[WMO VLab Regional Focus Group meeting]

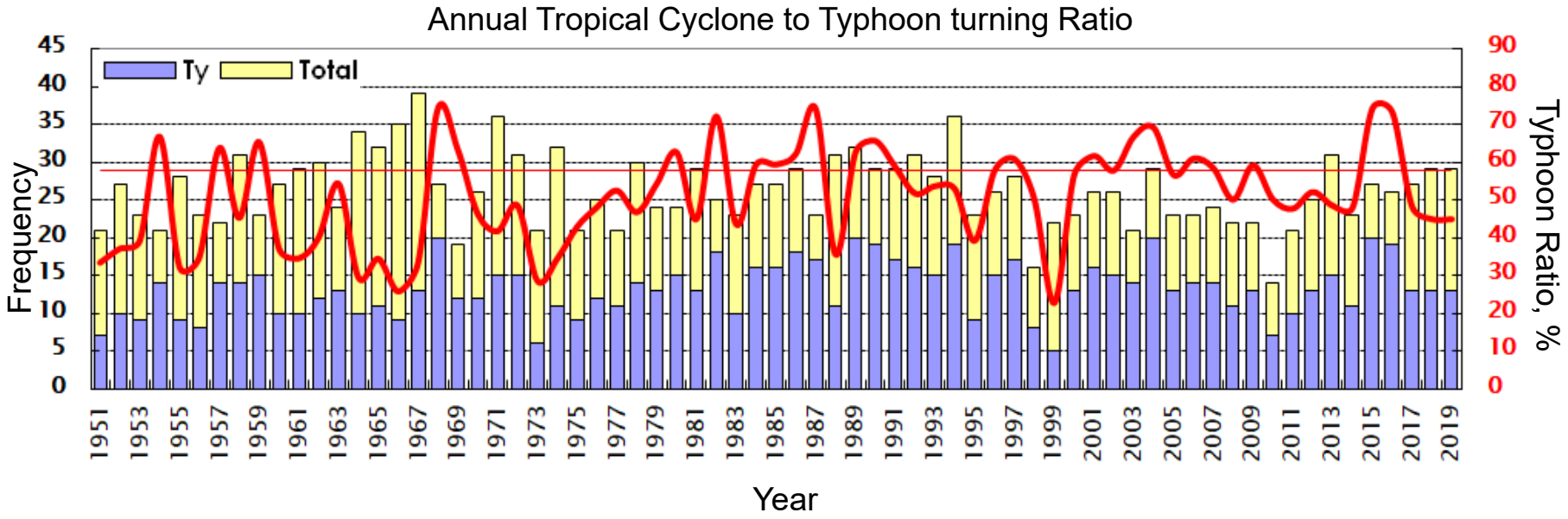
Satellite Analysis for Tropical Cyclone over KMA

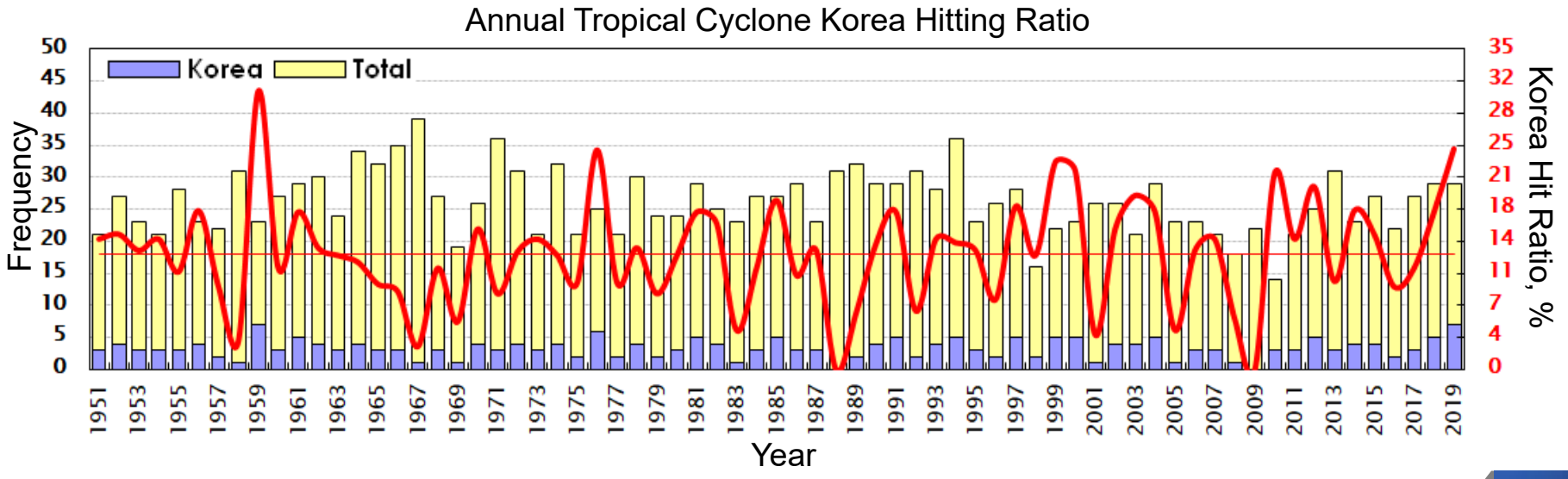
August 13, 2020
Jun Park (jun.park@kma.go.kr)
Satellite Analysis Division
National Meteorological Satellite Center
Korea Meteorological Administration

국가기상위성센터
National Meteorological Satellite Center

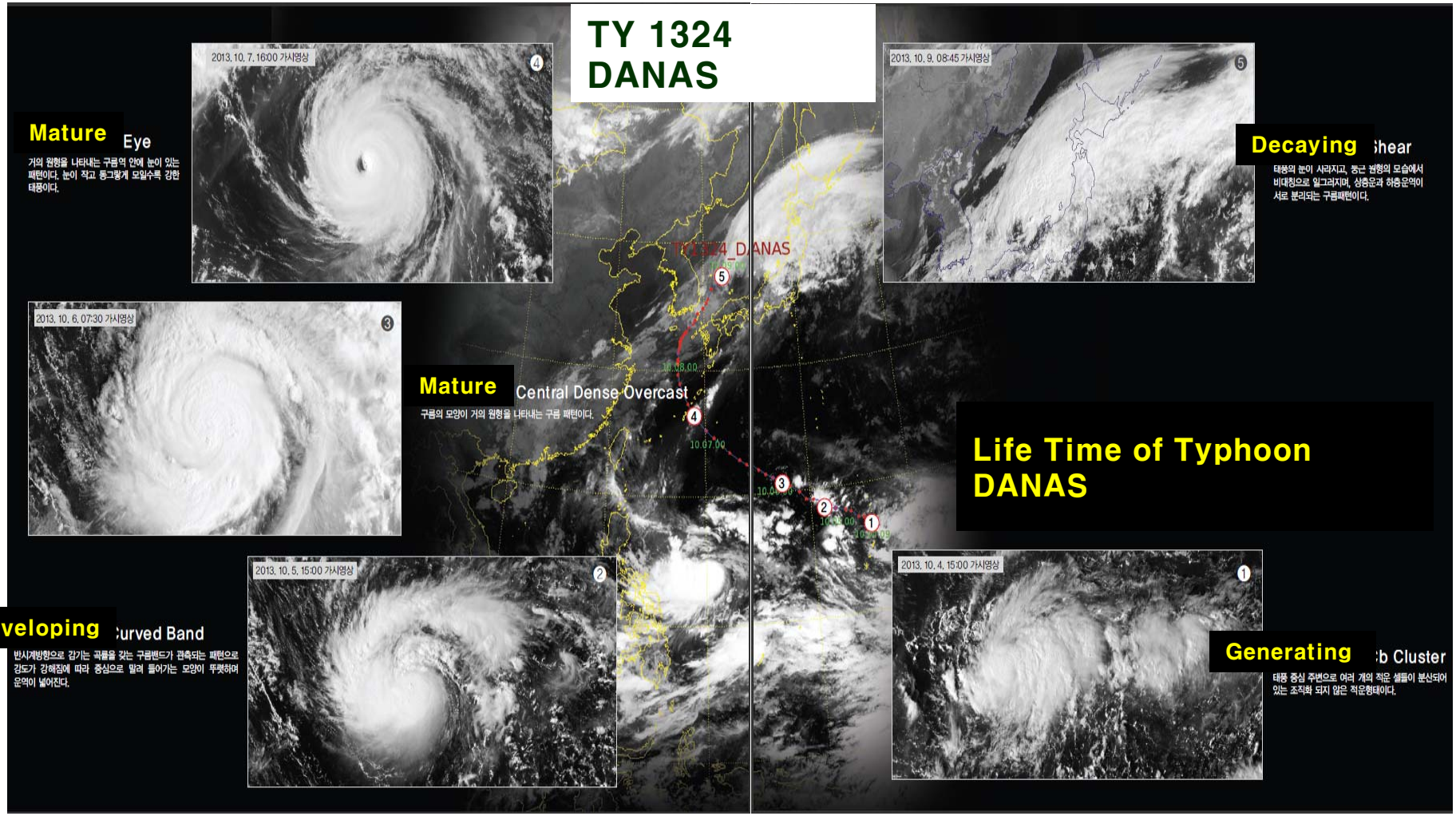
Contents

Last 69 years Typhoon over Northwest Pacific (1951~2019)





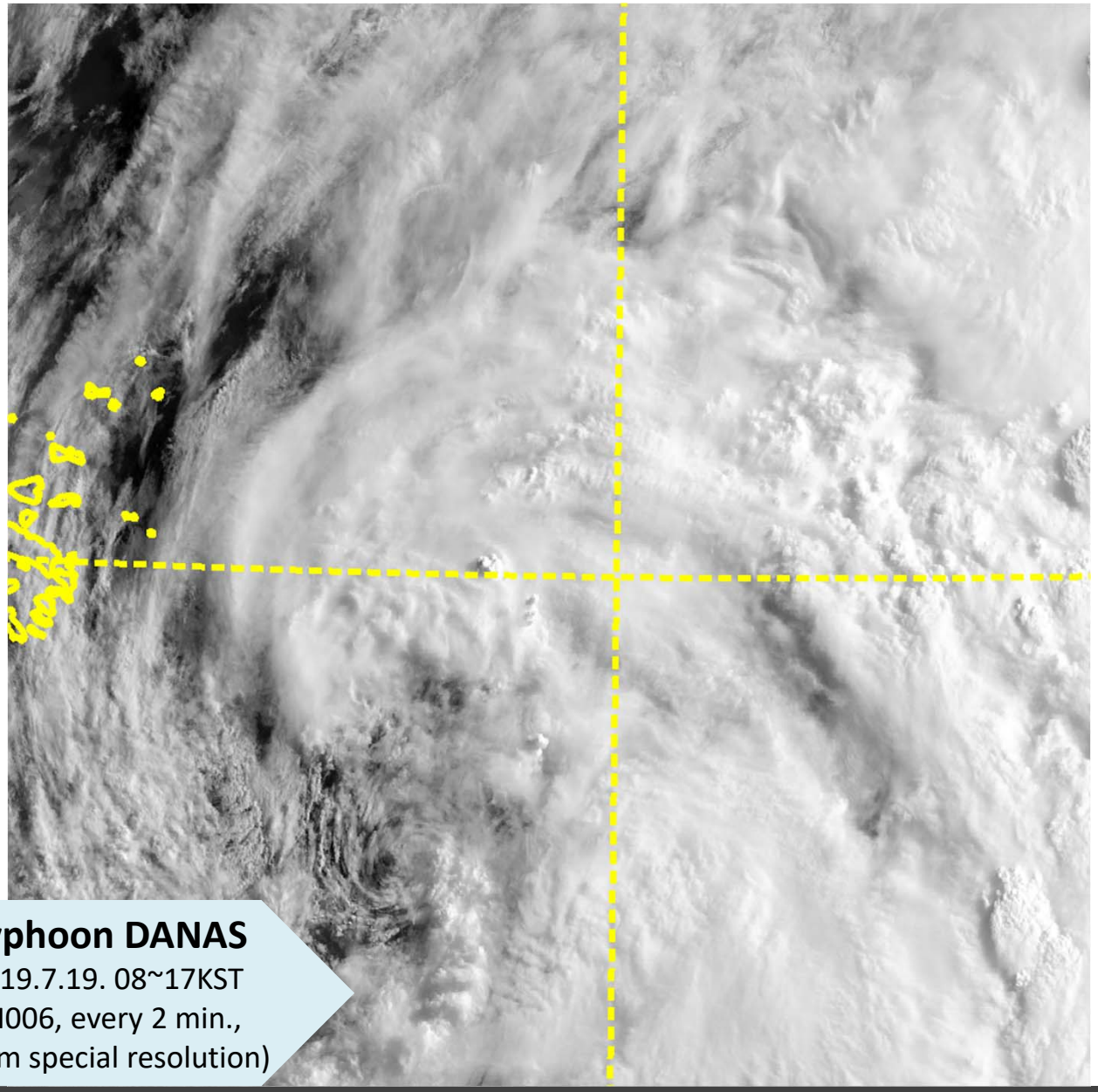
Typical pattern of Typhoon near Korea



Generating -> Developing -> Mature -> Weaking

①Cb Cluster -> ②Curved Band -> ③CDO -> ④EYE -> ⑤SHEAR

GK2A is now operational!



