The KMA Operational and Future Satellite Program

19 September 2022

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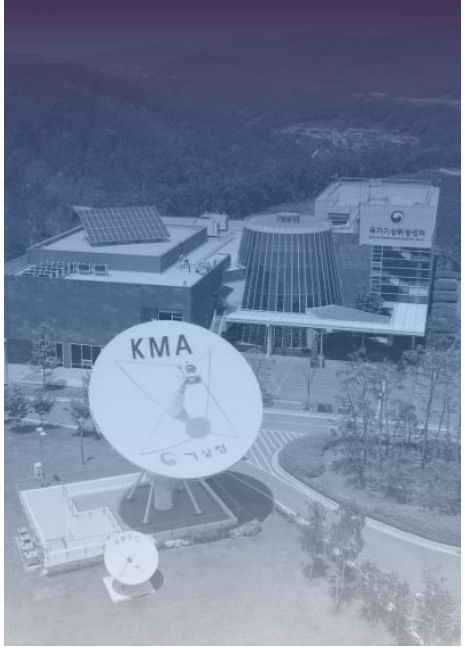
KMA/NMSC

Korea Meteorological Administration (KMA)
National Meteorological Satellite Center (NMSC)



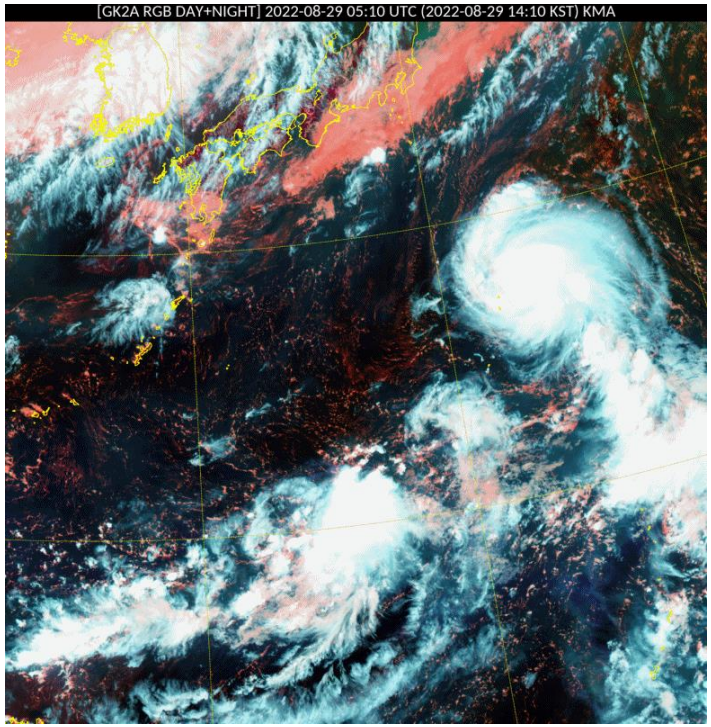
Contents

Application of AI Technique to GK2A Satellite Images

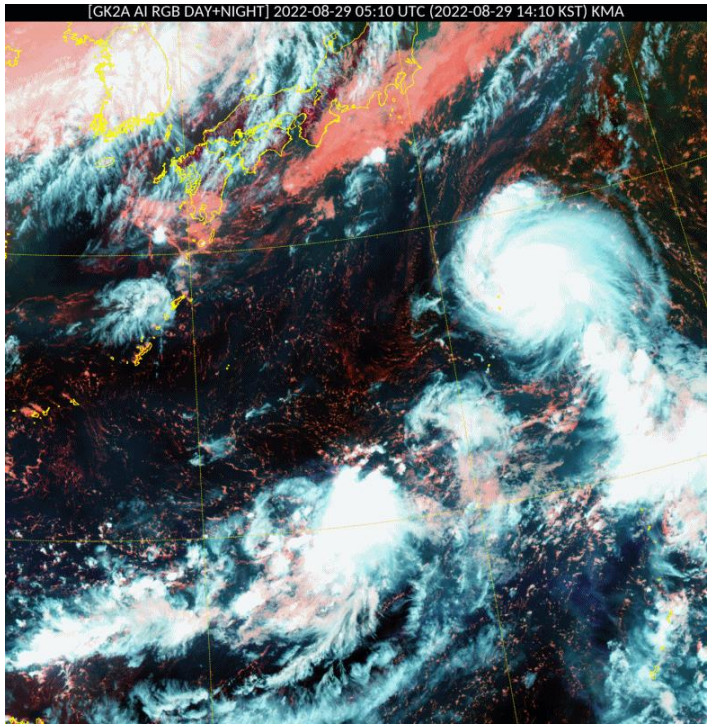
❖ **AI-based day-night RGB simulated images** with GK2A observation data **(TY 2022-11 Hinnamnor)**

