Cloud Products for KMA Satellites:

COMS & Geo-KOMPSAT-2A (GK-2A)

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KMA

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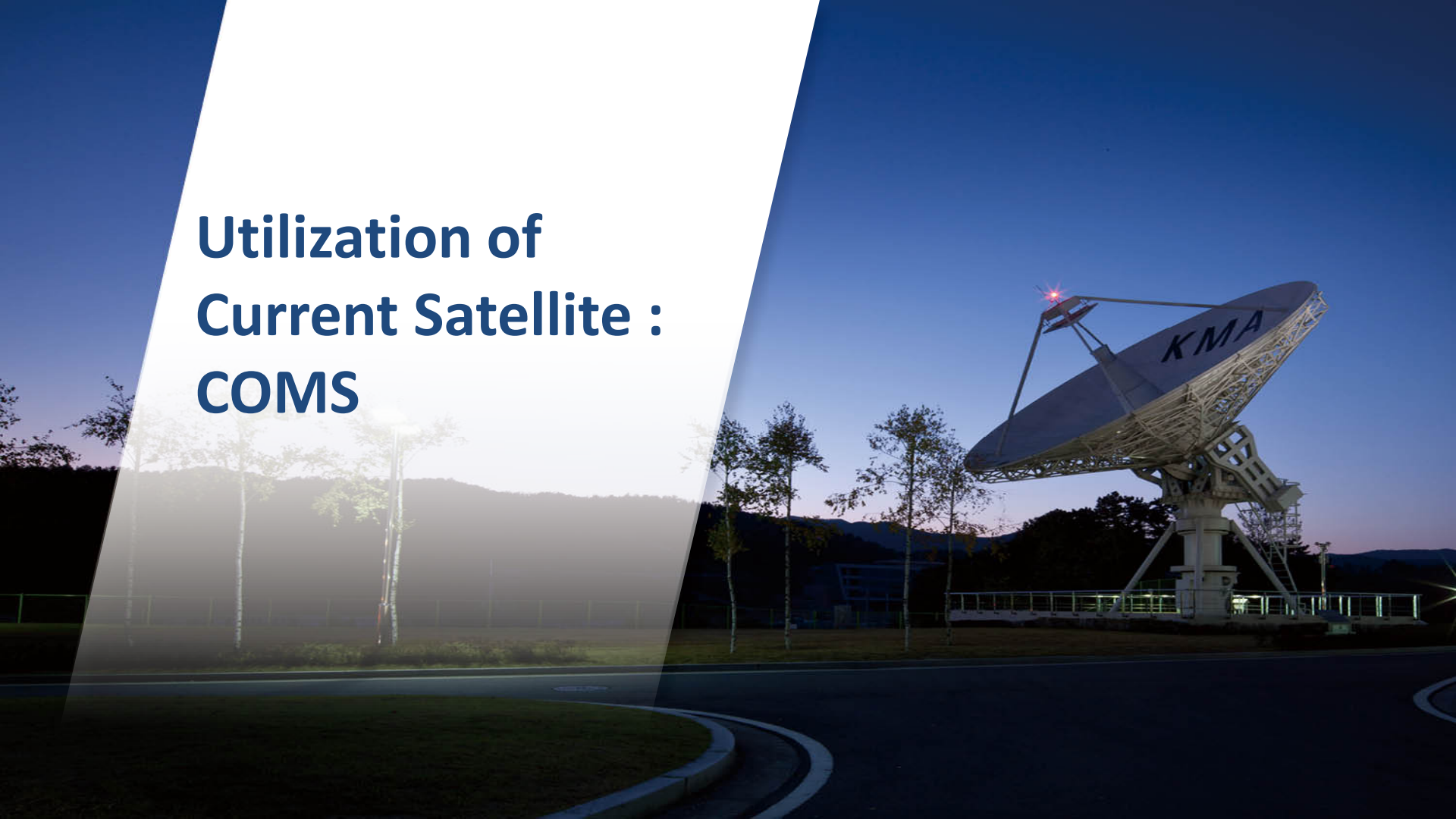
CGMS International Cloud Working Group (29 October - 2 November 2018, Madison, Wisconsin, USA)

