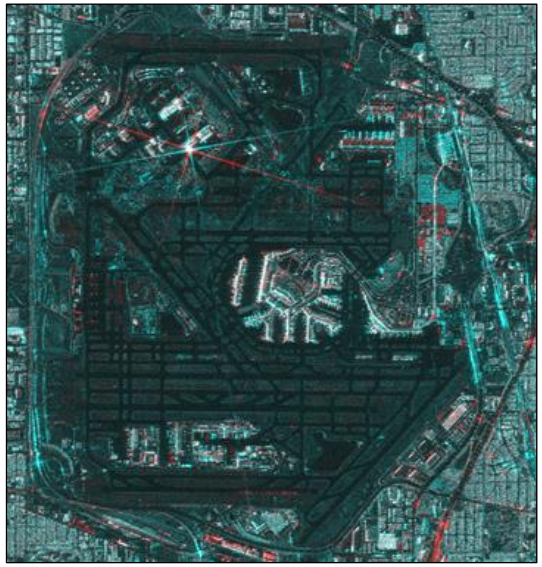
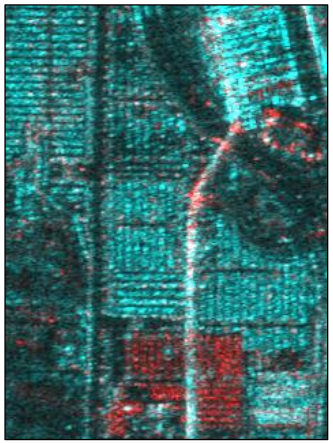
PRESENT AND FUTURE DATA VISIBILITY AND ACCESS OF INTERNATIONAL VIRTUAL SAR CONSTELLATION





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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.
- Found that their value will be significantly enhanced If all the data has standard geometric and radiometric formats.

Archive, Present and Future SAR Data

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

Prensent 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	$(commercial)	$ and Propsal (science)	$ and P	Ad hoc (e.g. disaster)	Ad hoc, $ and P	Ad hoc	Ad hoc	P	$ and P
O&F	N	N	N	Y	Y for ScanSAR	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

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

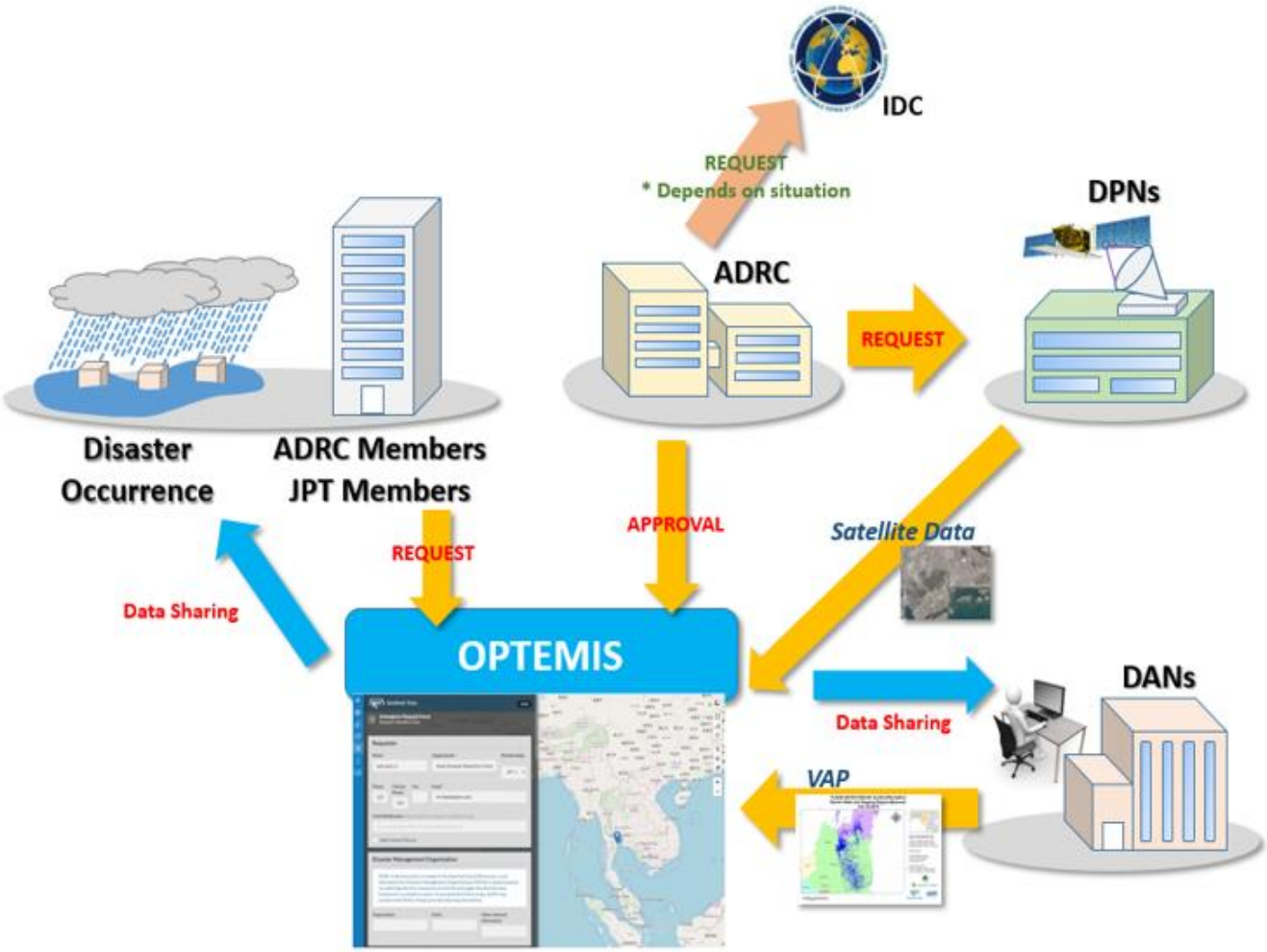
- Work toward simplified and common ARD standards.

