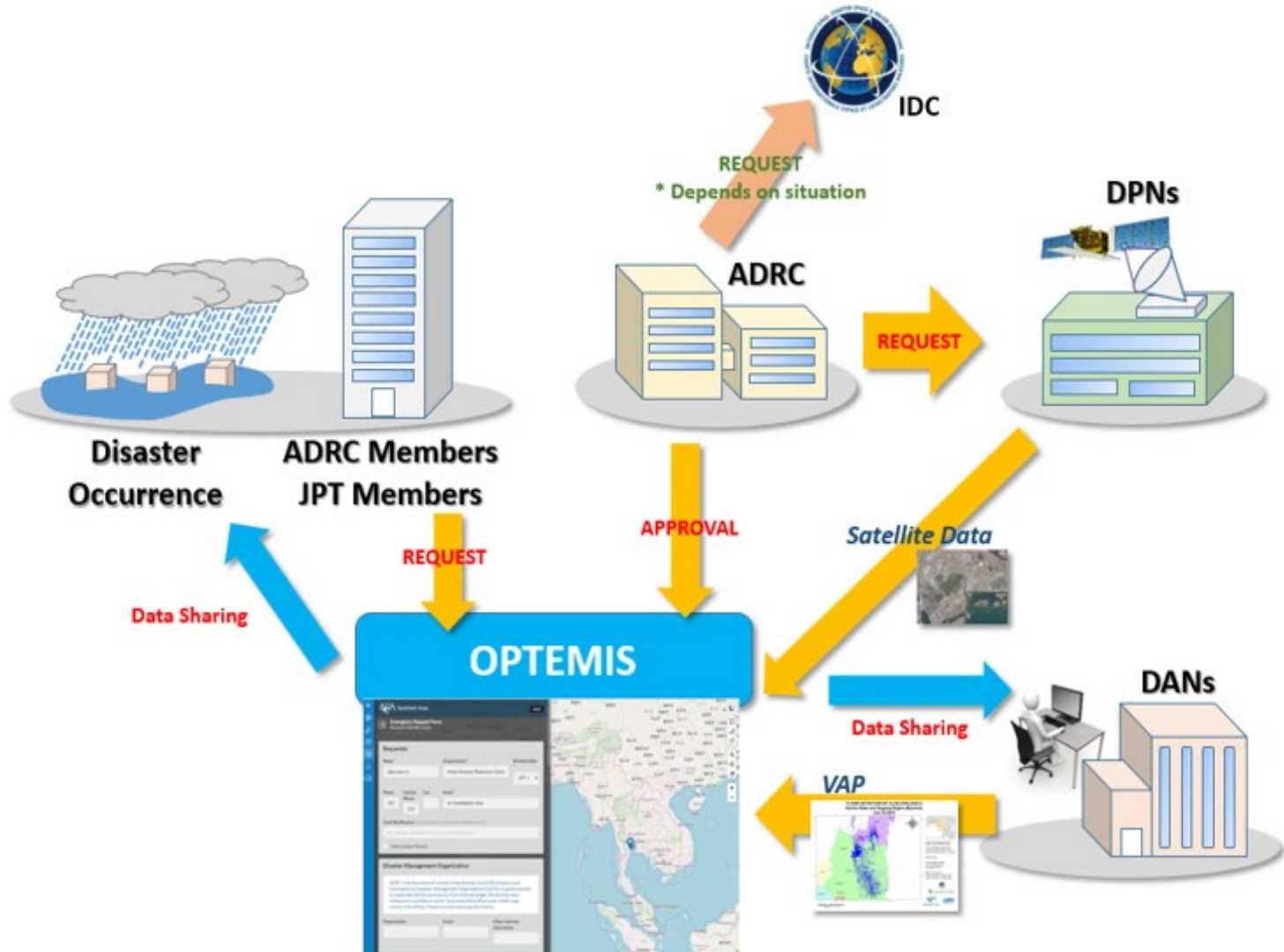
MBRSC



DubaiSat-2 and KhalifaSat

Coordination and Tasking Recommendations

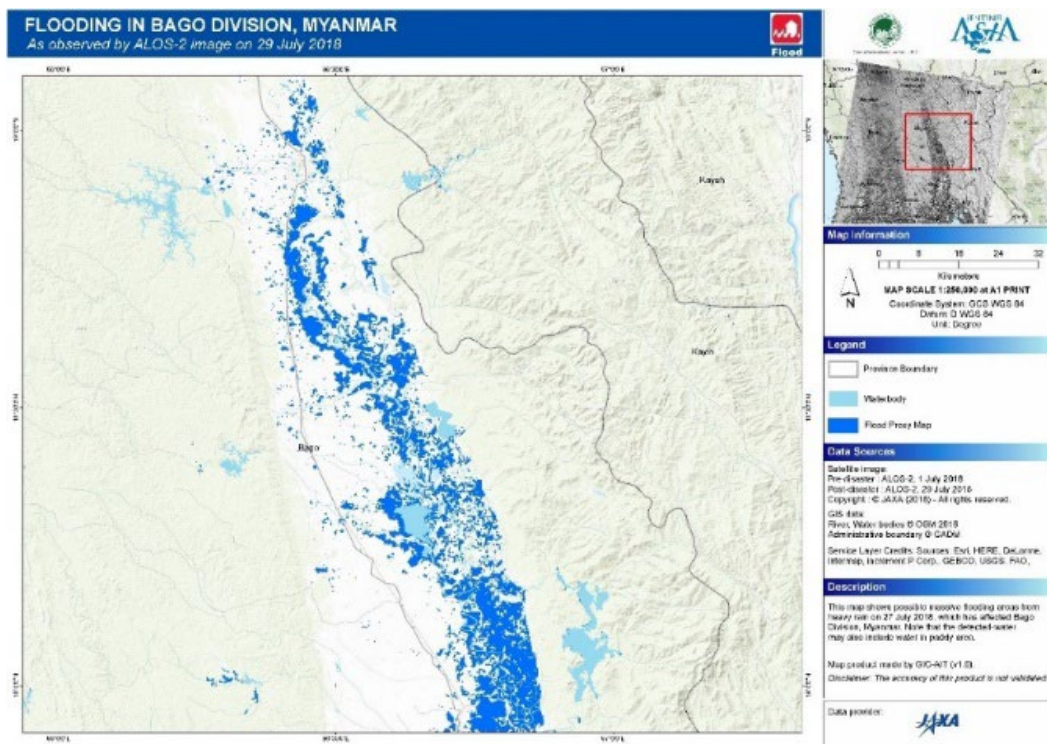
INTERNATIONAL SAR VIRTUAL CONSTELLATION EXAMPLES - DISASTER RESPONSE – SENTINEL ASIA



Good practice through cooperation in Sentinel Asia

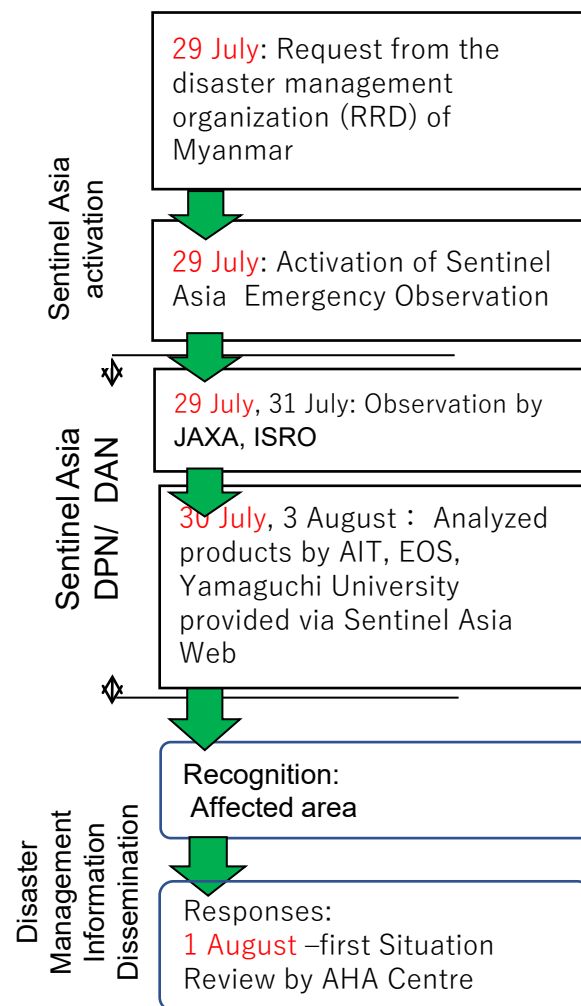
Floods in Myanmar, July 2018

Taninthayi Township, Myeik District in Taninthayi Region, was flooded as monsoon rains led the water level of the local river rise above the danger level, affecting many homes, lakes and wells in the villages and towns. Reportedly more than 100,000 were affected and more than 16,000 people were displaced.



