



FY SERIES SATELLITE DATA APPLICATION IN MONGOLIA

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General Information



Mongolia is an extreme continental climate with long, cold winters and short hot summers. The average **summer temperature is +20C (max +44 C)**. Winter is **-20 C (min -56 C)**. The average rainfall is **200-220 mm**.

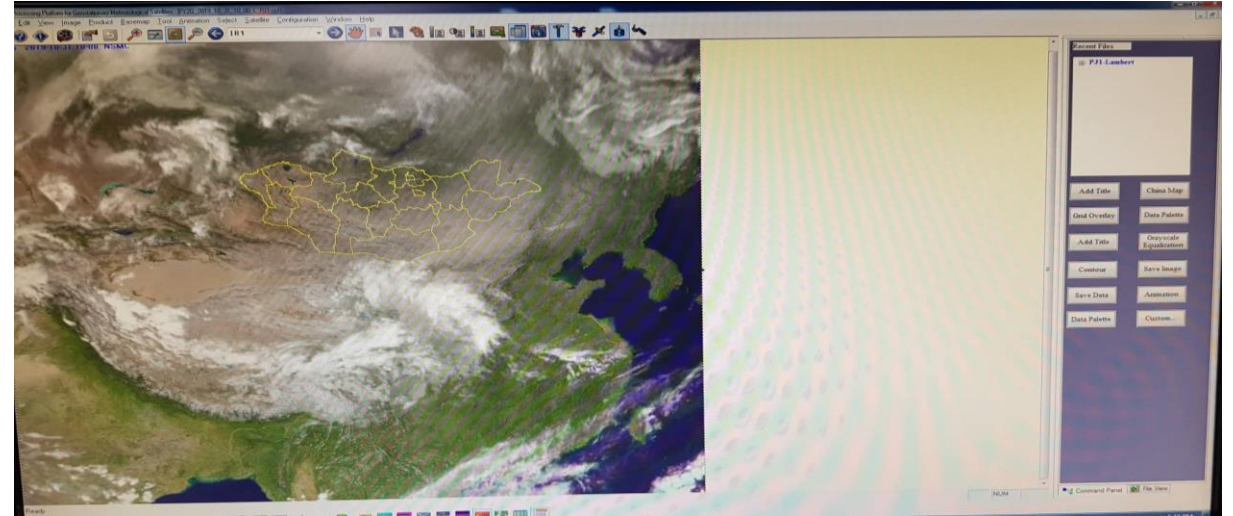
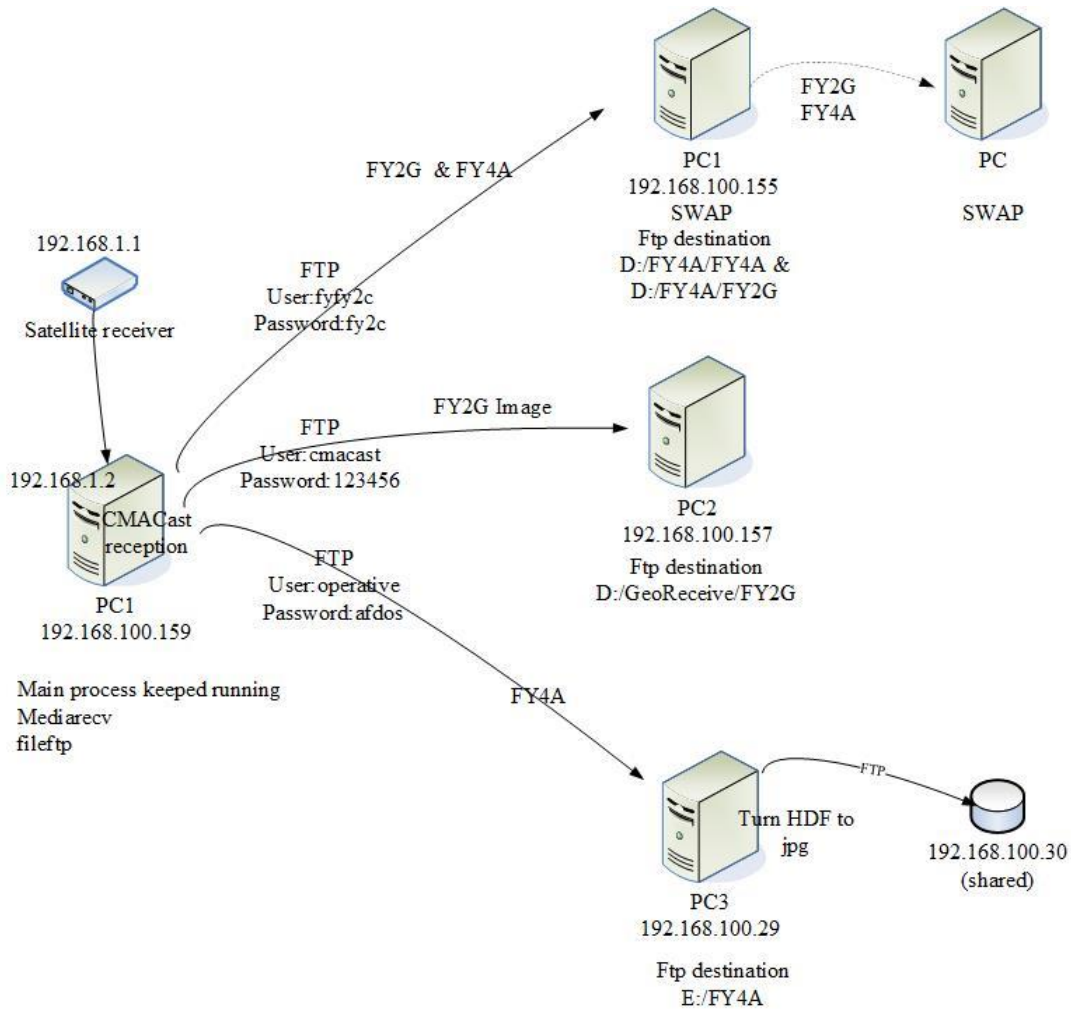
Country name: Mongolia
Population: 3.3 million (as estimated in 2019)
Capital: Ulaanbaatar
Area: 1.56 million sq kilometer
Language: Mongolian
Currency: Tugrik (MNT)
Religion: Buddhist (92%), Muslim (4%), others (4%)



Overview

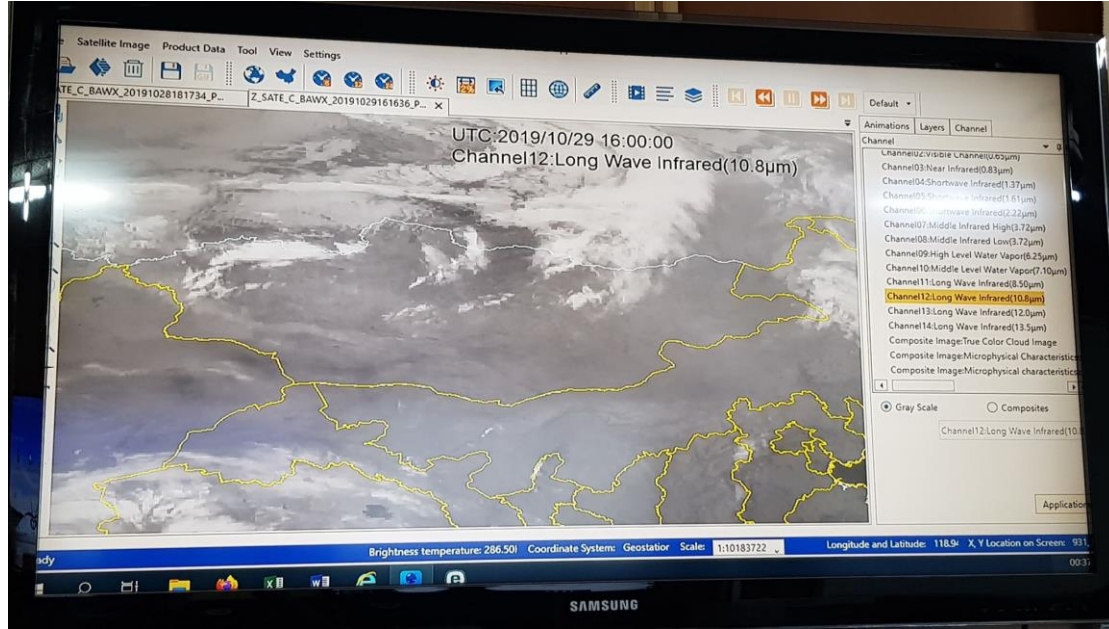
FY series meteorological satellites are playing an important role in weather forecasts, climate predictions, environment and natural disaster monitoring etc., They have been widely used in agriculture, forest, water resource, civil aviation and environment protection as a model for satellite applications. The satellite data which have been broadcasted through the CMAcast system in Mongolia is helpful for government decision making, disaster prevention, preparedness and mitigation as well as services in response to global climate change. Since we started receiving FY series satellite data, those have been used for different purposes such as cloud tracking, agriculture and climate change monitoring.