Typhoon DANAS
2019.7.19. 08~17KST
(VI006, every 2 min.,
0.5km special resolution)

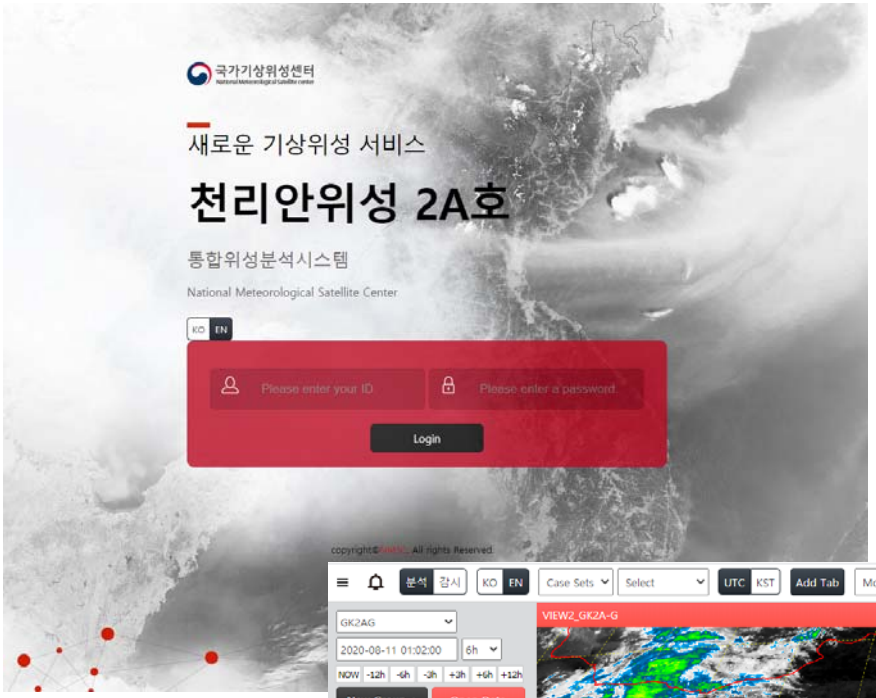
Launched on
December 5, 2018

Public release on
July 25, 2019

New GK-2A web-based
analysis system

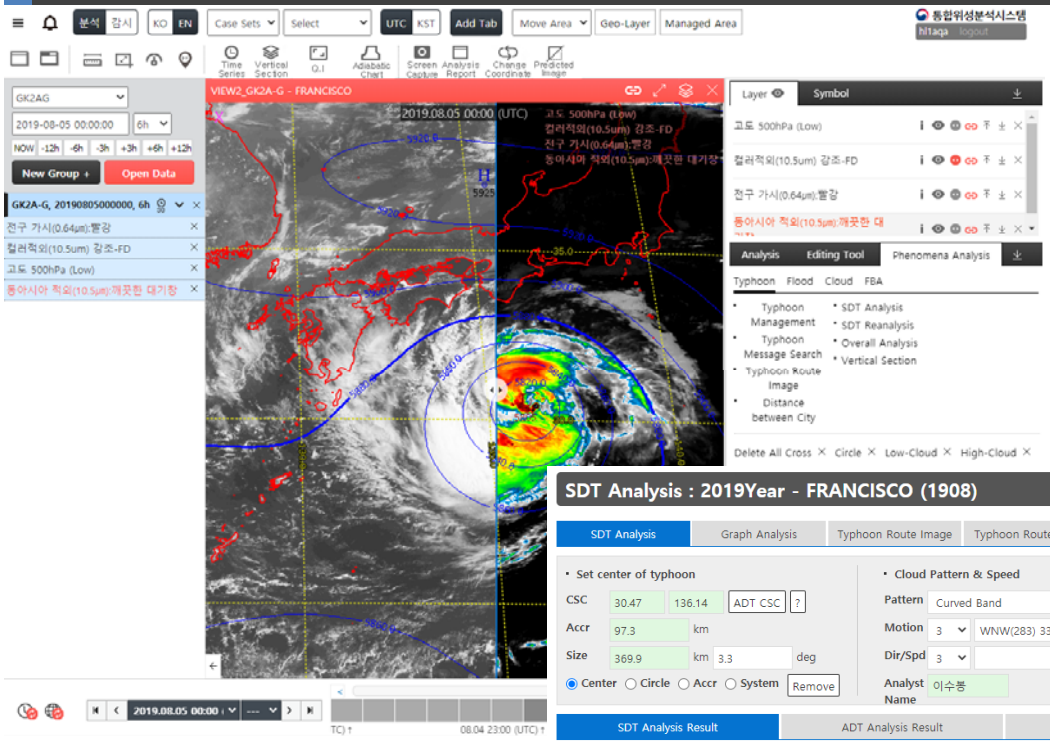
Web-based Satellite Image Analysis System

- New user friendly web-based system for COMS-2A
- Using Dvorak Technique from SSEC/CIMSS
- Create own UI, DB, and intensity algorithm for ADT/SDT
- Including all available observation data
- Automated tools including finding center position, intensity, wind radii beside subjected analysis by human
- Comparisons with other agencies report and best track



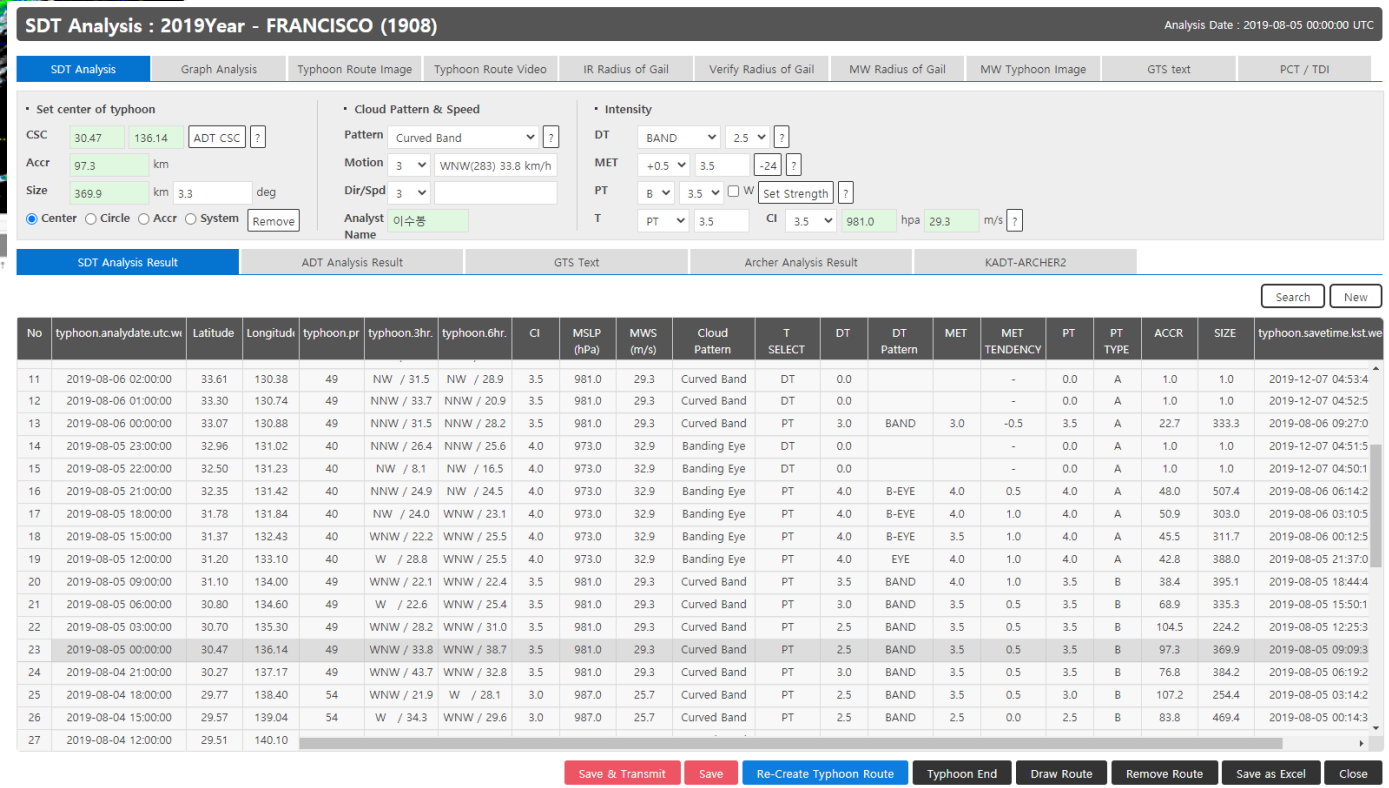
Web based Satellite image Analysis System

Tropical Cyclone Analysis



Main Window

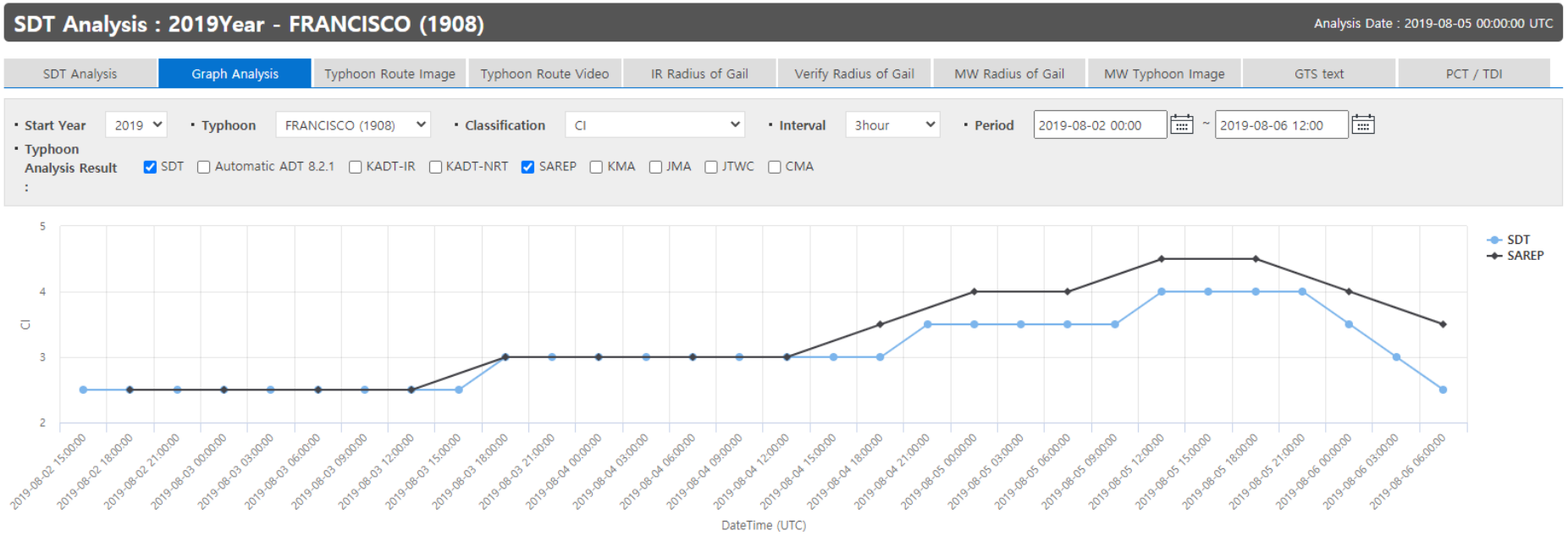
- Data selection(time, area, type, etc)
- Layer display
- Analysis tools(palette, effect, video, contour, distribution, editing, etc)
- Phenomena(Typhoon, Flood, Cloud, Fire/Volcanic ash/Fog etc)