0510 UTC 29 Aug.~ 0110 UTC 31 Aug. 2022

Operational day-night RGB images

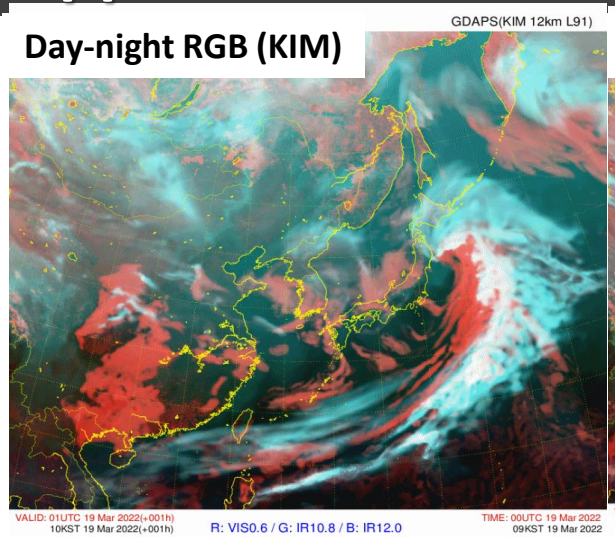


AI simulated day-night RGB images

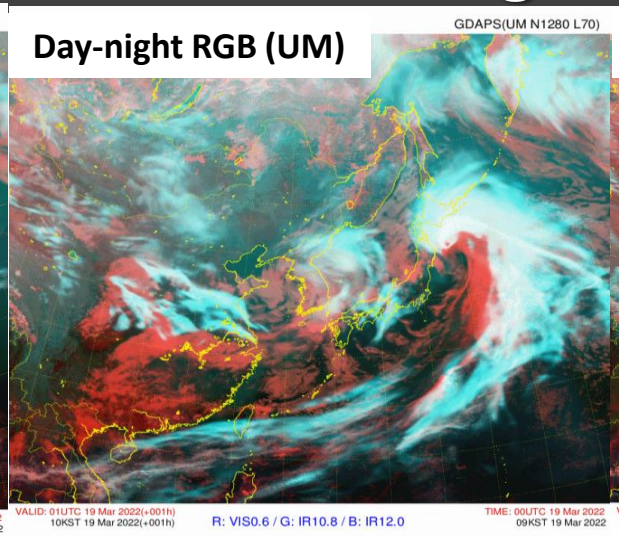


Application of Simulated GK2A images (2022. 03. 19)

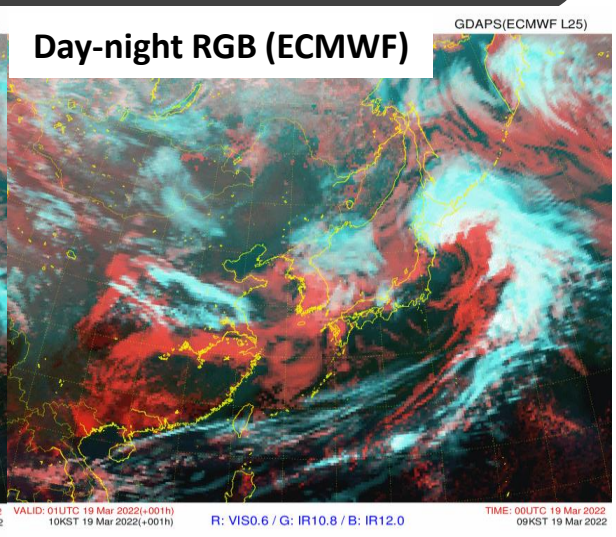
Day-night RGB (KIM)



Day-night RGB (UM)



Day-night RGB (ECMWF)

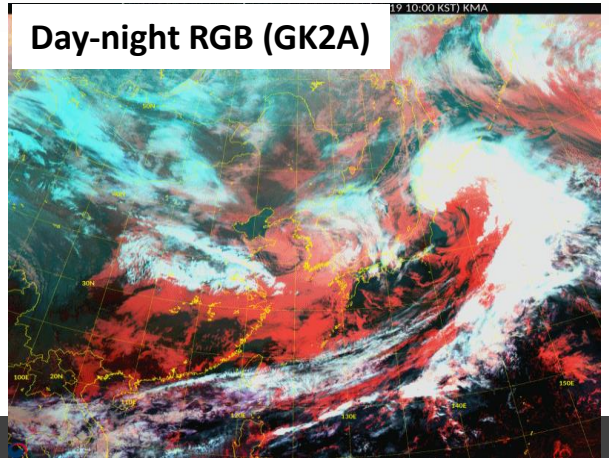


19 March 2022 00:00 UTC

Forecast: +01h~+18h

Korea Integrated Model (KIM) Unified Model (UM) and ECMWF variables are used as input for RTTOV v13 to estimate radiance

Day-night RGB (GK2A)

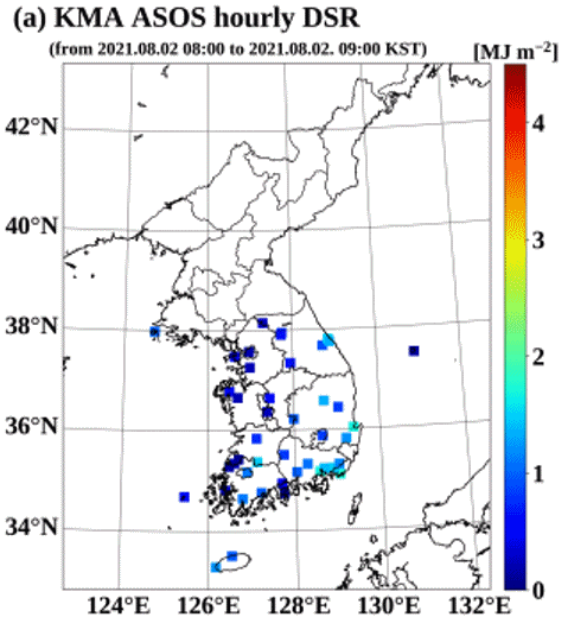


- To be helpful for forecaster to decide the now-casting and very short-range forecasting
- NWP-based night-time VI images useful for the low-cloud analysis