Data Receiving System And Milestones of FY Satellites



Year	Satellite	Resolution (m)	Temporal resolution (min)
May/2007	FY-2C	1000	30
Feb/2009	FY-2D/G/E	1000	30
Late Sep/2019	FY-4A	500	15

SATELLITE WEATHER APPLICATION PLATFORM (SWAP2) TRAINING AND INSTALLATION IN MONGOLIA, 18TH SEPTEMBER, 2019



FY-4A Meteorological Satellite Products Application

Satellite imagery is a powerful tool for quickly assessing the current weather situation over large areas at any time of day. We can diagnose synoptic-scale weather patterns, track the growth of individual convective storms, differentiate high clouds from low ones or ice clouds from liquid ones, and distinguish between low clouds, snow, dust, land and water surfaces using FY-4A satellite products.

However, there are many different applications, i have chosen one of the products that is showing the dust transportation over Mongolia on recent weather event.

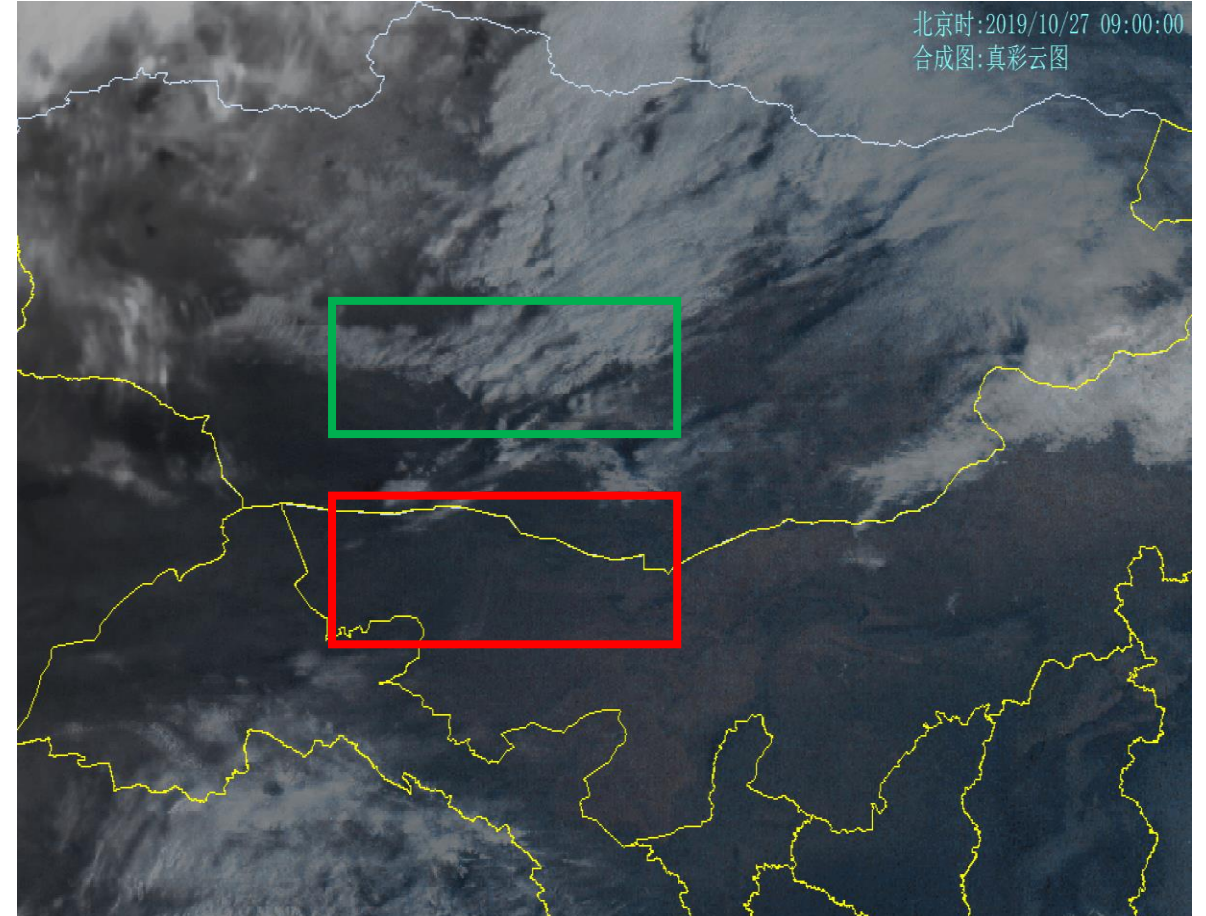
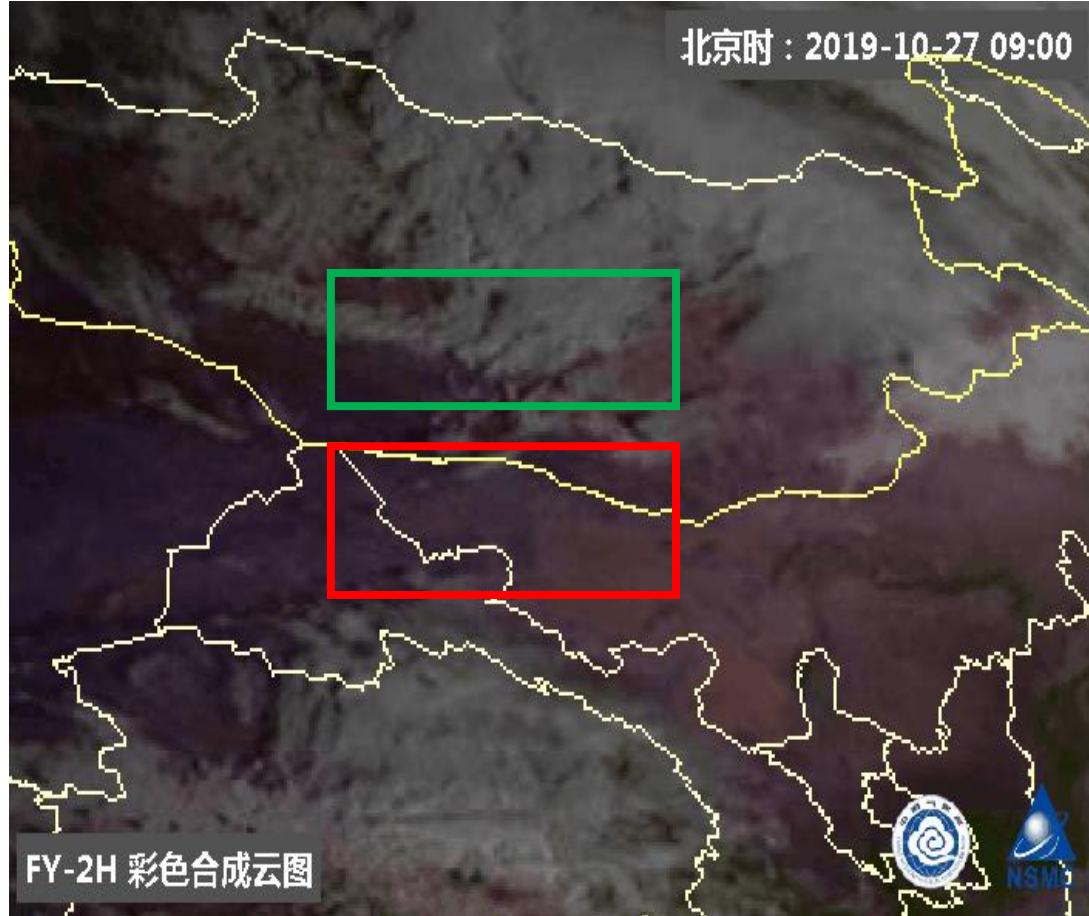
Case-1. Dust Transportation Over Mongolia (2019.10.27)