Utilization of Current Satellite : COMS



Current Geo-Satellite : COMS

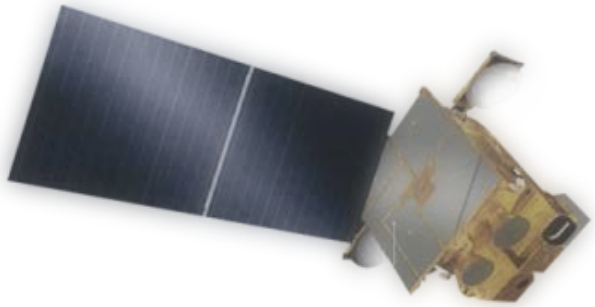
COMS(Communication, Ocean, and Meteorological Satellite)

- Orbit : 128.2E (Launched on June 26, 2010)

* Two years extended operation (1 April 2018 ~ 31 March 2020)

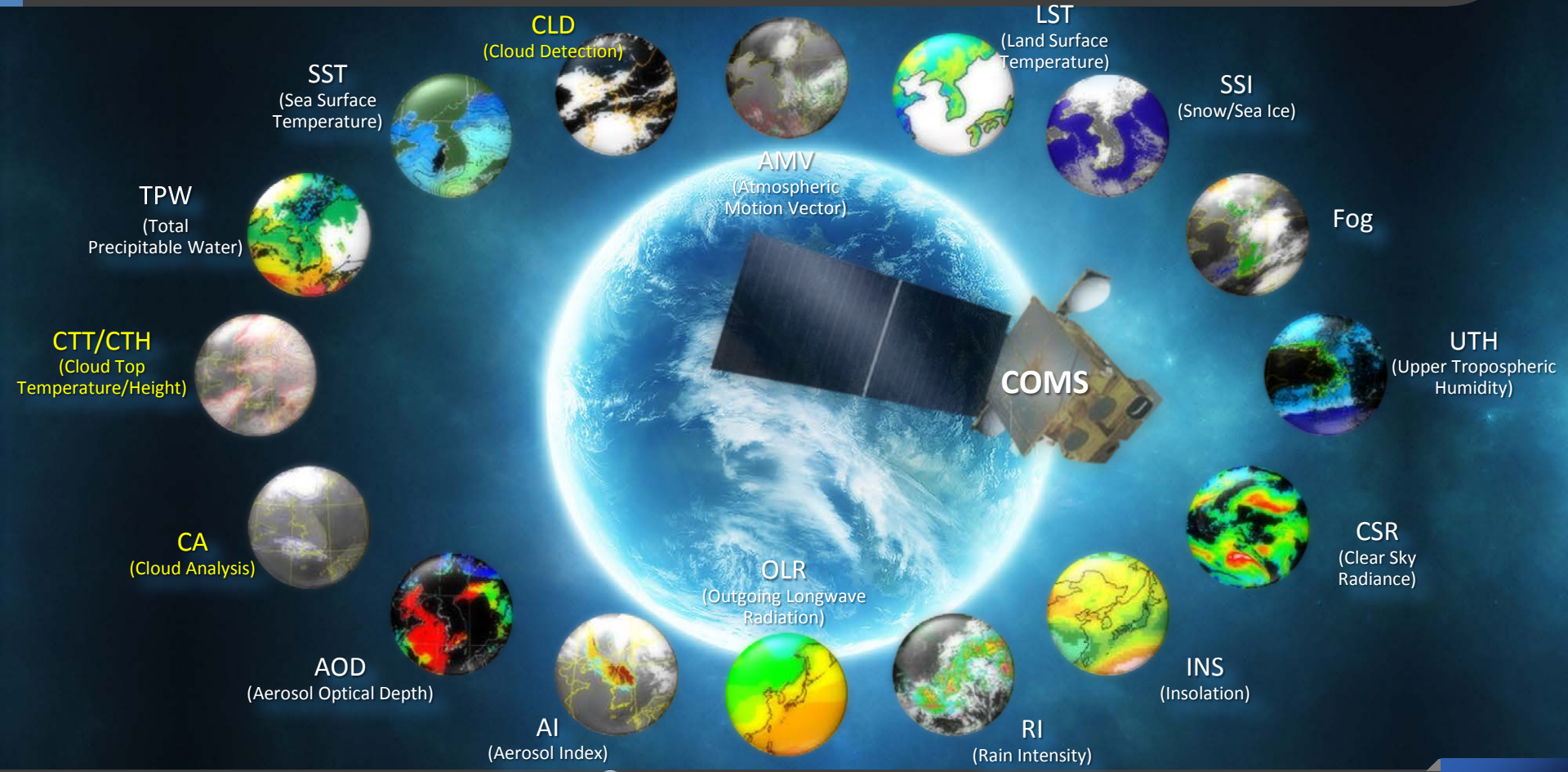
- **MI : 5 Channel VIS/IR Meteorological Imager**