Secondary Window

- SDT Analysis (intensity, center position, etc)
- Automated analysis (ADT, KADT, GTS, Archer, etc)

Comparisons

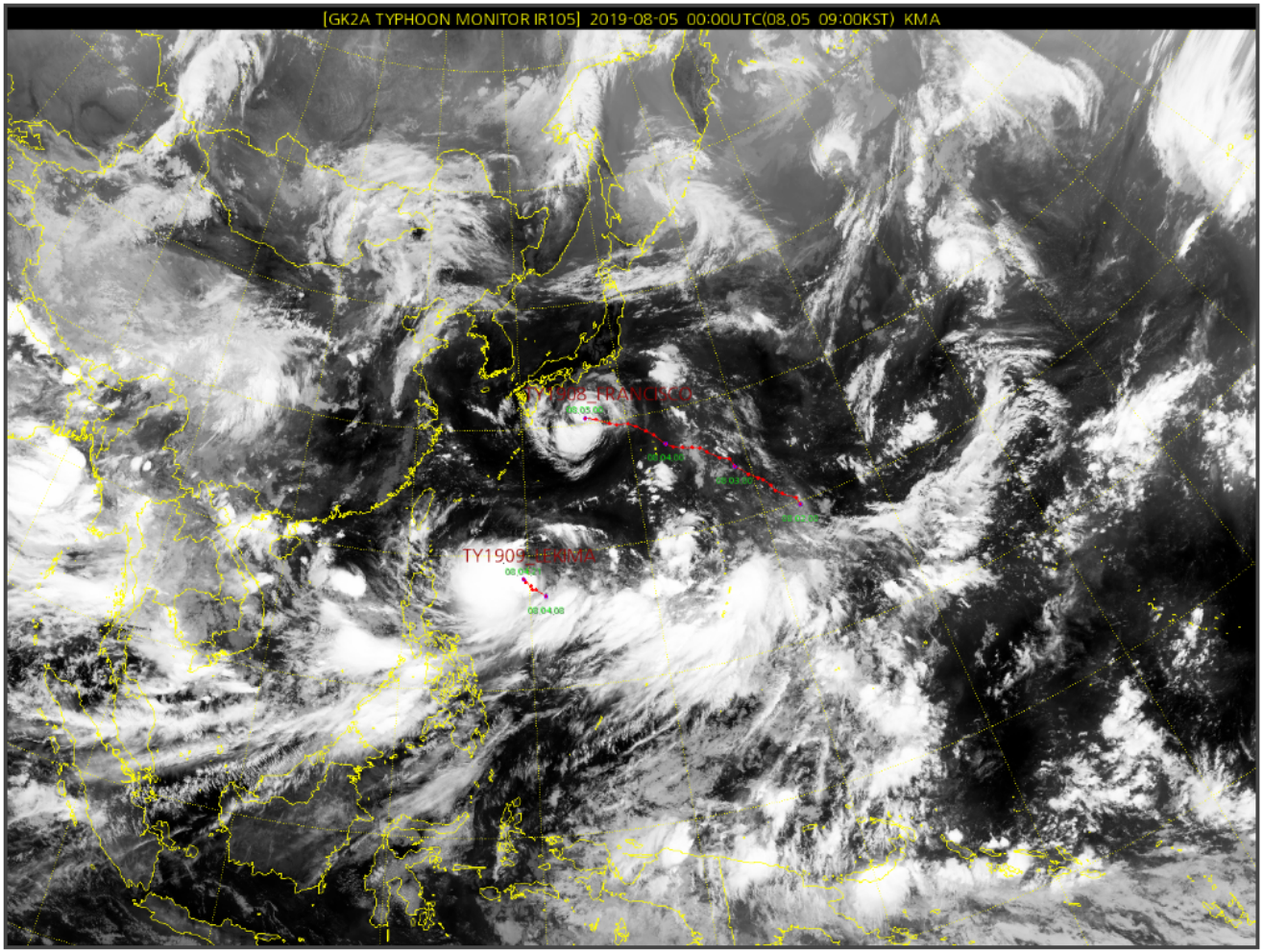


Route image

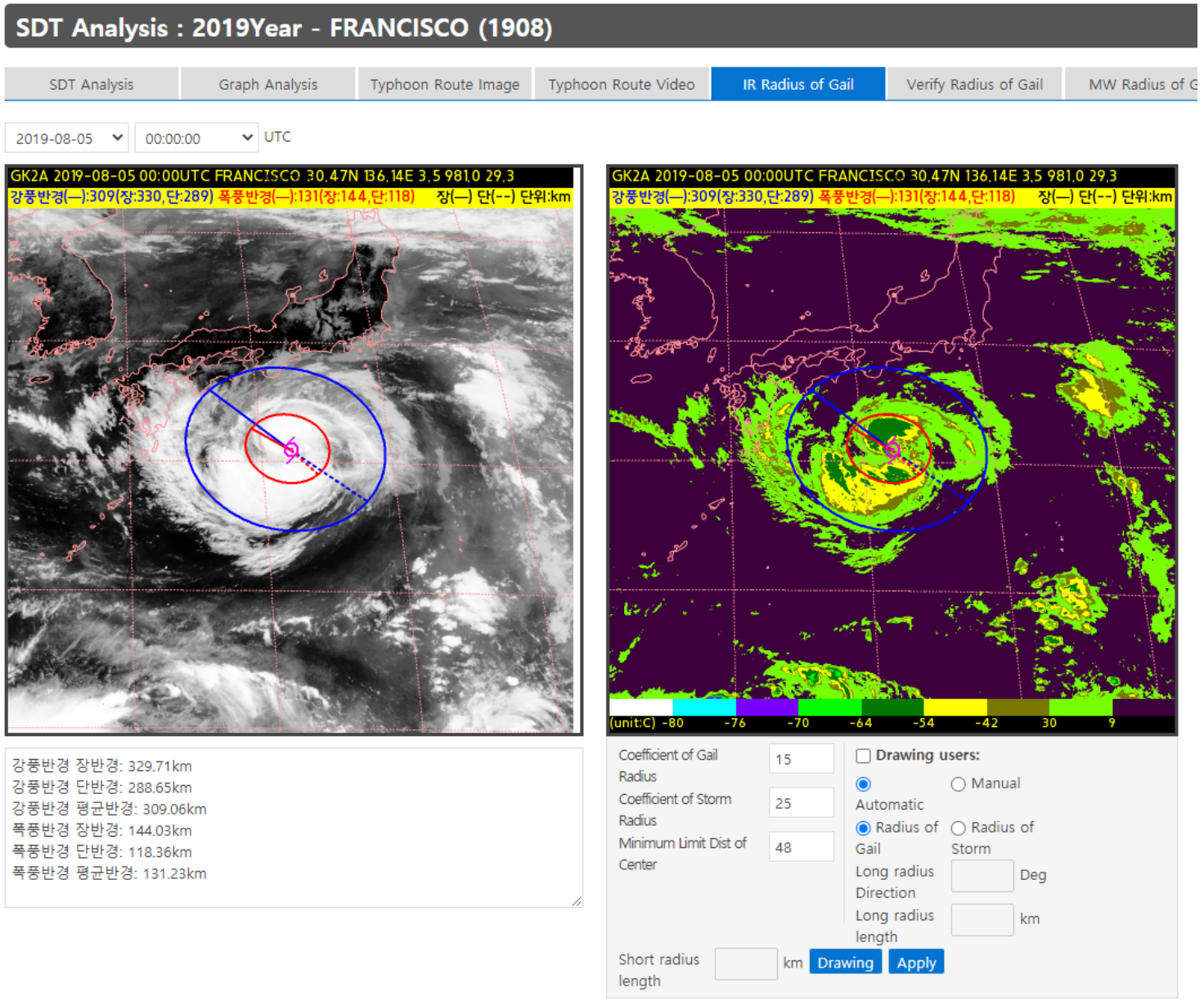
SDT Analysis : 2019Year - FRANCISCO (1908)

SDT Analysis | Graph Analysis | Typhoon Route Image | Typhoon Route Video | IR Radius of Gail | Verify Radius of Gail | MW Radius of Ga

2019-08-05 00:00:00 UTC



IR based Wind Radii (15 and 25 m/s)

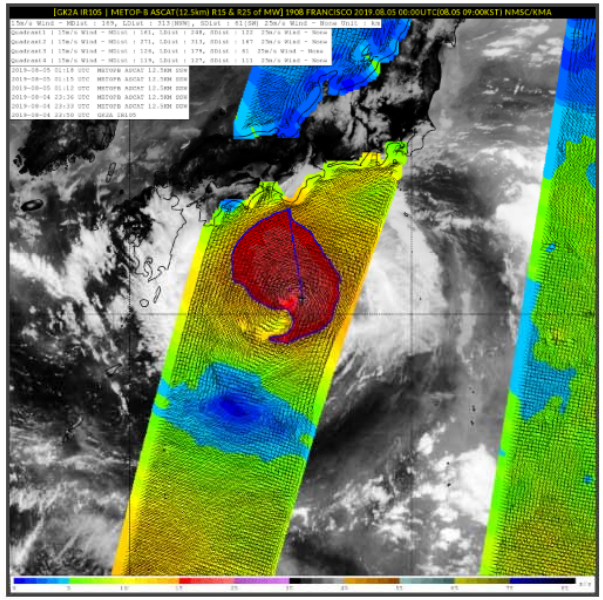


Additional Wind Radii

SDT Analysis : 2019Year - FRANCISCO (1908) Analysis Date : 2019-08-05 00:00:00 UTC

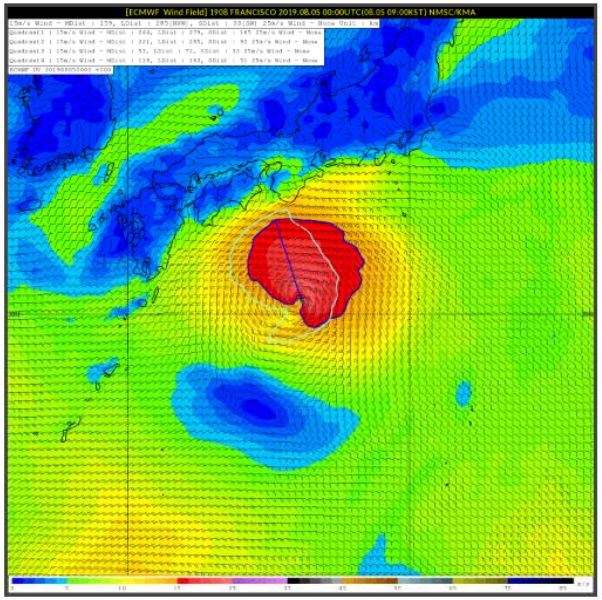
SDT Analysis | Graph Analysis | Typhoon Route Image | Typhoon Route Video | IR Radius of Gail | Verify Radius of Gail | **MW Radius of Gail** | MW Typhoon Image | GTS text | PCT / TDI

