

Sea-Ice Remote Sensing



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Remote Sensing for Sea Ice Observation

- **Passive microwave Sensors**
 - Have observed sea ice distribution and provided daily sea ice concentration since 1970s
 - Can observe sea ice distribution regardless of weather conditions and sun altitudes
 - Large errors in summer season, especially in marginal ice zone
- **Satellite optic sensors**
 - reasonable detection of sea ice over wide area
 - limited by weather conditions and sun altitudes
 - not enough to observe small scale ice in melting season

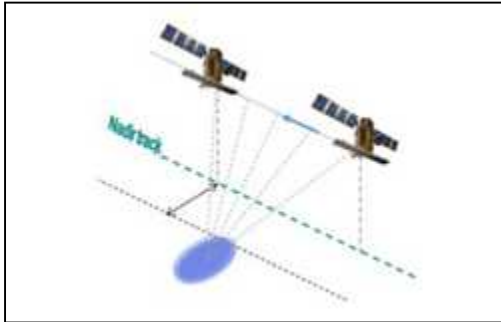
Remote Sensing for Sea Ice Observation

- **Synthetic Aperture Radar (SAR)**
 - all weather, day and night imaging
 - melt onset/freeze onset, sea ice characteristics
 - can detect small scale ice by present-day high-resolution SAR systems

- ***KOrea Multi-Purpose SATellite-5 (KOMPSAT-5)***
 - South Korea's first satellite equipped with SAR (X-band)
 - Launch - August 22, 2013
 - Provides high resolution images with various observation modes (various observing swaths)
 - capability of imaging twice a day

KOrea Multi-Purpose SATellite-5 (KOMPSAT-5)

- Imaging modes

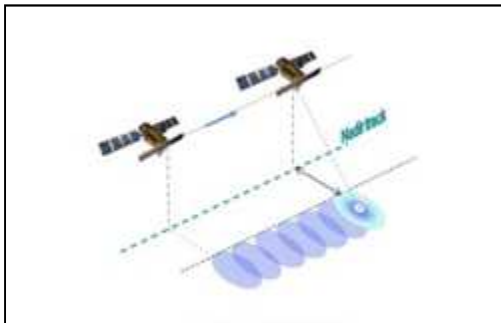


High-resolution mode over a small area (5 km swath)

High Resolution mode(HR) - 1.0 ~ 2.7 m GSD

Enhanced High Resolution mode(EH) - 1.0 ~ 2.0 m GSD, 5 km swath width

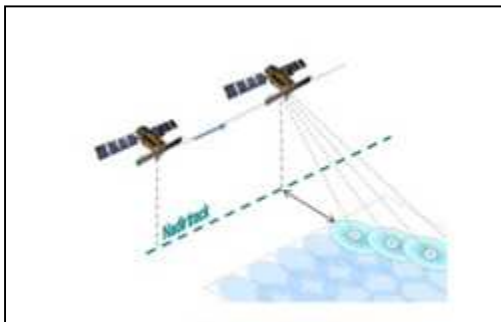
Ultra High Resolution mode(UH) - 0.85 ~ 2.0 m GSD, 5 km swath width



Medium-resolution mode over continuous swaths (30 km swath)

