

KOMPSAT-5



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KOMPSAT-5 Geolocation Accuracy Analysis with Mongolia and CEOS Calibration Site

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Agenda

- **Brief Introduction about K5 Imaging Mode**
 - System Operations Overview
 - K5 Image Quality for Enhanced Mode
- **Mongolia CAL Site for KOMPSAT-5**
 - Introduction about Mongolia CAL Site for KOMPSAT-5
 - Mongolia CAL Site Maintenance Activity
- **Geolocation Measurement Results**
 - K5 Geolocation Measure via Mongolia Site
 - K5 Geolocation Measure via CEOS targets (referred to CEOS website)
- **Conclusion**



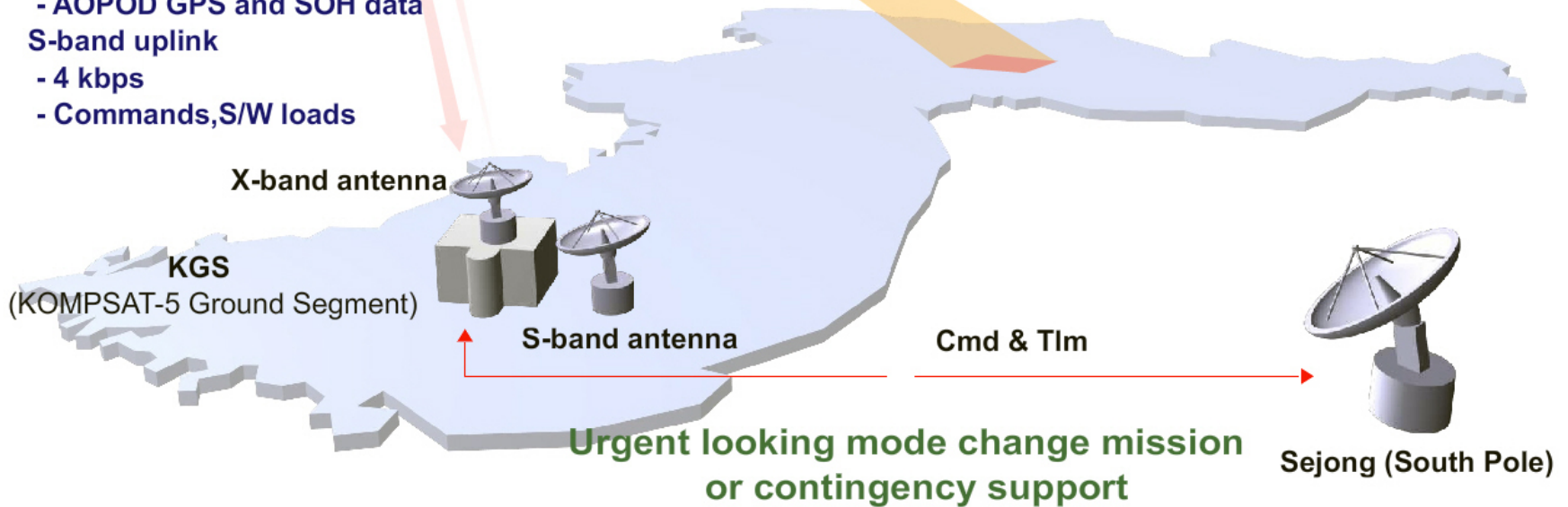
System Operations Overview



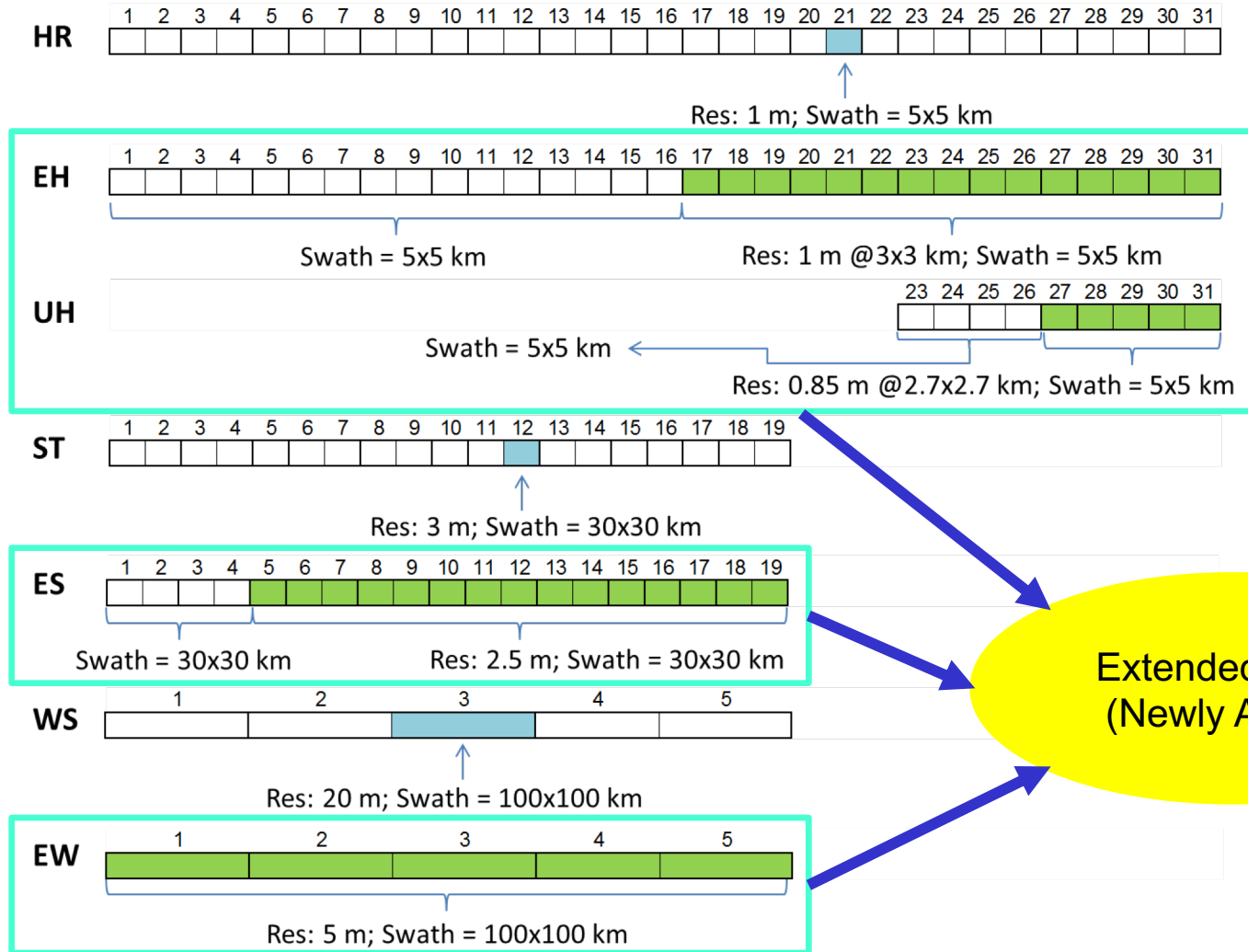
- KOMPSAT-5 Satellite**
- Dawn-dusk frozen orbit
 - Altitude 550 km
 - 06:00 am MLT of A.N.
 - 28 days repeat ground track/daily revisit time