2019-08-05 00:00 utc METOPB ASCAT



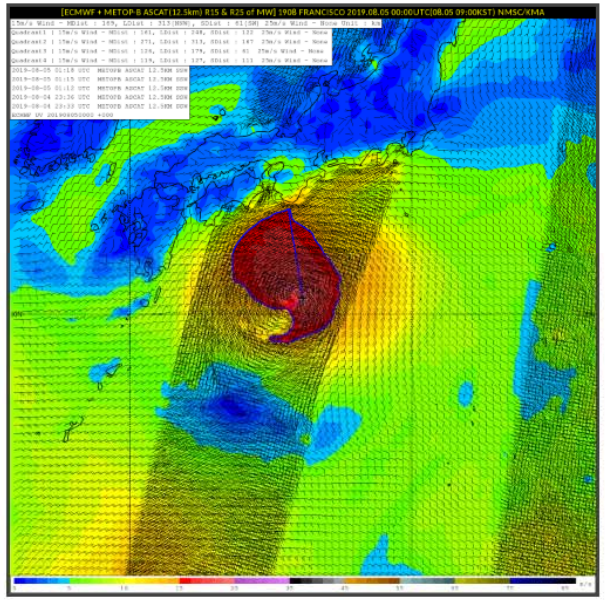
<< 강풍반경 METOPB ASCAT >>

Microwave



<< 수치모델 바람장 >>

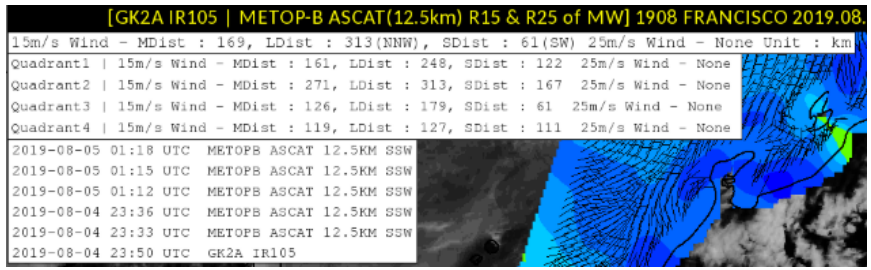
Numerical Model



<< 강풍반경/수치모델 합성 >>

MW + Model

Search Close



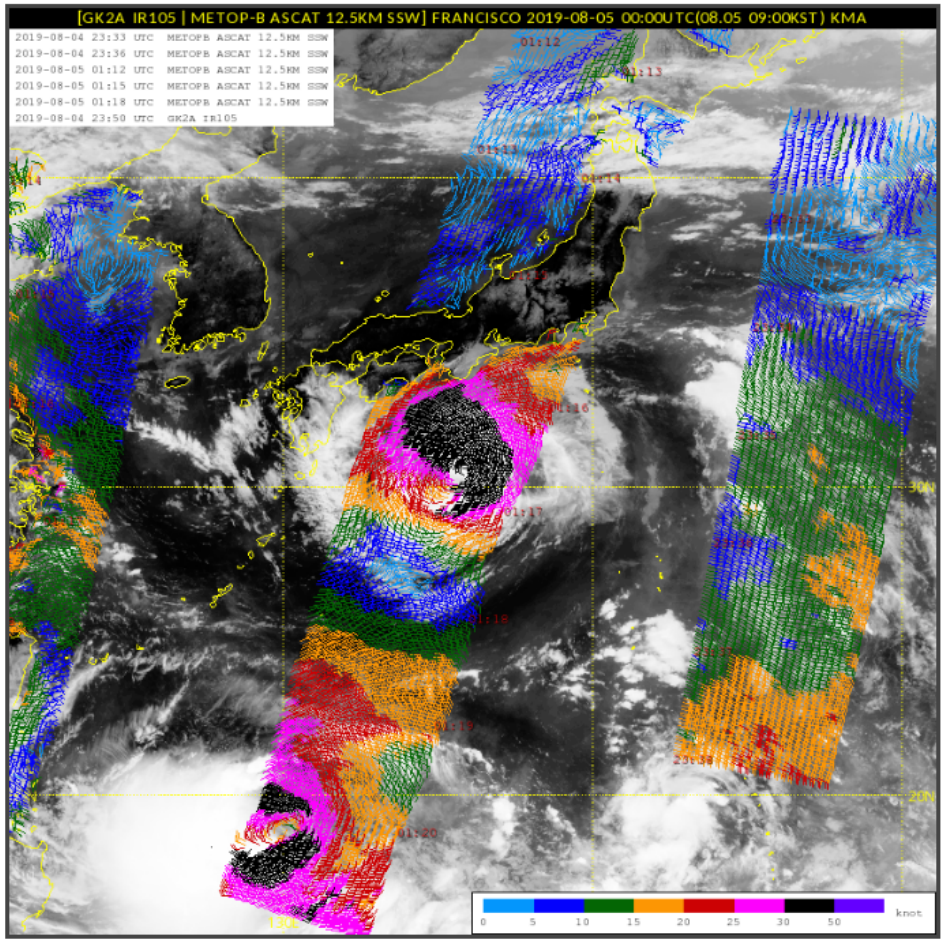
Graph Analysis

SDT Analysis : 2019Year - FRANCISCO (1908)

SDT Analysis | Graph Analysis | Typhoon Route Image | Typhoon Route Video | I

해상풍(METOP-A/B, SCATSAT1) | DMSP SSMI

2019-08-05 | 00:00 utc METOPB ASCAT



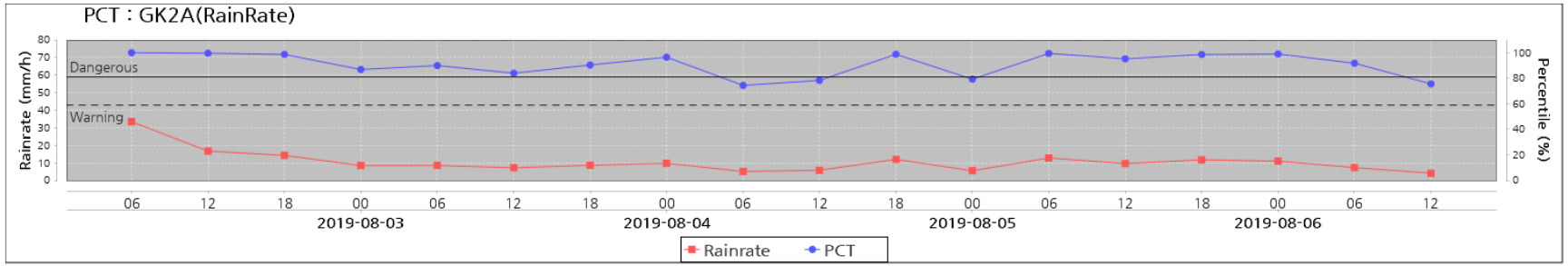
<< METOPB ASCAT >>

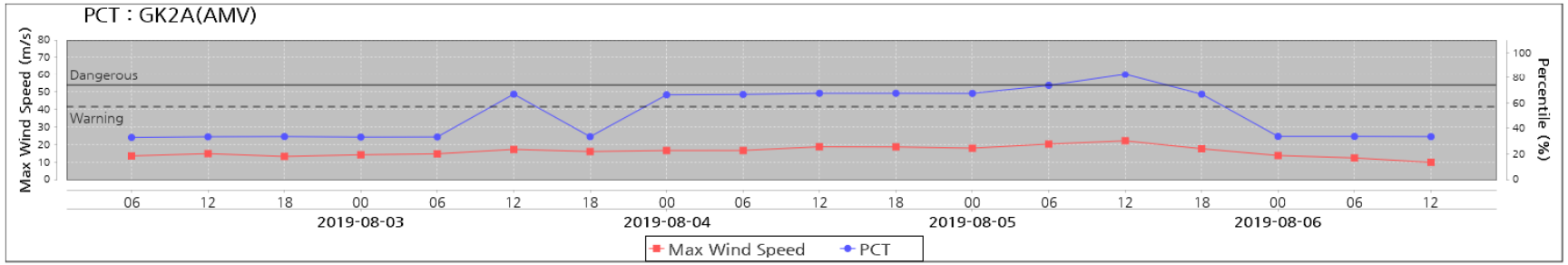
SDT Analysis : 2019Year - FRANCISCO (1908)

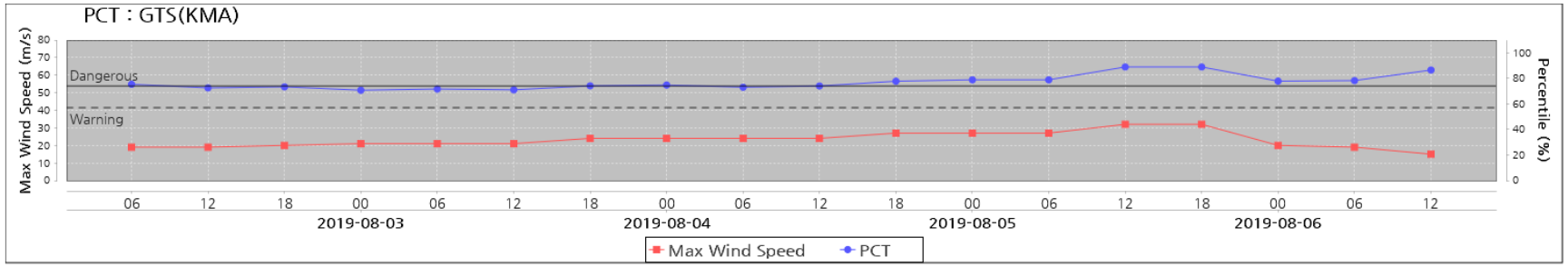
Analysis Date : 2019-08-05 00:00:00 UTC

SDT Analysis | Graph Analysis | Typhoon Route Image | Typhoon Route Video | IR Radius of Gail | Verify Radius of Gail | MW Radius of Gail | MW Typhoon Image | GTS text | PCT / TDI