5. Data Distribution Efficiencies and Robustness Recommendations

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

INTERNATIONAL SAR VIRTUAL CONSTELLATION EXAMPLES
- DISASTER RESPONSE – SENTINEL ASIA

Coordination and Tasking Recommendations



Emergency Observation Request

Review, Responded Disaster by Geographical Distribution

Sentinel Asia Satellite Constellation

Sentinel Asia Constellation
contributing to Emergency Observations

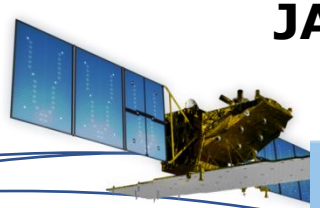
International Charter

Escalation from Sentinel Asia

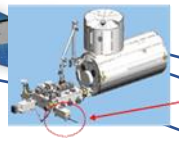
ISRO

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

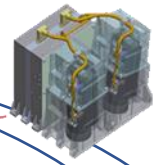
JAXA



ALOS-2

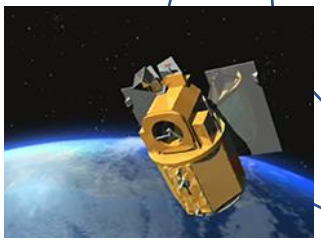


KIBO HDTV-EF2



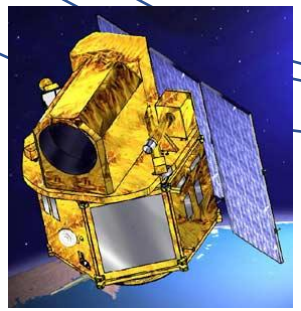
Sentinel Asia Constellation

NARLabs



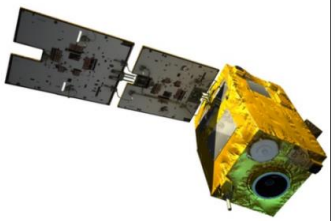
FORMOSAT-5

GISTDA



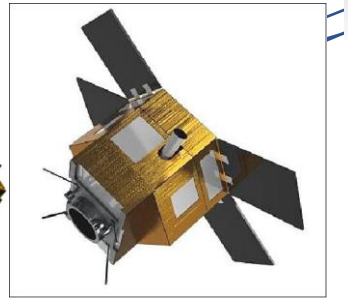
Taichote (THEOS)