FY-2H

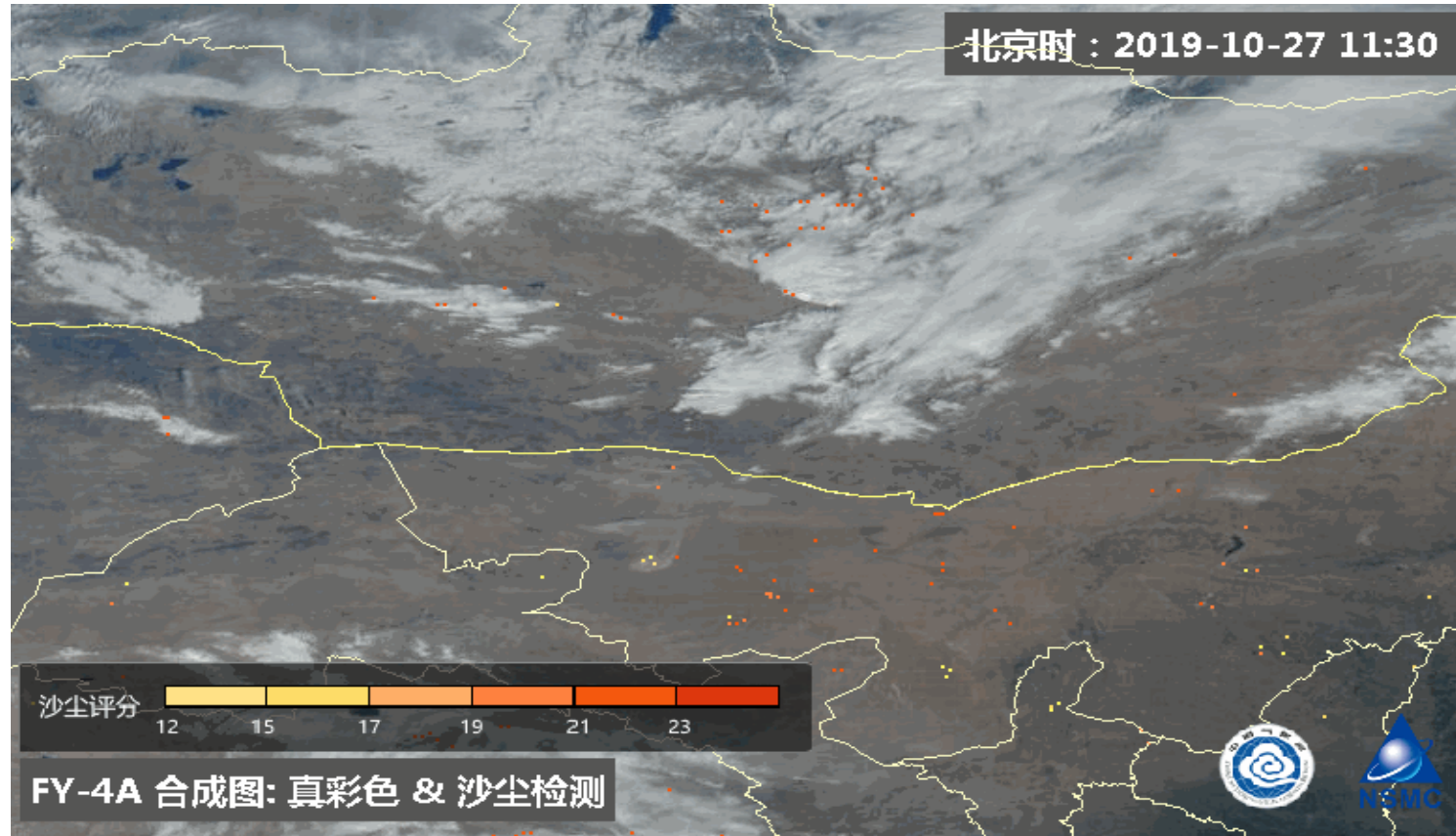
Region I

Region II

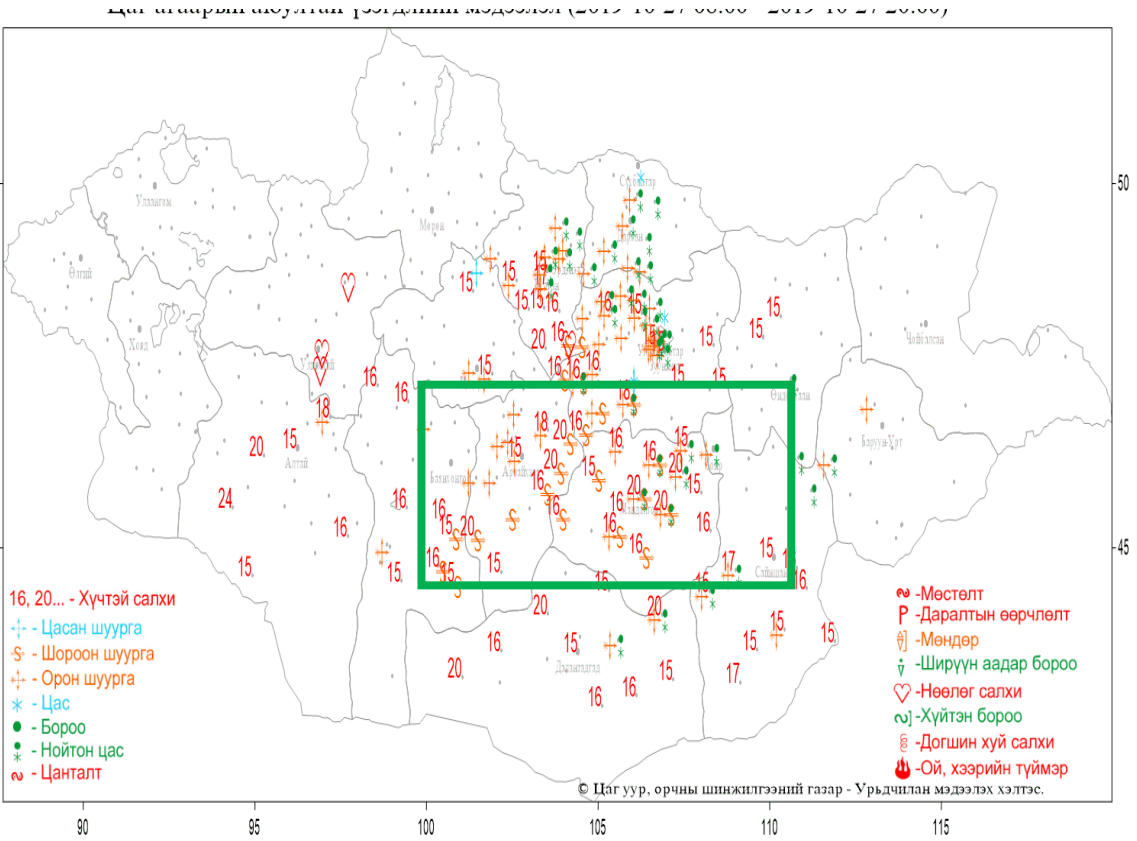
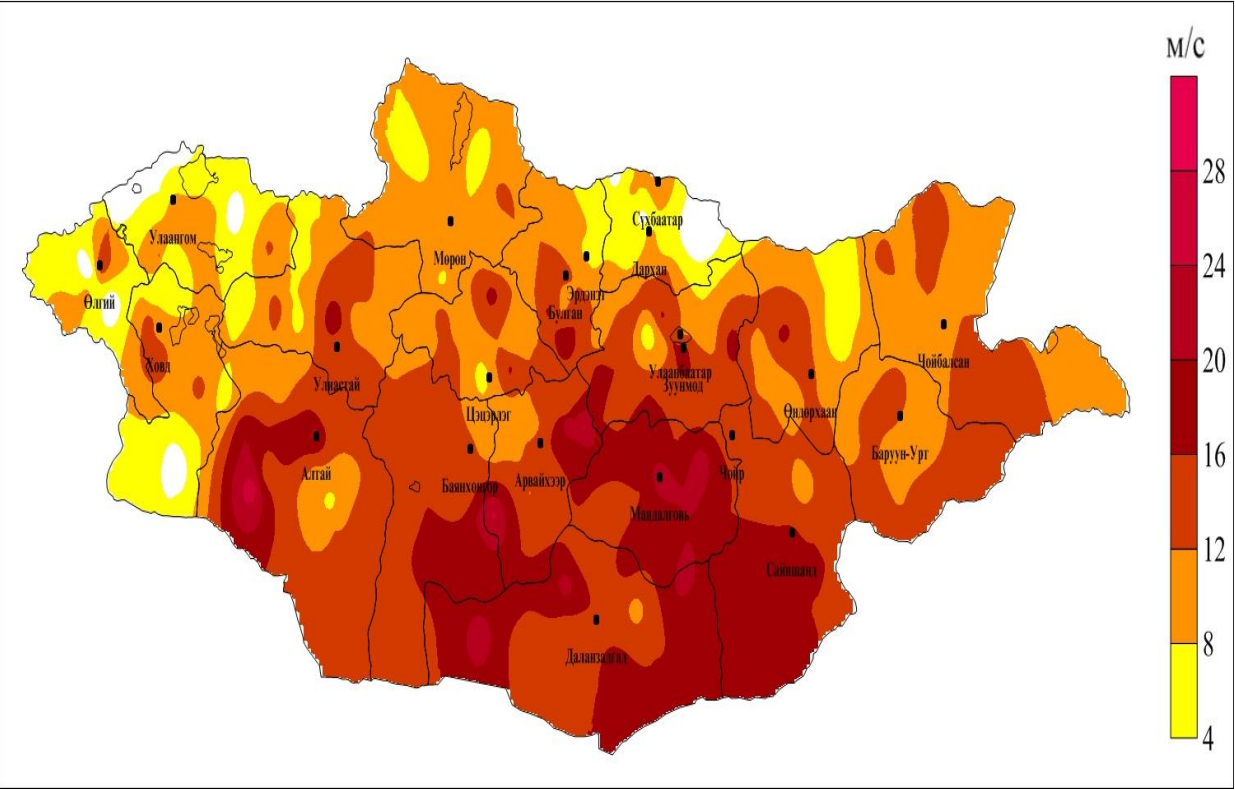
FY-4A