- MI data Service via Satellite : Broadcast to M/SDUSs with H/LRIT
- 16 Products (CMW, Fog, AOD, cloud amount, Convective rainfall rate….)
- Service via Landline [Website] KMA/NMSC homepage(for registered users)
  [FTP] Access to NMSC FTP(for organization with MOU)



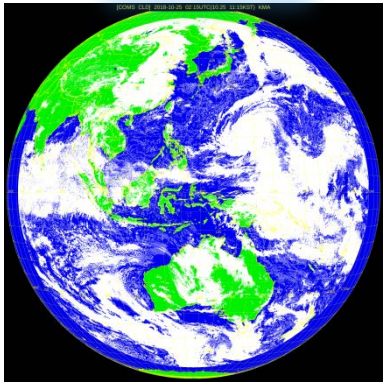
COMS Meteorological Products

16 Baseline Products are in operation (Apr. 2011-)

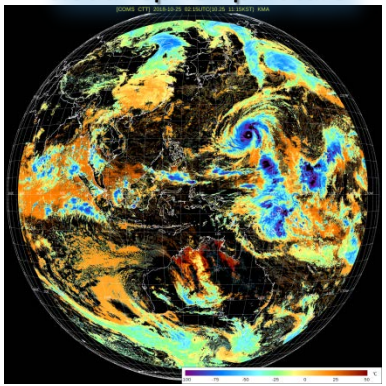


COMS Cloud Products

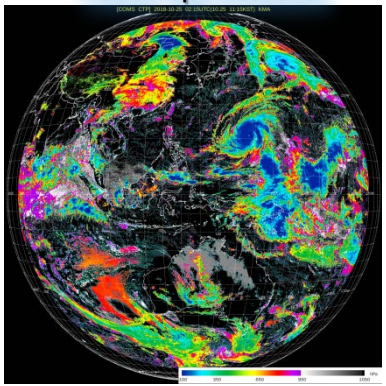
Cloud Detection



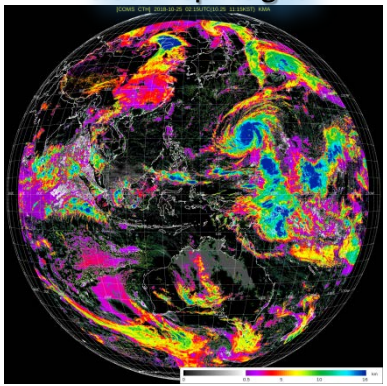
Cloud Top Temperature



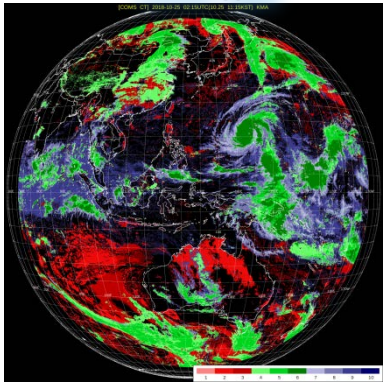
Cloud Top Pressure



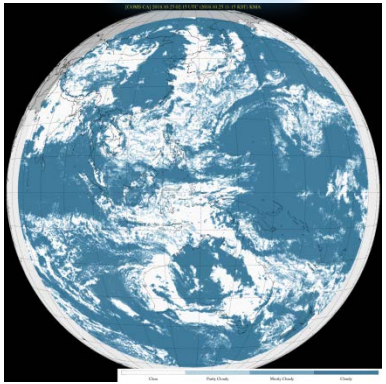
Cloud Top Height



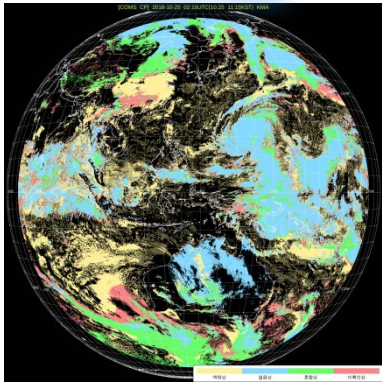
Cloud Type



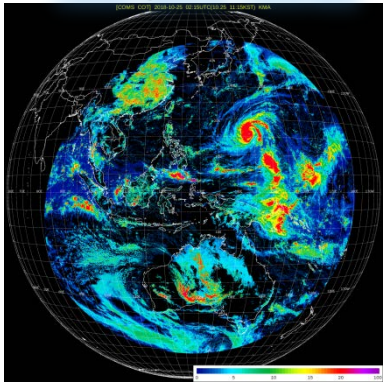
Cloud Amount



Cloud Phase



Cloud Optical Thickness



Geo-KOMPSAT-2A

Advanced Meteorological Imager and level-2 products