GK2A Surface Solar Irradiation (SSI) for Climate Application

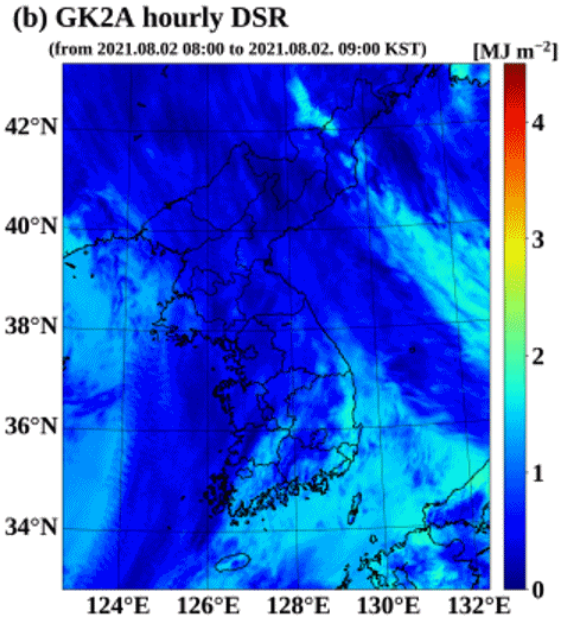
Ground based SSI measurement

- Averaged spatial resolution : about **67 km**

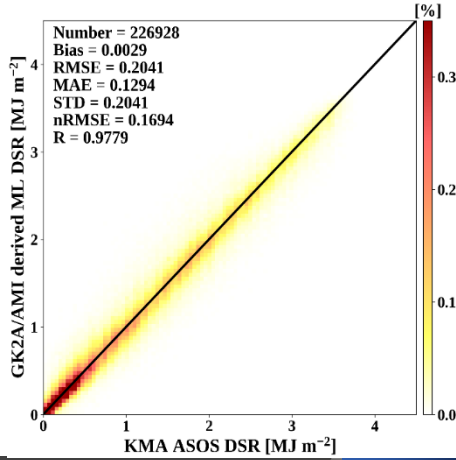


AI generated 1hr accumulated SSI

- Spatial resolution : **2 km x 2 km**



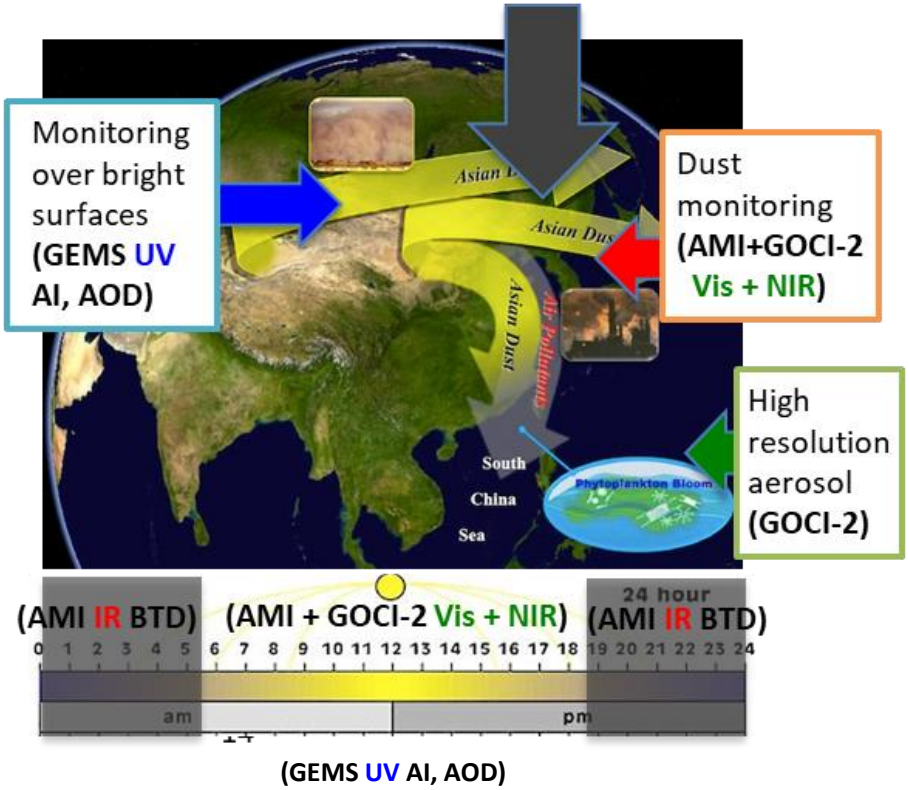
* Method: Convolutional Neural Network (CNN)