Standard mode(ST) - 3.0 ~ 7.9 m GSD

Enhanced Standard mode(ES) - 2.5 ~ 3.3 m GSD



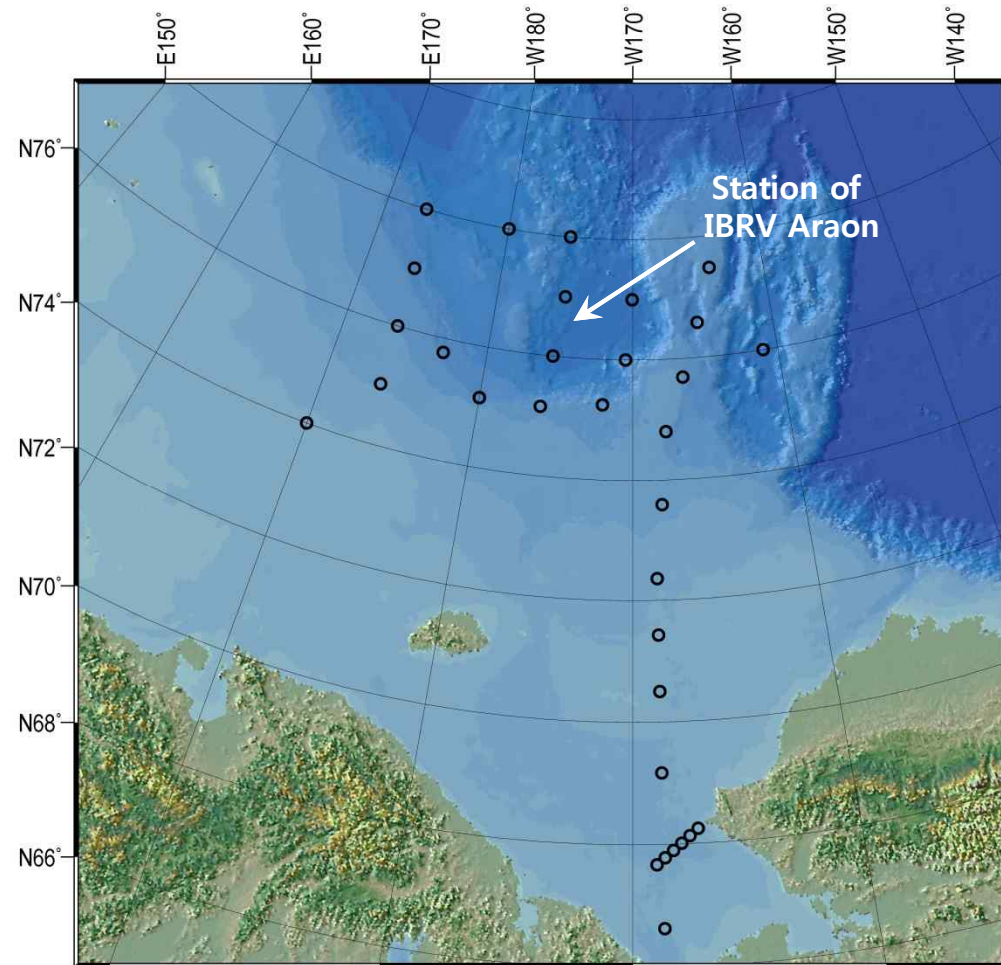
Low-resolution mode that creates extra-wide swaths by collecting short segments at different ranges (100 km swath)

Wide Swath mode(WS) - 20 m GSD (only for geocoded products)