PCT | TDI

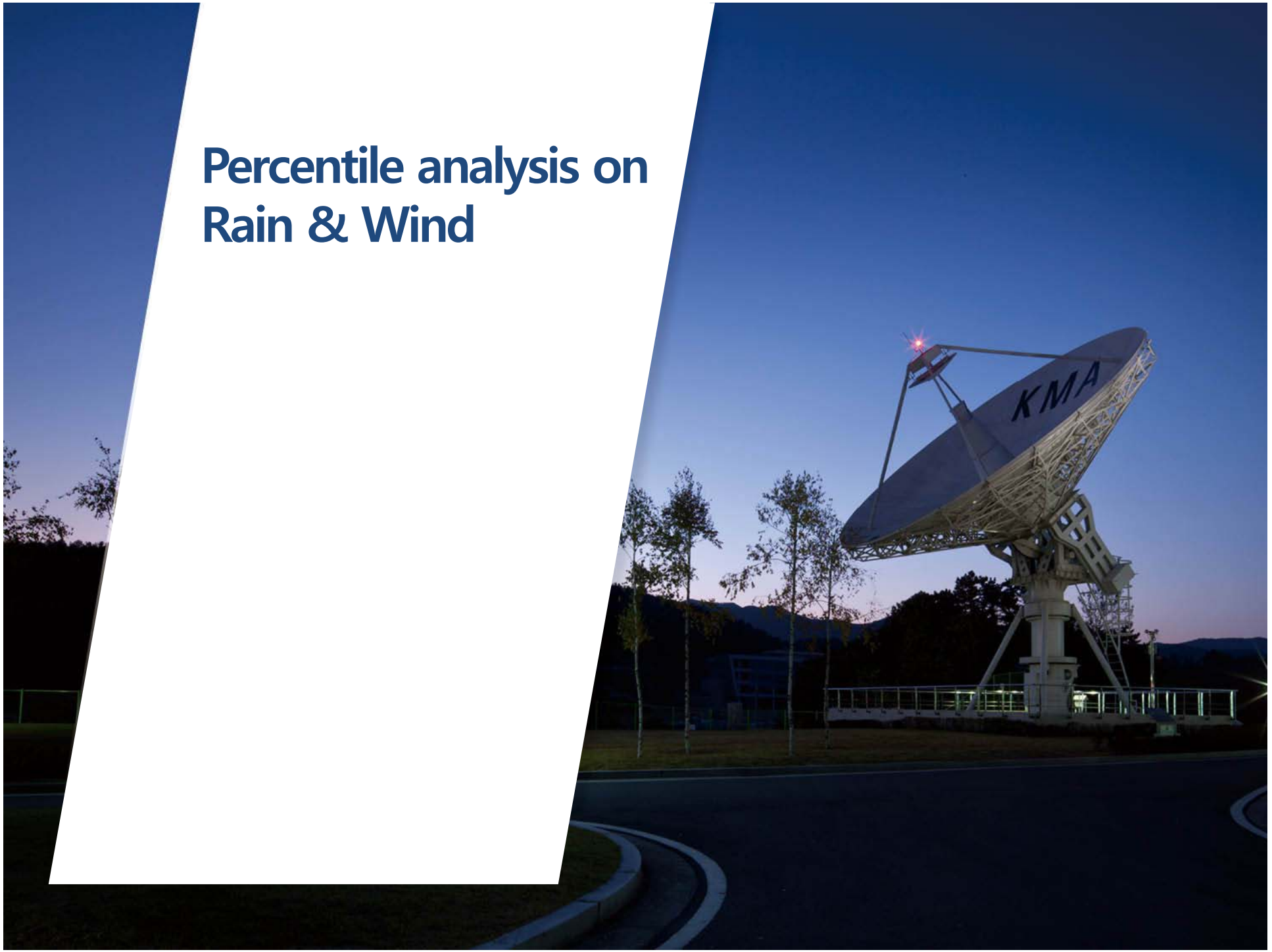




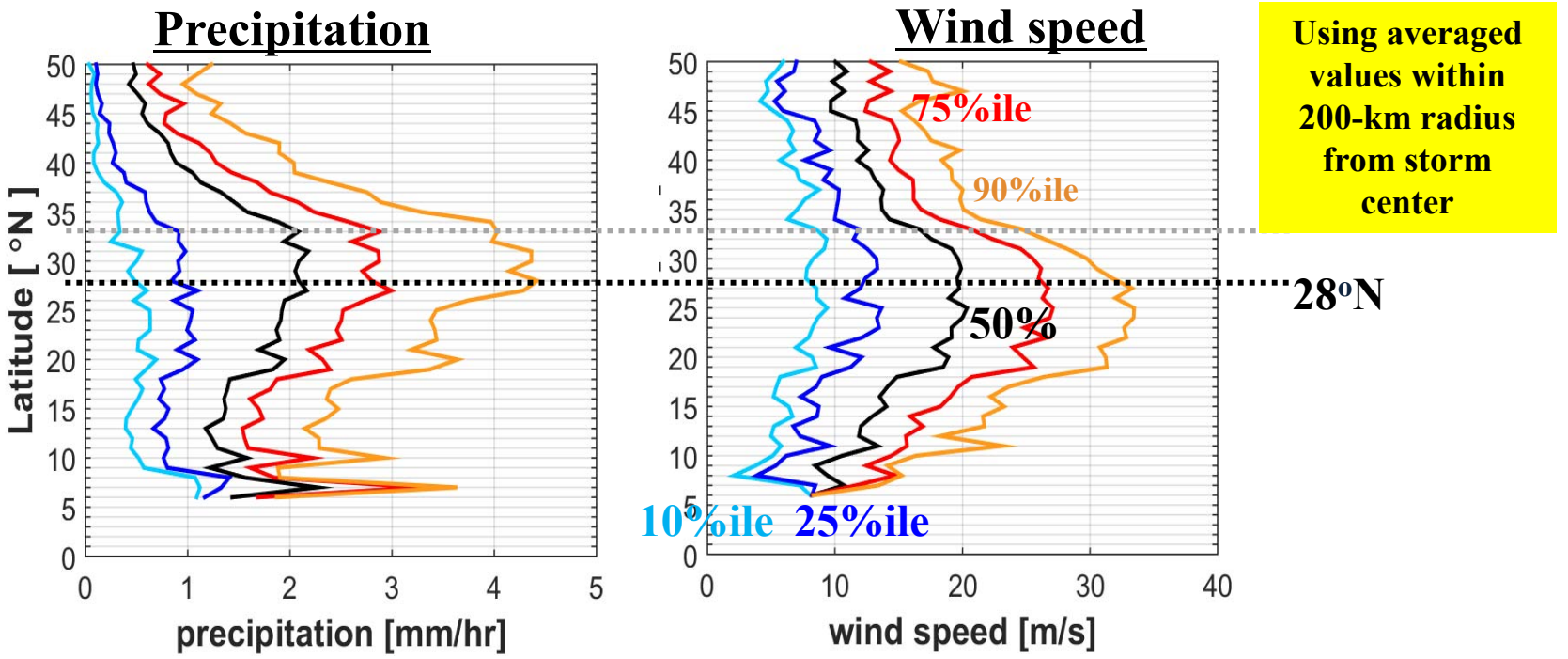


Search | Close

Percentile analysis on Rain & Wind



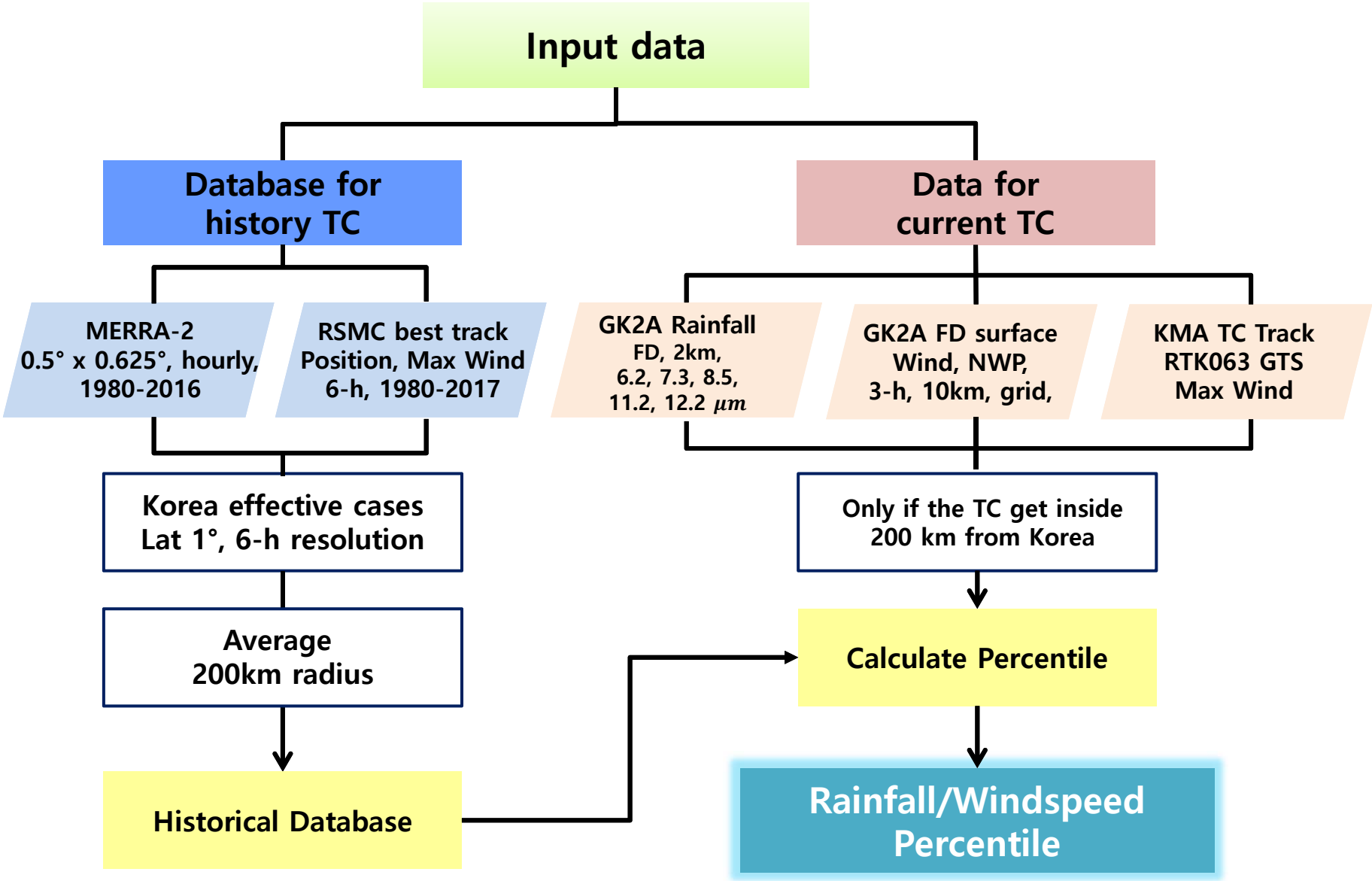
Percentile analysis for Historical Typhoons



[Example] The calculated 10%, 25%, 50%, 75%, 90% tile of precipitation and wind speed along every 1° latitude, which are estimated using MERRA-2 data for 113 historical typhoons

- Around 28°N latitude, 90%tile is about 4.3 mm/hour for precipitation and 33 m/s for wind speed. Here the values are averaged within 200-km radius from a storm center
- The latitude with peak value for rainfall data is **2-3°** higher than wind speed.

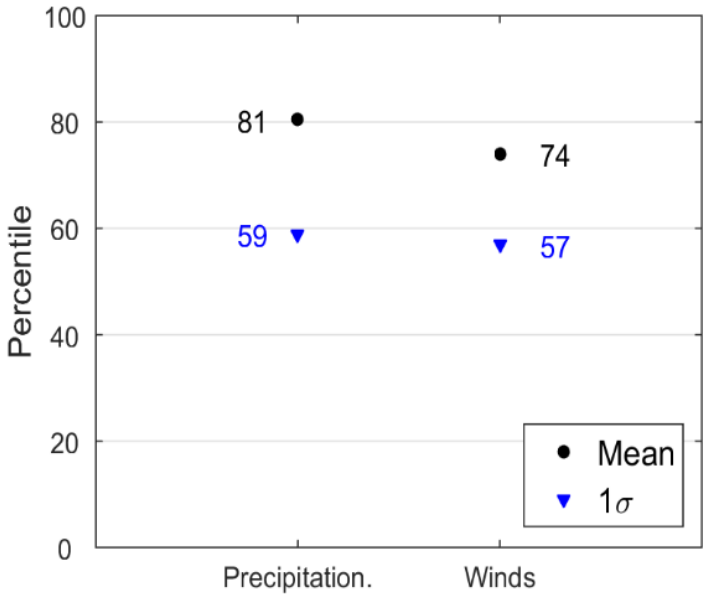
Algorithm


Input data
Database for history TC
Data for current TC
MERRA-2
0.5° x 0.625°, hourly,
1980-2016
RSMC best track
Position, Max Wind
6-h, 1980-2017
GK2A Rainfall
FD, 2km,
6.2, 7.3, 8.5,
11.2, 12.2 μm
GK2A FD surface
Wind, NWP,
3-h, 10km, grid,
KMA TC Track
RTK063 GTS
Max Wind
Korea effective cases
Lat 1°, 6-h resolution
Only if the TC get inside
200 km from Korea
Average
200km radius
Calculate Percentile
Historical Database
Rainfall/Windspeed
Percentile

Rain/wind warning threshold

Warning Thresholds

Warning Thresholds (Possibility)	Types According to Percentiles		
	Rain-Dominant	Wind-Dominant	Rain-Wind-Dominant
Warning (Medium)	59th–81st Percentile	57th–73rd Percentile	Both Satisfied
Severe Warning (High)	Above 82nd Percentile	Above 74th Percentile	Both Satisfied

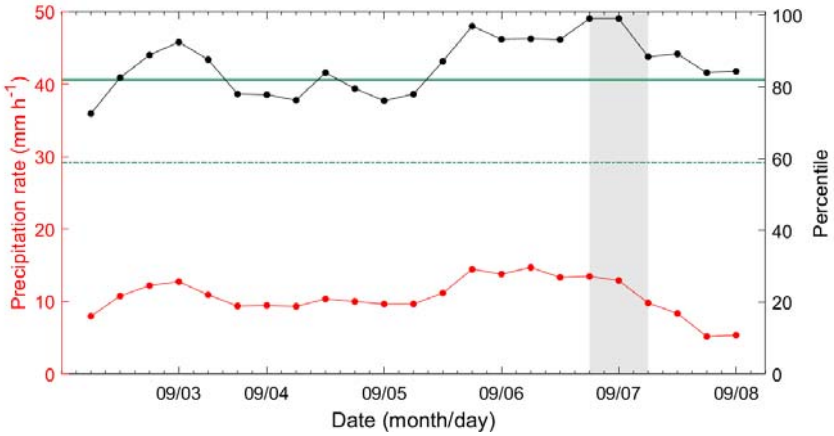


Mean and std of average top cases percentile near 32N during 1980 ~ 2017

Test Case (1913 LINGLING)