STI/VAST



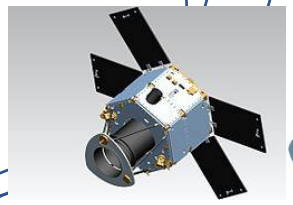
VNREDSat-1A

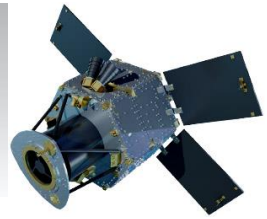
CRISP



TeLEOS-1

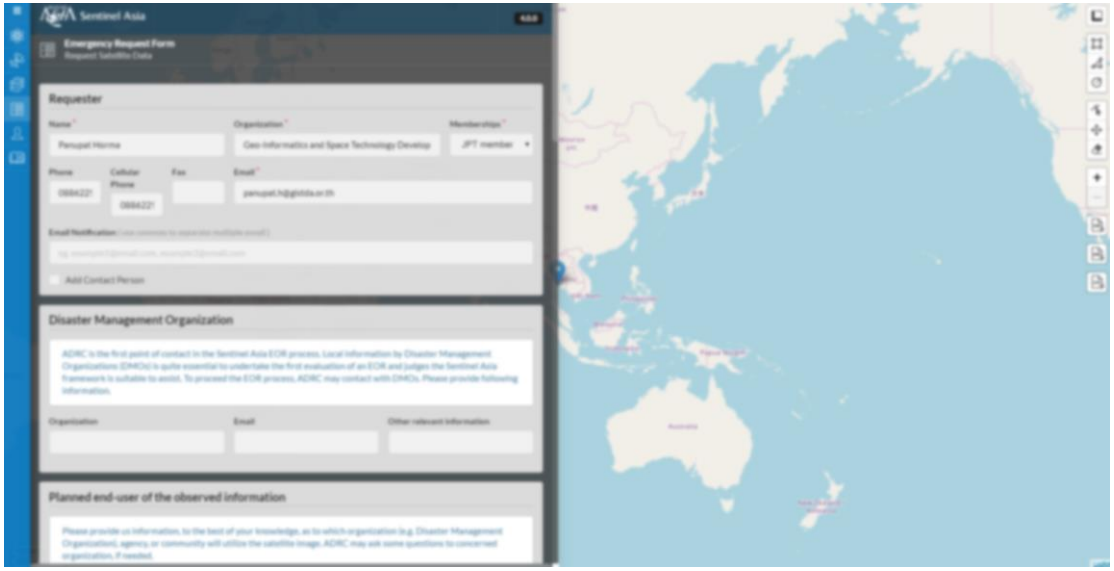
MBRSC





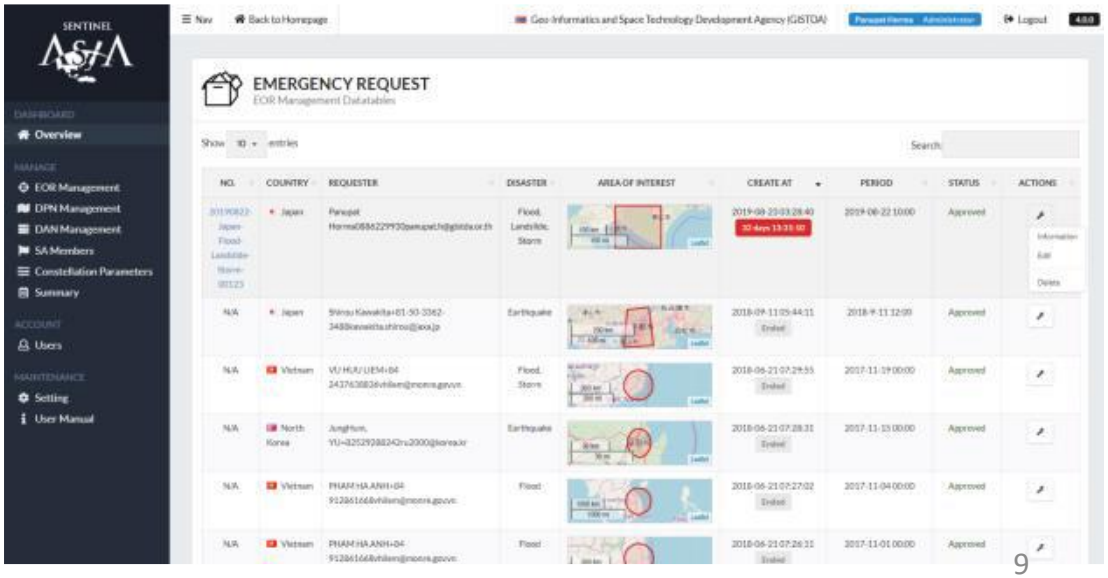
DubaiSat-2 and KhalifaSat

Disaster observation planning platform – OPTEMIS



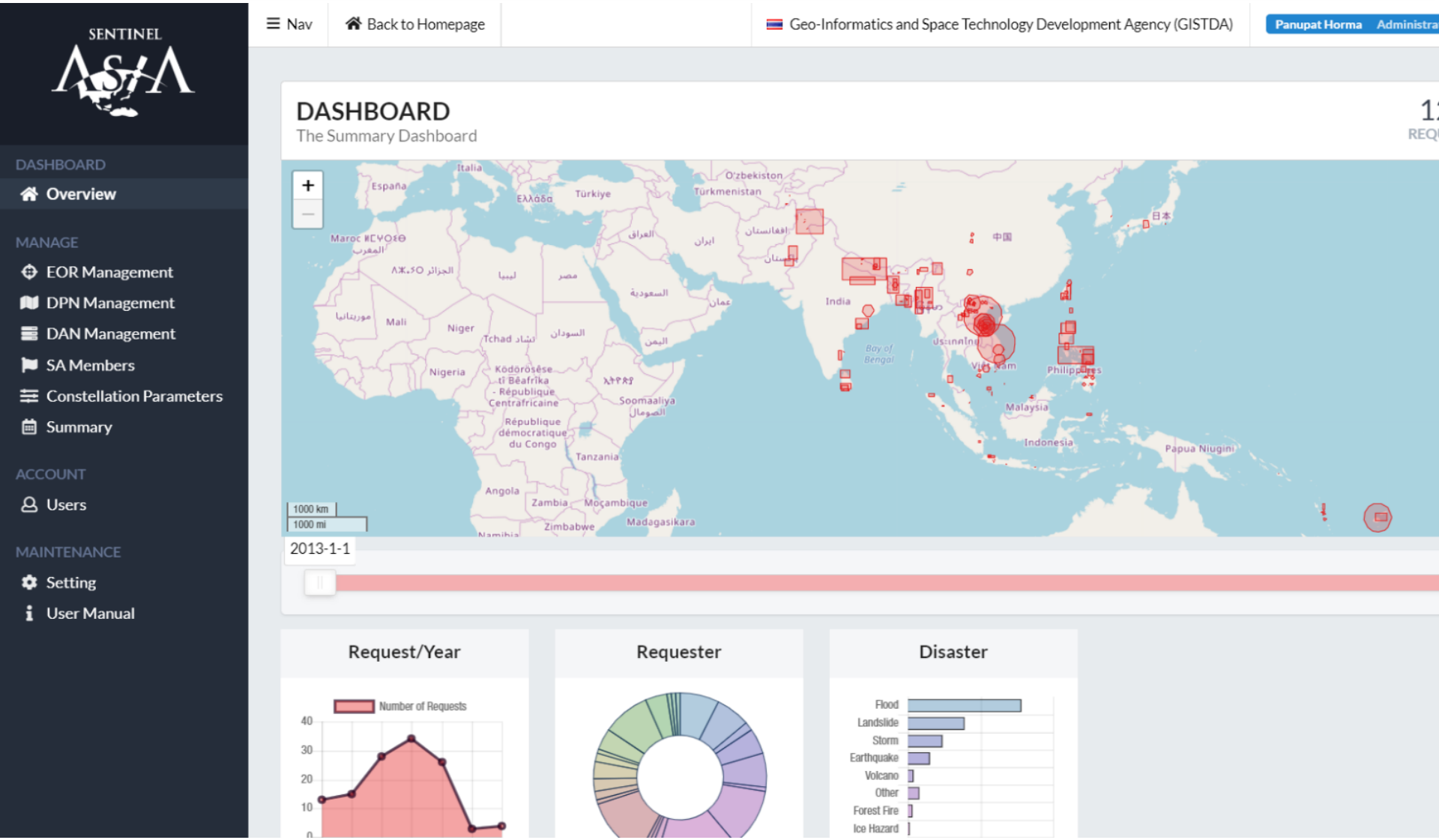
(a) User terminal for EOR request