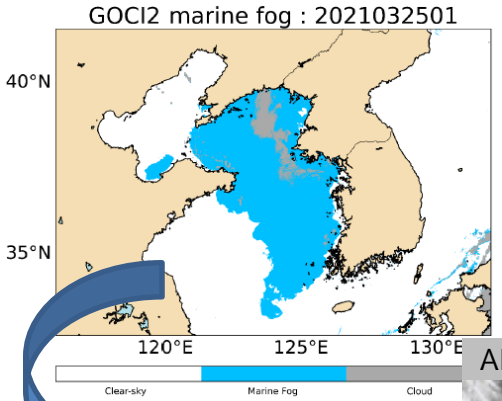
Collaborative Area for Fusion between GK2A and GK2B

- **GK2A/AMI, GK2B/GOCI-II & GEMS**

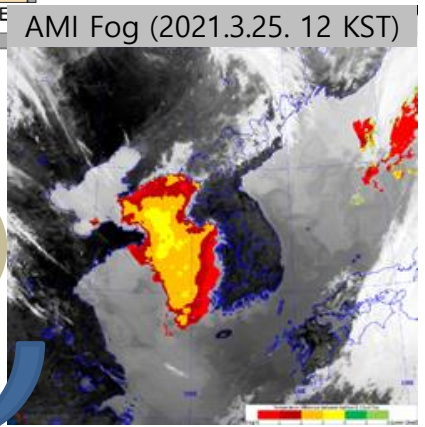
Strengthening aerosol monitoring



Sea Fog detection in high resolution



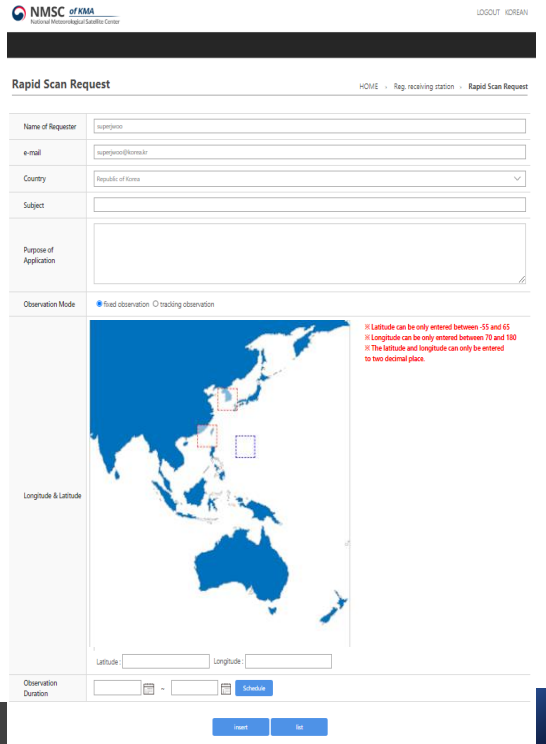
Collaborative research to provide high quality product



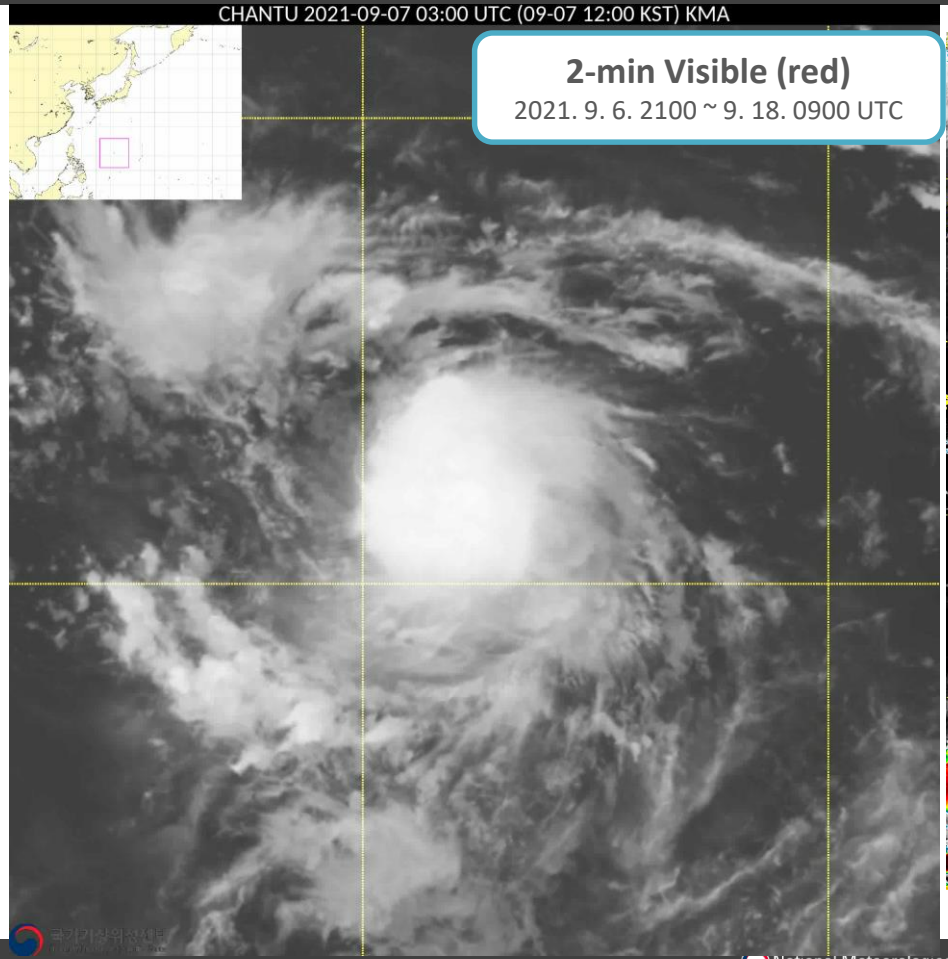
GK2A AMI Rapid Scan(2-min) Observation Service

