KOMPSATs for Arctic Sea

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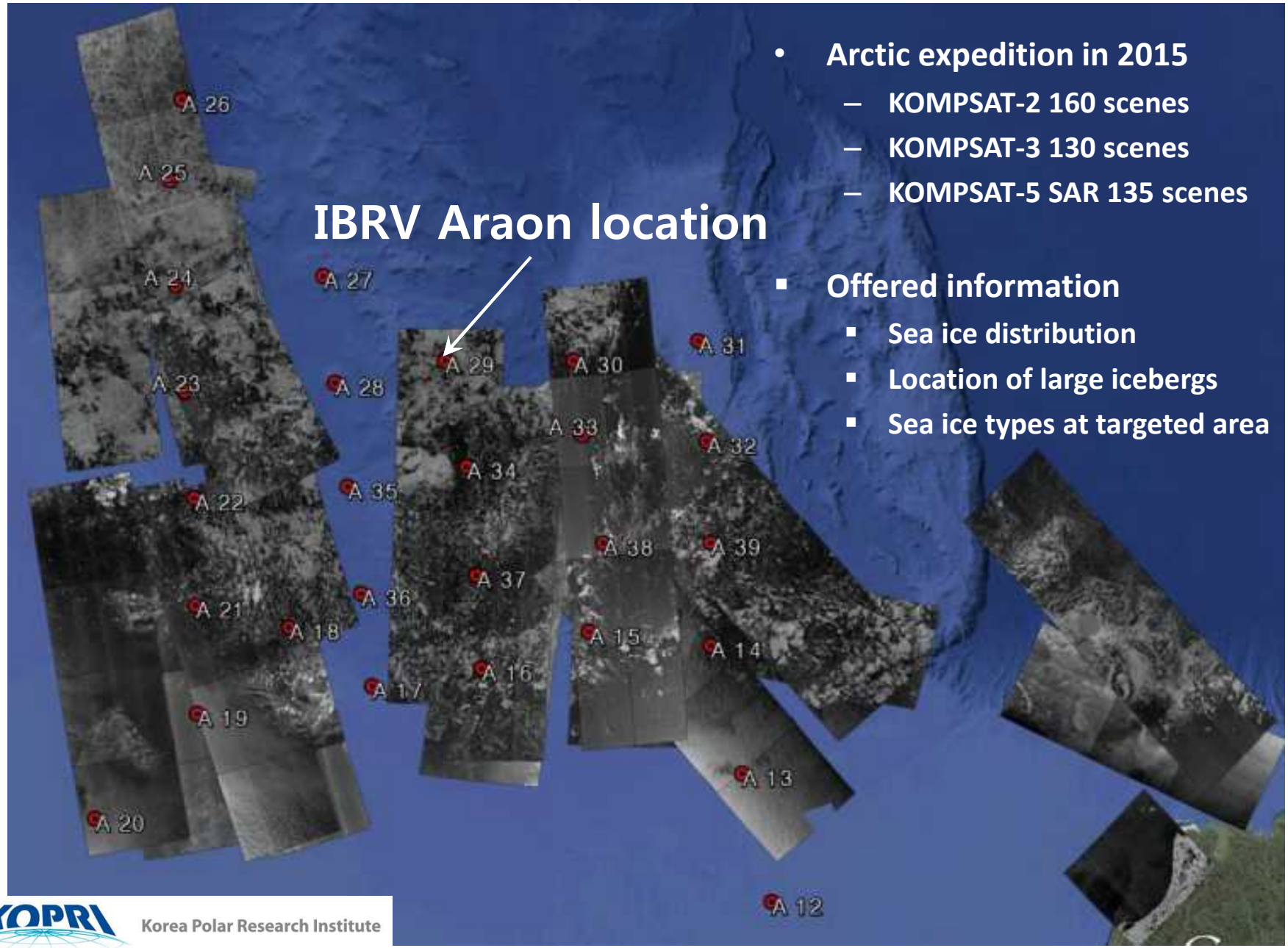
KOMPSAT series