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



(b) EOR request dashboard for SA operators

Disaster observation planning platform – OPTEMIS

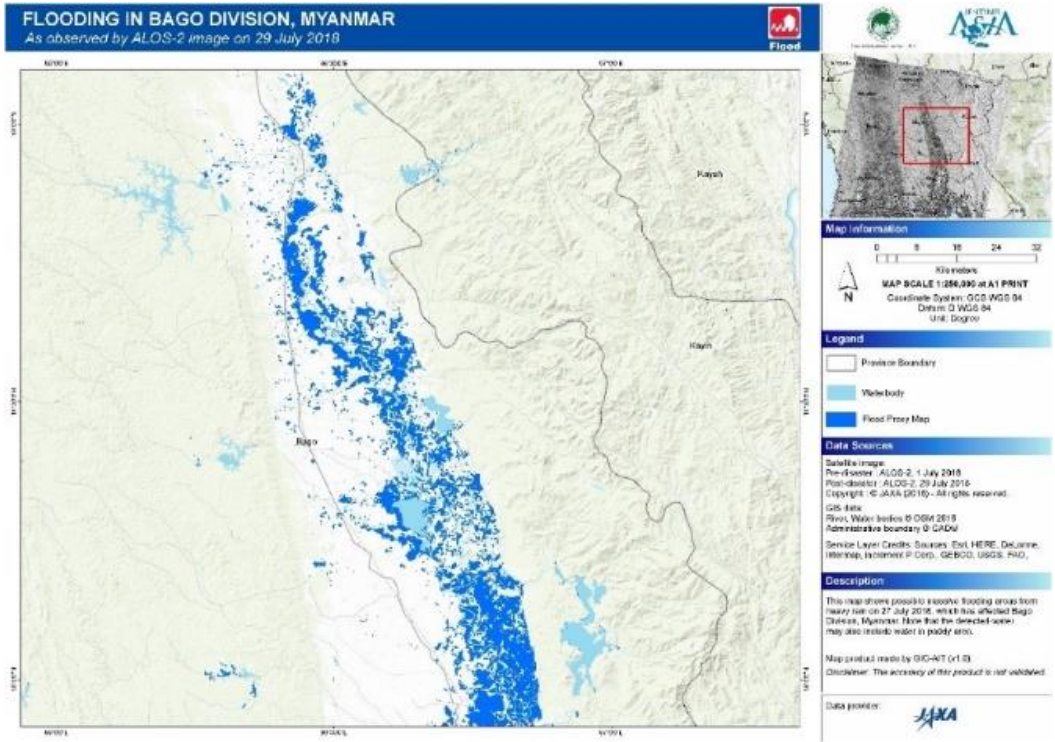


Example of OPTEMIS SA statistics dashboard

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

Sentinel Asia activation