The first analyzed product provided by AIT on 30 July

Courtesy: AIT



Disaster observation planning platform – OPTEMIS

Requester

Name: Organization: Membership:

Phone: Cellular: Fax: Email:

0884227 0884227 perapat.h@jstec.or.jp

Disaster Management Organization

ADRC is the first point of contact in the Sentinel Asia EOR process. Local information by Disaster Management Organizations (DMOs) is quite essential to undertake the first evaluation of an EOR and judge the Sentinel Asia framework is suitable to assist. To proceed the EOR process, ADRC may contact with DMOs. Please provide following information.

Organization: Email: Other relevant information:

Planned end-user of the observed information

Please provide an information, to the best of your knowledge, as to which organization (e.g. Disaster Management Organization, agency or community) will utilize the satellite image. ADRC may ask some questions to concerned organization, if needed.

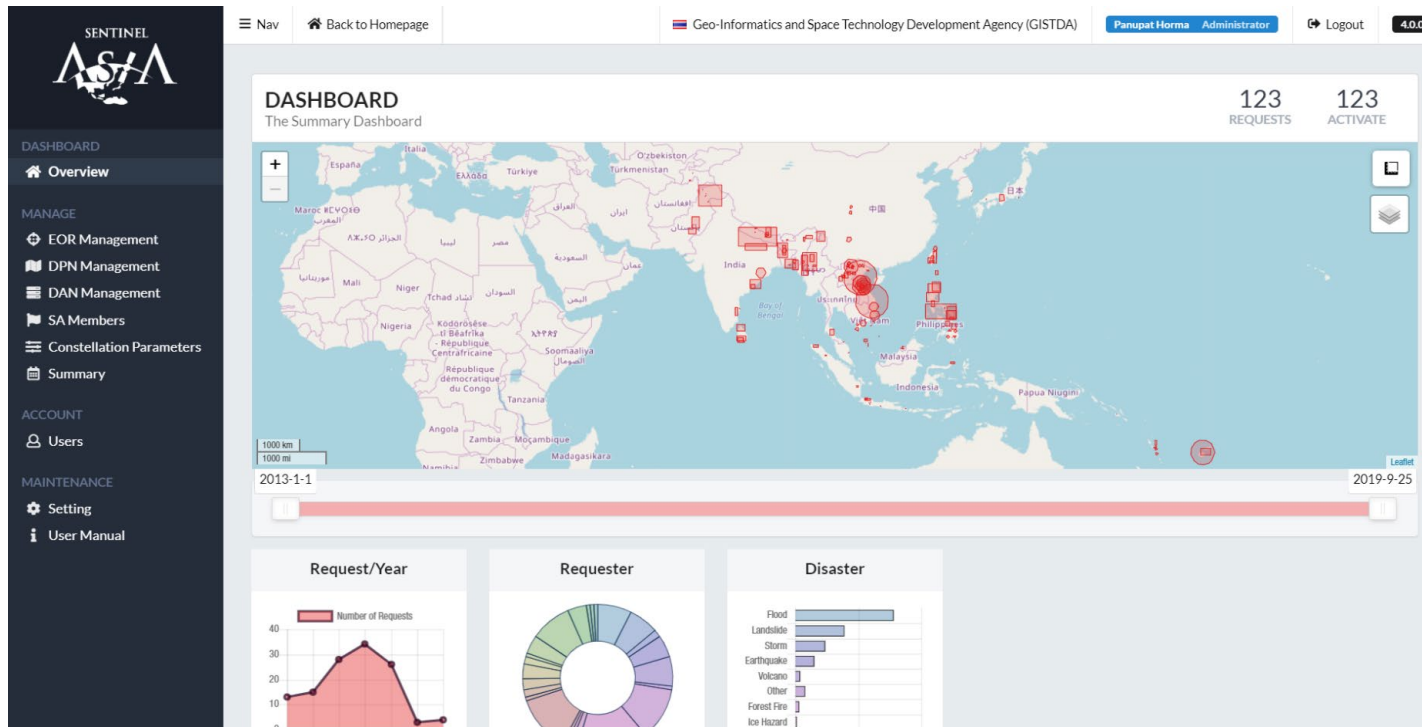
Synergize different information layers of users and operators to support disaster response timely and perform collaborative operations effectively,