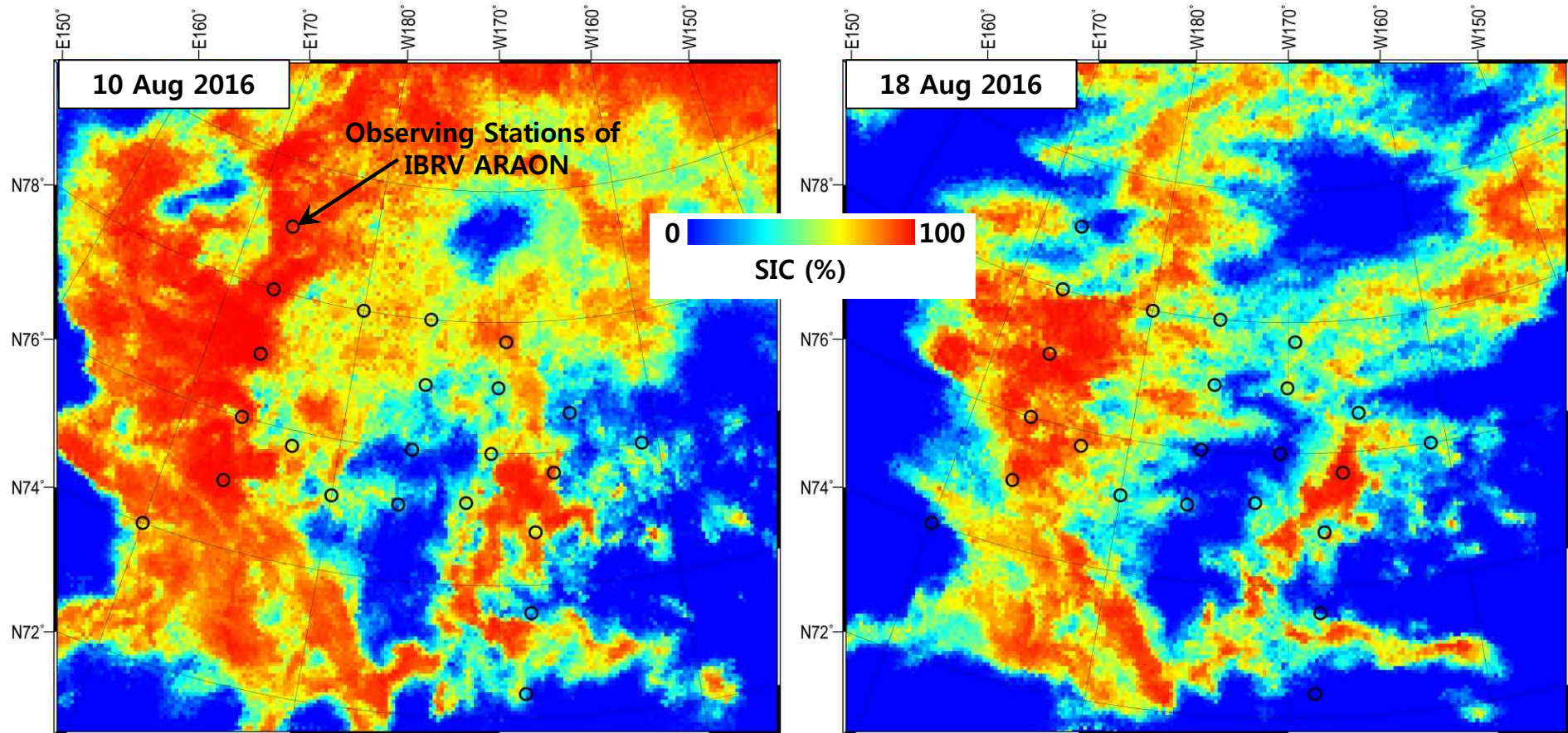
Enhanced Wide Swath mode(EW) - 6.25 m GSD

Arctic Expedition of IBRV ARAON in 2016

- ❑ Safe ocean expedition of IBRV ARAON in 2016
- ❑ Search ice sheet for ice camp
- ❑ KOMPSAT 5 for Sea Ice
- ❑ Satellite Data
 - AMSR2 (passive microwave) sea ice concentration
 - Terra/Aqua MODIS RGB True & False color images
 - KOMPSAT-5 EW SAR images