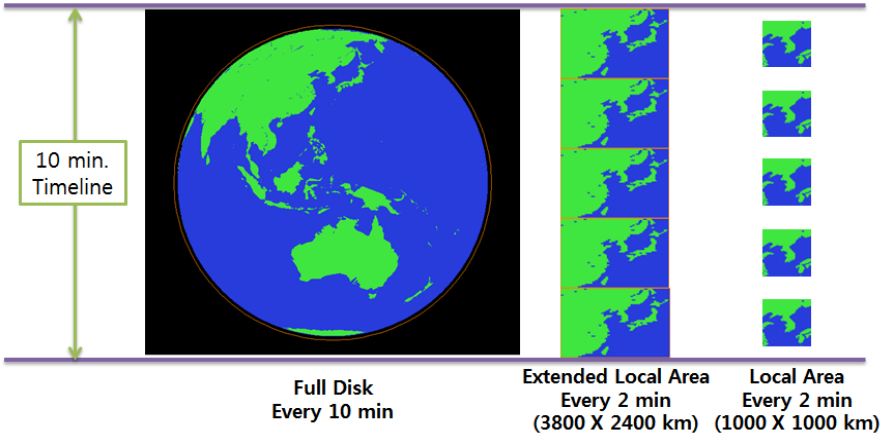
Advanced Meteorological Imager (AMI)

The GK2A is scheduled to be launched in 05:30 ~ 06:30 5th December 2018

〉 **GK-2A** : **Advanced Meteorological Imager** and Space Environment monitoring
〉 GK-2B : Ocean Color (GOCI2) and Atmospheric Trace Gas (GEMS) monitoring

Center wavelength (μm)			
AMI (Resolution)		ABI	AHI
1 blue	0.47 (1km)	0.47	0.46
2 green	0.511 (1km)		0.51
3 red	0.64 (0.5km)	0.64	0.64
4	0.856 (1km)	0.865	0.86
5	1.38 (2km)	1.378	
6	1.61 (2km)	1.61	1.6
		2.25	2.3
7	3.830 (2km)	3.90	3.9
8	6.241 (2km)	6.185	6.2
9	6.952 (2km)	6.95	7.0
10	7.344 (2km)	7.34	7.3
11	8.592 (2km)	8.50	8.6
12	9.625 (2km)	9.61	9.6
13	10.403 (2lkm)	10.35	10.4
14	11.212 (2km)	11.2	11.2
15	12.364 (2km)	12.3	12.3
16	13.31 (2km)	13.3	13.3

※ *vs. AHI → addition 1.38 μm (NIR), subtraction 2.3 μm (NIR)*
1.38 μm : favorable for cirrus cloud detection, cloud type and amount
2.3 μm : favorable for Land/cloud Properties