29 July: Request from the disaster management organization (RRD) of Myanmar

29 July: Activation of Sentinel Asia Emergency Observation

Sentinel Asia DPN/ DAN

29 July, 31 July: Observation by JAXA, ISRO

30 July, 3 August： Analyzed products by AIT, EOS, Yamaguchi University provided via Sentinel Asia Web

Disaster Management Information Dissemination

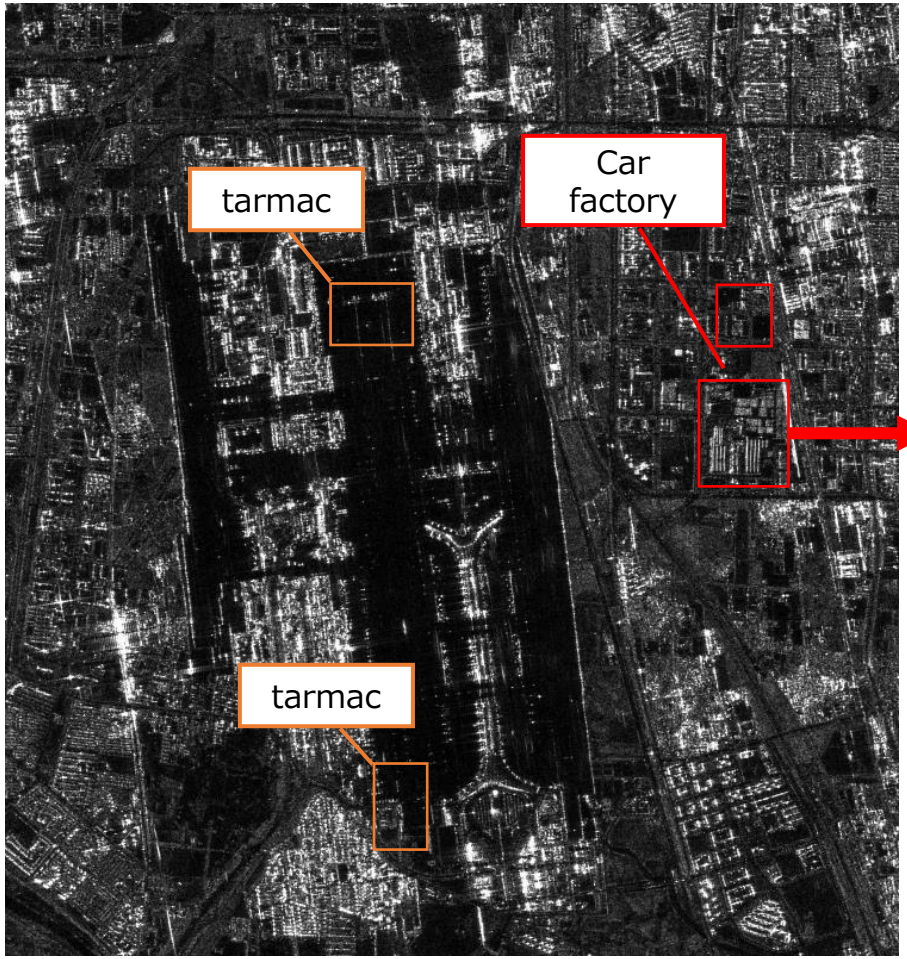