(a) Users terminal for EOR request

| ID | COUNTRY | REQUESTER | DISASTER | AREA OF INTEREST | CREATE AT | PERIOD | STATUS | ACTIONS |
|--|-------------|---|-------------------------------|------------------|--|------------------|----------|------------------------------|
| 0110042 Japan Flood Landslide Storm Name: 081123 | Japan | Perapat Horn0884227975@perapat.h@jstec.or.jp | Flood, Landslide, Storm | | 2019-08-25 03:28:40 30 Aug 13:31:10 | 2019-08-22 10:00 | Approved | Information Edit Dates |
| N/A | Japan | Shiroi Kawahira 01-53-3362-3480@seawest.hiroshima.jp | Earthquake | | 2018-09-11 05:44:11 Deleted | 2018-9-11 12:00 | Approved | |
| N/A | Vietnam | VU/HUA/UEM-04 243763826@hlem@nrc.gov.vn | Flood, Storm | | 2018-06-21 07:24:55 Deleted | 2017-11-19 00:00 | Approved | |
| N/A | North Korea | Jung Hyeon, YU=82529382@Qrs2000@korea.co | Earthquake | | 2018-06-21 07:28:31 Deleted | 2017-11-13 00:00 | Approved | |
| N/A | Vietnam | PHAM HA ANH-05 91286164@hlem@nrc.gov.vn | Flood | | 2018-06-21 07:27:02 Deleted | 2017-11-04 00:00 | Approved | |
| N/A | Vietnam | PHAM HA ANH-04 91286164@hlem@nrc.gov.vn | Flood | | 2018-06-21 07:26:31 Deleted | 2017-11-01 00:00 | Approved | |

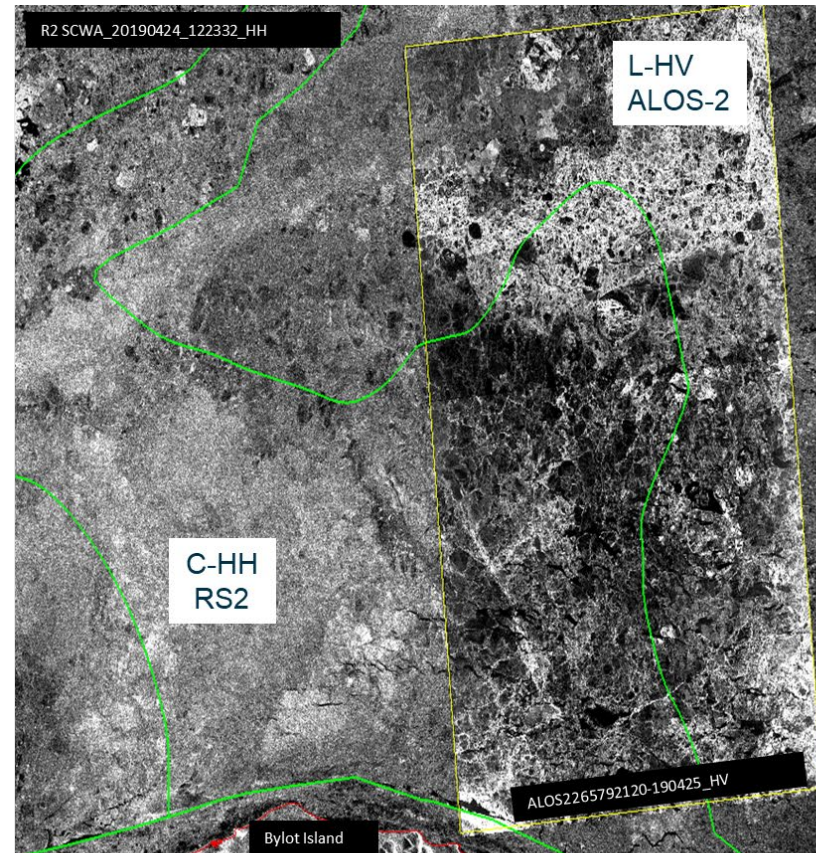
(b) EOR request dashboard for SA operators