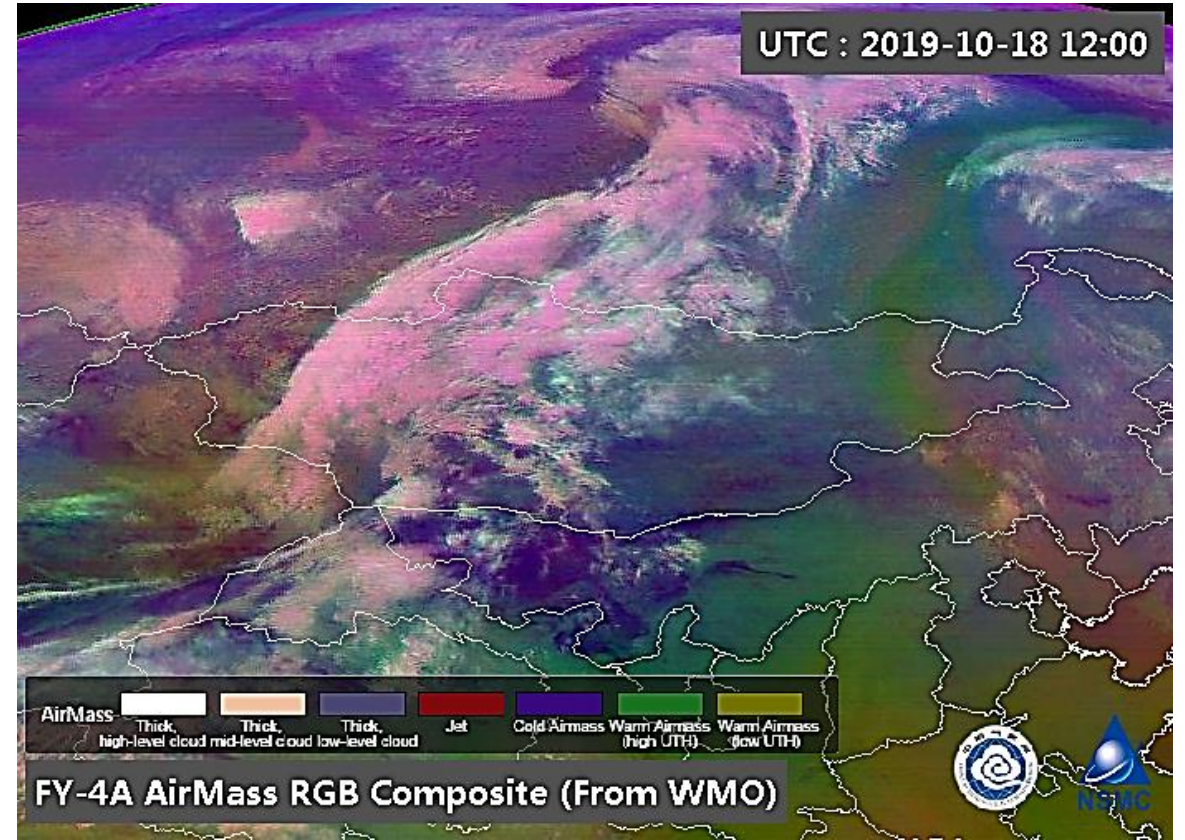
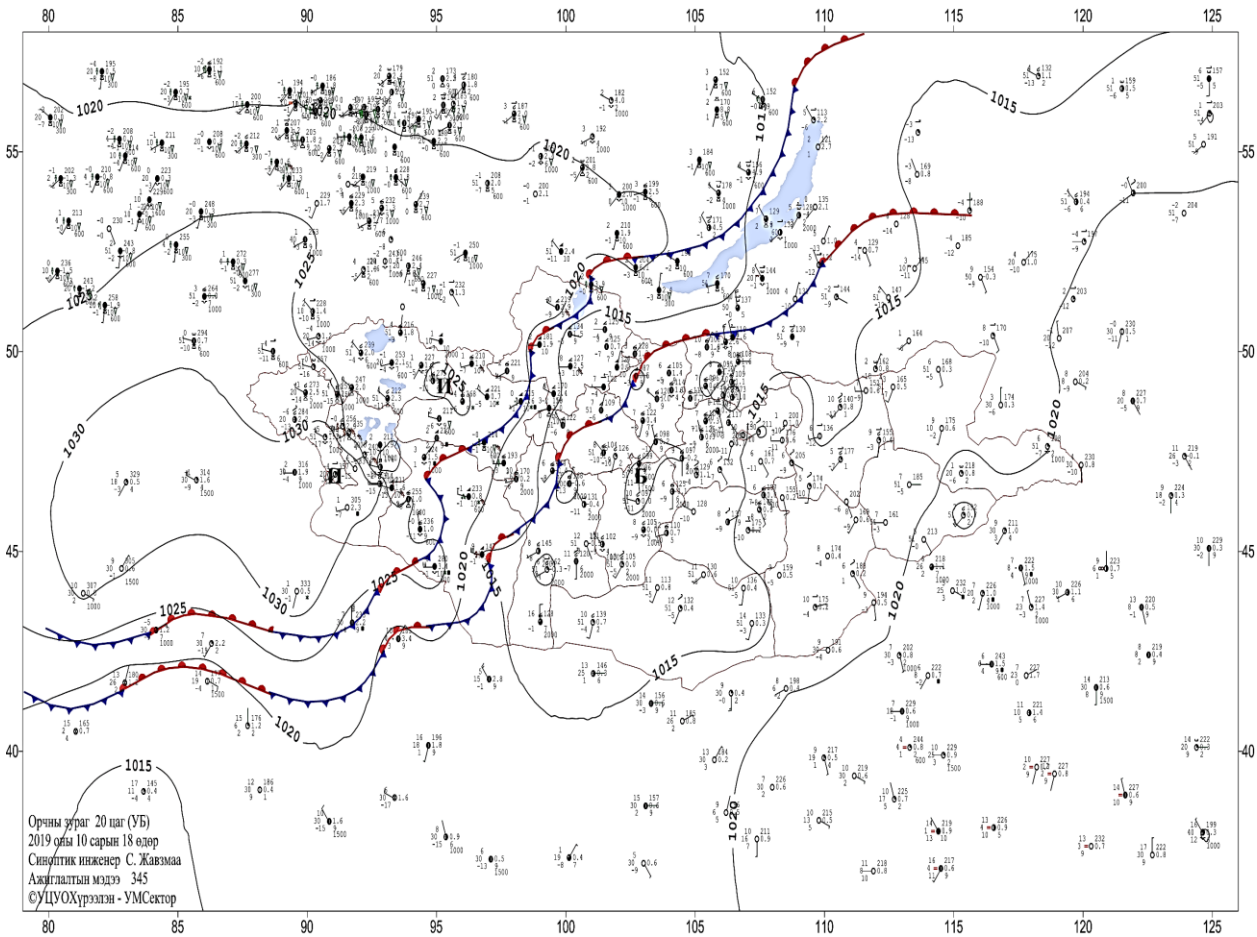
FY-4A L2: Dust Identification Products