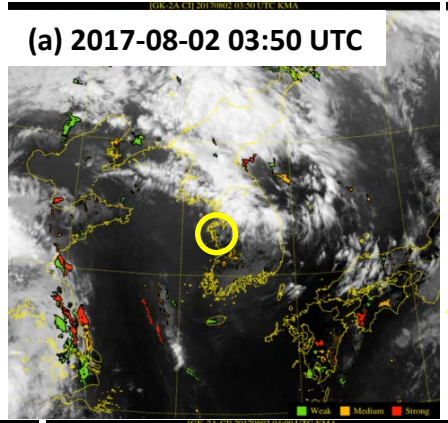


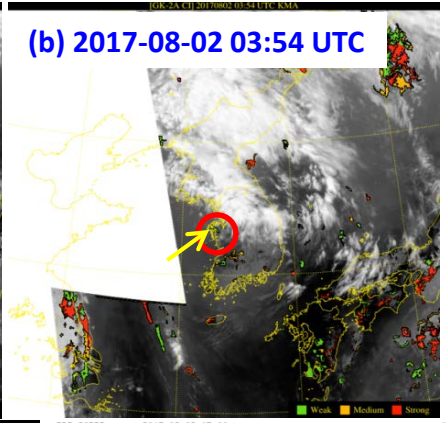
- Higher spectral resolution with 16 channels can retrieve variable meteorological products
- New and rapid updated information can be given every 10 min for Full Disk and every 2 min for East Asia with low latency below 1 min

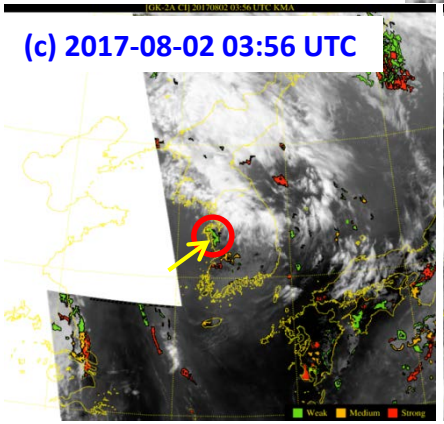
Expectation of Rapid Scan Observations

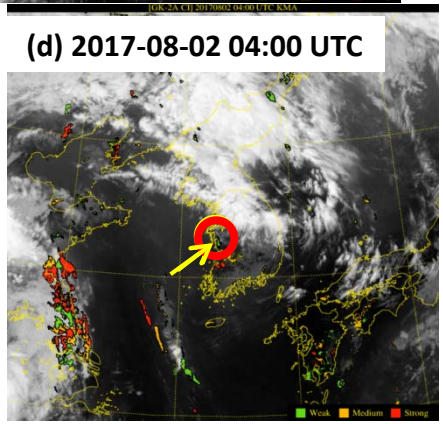
- **Provide significant improvements in the real time monitoring of hazardous weather with 2-min rapid scan imagery**

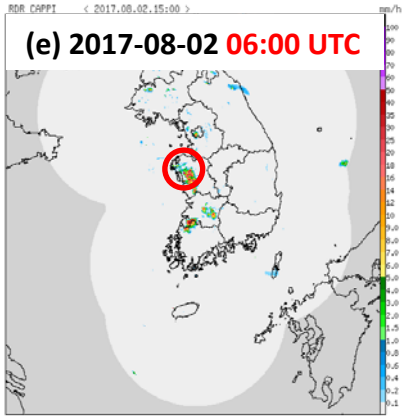
Ex) Convective Initiation using rapid scan data (b, c) has a possibility of earlier detection of convective clouds than that using regular scan data (a, d)