2019. 9. 2. 9:00 KST ~ 9. 8. 9:00 KST

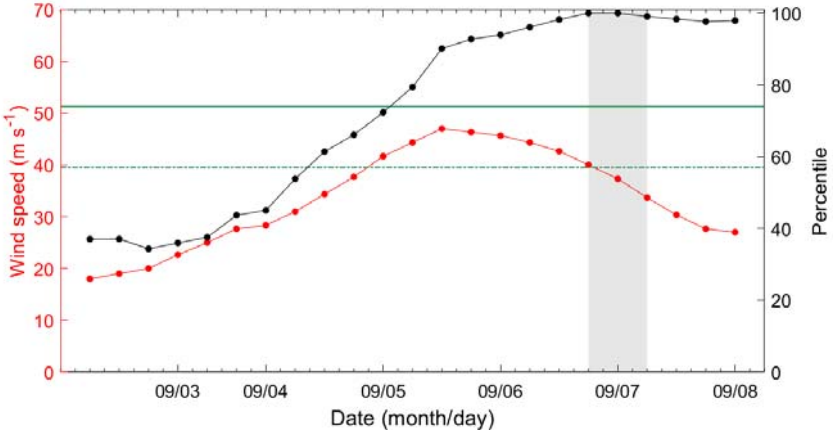
GK2A Rain



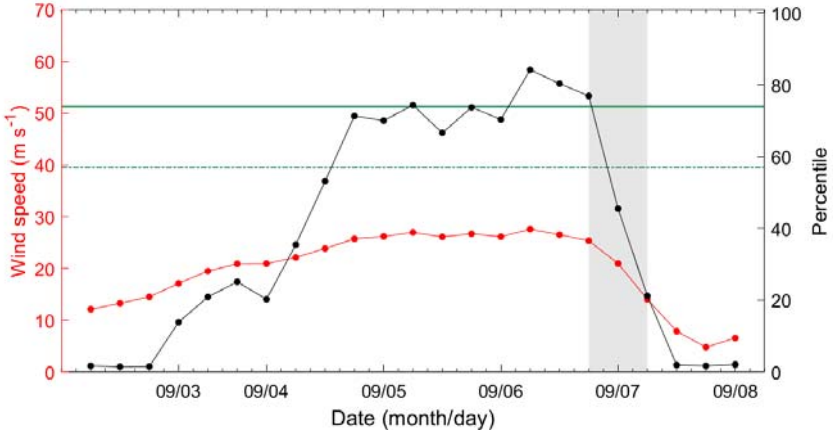
GK2A PREC : Severe
GK2A WIND : Severe
RTK WIND : Severe
to warning

Rainfall and Wind effect

GK2A Wind



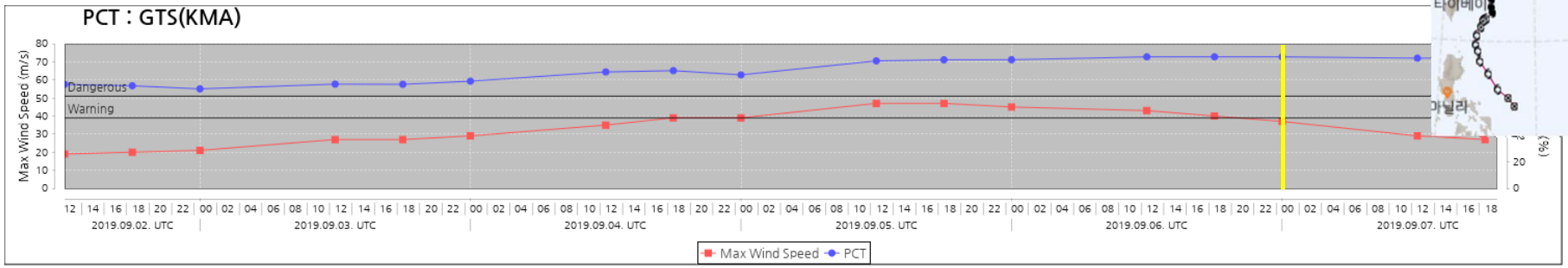
RTK Wind



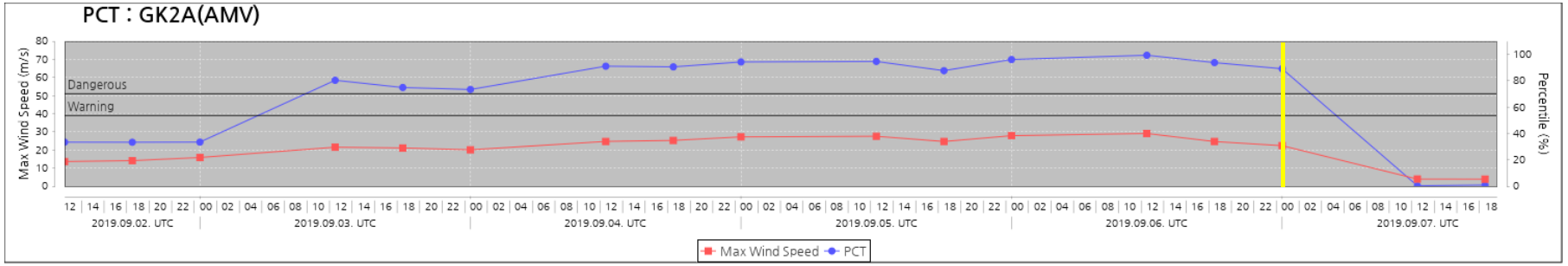
Case study – cont.

2019. 9. 2. 9:00 KST ~ 9. 8. 9:00 KST

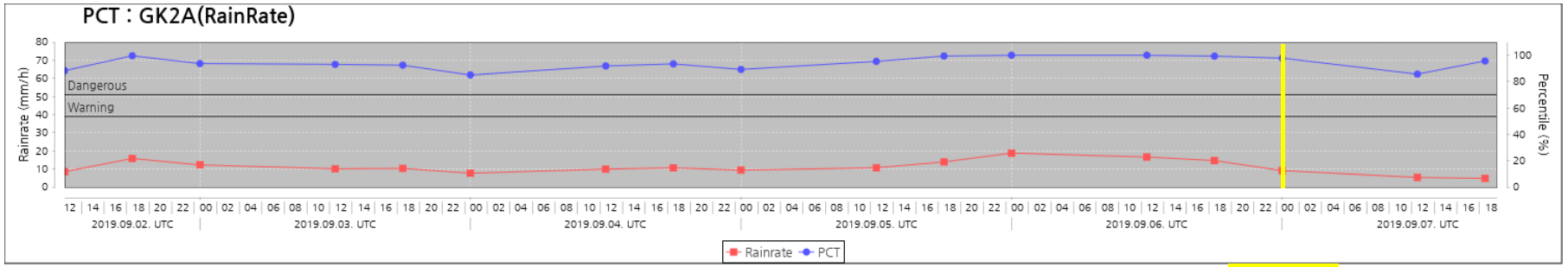
RTK Wind → Severe



GK2A Wind → Severe



GK2A Rain → Severe



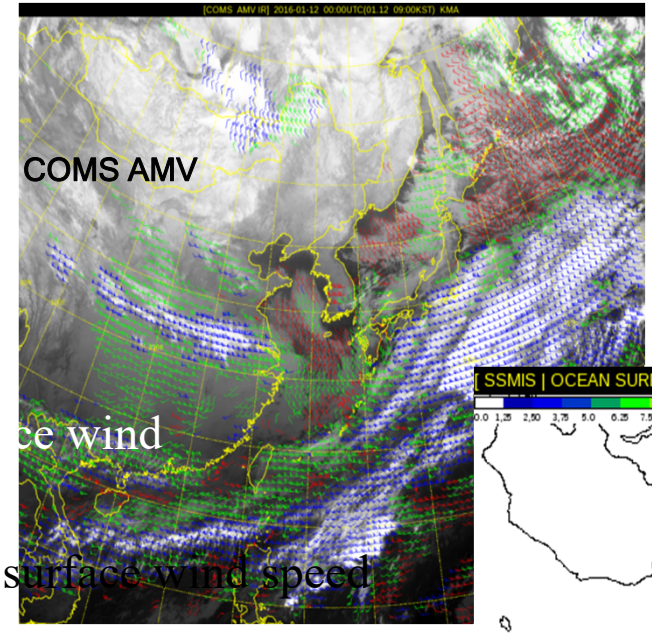
32°N

Application of Lower level Winds

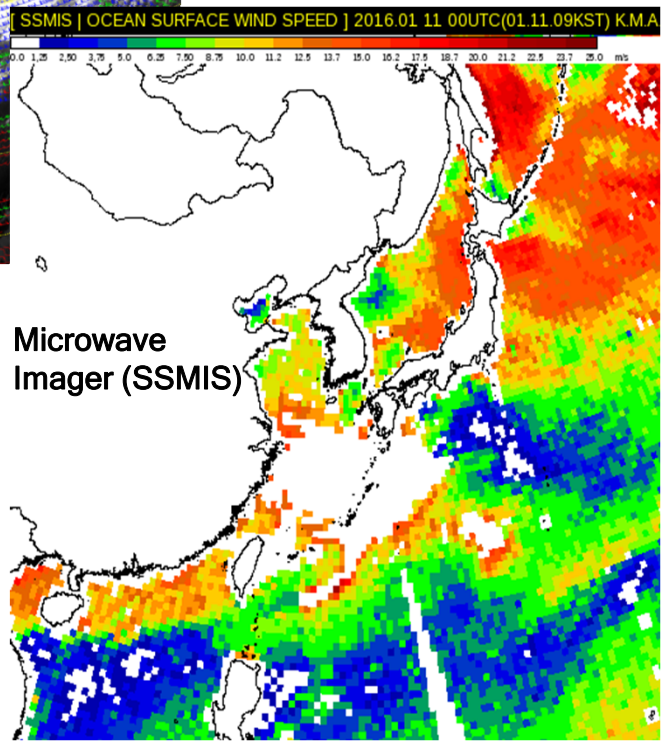
Background

❖ GEO wind field

- COMS AMV
  - ·1000-700hPa
  - ·700-400hPa
  - · above 400hPa
- Scatterometer (ASCAT) sea s ce wind
  - · 2 times per 1day
- Microwave Imager (SSMIS) sea surface wind speed
  - · 2 times per 1day



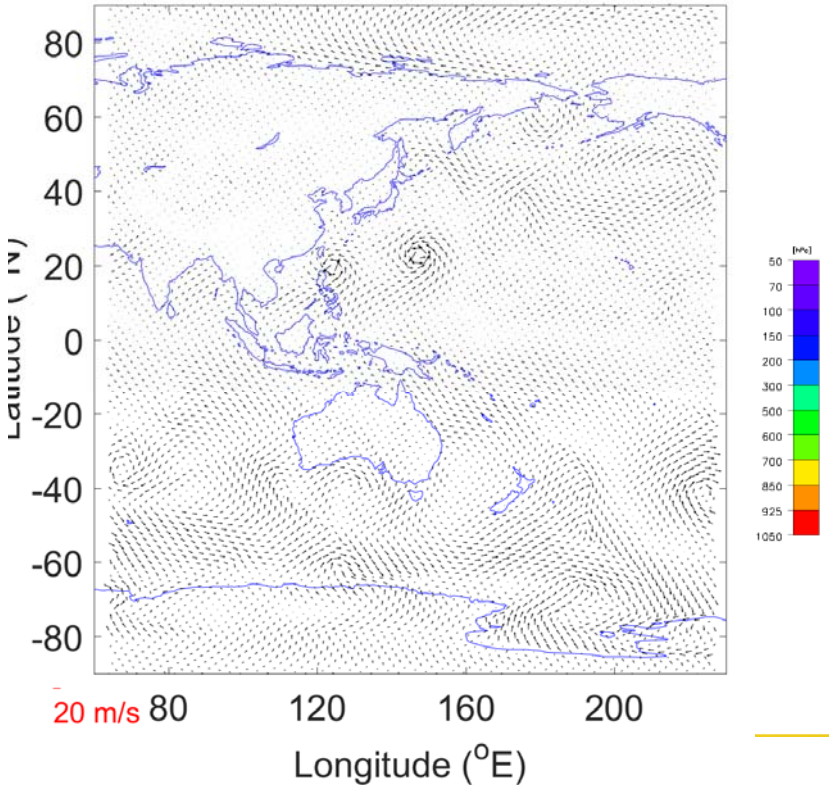
(from KMA/NMSC page)