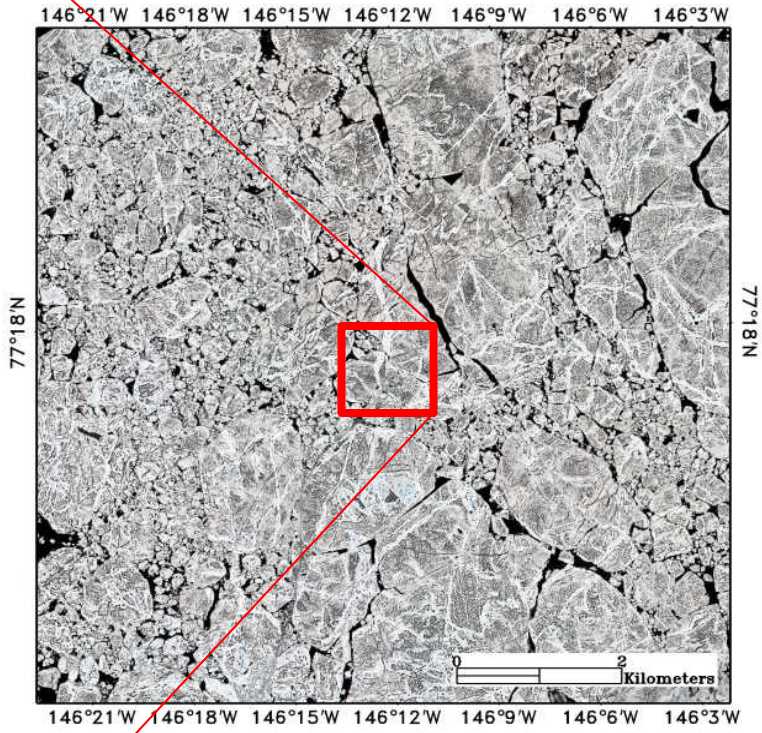
- **KOMPSAT-2**
  - Panchromatic band: 1.0 m
  - Multispectral 4 bands: 4.0 m
- **KOMPSAT-3 & 3A**
  - Panchromatic band: 0.7 m
  - Multispectral 4 bands: 2.8 m
- **KOMPSAT-5**
  - Synthetic aperture radar (X-band)
  - 1 m at HR, 3 m at ST and 20 m at WS mode

KOMPSATs over Arctic Sea expedition of IBRV



- Arctic expedition in 2015
  - KOMPSAT-2 160 scenes
  - KOMPSAT-3 130 scenes
  - KOMPSAT-5 SAR 135 scenes
- Offered information
  - Sea ice distribution
  - Location of large icebergs
  - Sea ice types at targeted area

KOPRI 2014 Ice Camp & MIZ Project



4 KOMPSAT-3 optic images (KOPRI) and 18 TerraSAR-X radar images (MIZ) were acquired during the mission period as a research collaboration of KOPRI and MIZ team.

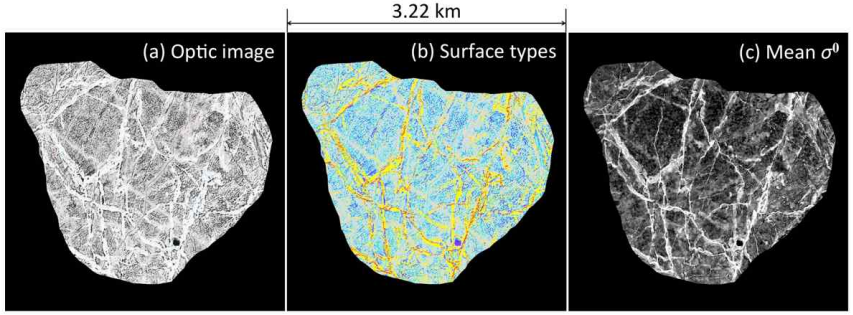
International Collaboration (KOPRI-MIZ/ONR) 2014 Summer

Table 1. Specifications of the sensors and data used in this study.