Recognition:
Affected area

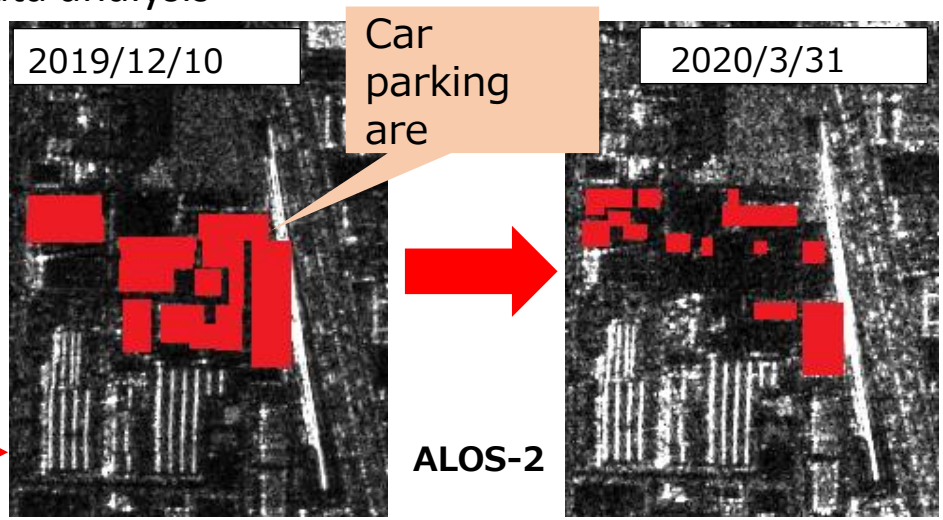
Responses:
1 August –first Situation Review by AHA Centre

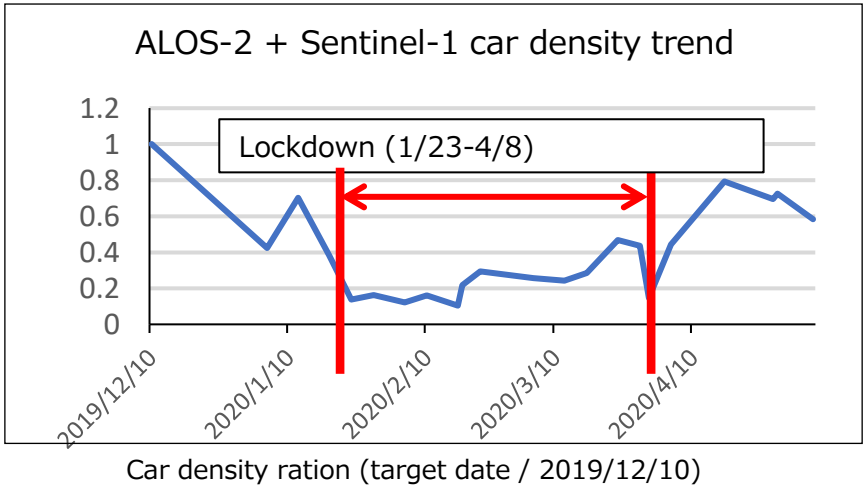
11

COVID-19 economic impact assessment using multiple SARs

-Vacant parking area = dark, car parked aera = bright by SAR backscattering
Parked car density using time series SAR data analysis