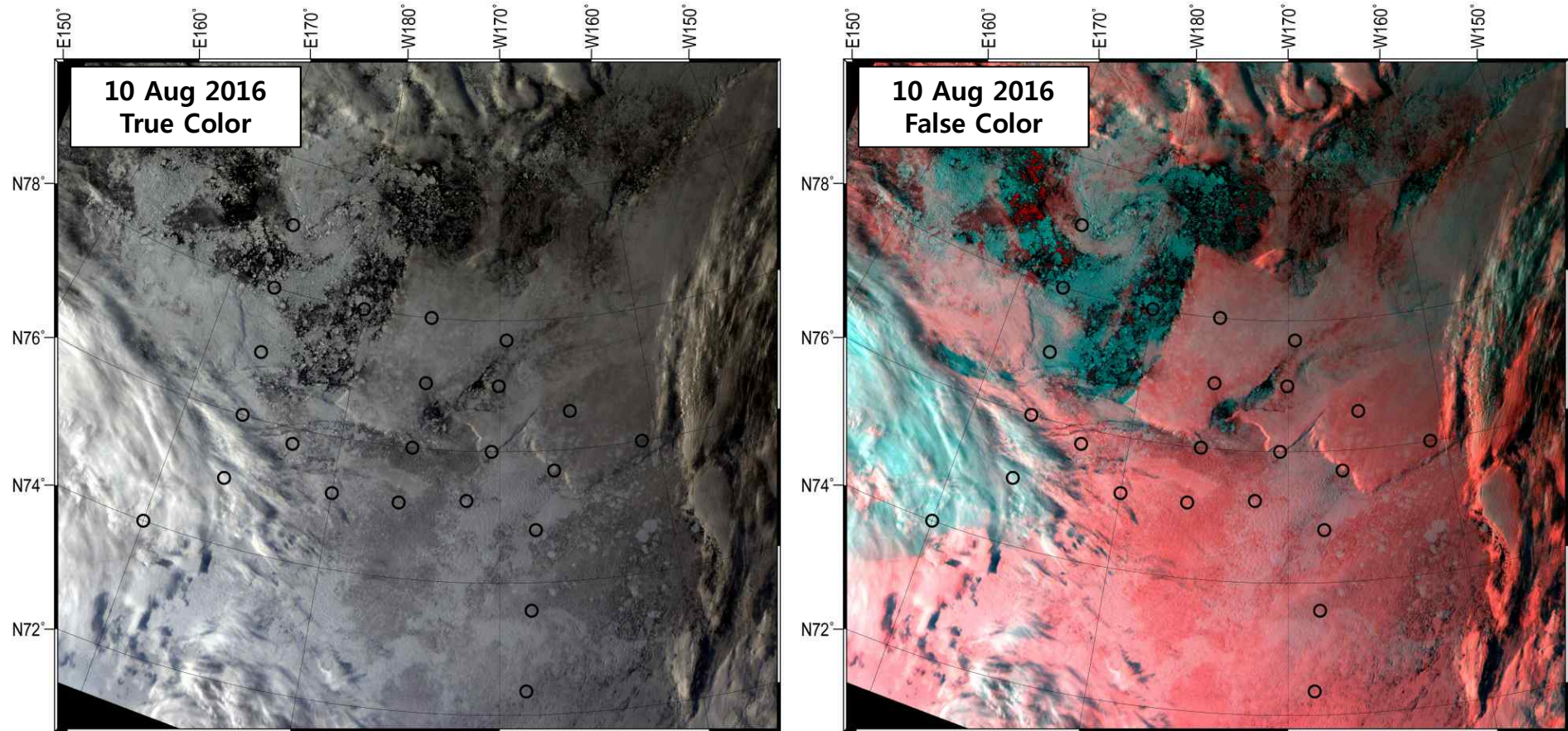


SIC for Arctic Expedition of IBRV ARAON in 2016



- ❑ AMSR2 sea ice concentration data
 - Daily products over the Arctic Ocean
 - Very low spatial resolution (12.5 km)
 - No information about ice size, shape, etc.