Satellite Name	Sensor Type	Band	Acquisition Date	Number of Scenes	Spatial Resolution
Landsat-8	Multispectral (MS)	11 channels in VNIR-TIR (0.43-2.3, 10.6-12.5 μm)	17 August 2014	1	30 m (MS) 15 m (PAN)
KOMPSAT-3	Multispectral (MS)	5 channels in VNIR (0.45-0.90 μm)	14 August 2014	1	2.8 m (MS) 0.7 m (PAN)
TerraSAR-X	Synthetic Aperture Radar (SAR)	1 channel in X-band (9.65 GHz), HH polarization	19 August – 3 October 2014	15	3 m

MS: multispectral band
PAN: panchromatic band
VNIR: visible and near infrared
TIR: thermal infrared

Figure 4. Target ice floe analyzed in this study. (a) Red-green-blue (RGB) composite optical image; (b) Five surface class types: pressure ridge (red), white ice (yellow), gray ice (white), blue melt pond (cyan), and dark melt pond (purple); (c) Temporal mean of radar backscattering coefficient (σ^0). Brighter tones correspond to higher back-scatterings.



Radar backscattering changes in Arctic sea ice from late summer to early autumn observed by space-borne X-band HH-polarization SAR, Remote Sensing Letters(2016) April (in press)

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Figure 2. Data-processing workflow of this study

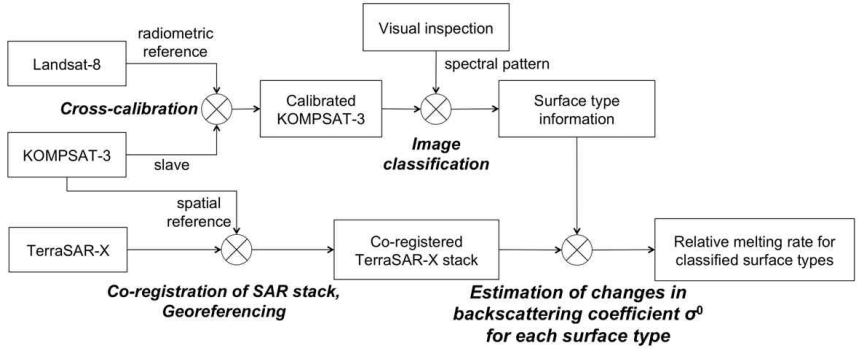
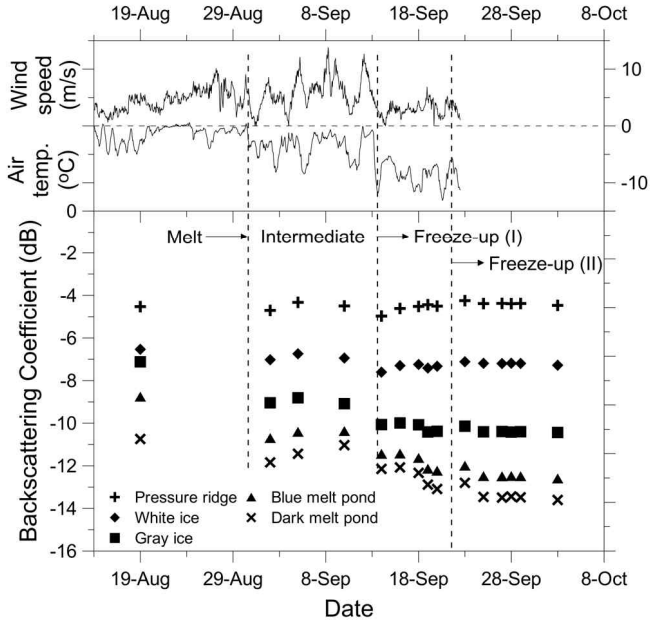
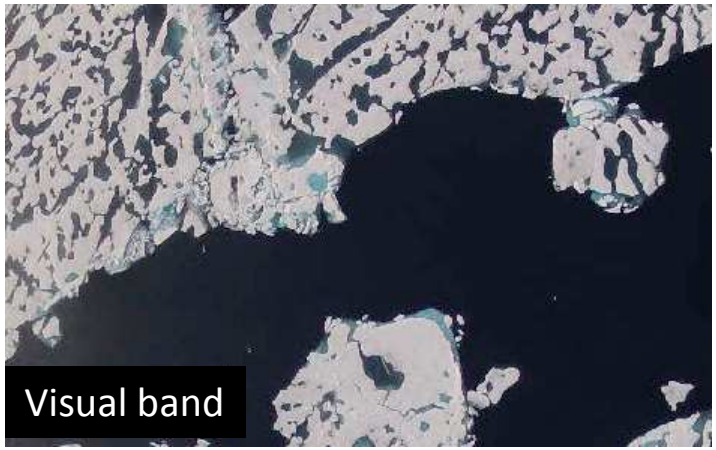
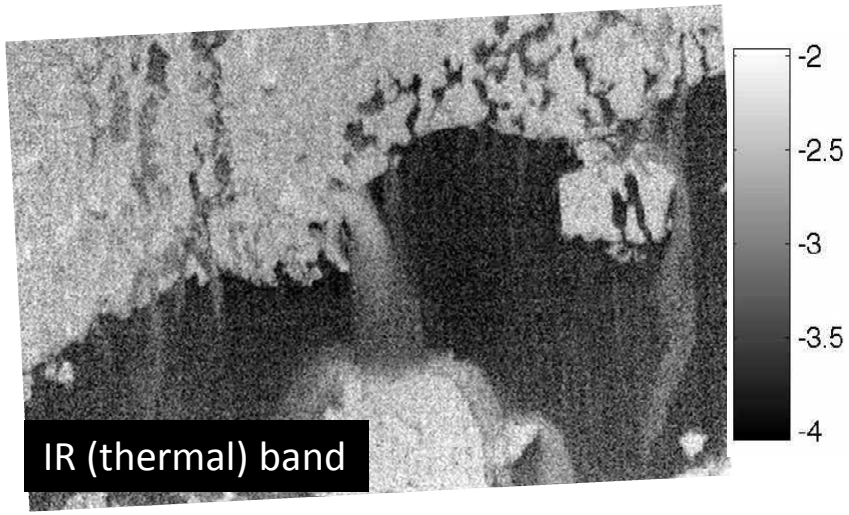