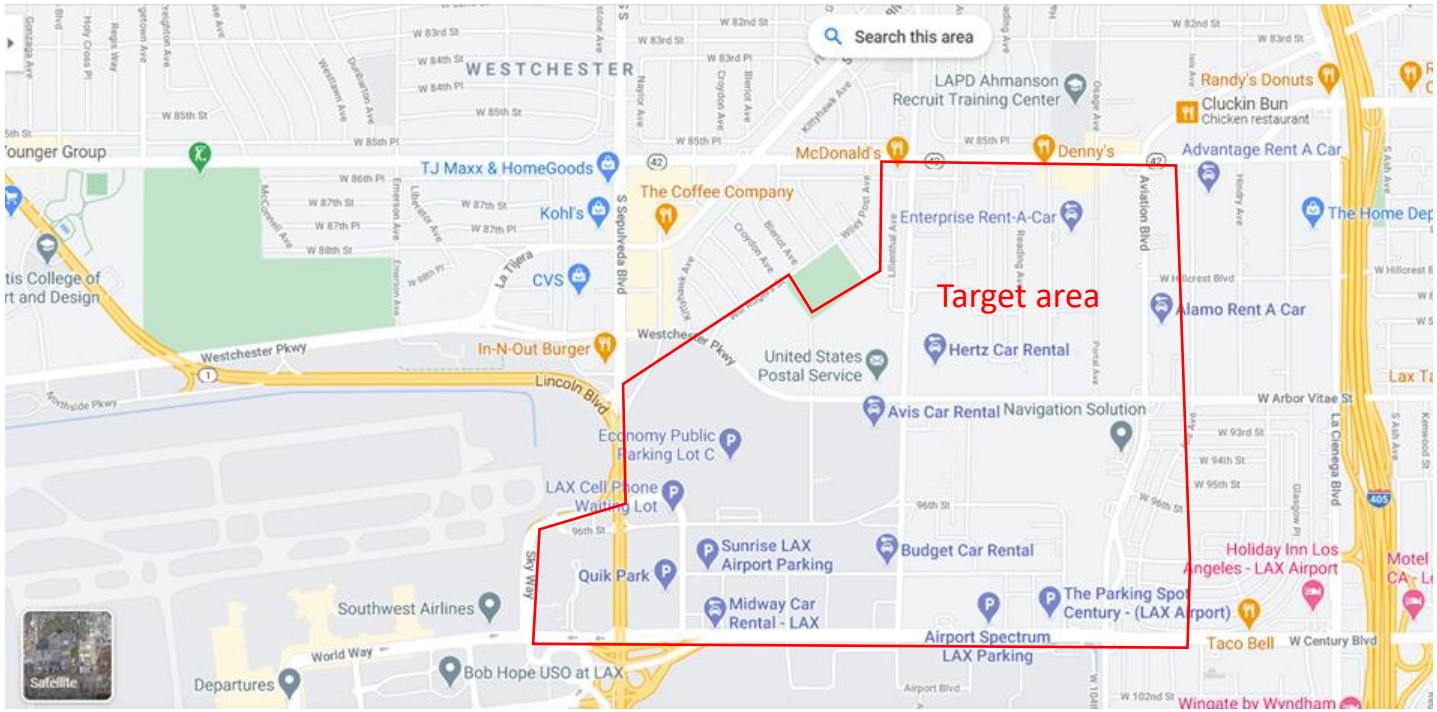






LAX car parking area analysis

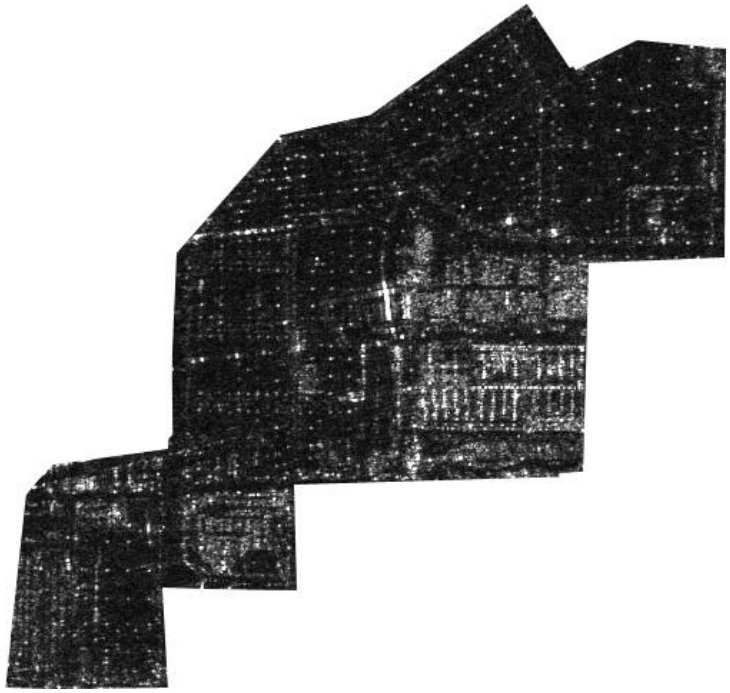
- Using time series of ALOS-2 SM1 = 3m HH data with Sentinel-1 10m from January to September to estimate car density in car parking area (north east) near LAX.