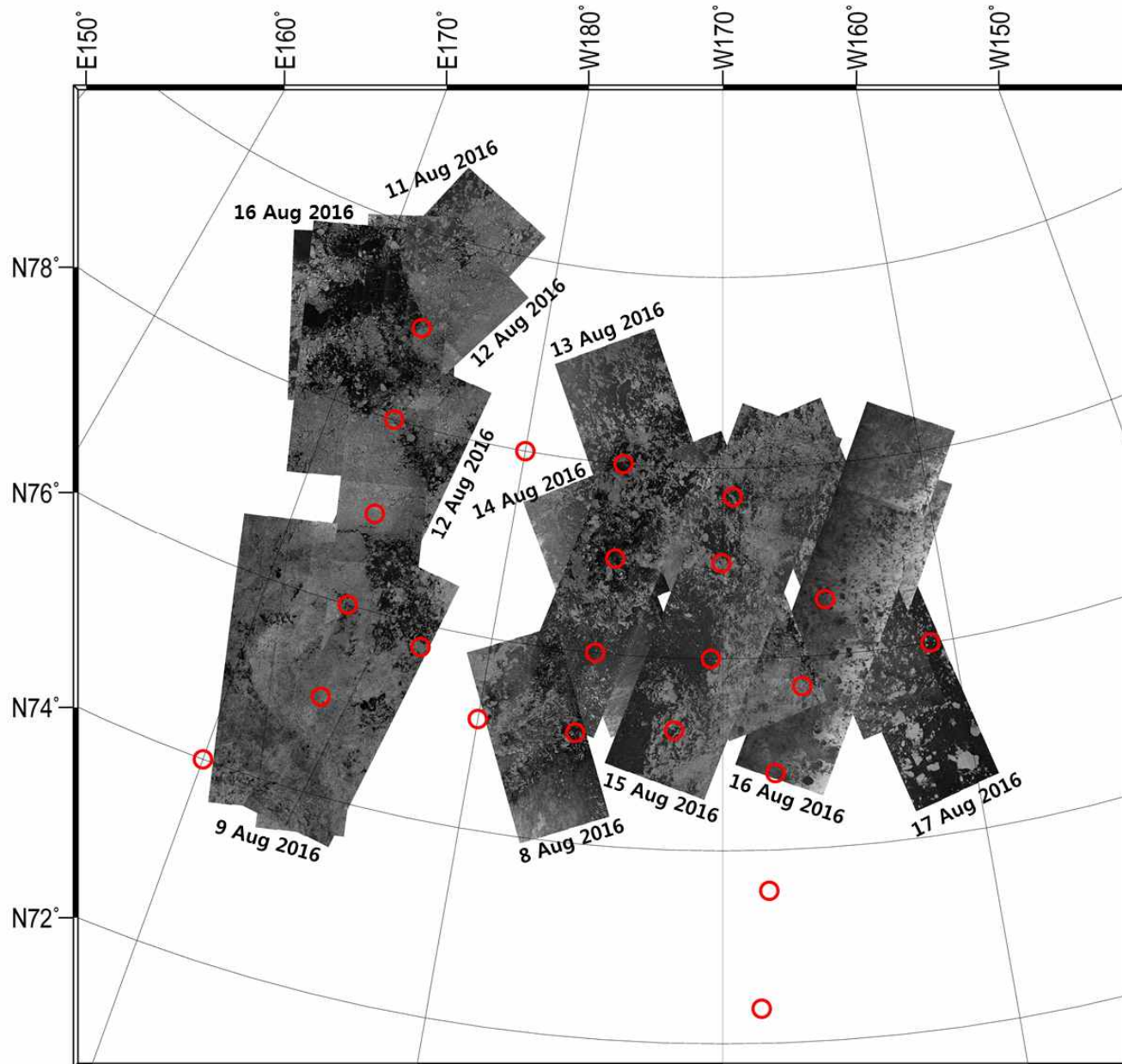
MODIS for Arctic Expedition of IBRV ARAON in 2016



☐ Terra/Aqua MODIS images

- Daily images over the expedition area
- Low spatial resolution (500 m ~ 1 km)
- Significantly influenced by cloud cover and sun altitudes