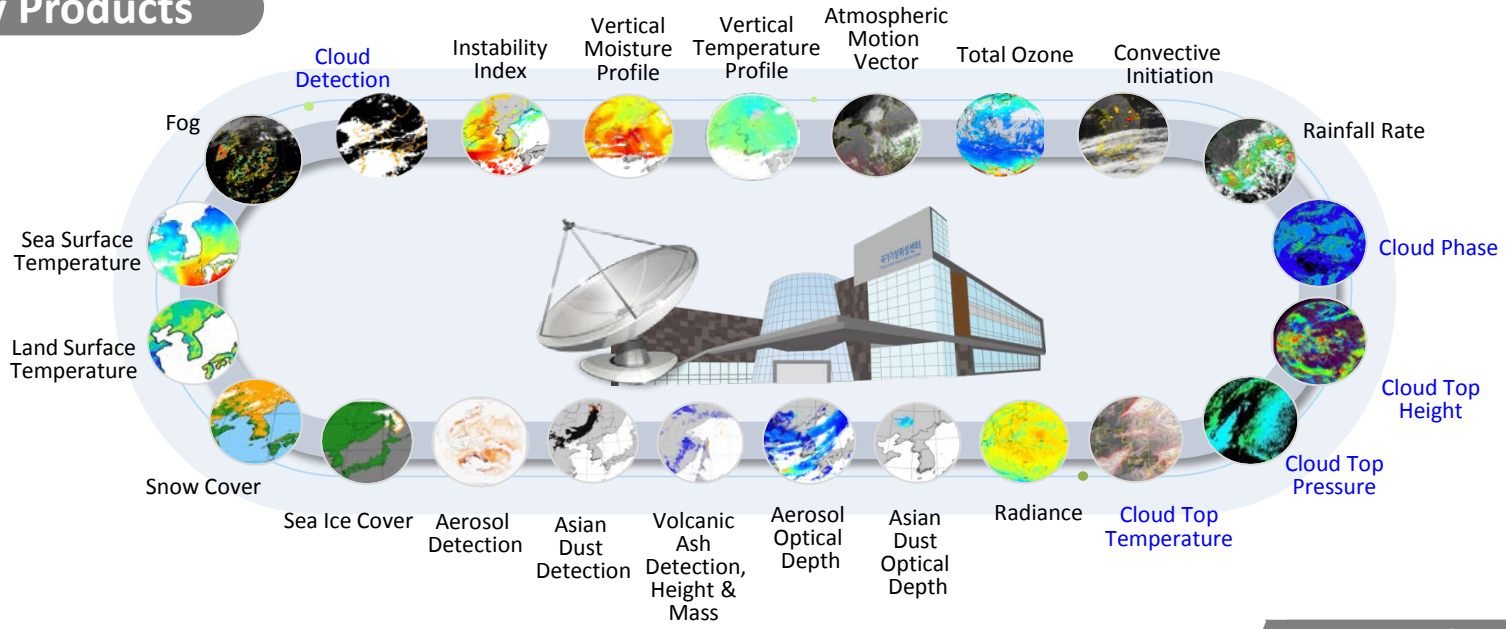




: Detection
: Miss

GK-2A/AMI Level-2 Products

Primary Products



- Fire Detection
- Vegetation Index
- Vegetation Green Fraction
- Surface Emissivity
- Surface Albedo

- Snow Depth
- Ocean Current
- **Cloud Type**
- **Cloud Amount**
- **Cloud Optical Depth**

- **Cloud Effective Radius**
- **Cloud Liquid Water Path**
- **Cloud Ice Water Path**
- Probability of Rainfall

- Rainfall Potential
- Aerosol Particle Size
- Visibility
- Absorbed SW Radiation
- Downward SW Radiation

- Reflected SW Radiation
  Downward LW Radiation
  Upward LW Radiation
- Upward LW Radiation
- Aircraft Icing

Secondary Products

- Overshooting Top Detection
- SO2 Detection
- Total Precipitable Water
- Clear Sky Turbulence

Status of Algorithm Development

I Development Level-2 product algorithms

- Develop the level-2 product algorithms in the test-bed system
- Investigate the accuracy if meet the users requirements and evaluate their maturities

II Improve the algorithms and processing system through feedback process between users and developers

- To begin with analyze the performance of the related products in cooperation with KMA users
- Improve the algorithms through review processes with the developers and the international review team