- X-band downlink**
- Greater than 300Mbps
 - Image data including Ancillary data
- S-band downlink**
- 4.096 kbps
 - AOPD GPS and SOH data
- S-band uplink**
- 4 kbps
 - Commands, S/W loads

- COSI Image**
- High Resolution Mode : 1 m GR / 5 km SW
 - Standard Mode : 3 m GR / 30 km SW
 - Wide Swath Mode : 20 m GR / 100 km SW



• K5 System Image Quality for Enhanced Mode

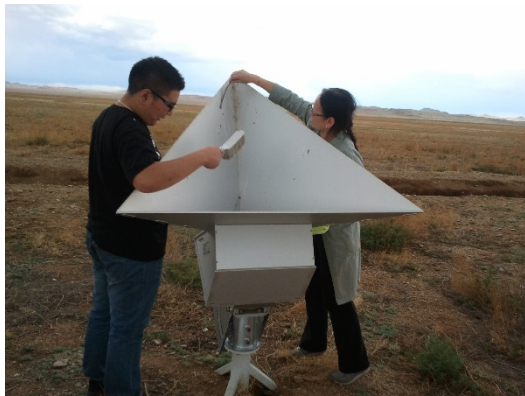




Introduction about Mongolia CAL Site for KOMPSAT-5



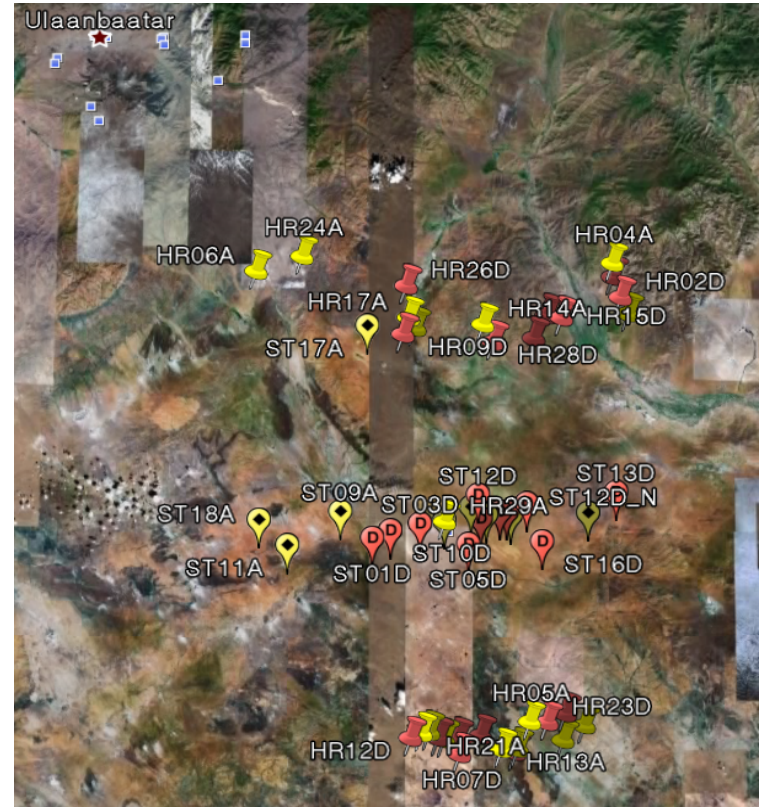
- Introduction about Mongolia CAL Site for KOMPSAT-5
 - 52 CRs consisting of 20 ST and 32 HR CR are installed in Mongolia CAL site
 - Background level of Mongolia is very low and it is very suitable for SAR calibration site
 - No artificial buildings and structures exist around Mongolia calibration site



CR for High-Resolution Mode



CR for Standard Mode



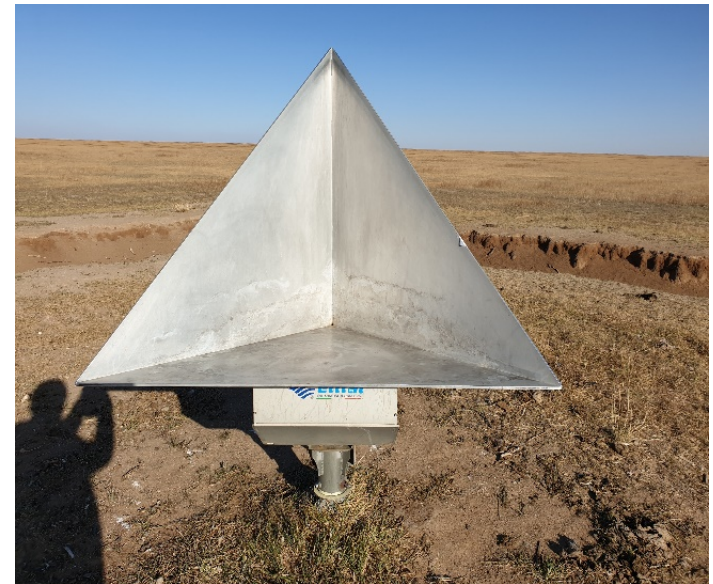
CR Deployment in Mongolia CAL Site

- **Maintenance of Mongolia CAL Site**

- KARI contract with NRSC(National Remote Sensing Center), Mongolia national institute, to maintain optic and SAR CAL targets every year
- Main activities for Mongolia CR
 - **Cleaning CR surface**
 - **Checking and adjusting CR elevation and azimuth angle to point K5 orbit**
 - **Repairing or replacing CR parts (if needed)**