Severe Weather Information And Wind Speed Those Recorded At Meteorological Stations Between 26th And 27th of October, 2019.



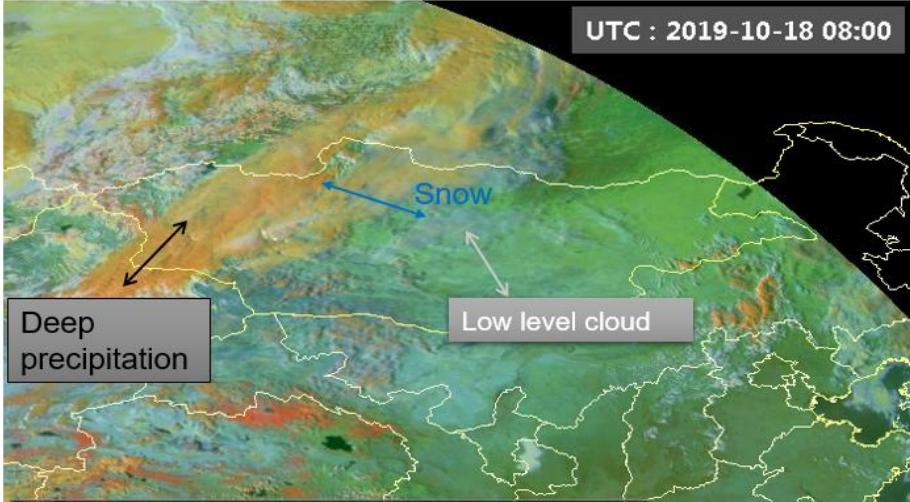
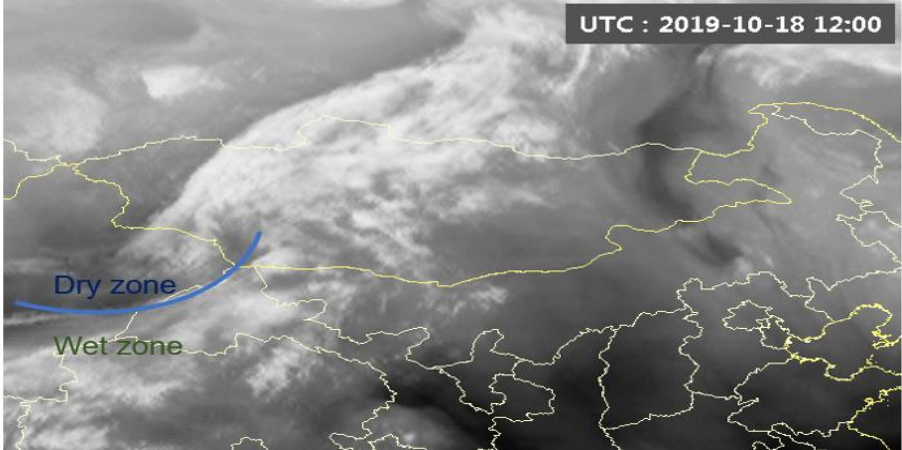
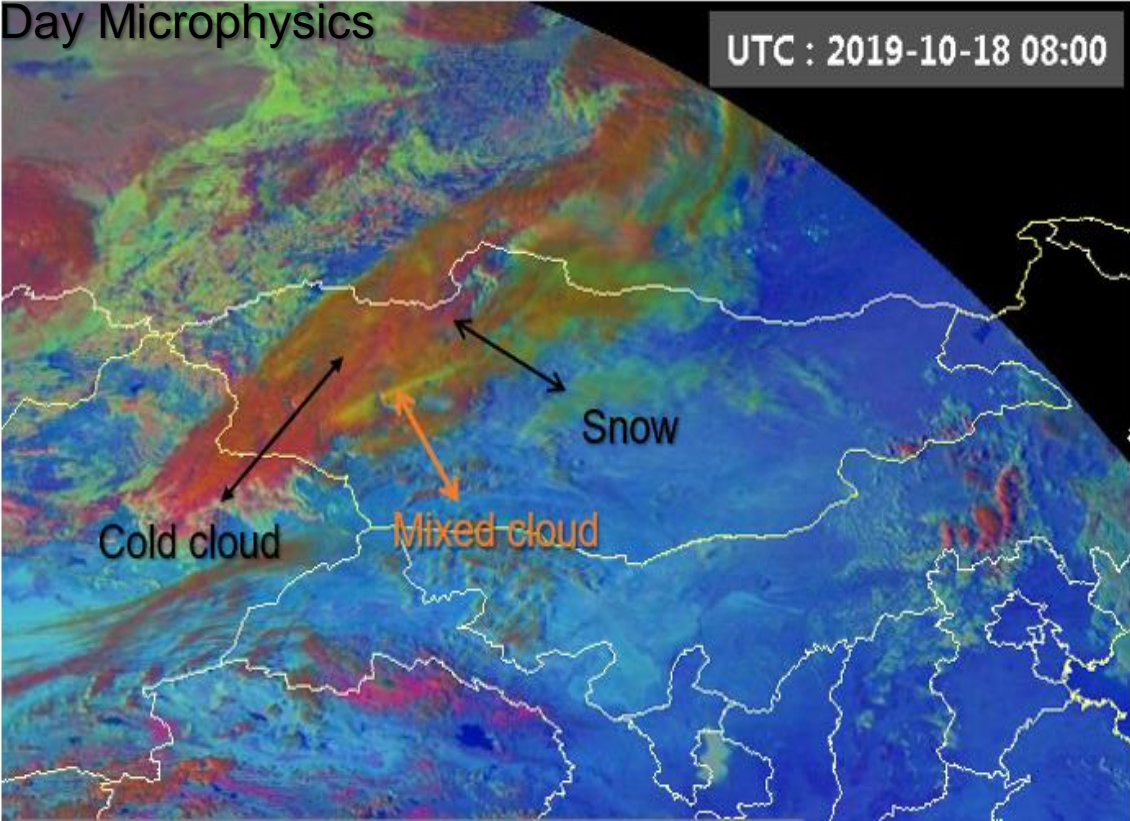
Other Applications FY-4A