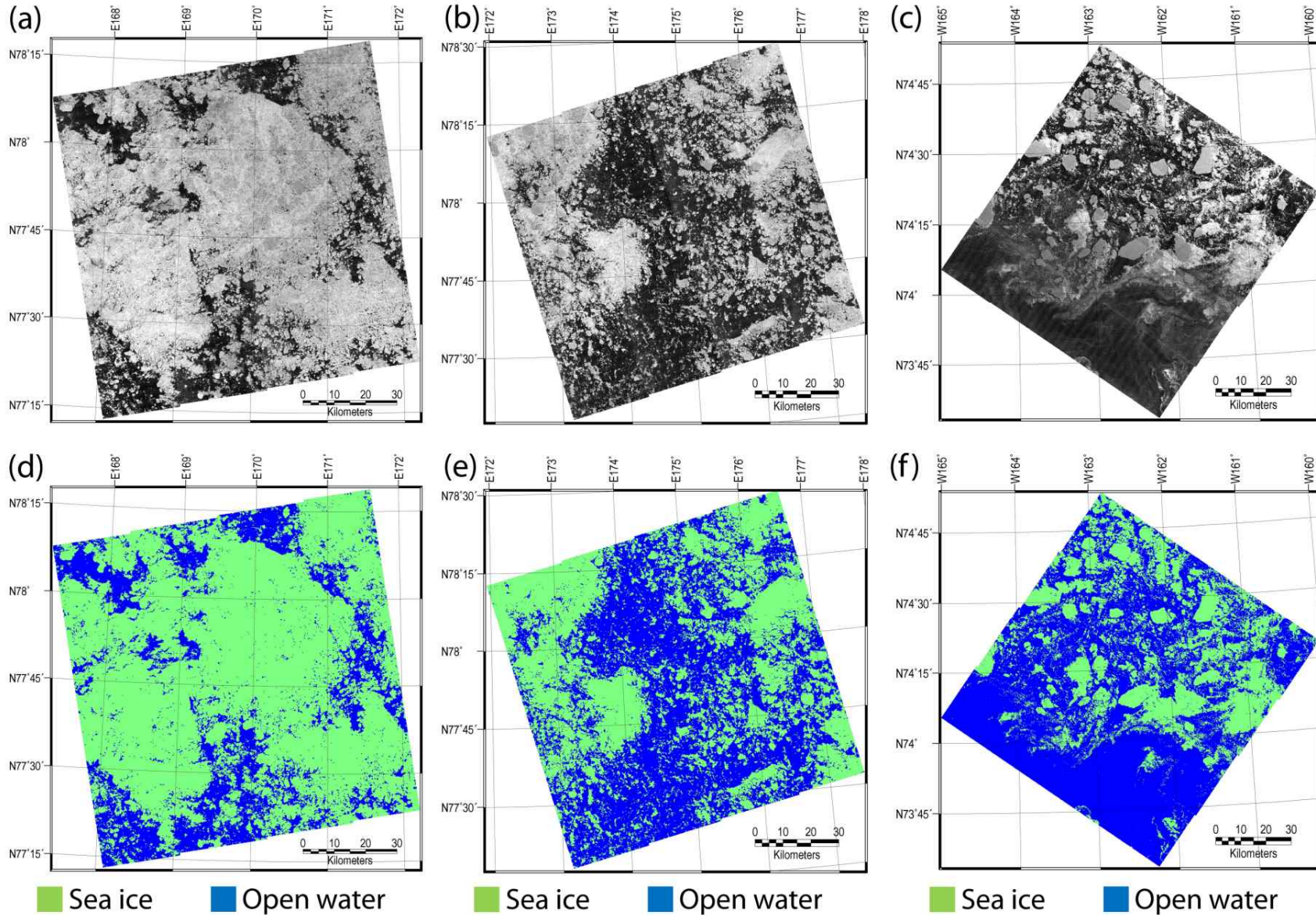
KOMPSAT-5 for Arctic Expedition of IBRV ARAON in 2016



□ KOMPSAT-5 SAR images

- 74 imgeries
- Delivery time : ~1.5 day
- Very high spatial resolution: 6.25 m/100km swath
- Independent on clouds and sun altitudes
- provide valuable information about sea ice

K-5 new product SAR-based high-resolution sea ice map



KOMPSAT-5 for sea ice

❑ Strong points

- High resolution SAR with X-band
 - Fine discrimination between features (e.g., sea ice vs. open water)
- Capability of imaging twice a day
 - Good for change detection in polar regions

❑ Weak points at this stage

- Incomplete post-launch radiometric calibration
 - Cannot provide radar backscattering coefficients from wide swath images