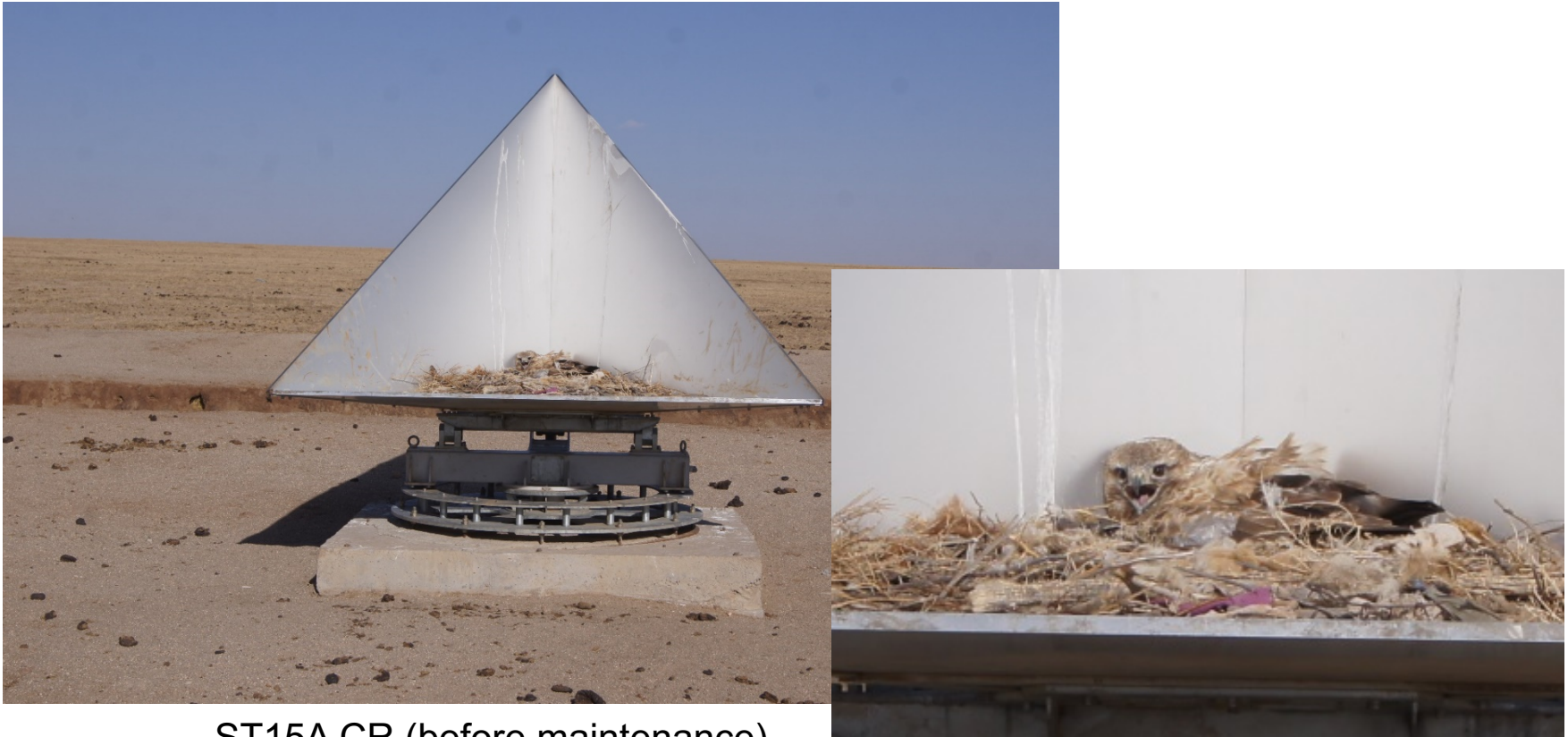


Before Cleaning



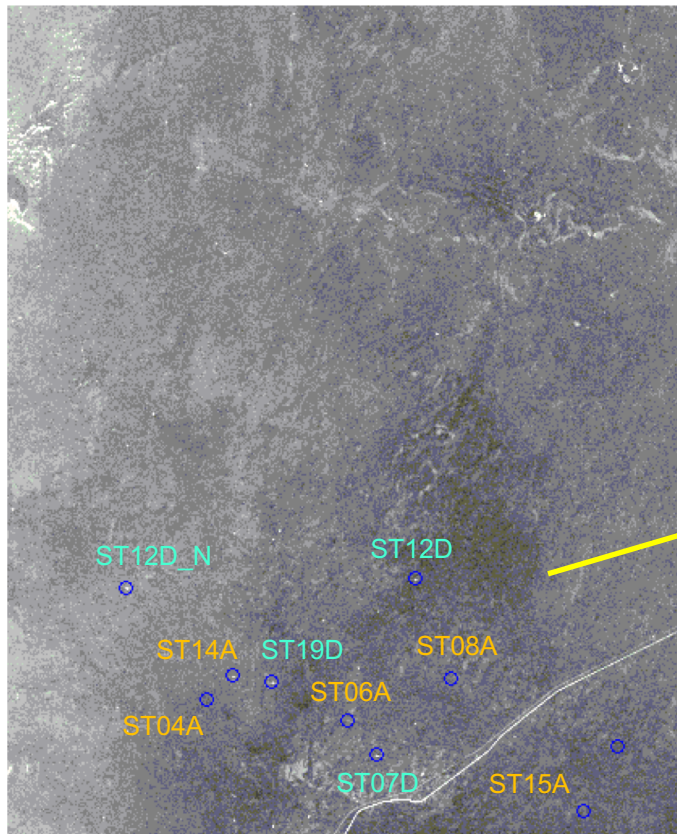
After Cleaning

- **Special Case to Degrade CR Impulse Response**
 - Bird nest on CR plate
 - Cleaning activity was performed after young bird upbringing was completed

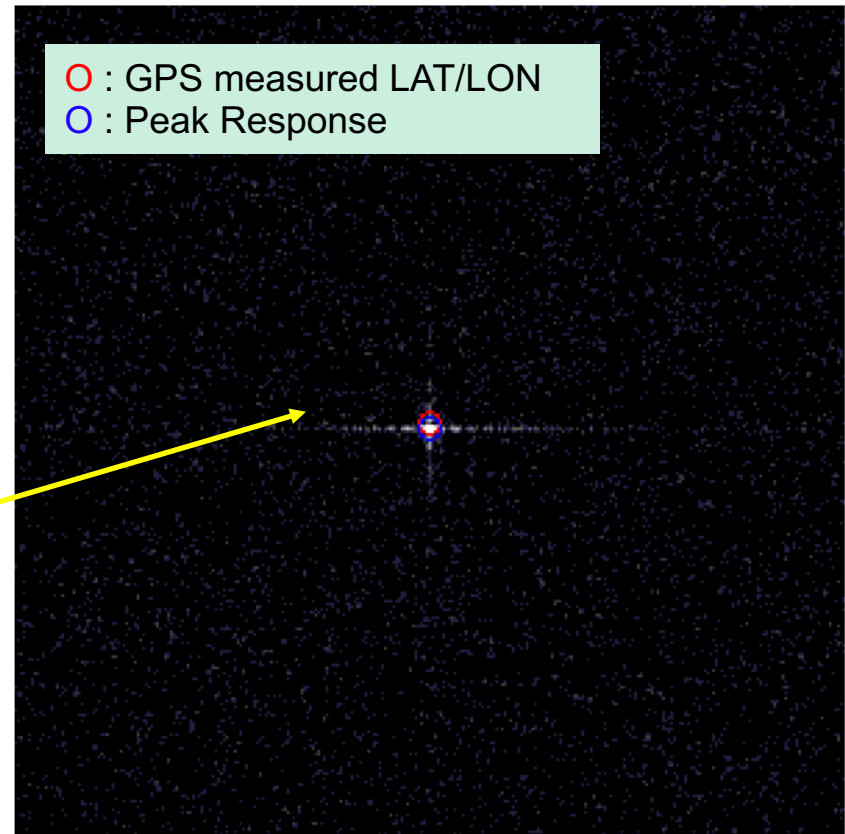


ST15A CR (before maintenance)