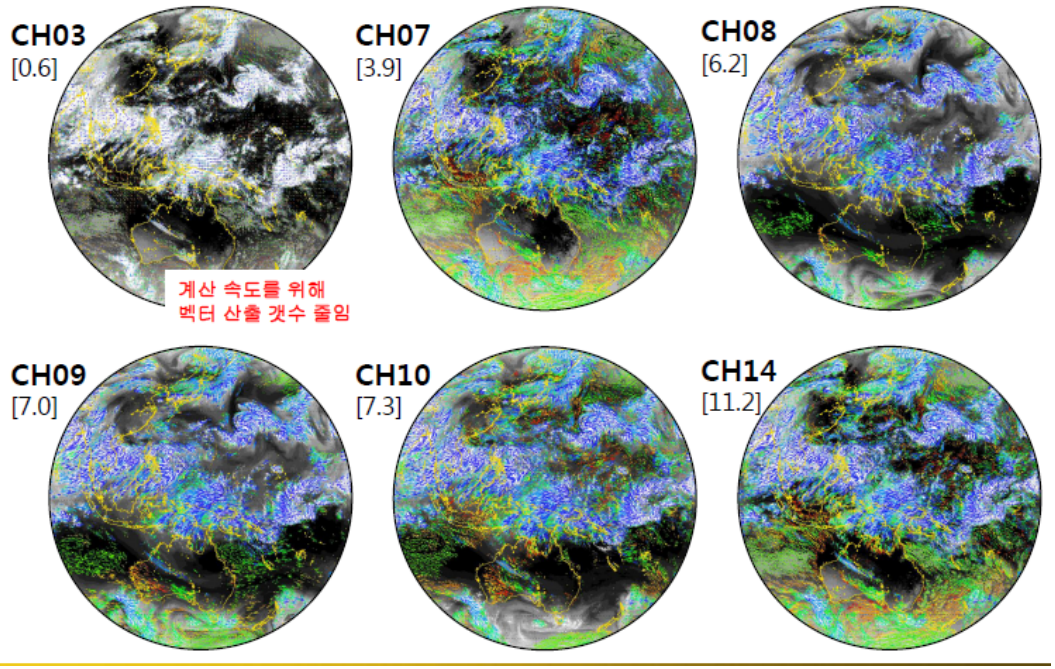
Full Disk Wind

❖ FD wind data

➢ UM model data



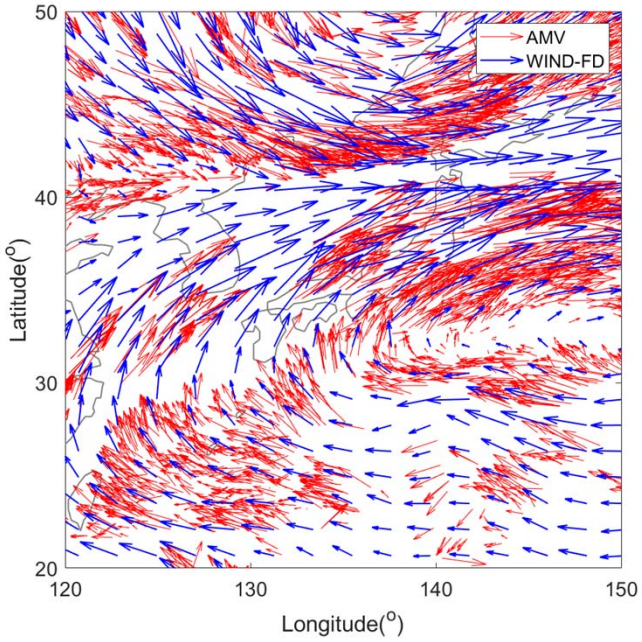
➢ AMV



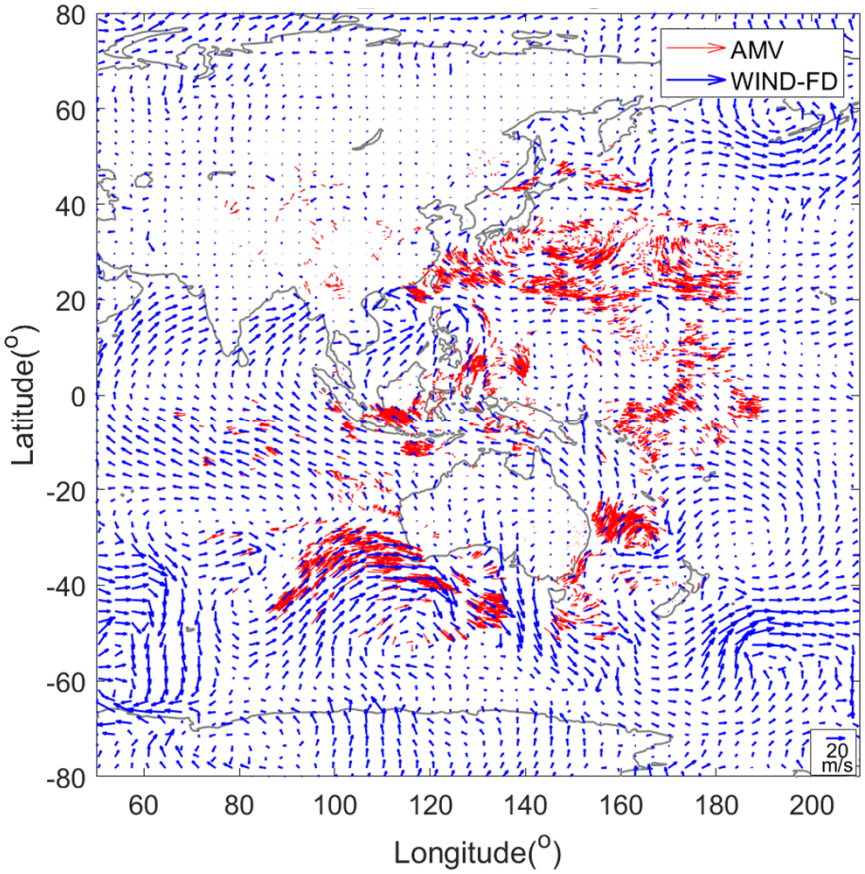
Validation

TC LINGLING(1913) : WIND-FD

2019.09.02 00:00 @ 500hPa

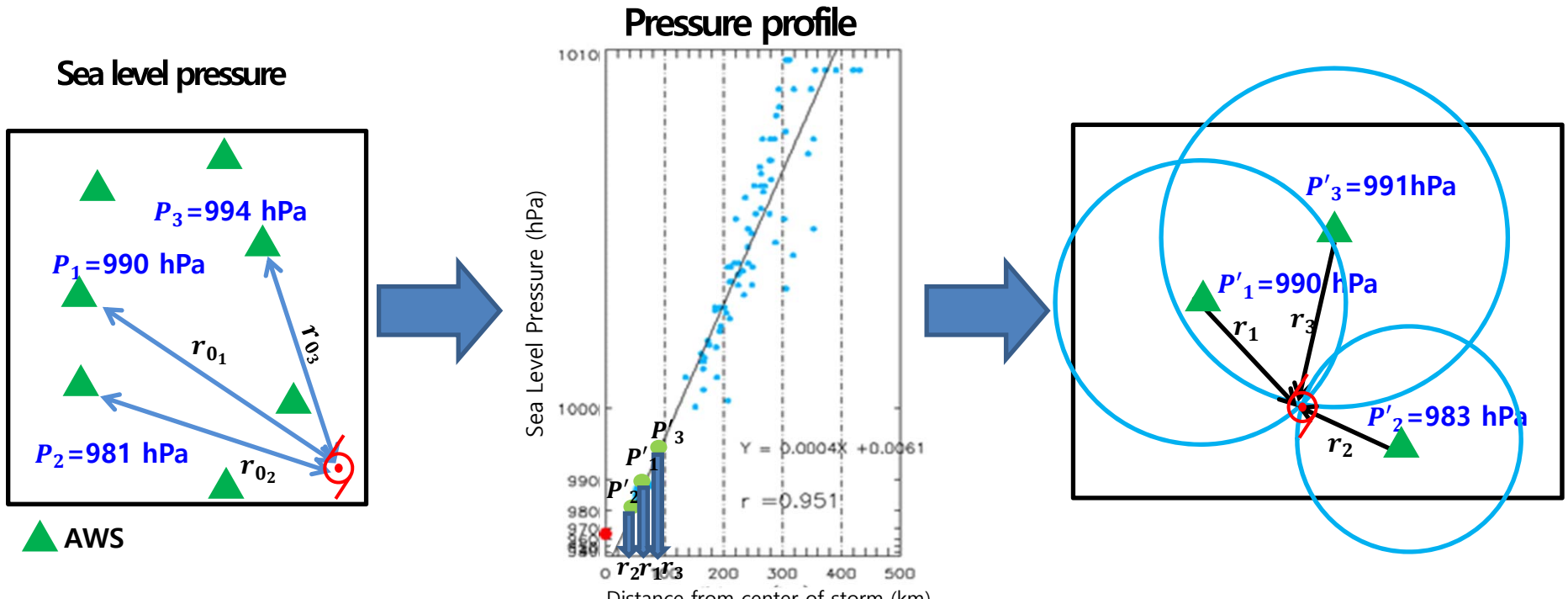


2019.09.02 00:00 @ 1000hPa

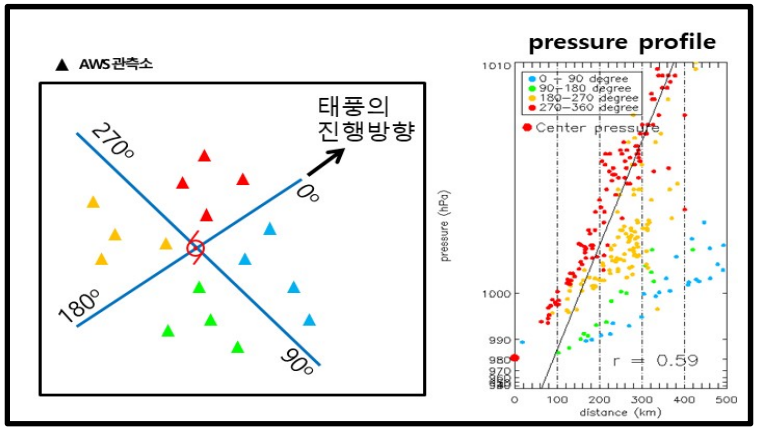


COMPASS

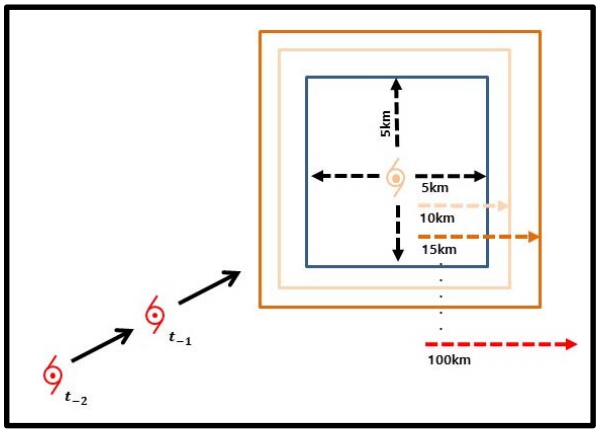
COMPASS technic using ground data



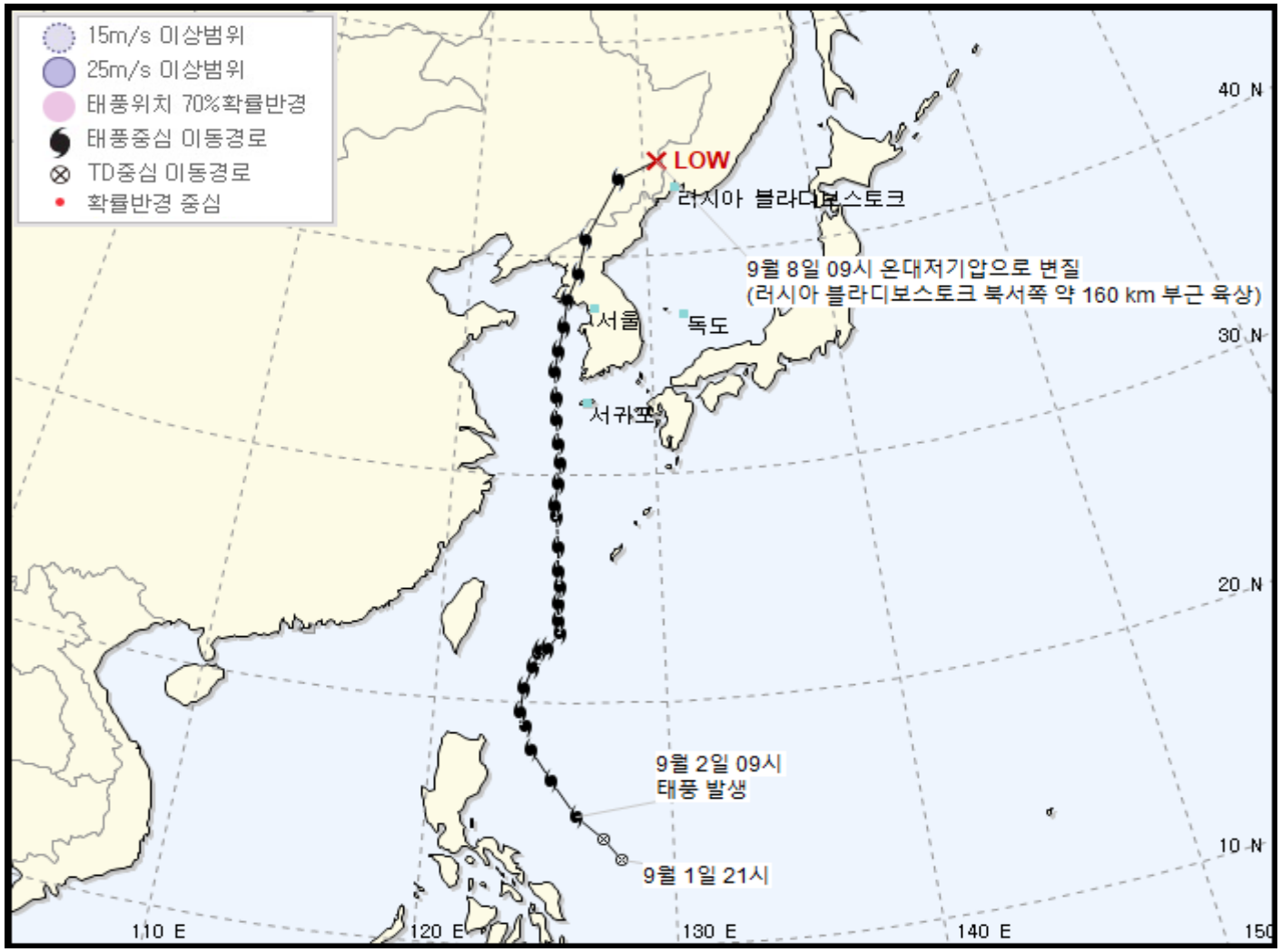
Sub 1



Sub 2