KMA provides targeted area observation services to users of the Asia-Pacific region

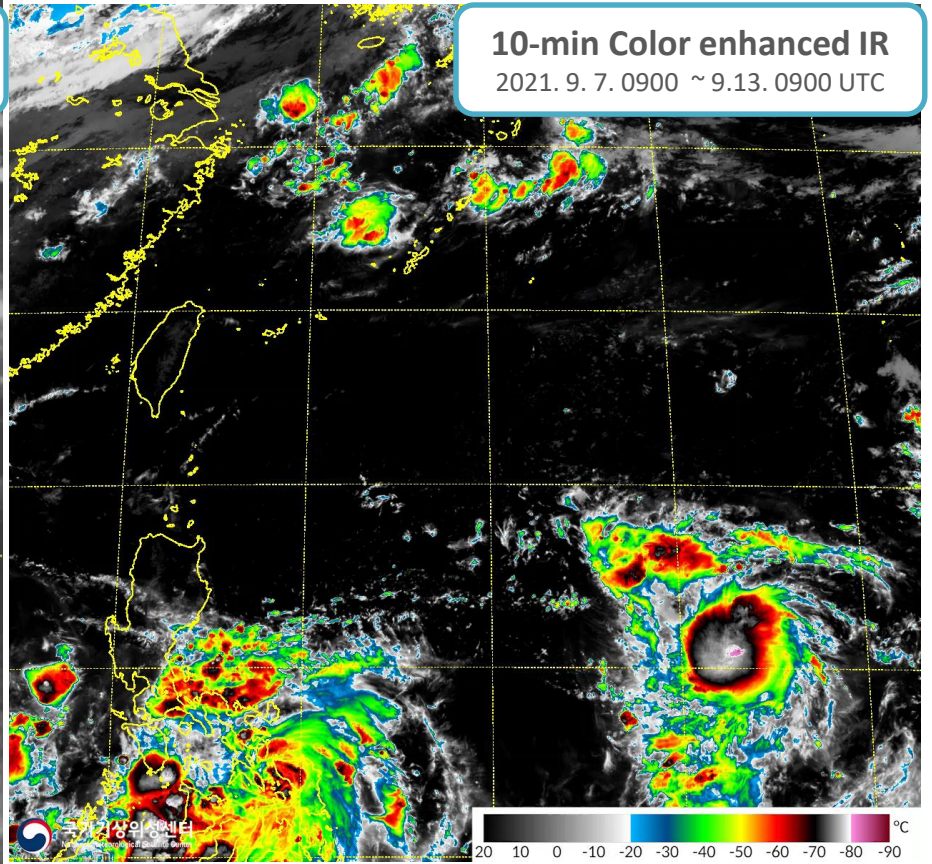
- NMHSs in RA-II and RA-V regions are able to register and request for their own purpose of GK2A observations on the KMA/NMSC website (http://datasvc.nmsc.kma.go.kr/datasvc/html/special/specialReqMain.do
- Currently, 35 domestic/international requests since the commencement of the service
- Targets have included tropical cyclones in the South Pacific, extreme weather and wildfires in Australia, and volcanic activity in Indonesia
- Now, 7 countries had completed preparations for request submission
- In 2022, KMA has improved and service utilization manuals will be provided so that users can conveniently use the Rapid Scan service



GK2A Target Observation (2021 Chantu)