- Example of K5 CR image (Mongolia CAL site)
 - In case of ST, about 5~7 CRs were included in images
 - In case of HR, about 1~3 CRs were included in images



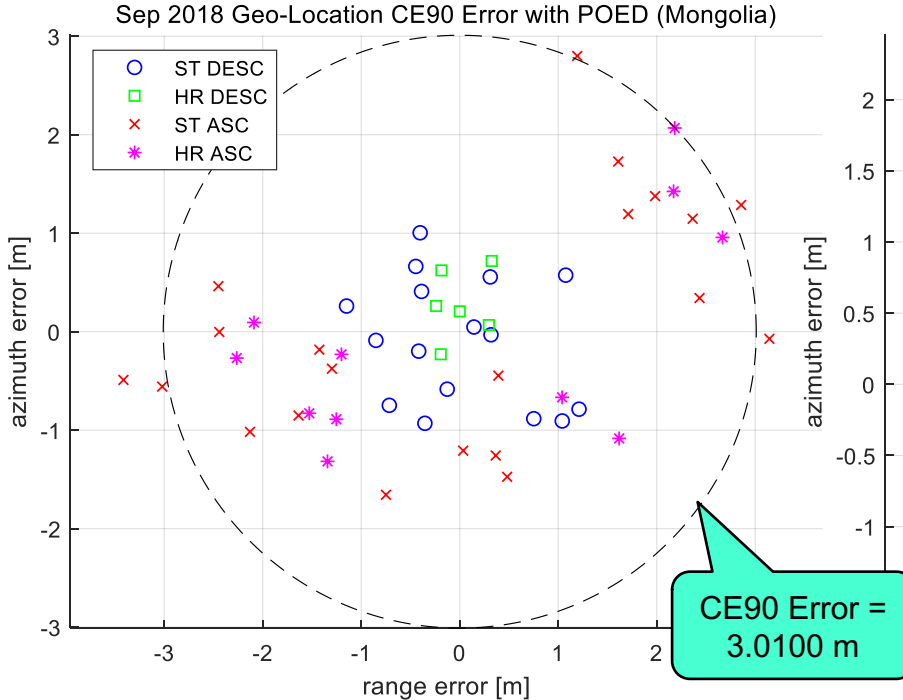
ST12 DESC acquired in 20/Jan2014



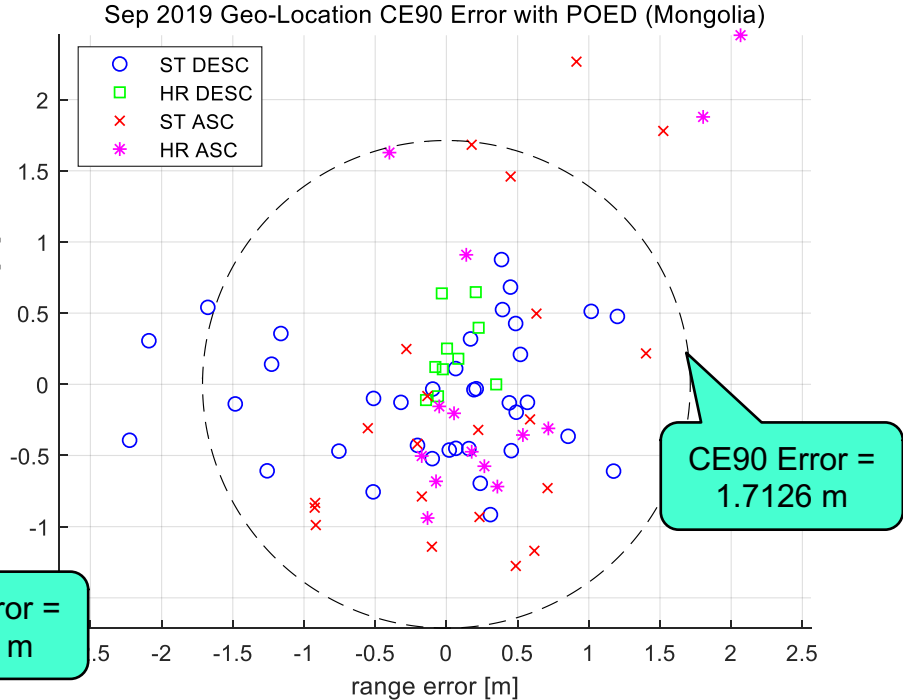
ST12D CR response (zoom-in)

• Geolocation Comparison btw. Sep 2018 & 2019 (Mongolia)

- Geolocation measured in Sep 2018 is slightly large because of heavy rain on Mongolia site
- However, CE90 error was recovered in Sep 2019 after CR condition becomes normal