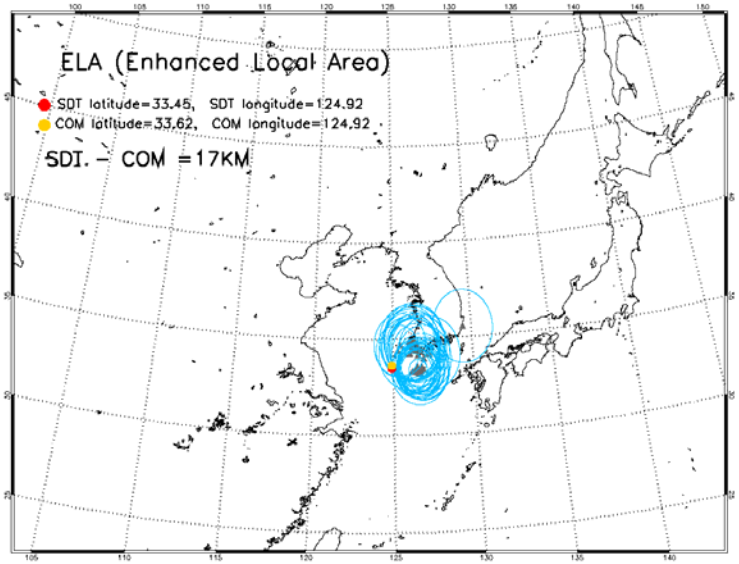


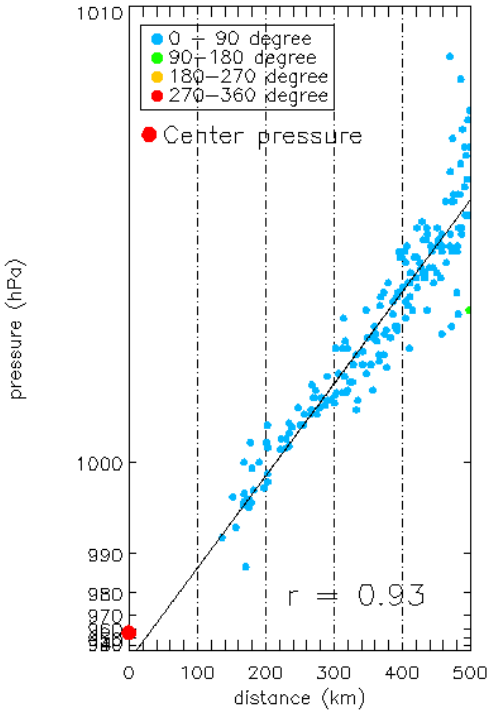
Test case 1913 LINGLING

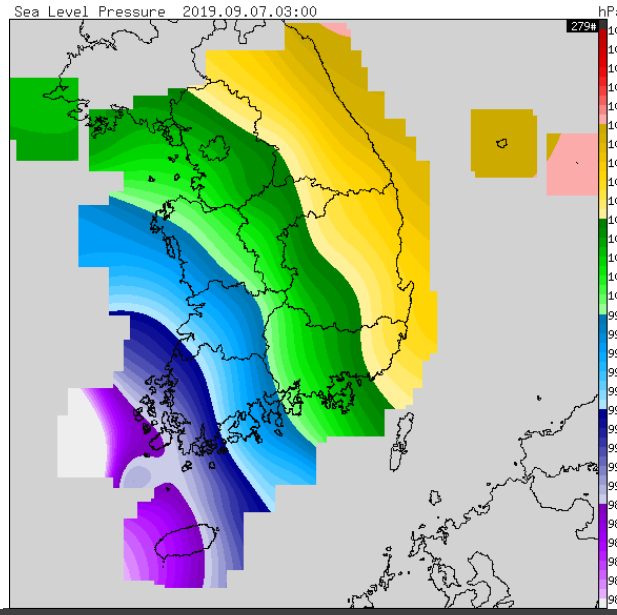


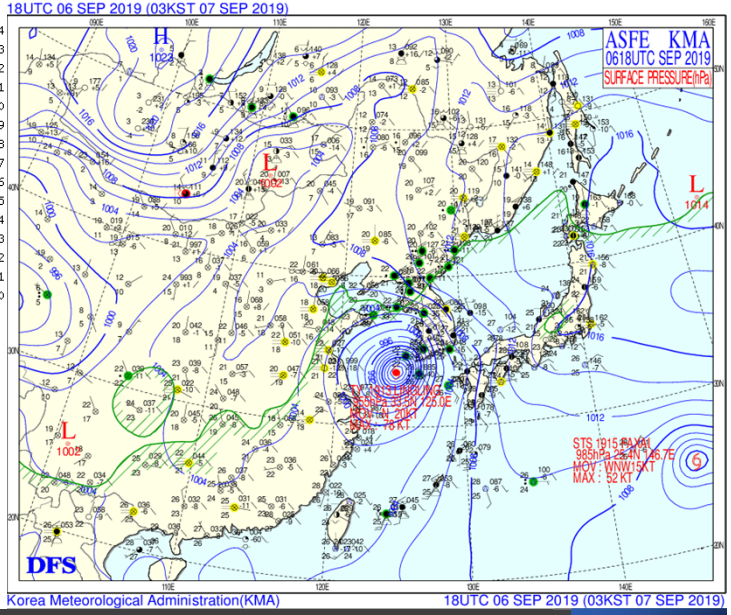
Test case - 1913 LINGLING

Time	Diff	Time	Diff
03KST	17 km	12KST	43 km
06KST	16 km	15KST	49 km
09KST	29 km	18KST	14 km

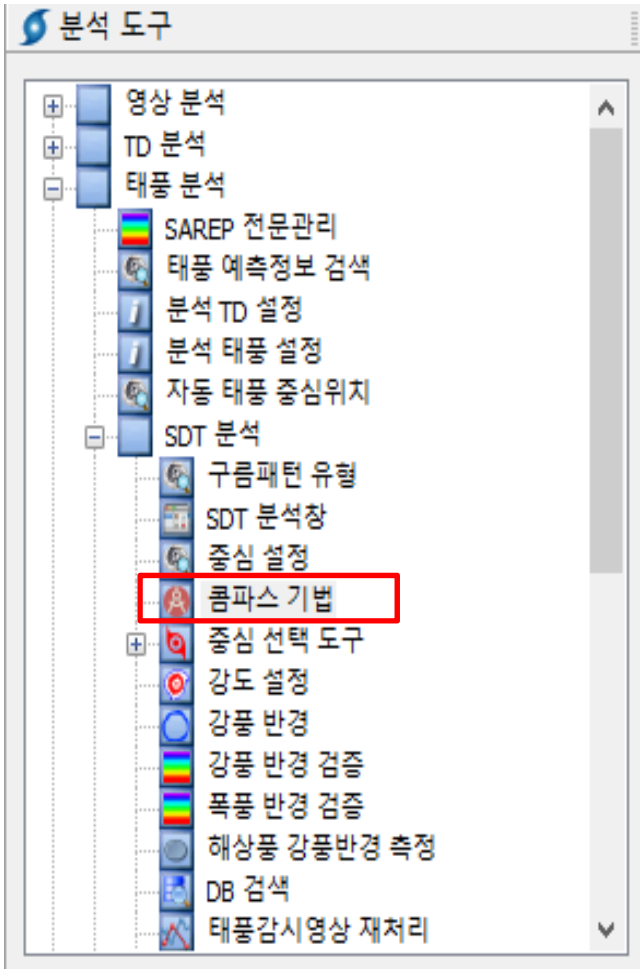


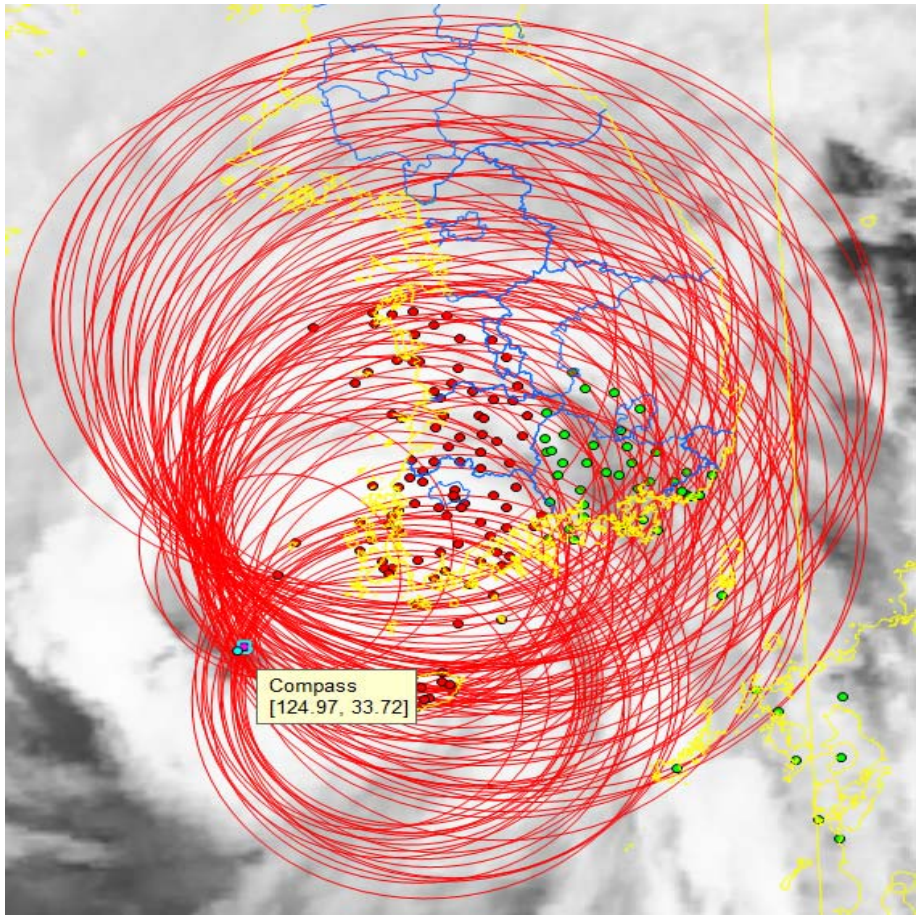






Test the Compass Technic on the system





1913 Typhoon LINGLING

Thank you
for your attention!

국가기상위성센터
National Meteorological Satellite Center