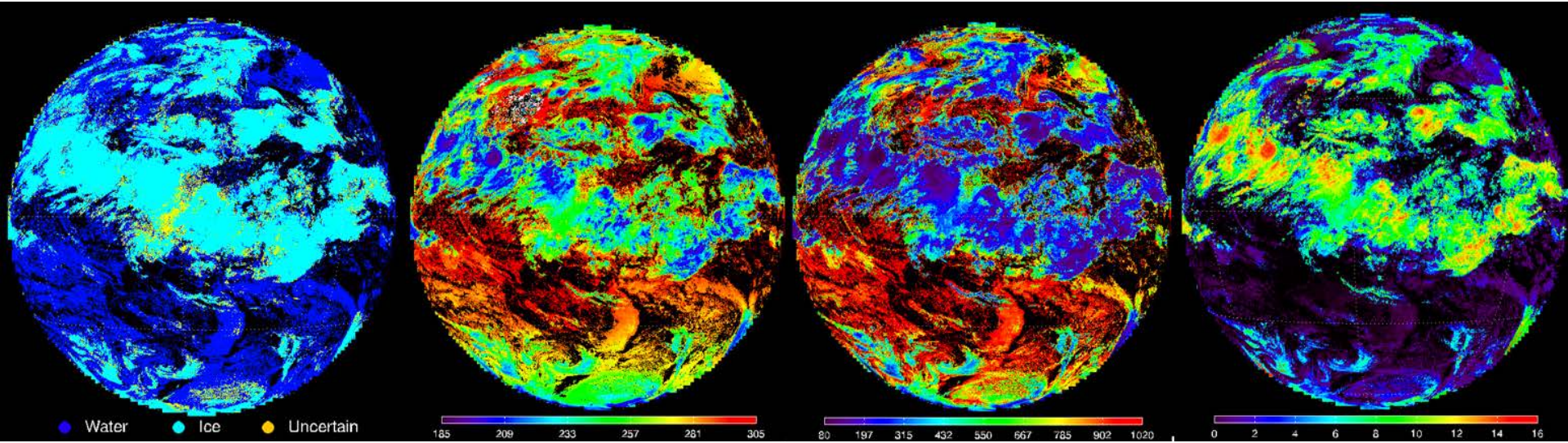
III Implement Level-2 product processing system

- Implement the integrated algorithms in the operational demonstration environment for a long-term period (-ing)

Geo-KOMPSAT-2A

Cloud Products

Cloud Top Properties



CLOUD PHASE

Products

> Thermodynamic state of cloud particles
> **WATER**, ICE and UNCERTAIN phase

Retrieval Method

> BTD (8.6-11.2) Test
> Spectral cloud emissivity ratio (Beta) between Channels [8.6, 11] & [11, 12]

CLOUD TOP TEMPERATURE / CLOUD TOP PRESSURE / CLOUD TOP HEIGHT

Products

> TEMPERATURE, PRESSURE, HEIGHT of cloud tops, precisely the infrared emission level that can be slightly (up to few meters) below the actual morphologic cloud tops

Retrieval Method

> **CTT** : Cloud emissivity obtained from a look-up table of Ch14, 15 and 16
: Effective black-body temperature(EBBT) method (only water cloud)
> **CTP** : Converted from cloud top temperature based on NWP temperature-pressure profile
> **CTH** : Calculated from cloud top pressure using hydrostatic equation

Cloud Optical Properties

Cloud Optical Thickness

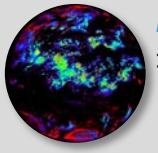
Products

> Indication of the extinction of light passing through clouds

Retrieval Method

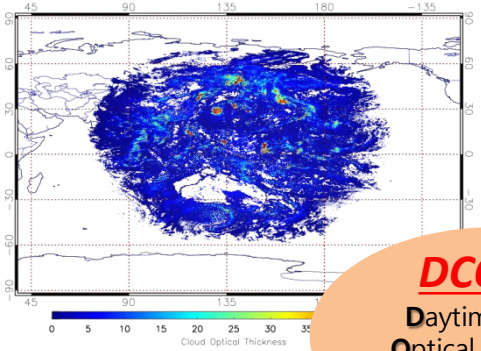
> Optimal Estimation

> The ratio of VIS & NIR



NCOT (Night COT)

> Retrieved by infrared cloud emissivity



Cloud Effective Radius

Products

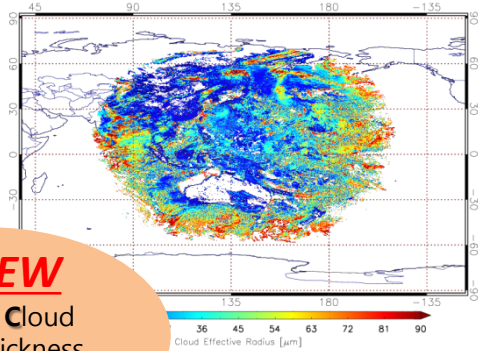
> Area weighted radius of the cloud particles