K5 geolocation from Mongolia
CR, Sep 2018



K5 geolocation from Mongolia
CR, Sep 2019

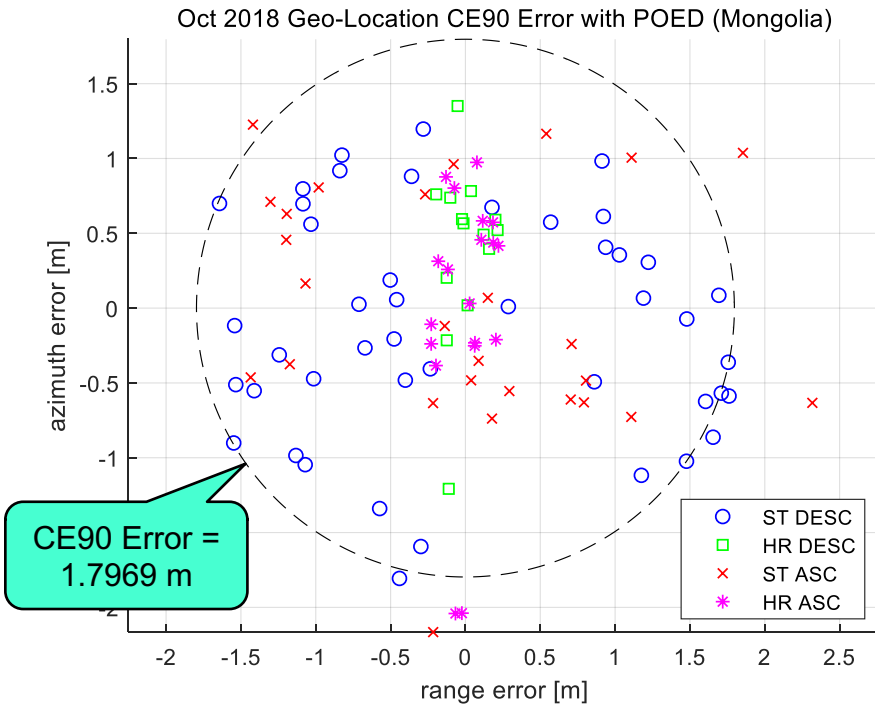


K5 Geolocation Measure via Mongolia Site

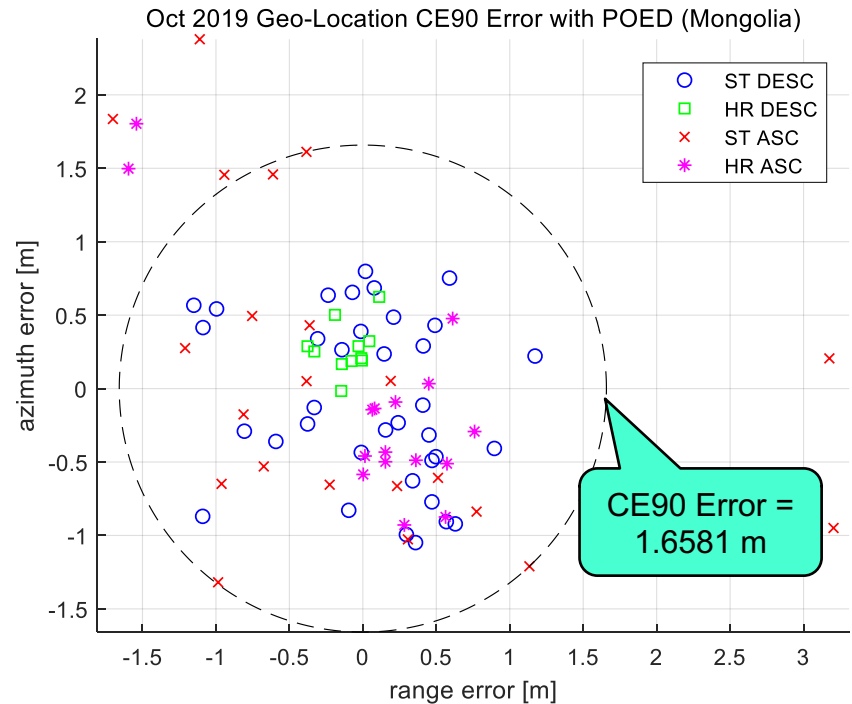


• Geolocation Comparison btw. Oct 2018 & 2019 (Mongolia)

- CE90 error in Oct 2019 maintained as that of Oct 2018
- Every October month is recommended time to survey CRs because the weather is clear and little rain



K5 geolocation from Mongolia
CR, Oct 2018



K5 geolocation from Mongolia
CR, Oct 2019

- **Targets for K5 geolocation measurement**

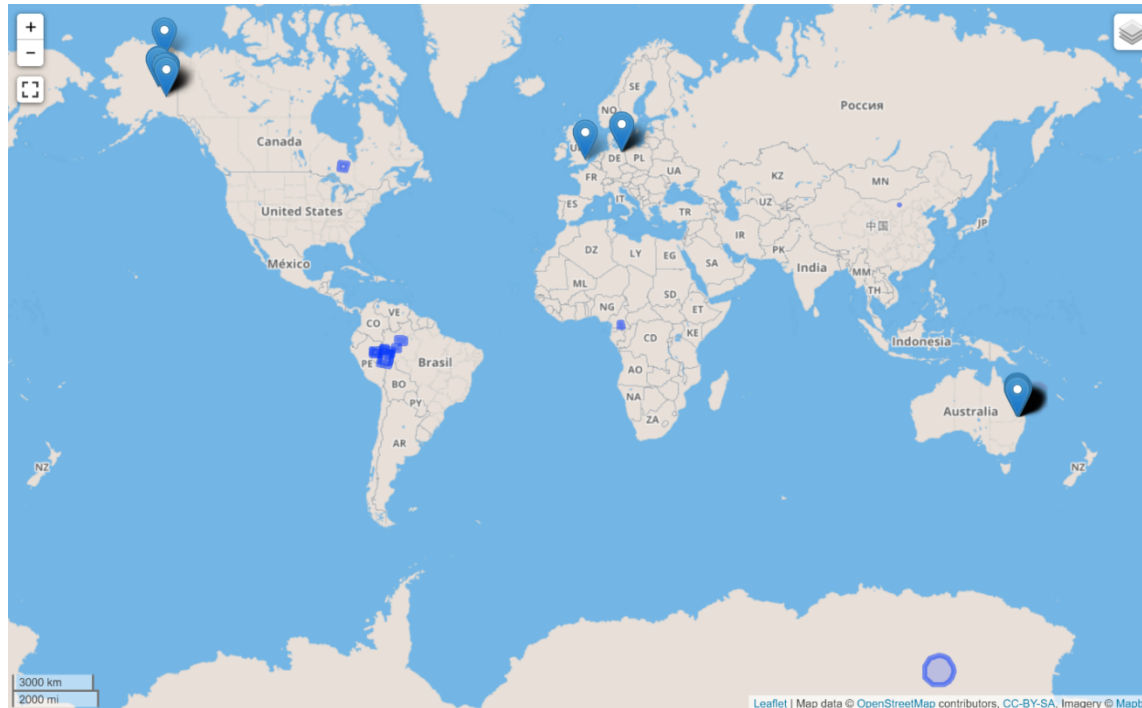
- Rosamond(USA), Argentina and Italy site