Disaster observation planning platform – OPTEMIS

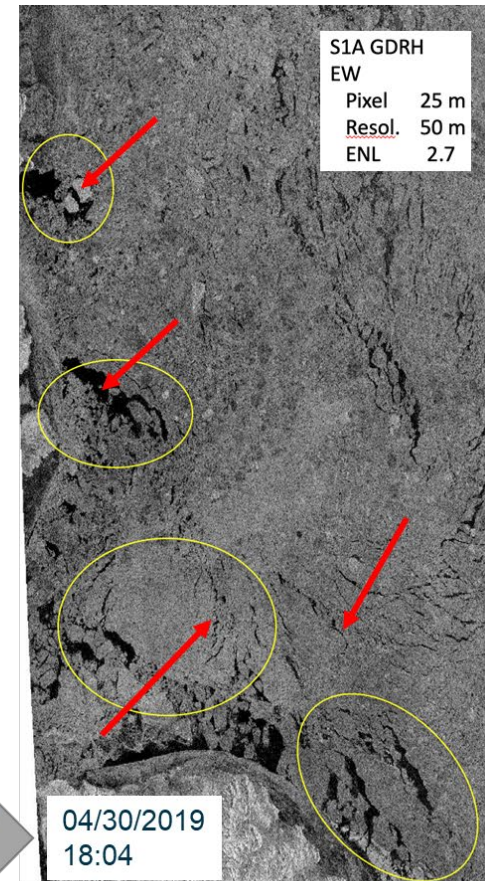
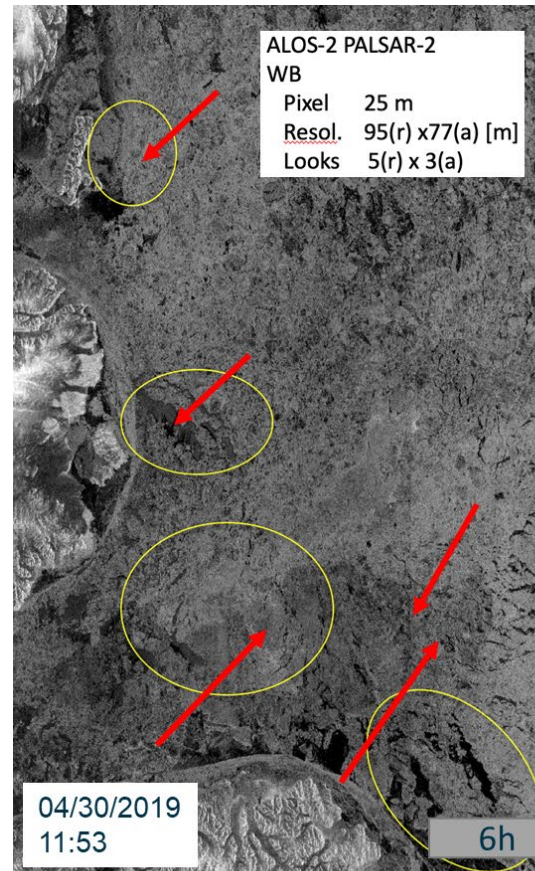