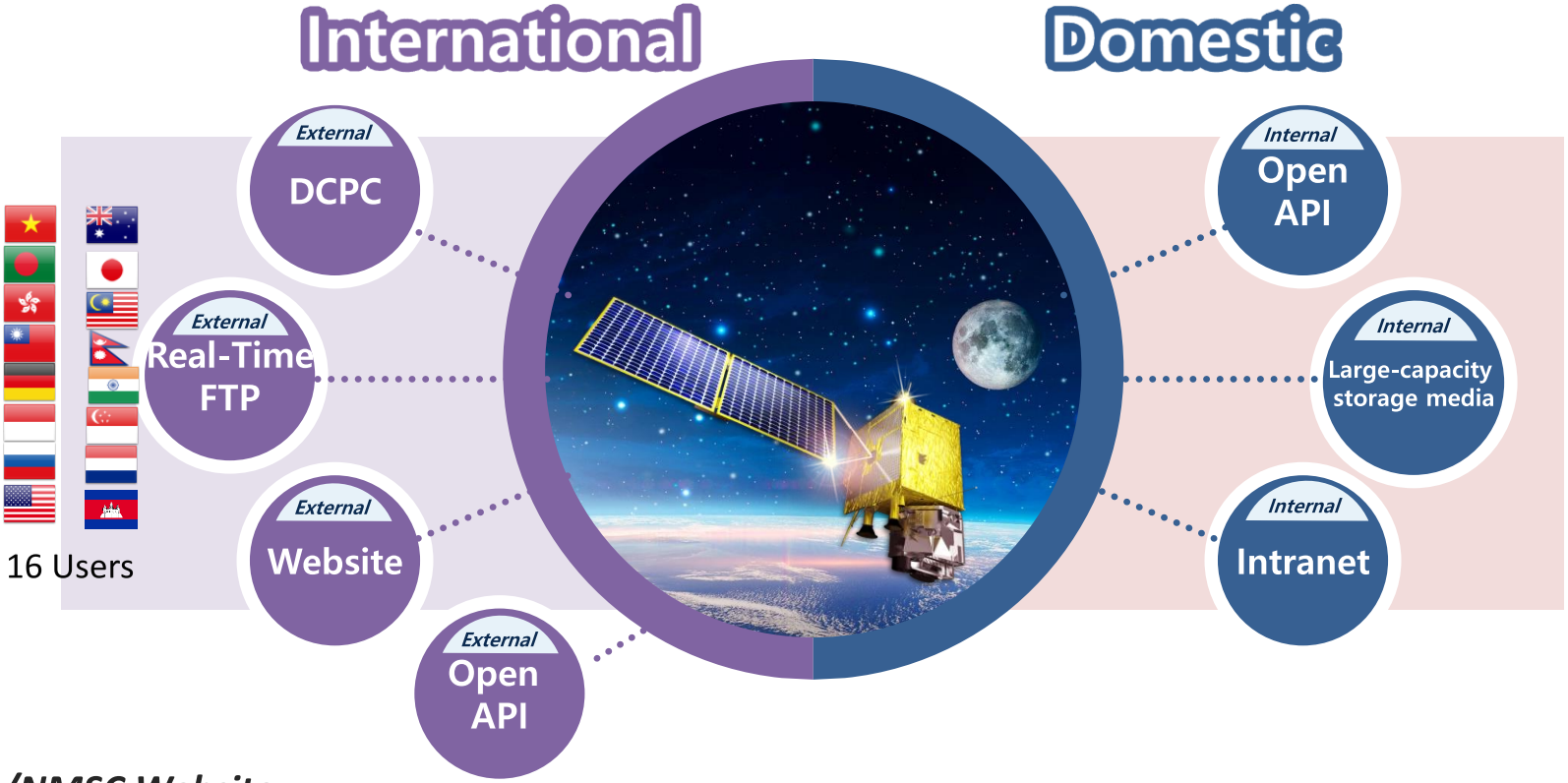


2-min Visible (red)
2021. 9. 6. 2100 ~ 9. 18. 0900 UTC



10-min Color enhanced IR
2021. 9. 7. 0900 ~ 9.13. 0900 UTC

GK2A Data Services via Landline



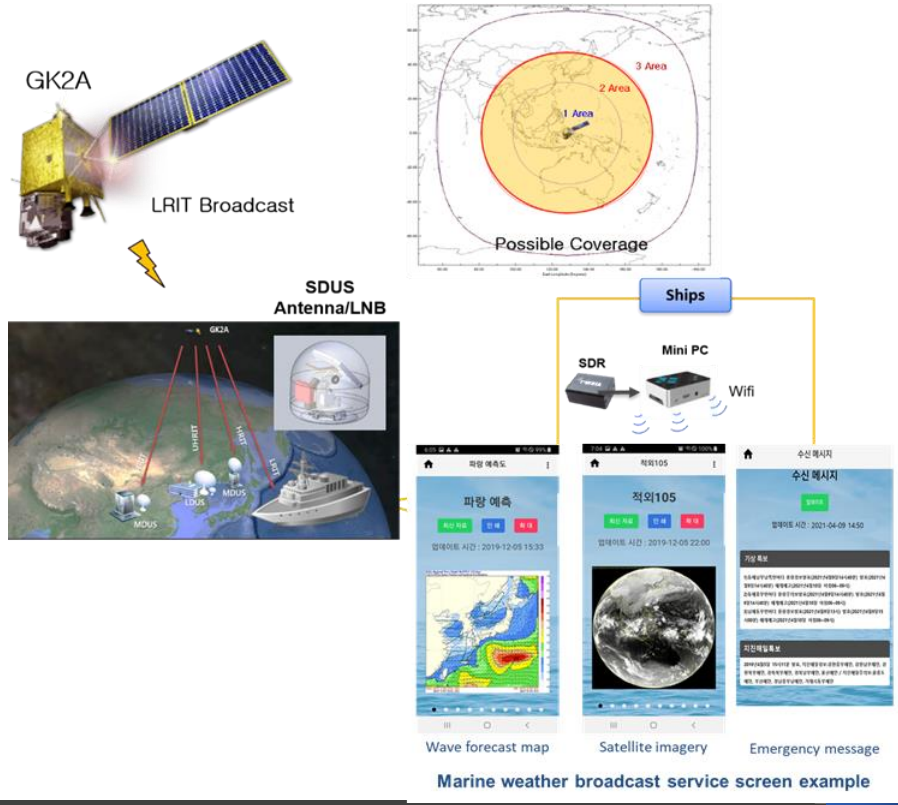
KMA/NMSC Website

http://nmsc.kma.go.kr/enhome/html/main/main.do

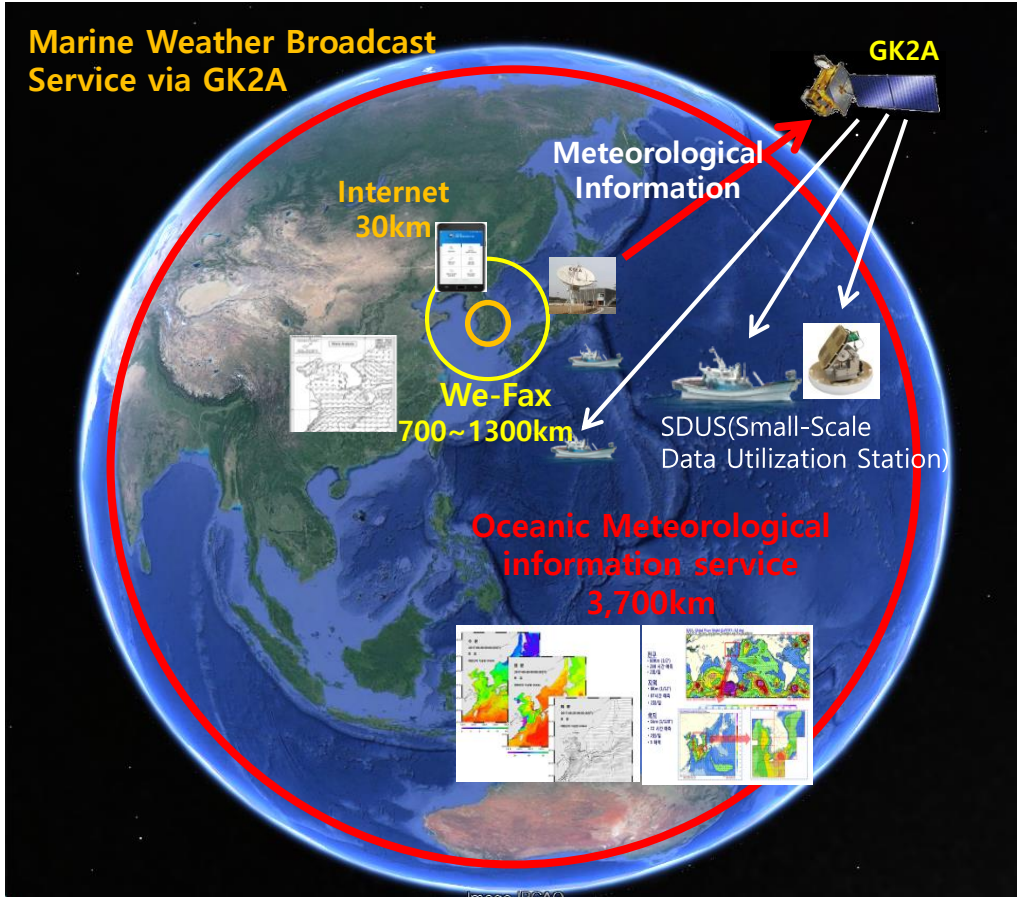
GK2A Marine Weather Broadcast Service

KMA has operated **GK2A marine weather broadcast service via SDUS** from July 23, 2020.

- This is high-quality digital marine weather information service using antenna and reception system connects with smartphone and tablet for ships and remote area within RA-II and RA-V regions
- The information includes
  - GK2A satellite images
  - surface and wave analysis and forecast charts
  - Emergency message : severe weather and disaster information such as typhoon, storm, earthquake and tsunami warning



GK2A Marine Weather Broadcast Service



Advantages of broadcasting using GK2A

- Wide service area including Western Pacific, Oceania, and Indian Ocean