- Germany in CEOS webpage

- **Referred to KML file in <http://sarcv.ceos.org/targets/>**

- Alaska site was excluded because of little K5 access chance

- Distributed targets are also referred to evaluate K5 Doppler centroid



- **Brief Information About Image Acquisition from Argentina Site**

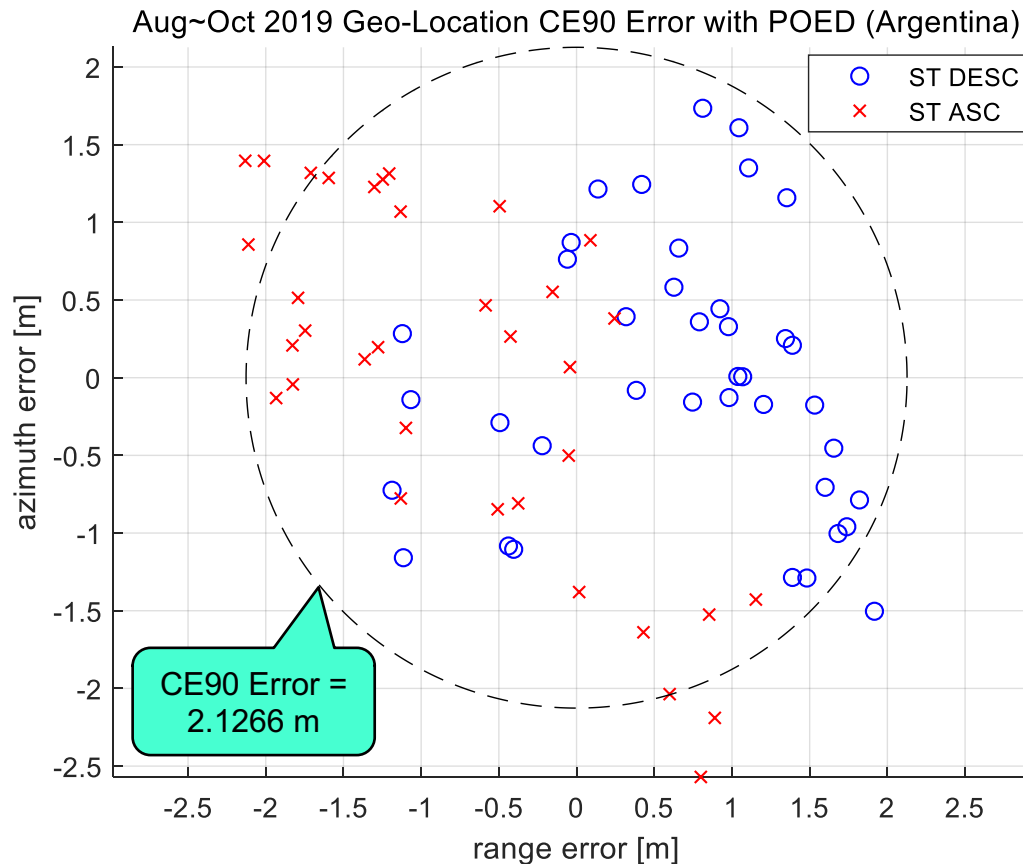
- Imaging time for measurement : from Aug to Oct 2019
- Number of CRs in the site : 14
- Summary of target information

	Aug	Sep	Oct
# of ASC images	4	3	0
# of DESC images	2	1	1
# of point targets included all images	38	28	8
Acquisition Mode	ES	ES	ES



Argentina CR image acquired in 23/Oct/2019

- **K5 Geolocation Measured from Argentina CR**
 - Geolocation of ST mode was measured
 - CE90 is about 2.1266 m and it is similar to Mongolia measurement

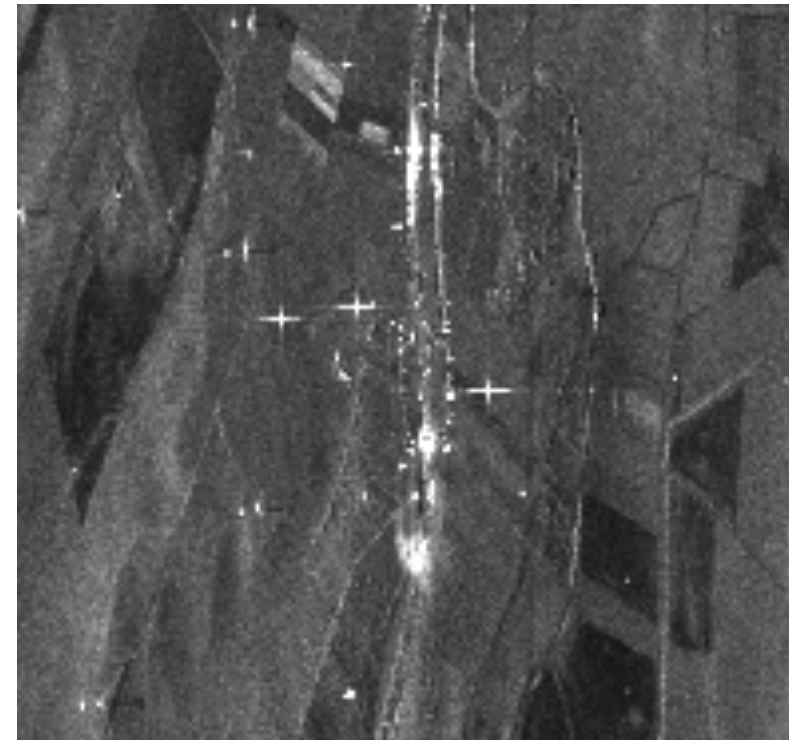


K5 geolocation from Argentina CR, Aug~Oct 2019

- **Brief Information About Image Acquisition from Italy Site**

- Imaging time for measurement : from Aug to Oct 2019
- Number of CRs in the site : 4 & 7
- Summary of target information