Frontal analysis using Airmass image

Other Applications FY-4A

Clouds and other feature identifications at various RGB products



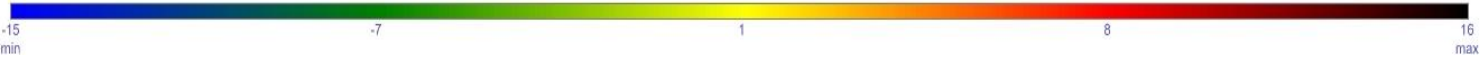
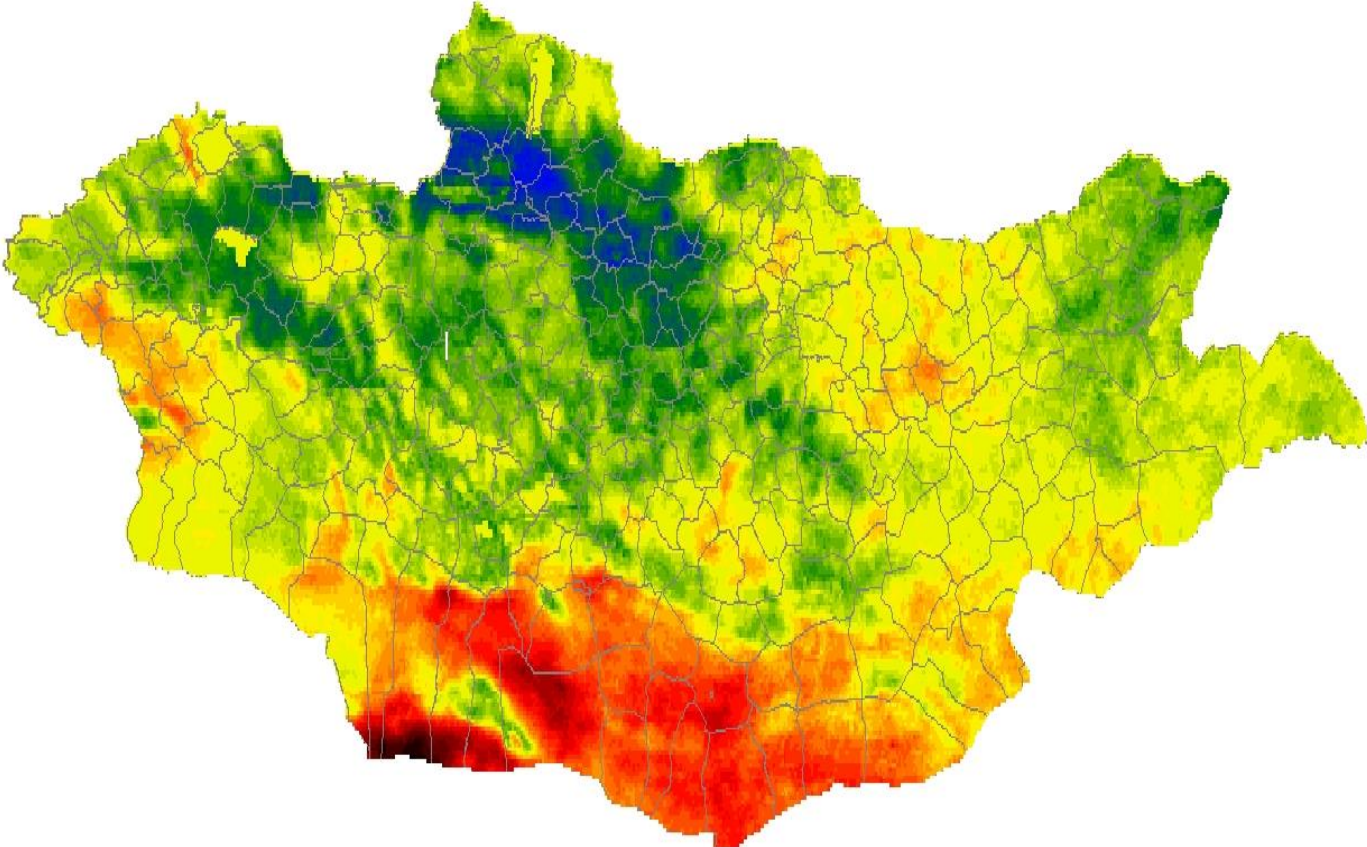
FY-2 SERIES SATELLITE APPLICATION IN ASSESSMENT AND MONITORING

FY-2 satellites were used mapping 10 days average temperature and total precipitation over Mongolia since 2007. Because our country's economy highly depended upon animal husbandry, therefore such information provides wide view over large territory. Moreover, it is mainly used to assess grassland cover that relates to **drought condition** while snow cover which is needed to monitor the **severity of dzud** condition.

FY-2 Applications

Product	File naming system	Conversion equation	UNIT
1.5meter air temperature	[YY][MM][DD]	$T_{1.5m} = DN + 100$	Kelvin
*DN=digital number in map			

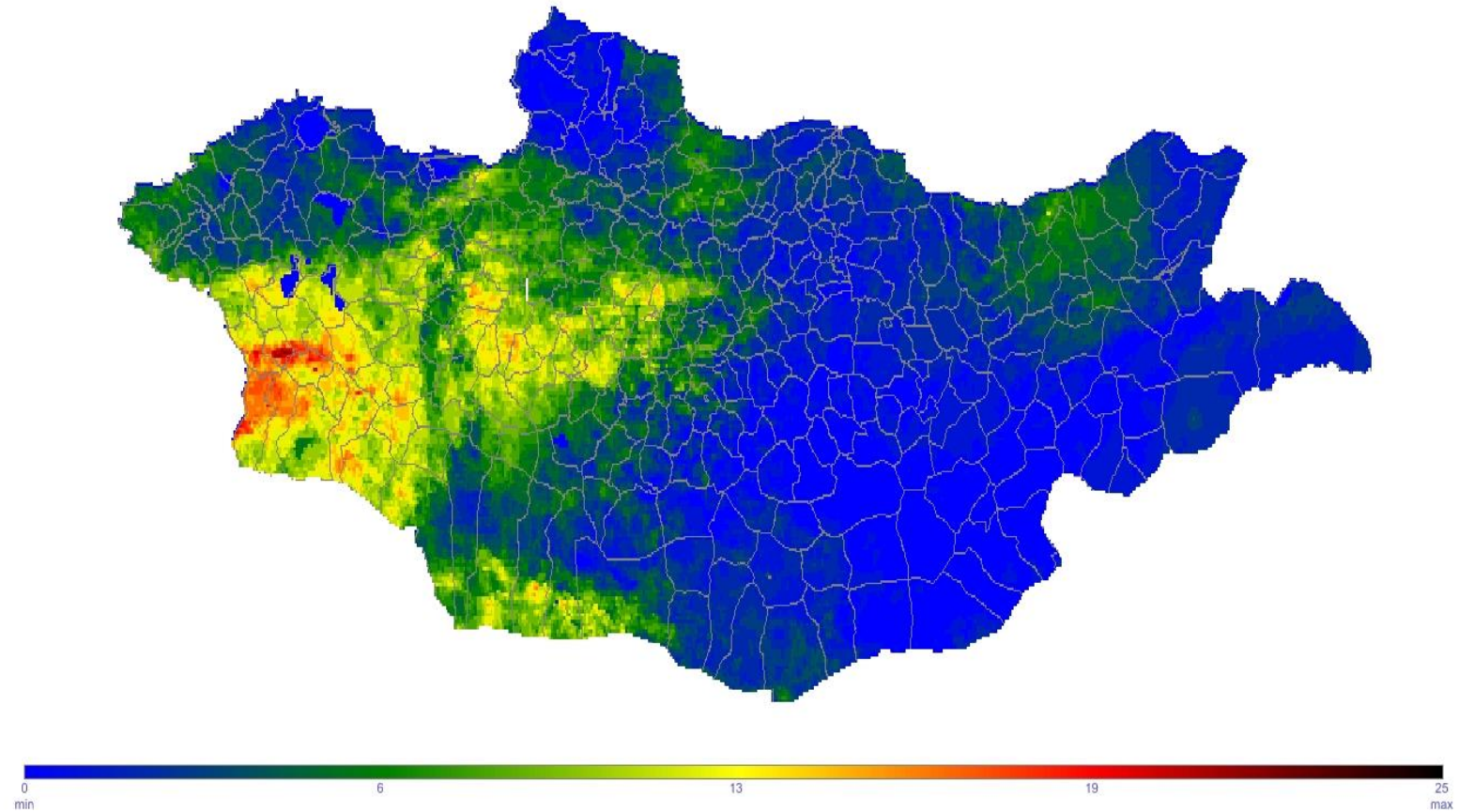
10 day average temperature (estimated by FY-2 satellite data)



FY-2 applications

Rainfall maps based on the satellite derived cloud duration as well as precipitation recorded at meteorological stations.