> Related to radiative and microphysical properties of cloud

Retrieval Method

> Optimal Estimation

> The ratio of VIS & NIR



DCOEW

Daytime **C**loud **O**ptical thickness, **E**ffective radius, **W**ater path

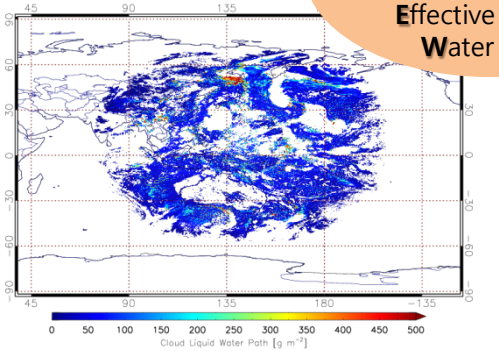
Liquid Water Path

Products

> Total amount of liquid water present between two points in the atmosphere

Retrieval Method

> Empirical relation with COT and CER



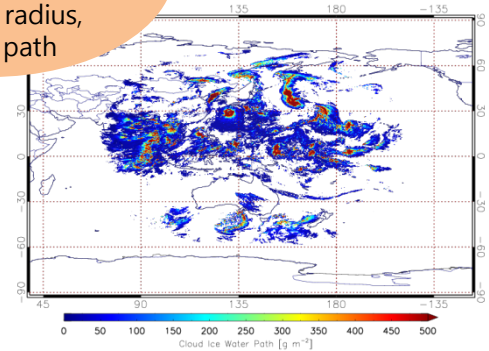
Ice Water Path

Products

> The integral of the ice water content through the depth of an ice cloud layer

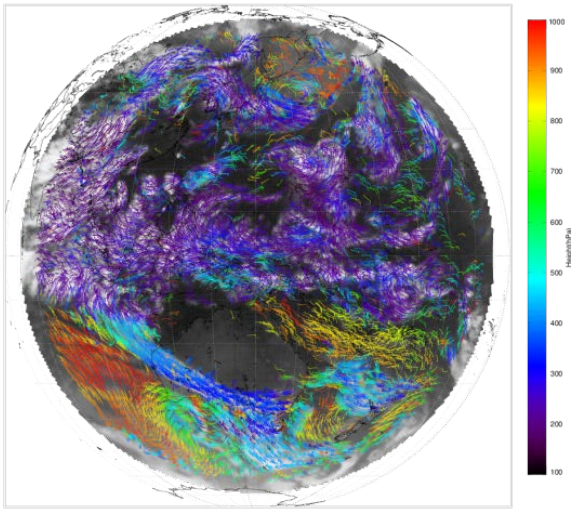
Retrieval Method

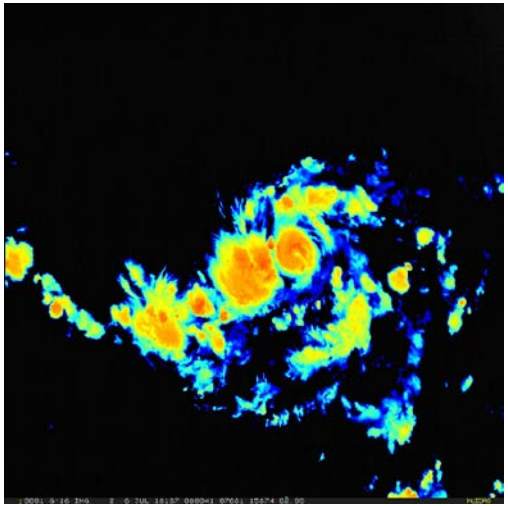
> Empirical relation with COT and CER



Applications of Cloud Products

- To predict the growth of strong convective clouds
- To analyze the intensity and tracking of typhoons
- To help determine flight routes based on weather conditions and risk information
- To be used as input data for the GK-2A level-2 products such as AMV
- To study for Earth's radiation transfer
- To help reduce uncertainties in climate research as well as weather forecasts





Thank you
for your listening!

NMSC