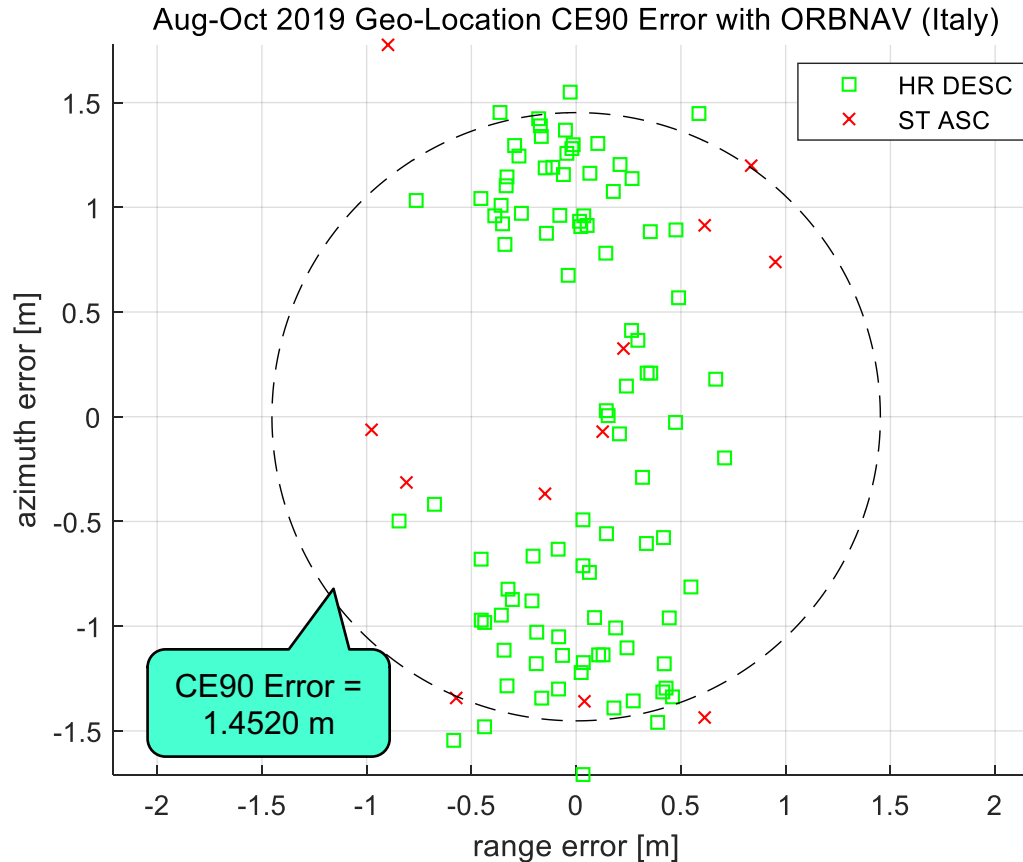
	Aug	Sep	Oct
# of ASC images	7	4	3
# of DESC images	5	6	4
# of point targets included all images	70	64	42
Acquisition Mode	HR & ST	HR & ST	HR & ST



Italy CR image acquired in 26/Oct/2019

- **K5 Geolocation Measured from Italy CR**

- Geolocation of ST & HR mode was measured
- CE90 is about 1.4520 m and it is similar to Mongolia measurement



K5 geolocation from Italy CR, Aug~Oct 2019

- **Brief Information About Image Acquisition from USA(Rosamond) Site**

- Imaging time for measurement : from Aug to Oct 2019
- Number of CRs in the site : 35
- Summary of target information

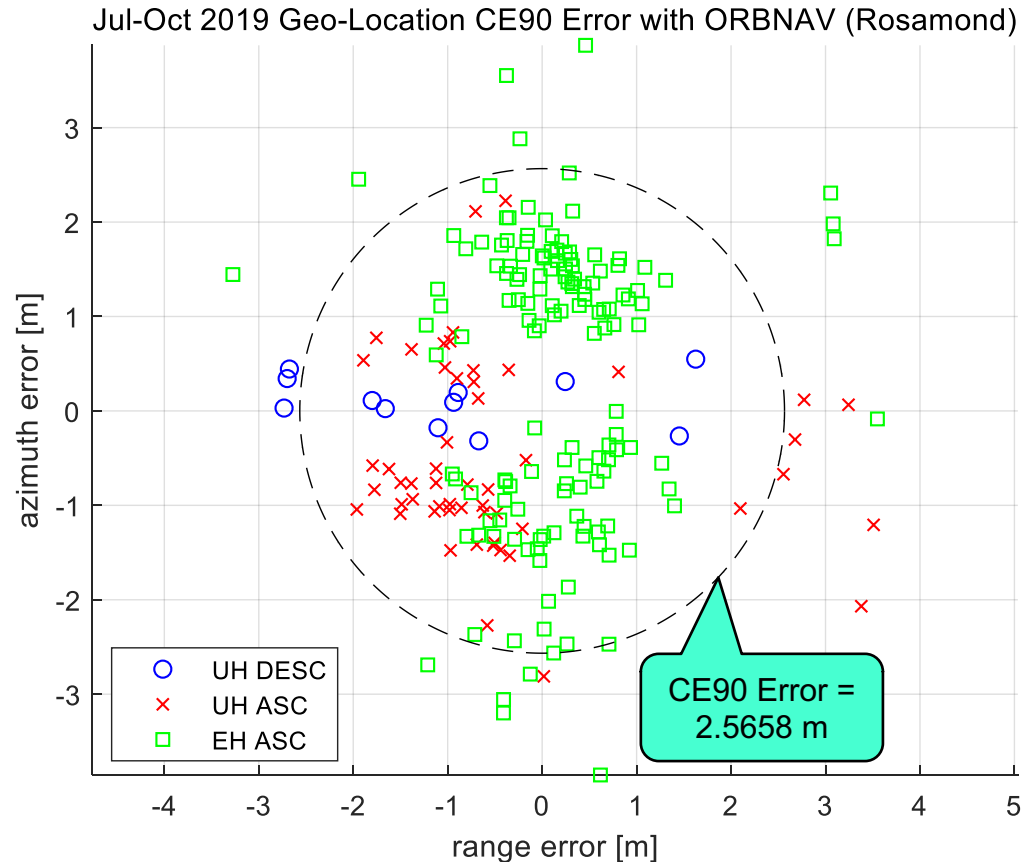
	Aug	Sep	Oct
# of ASC images	6	6	6
# of DESC images	2	3	2
# of point targets included all images	108	128	114
Acquisition Mode	EH & UH	EH & UH	EH & UH



Rosamond CR image acquired in 11/Oct/2019

- **K5 Geolocation Measured from USA(Rosamond) CR**

- Geolocation of UH & EH mode was measured
- CE90 is about 2.5658 m and it is similar to Mongolia measurement



K5 geolocation from USA(Rosamond) CR, Aug~Oct 2019

• Brief Information About Image Acquisition from Germany Site

- Imaging time for measurement : from Aug to Oct 2019
- Number of CRs in the site : 4
- Summary of target information