Google Map

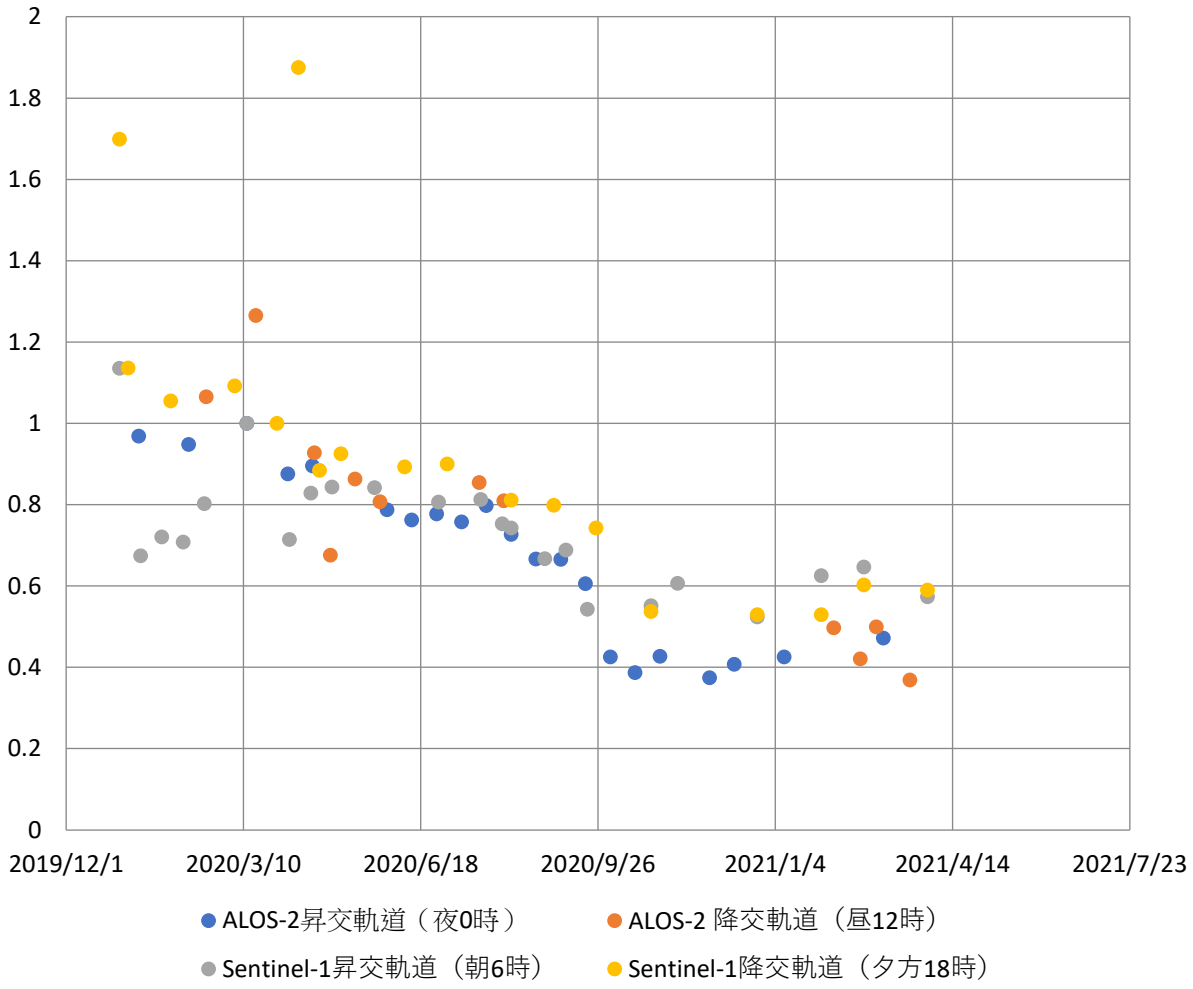
ALOS-2 SM1 sample data in AOI in LAX parking area in north east end.

2020/1/11



2020/7/11

Car density in parking are trend analysis



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.

Way forward

- Second Workshop on International Coordination for Spaceborne Synthetic Aperture Radar will be held at ESA/ESRIN, Italy during 20-22 October 2021

https://nikal.eventsair.com/NikalWebsitePortal/second-workshop-on-international-coordination-for-spaceborne-synthetic-aperture-radar/esa

- Observed that combining both SAR and optical sensors could provide evidence-based facts on social behavior that would effectively supports status of socio-economic situation in a pandemic like COVID

-> Promote the virtual constellation concept to provide SAR data timely and frequently with available tools to help monitor social behavior from the space.