Example of OPTEMIS SA statistics dashboard

Sea Ice and Oil spill by C-band and L-band – will be presented at WG1 session



Canadian Ice Service

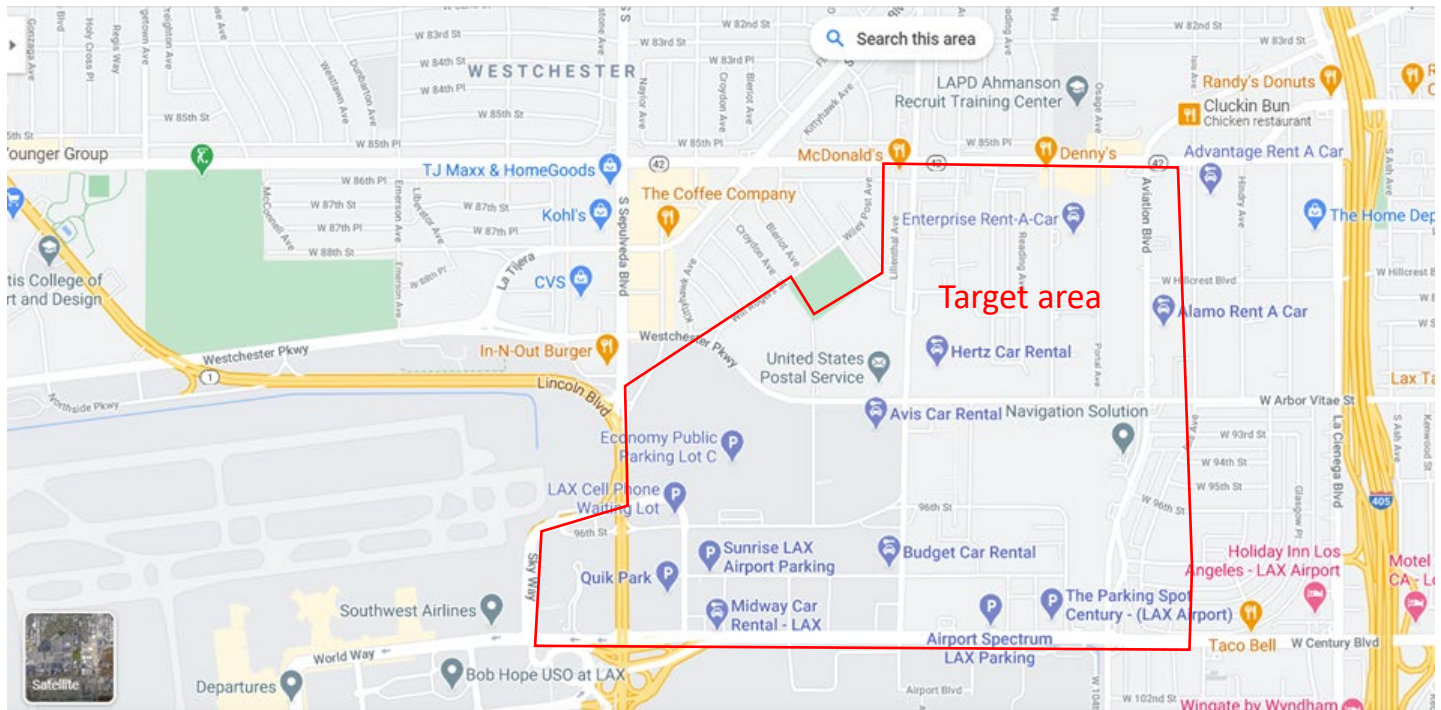


Integrated data analysis by C-band and L-band with optics for LAX parking lots car trend during COVID-19

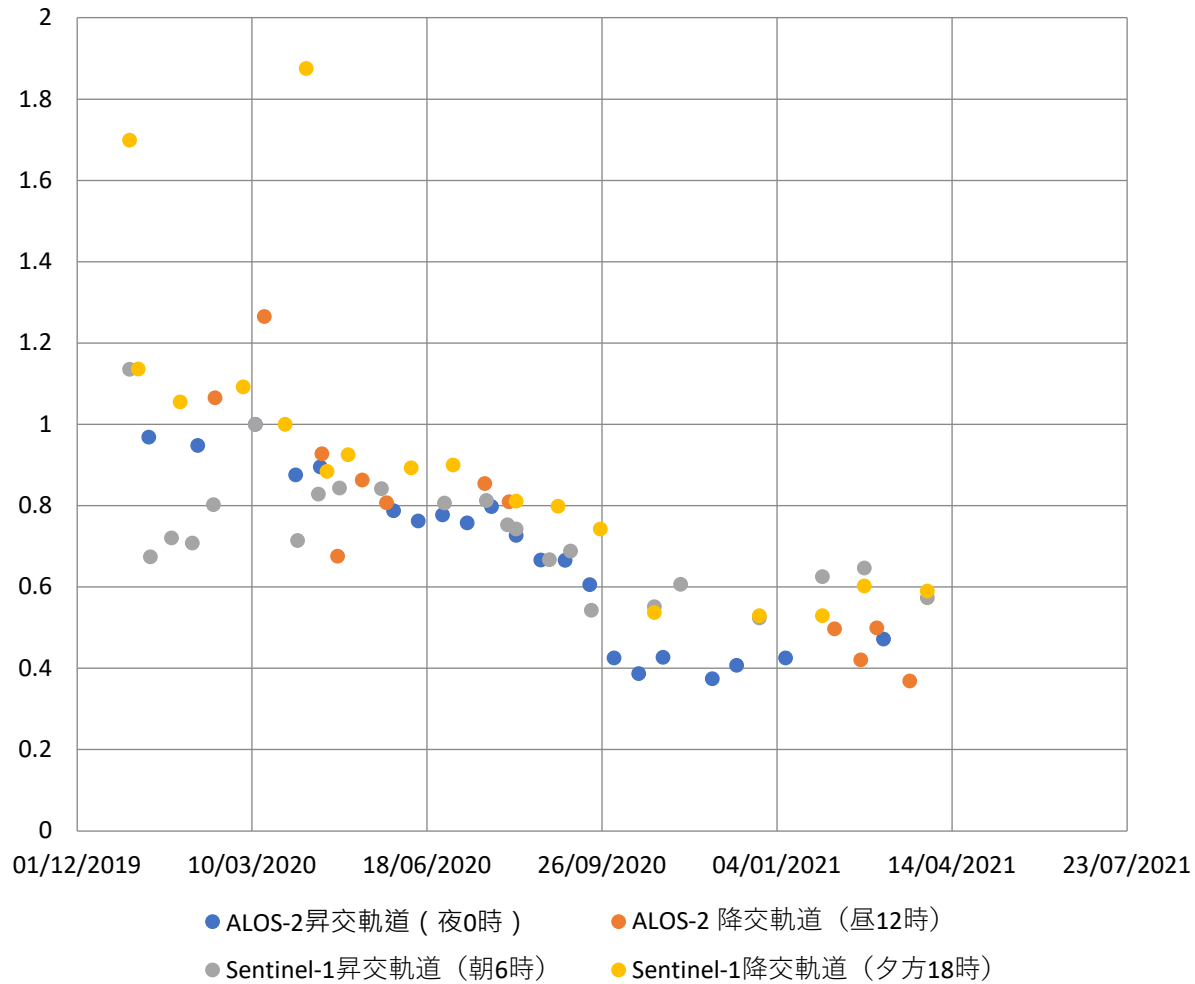
- Quantitative analysis of satellite imagery from three international space agencies has shown the decline in traffic at Los Angeles International Airport (LAX) since the start of COVID-19.
- Observed that there are fewer cars in the pay parking lot and there is a consistency of this fewer number of parking lots usage throughout the day.