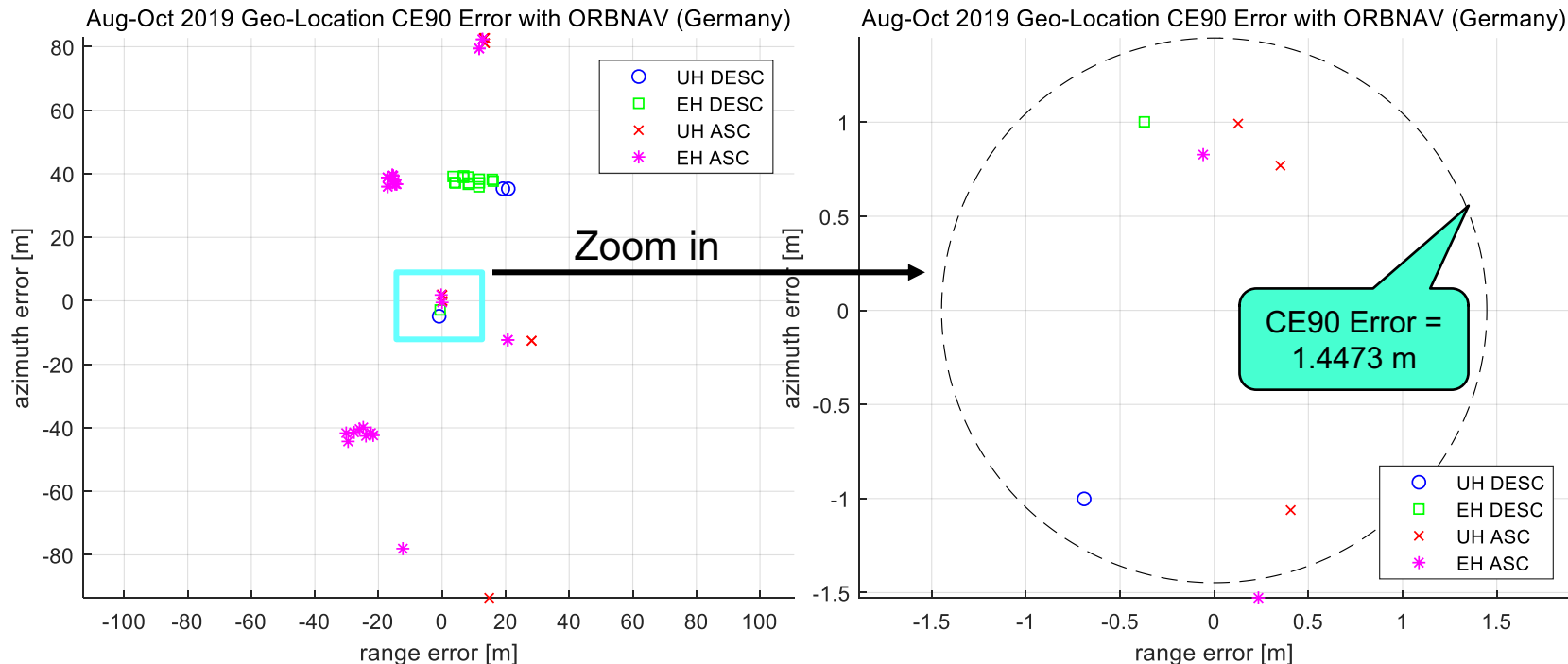
	Aug	Sep	Oct
# of ASC images	5	5	5
# of DESC images	5	7	5
# of point targets included all images	19	21	19
Acquisition Mode	EH & UH	EH & UH	EH & UH



Germany CR image acquired in 20/Oct/2019

• K5 Geolocation Measured from Germany CR

- Almost geolocation measurements showed very large CE90
- It is expected that CR elevation angles were mismatched with K5 incidence angle, and therefore SW detect other object as CR
- However, CE90 measured from exactly detected 7 points is about 1.4473 m and it is similar to Mongolia measurement



K5 geolocation from Germany CR, Aug~Oct 2019

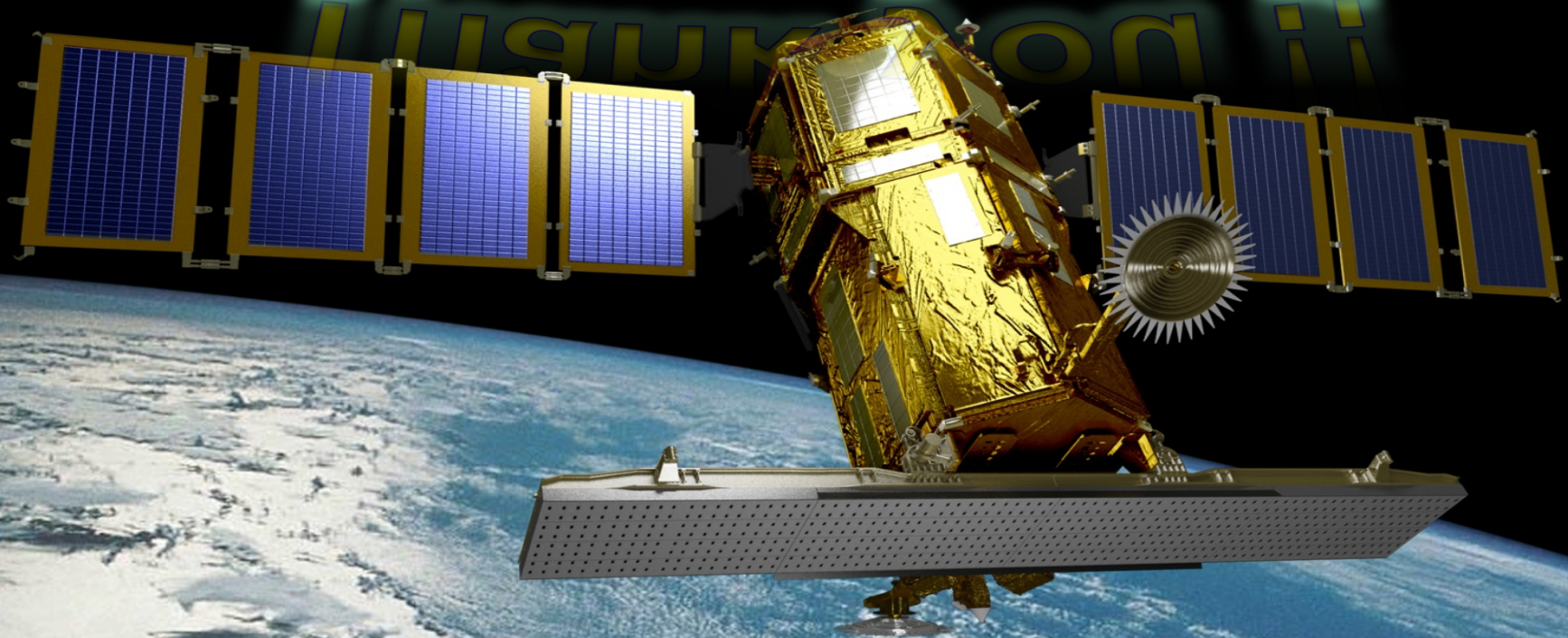


Conclusion



- **CE90 measured from Mongolia CR is good and maintained from 2018 well**
- **CE90 measured from CR sited recorded in CEOS DB is also good and similar as that measured from Mongolia site**
 - Some cases (such as Germany site) KARI SW cannot detect peak response of CR in the image because incidence angle of K5 beam is not matched with CR elevation angle

Thank you !!



전·천·후 영상레이더(SAR) 위성
다목적실용위성5호