Figure 5. Changes in the class mean backscattering coefficient of TerraSAR-X observations between August 19th and October 3rd, 2014. The wind speed and air temperature were measured by an AWS. The observation period can be subdivided into four phases based on the change patterns.



Thermal response of Sea Ice and Melt Pond

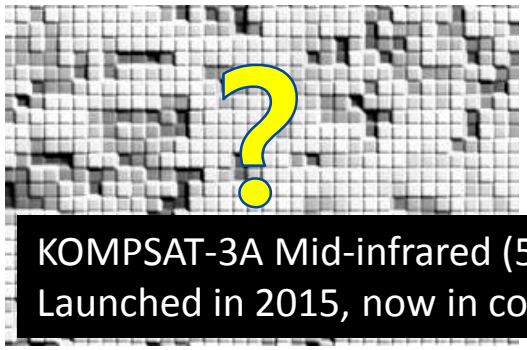




< US Navy report, 2013 >

KOMPSAT-3 Multi-spectral (2.8m)
Launched in 2012, now in operation

Reduced spatial Resolution



(Relative) Temperature information

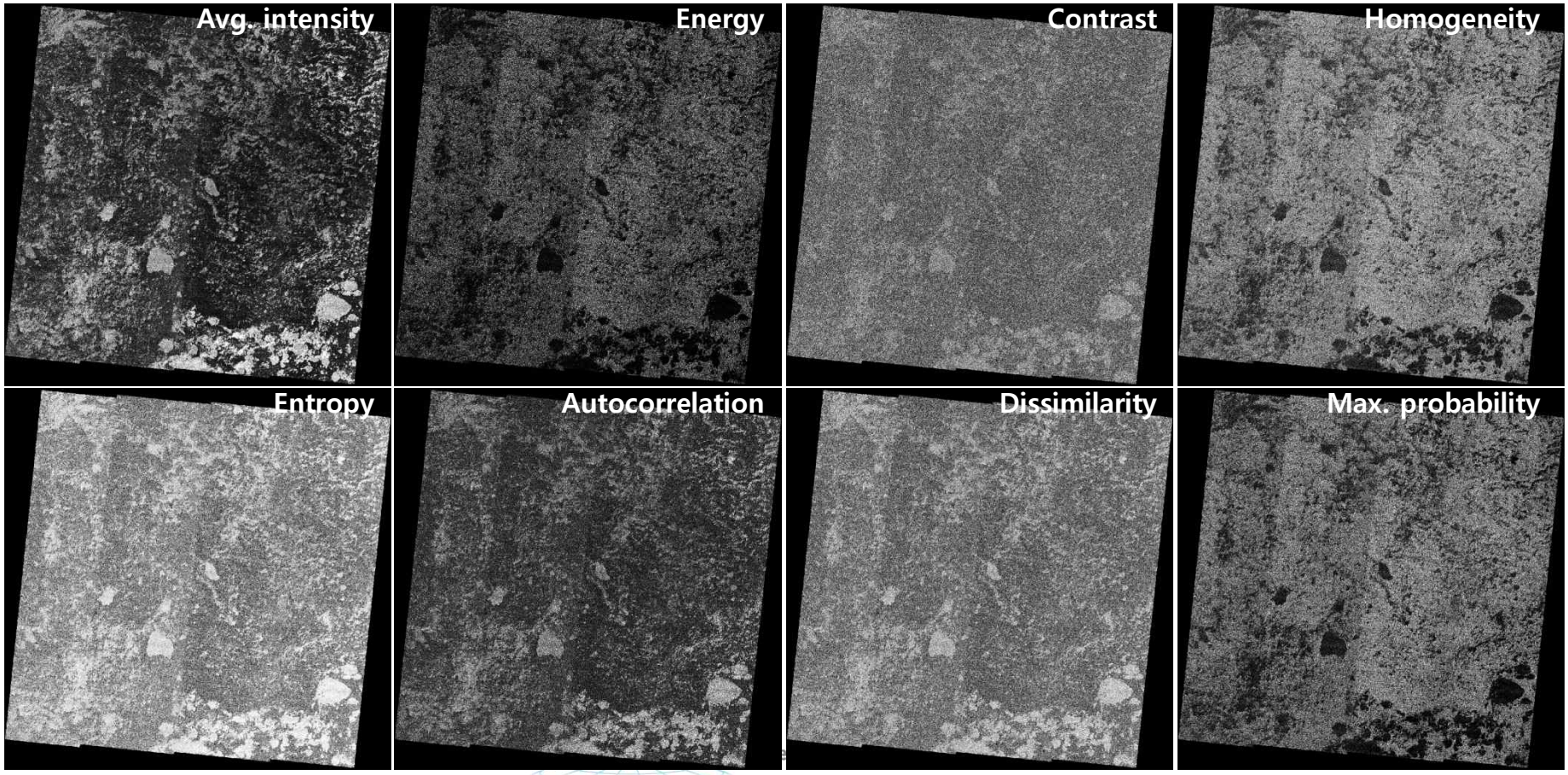
KOMPSAT-3A Mid-infrared (5.5m)
Launched in 2015, now in commissioning phase

Discrimination of pond types (open/closed) and evolution stage by sensing temperature difference (related to pond bottom structure)