- Various display media available such as PC monitor, tablet, mobile, etc.
- Large capacity and variety of information over 360/day with image, text, etc.
- Sending urgent information by alarming and pop-up message

International services

- Establish a web page for service (2022)
- Start the international broadcast service for BMKG Indonesia(2023)
- Provide receivers(2024-2025)

The Vision of KMA/NMSC

Vision

Meteorological Satellites services for leading a safe and prosperous society

Goal

Provision of high value-added meteorological satellites information

Stereoscopic satellite observation system

Meteorological observations using multi-satellites (GEO-LEO)

Smart integrated satellite operating system

Enhancing climate change monitoring

AI-based real-time severe weather detection technology

Satellite-based decision-making information service

Smart satellite information service

Big data service cloud platform

Establish real-time global satellite data hub

Strengthening global leadership

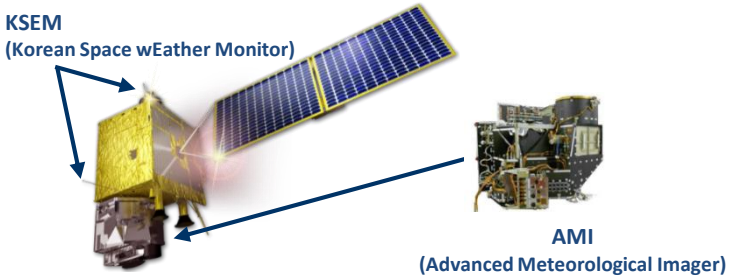
Expand leadership through global cooperation