10 day average precipitation, mm (estimated by FY-2 satellite data)

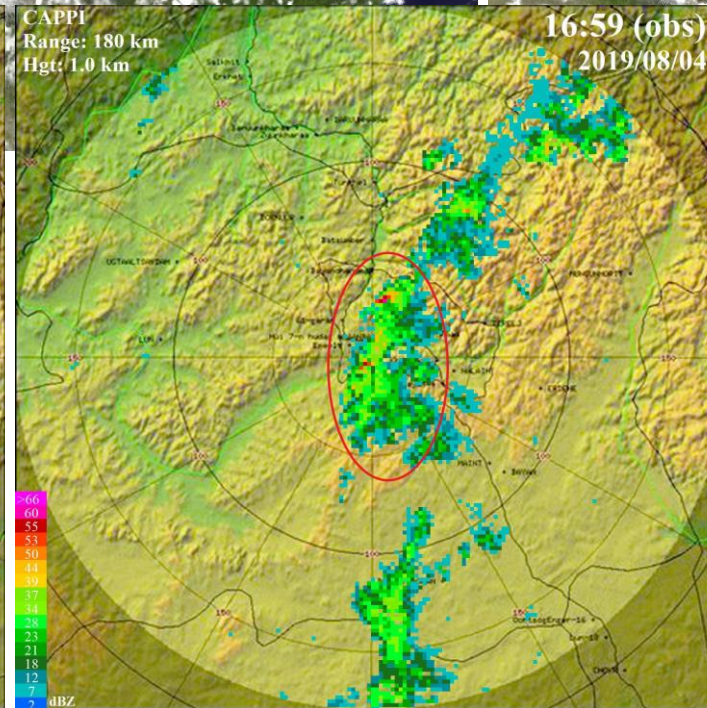
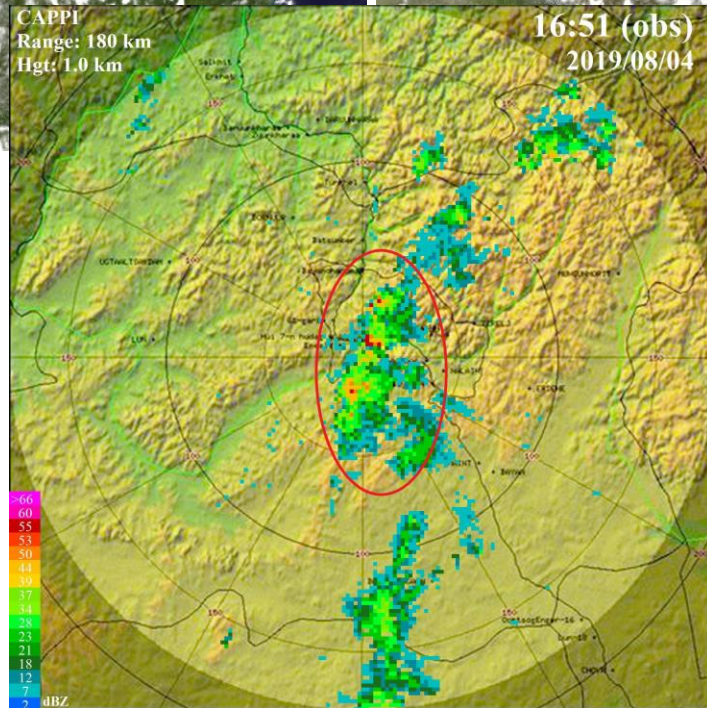
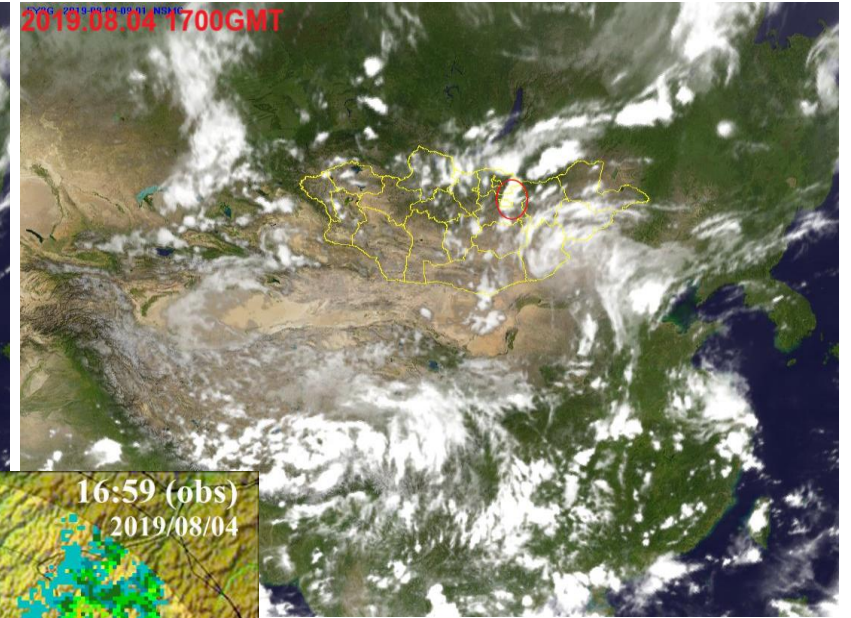
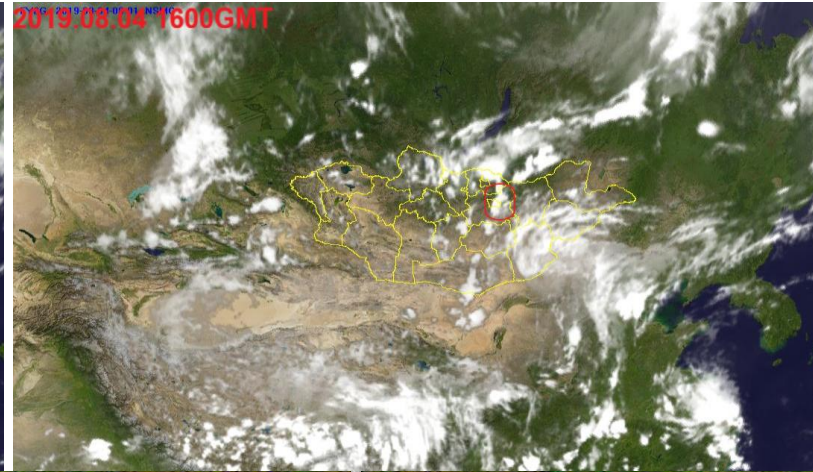
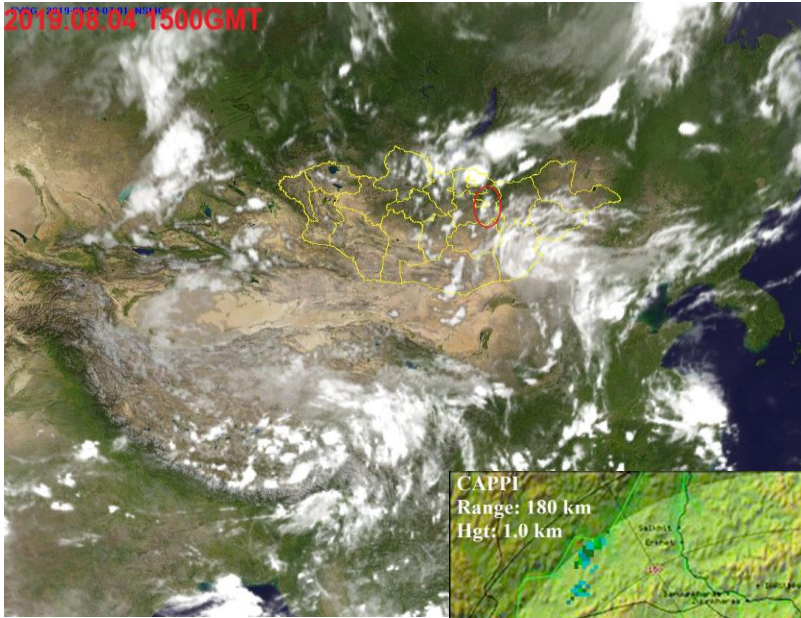