LAX car parking area analysis

- Using time series of ALOS-2 SM1 = 3m HH data from January to September to estimate car density in car parking area near LAX.



Car density in parking are trend analysis



Need to survey, discuss and sharing of success story and beyond of international cooperation

1) Virtual Observation Constellation (purpose / scope, observation target, framework,

a) Current

b) Planning

2) Emergency observation tasking and observation plan coordination

- Tasking mechanism

- International disaster charter (manual coordination?)

- Sentinel Asia (OPETIMS system)

- Observation plan process / procedure and observation plan provision scheme

3) Data and information access and sharing

- List of Data products and distribution policy / method (WG1 table 1 / 2 update)

- Information provision: EO dashboard (covid-19, atmosphere, cryosphere, ocean,)

- Technology - OGC

- Platform - Cloud system - ODC (EAIL/Sandbox)

- Data format standardization - CEOS ARD (CARD4L)

Future Discussion topics

1) Need active participation of WG 1 from participating organizations (ASI, CSA, CONAE, DLR, ESA, ISRO, JAXA, NASA with new space?)

2) Request to provide information and compile survey results of three main target area (virtual observation constellation, tasking and data sharing)

- Not limited governmental cooperation but also invite commercial small SAR satellite constellation – what is observation target and value?

- Include survey of SAR + OPTICS constellation? (e.g. S1+S2?) – what is observation target and value?

- request information from CEOS WGISS, GEO/CEOS ODC community and OGC to improve data and information access?

3) Discuss and coordinate way forward to enhance the current cooperative framework for virtual observation constellation, tasking and data sharing.

a) Virtual constellation

- Need to establish a scheme to have multi-agencies / organization virtual constellations? (A-Train type framework, GPM or ACCP?) for what?

b) Tasking and observation planning

- Do we need enhance emergency observation tasking beyond international disaster charter or sentinel Asia (what is a value / advantage of SAR emergency observation? Night / bad weather? And other reason?)

- Mechanism of observation plan sharing (just KML?)

c) data sharing

- How to enhance / improve data and information sharing and for what? Need to have a pilot / demonstration projects (- cooperation with CEOS and/or GEO to specific theme?) to provide valuable outcome (e.g. Carbon STK – Biomass, sea ice monitoring, etc.)

- Data format standardization with CEOS WGISS or WGCV?