Activate industrial ecosystem through public and private cooperation

The Korea Geo-KOMPSAT Series

GK2A

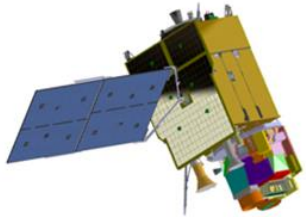
launched on December 4, 2018



Preparing for continuity

GK5

scheduled on 1st Q, 2031



	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
COMS (GK1) (MI, GOCI)	MI, GOCI	GOCI															
GK2A (AMI, KSEM)	In-operation (weather & space weather)																
GK2B (GOCI-II, GEMS)		Launch	In-operation (ocean & environment)														
GK5 (AMI-II, KSEM-II)				Mission Analysis & Feasibility Phase		Phase A	Main Development Phases						Launch	Operation			

GOCI: Geostationary Ocean Color Imager
GEMS: Geostationary Environmental Monitoring Spectrometer

KMA's Future Satellite Program (2022-2040)

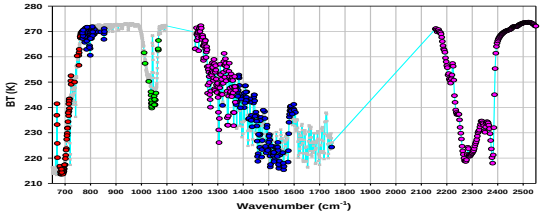
GEO-LEO satellite program

- The KMA GEO satellite program will continue based on CGMS baseline and WIGOS vision 2040.
  - VIS/IR Imager, hyperspectral IR sounder, space weather mission
- KMA's long-term satellite development plan (2022) introduced **the multi-GEO program**; one is Imager and another is Hyperspectral IR Sounder.
- LEO satellite with MW sounder will be considered after multi-GEO program feasibility studies.

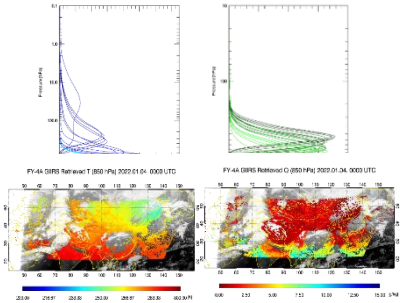
The Future Core Activities for New Climate Regime

❖ GEO Hyperspectral Sounder

- Support nowcasting with 3D weather field(T, Q, wind)
- Monitoring Greenhouse Gas
- Support data assimilation for NWP

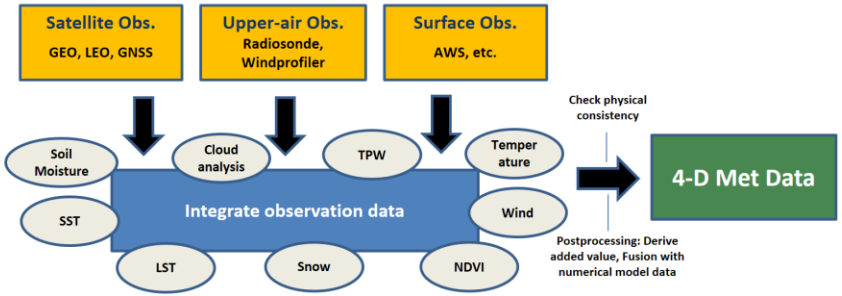


Temperature Humidity



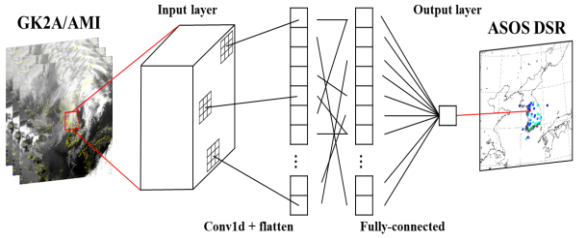
❖ Data Fusion

- 4-D cube weather data based on observation with high temporal and spatial resolution



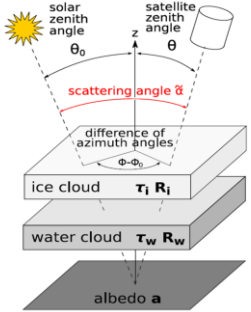
❖ Application of AI

- Predict severe weather
- Support short-range forecasting
- Produce super-resolution and proxy-data

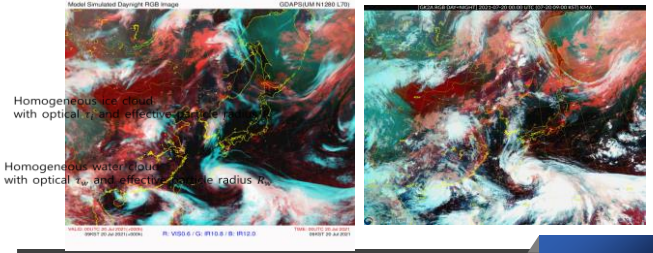


❖ Simulation

- Nowcasting and very short-range forecasting
- NWP model validation



Simulation Observation



Thank you

Korea Meteorological Administration (KMA)
National Meteorological Satellite Center (NMSC)