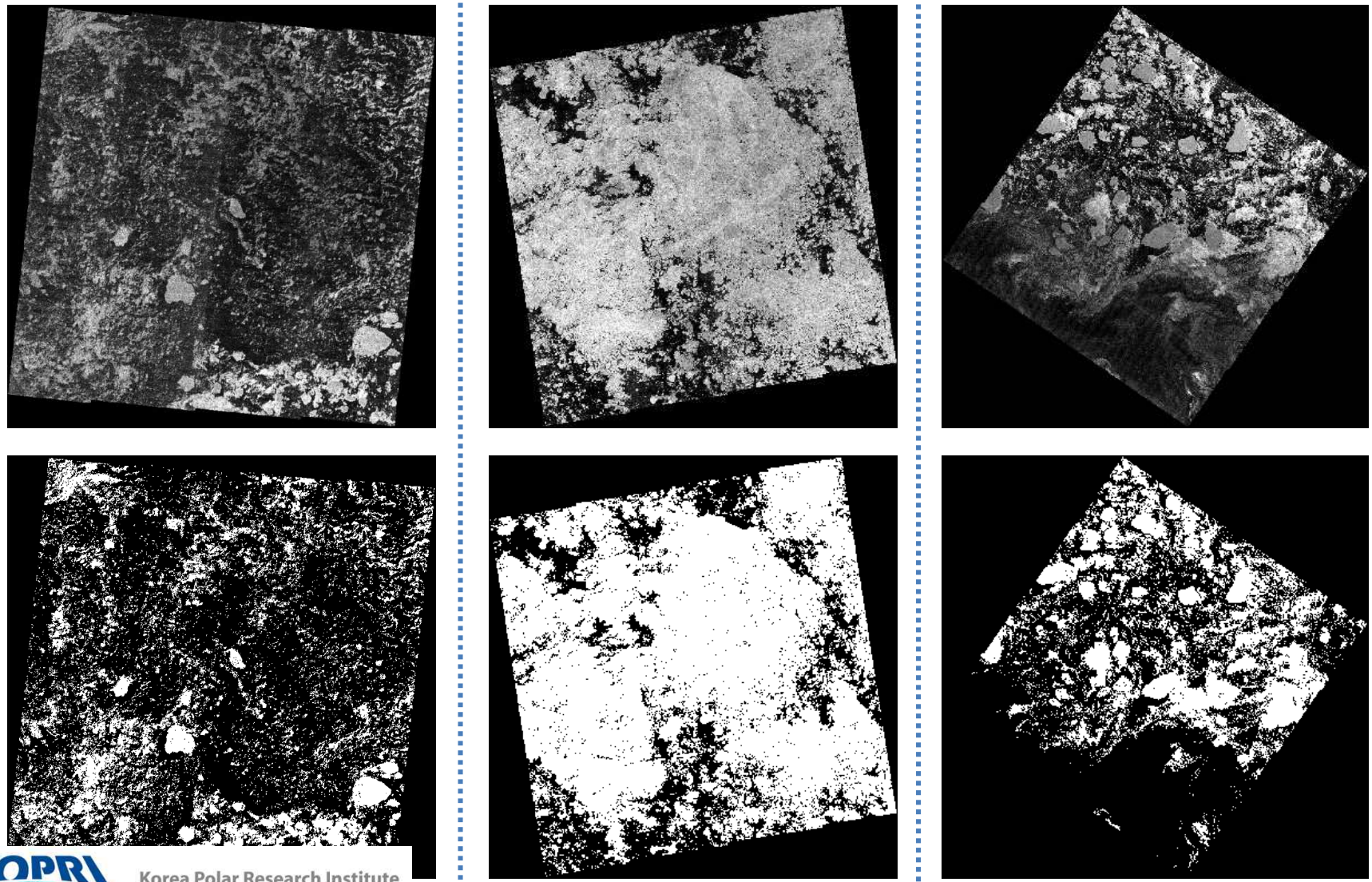
Sea Ice/Open Water Mapping using KOMPSAT-5 SAR

- **Classification of sea ice and open water from KOMPSAT-5 SAR textures**
  - **machine learning approach (random forest) was used**

Examples of KOMPSAT-5 SAR textures



Examples of KOMPSAT-5 sea ice map



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Sea ice mapping by KOMPSAT-5

- Developing sea ice mapping model for the *Polar Ocean*
- Classifying sea ice types from KOMPSAT-5 SAR data (year-long observation)
- Continuous updating sea ice mapping model using newly acquired KOMPSAT-5 SAR images

Thank you for your attention.