Case-2. Convective Event (2019.08.04)

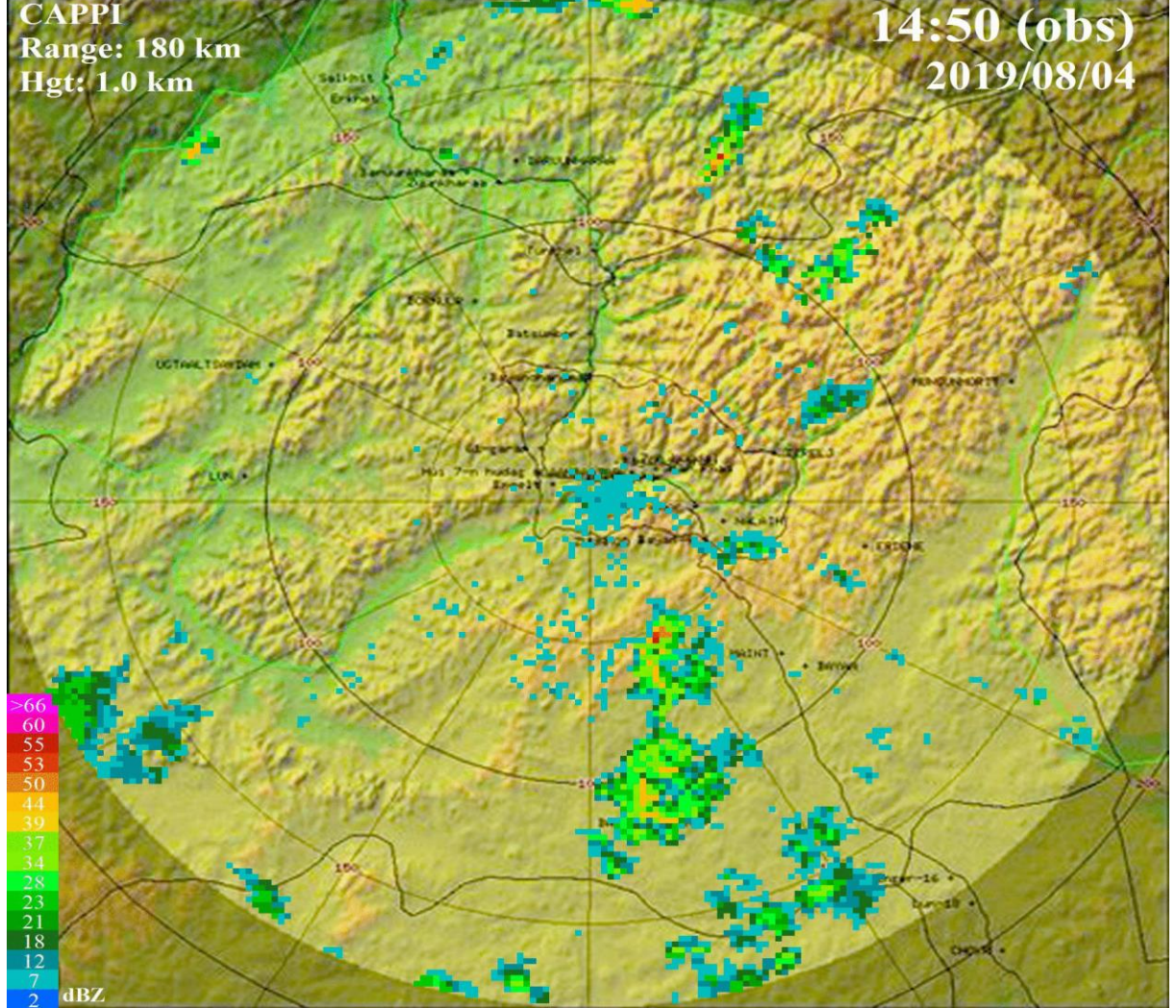
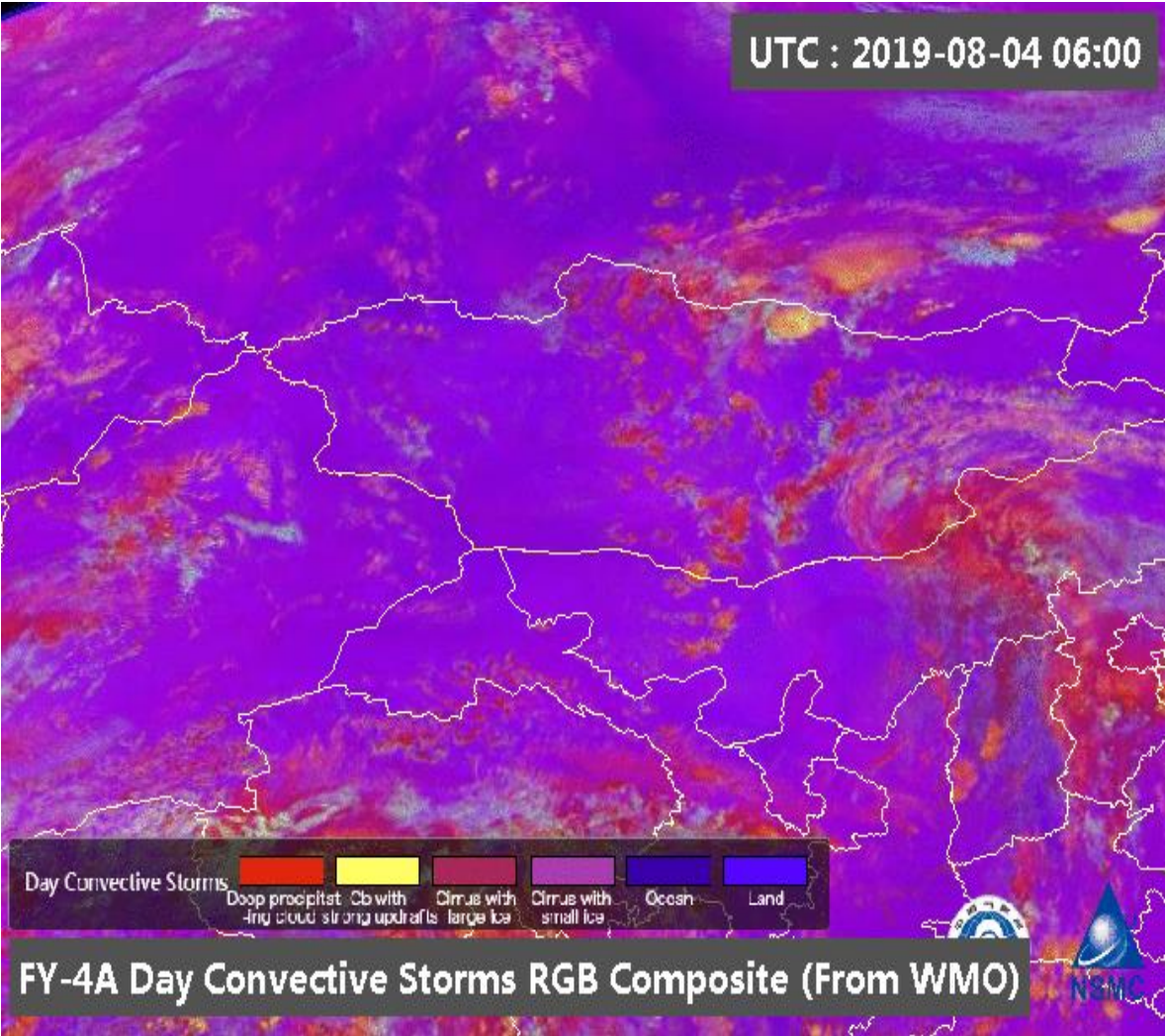
One of the most severe weather type during summer season in Mongolia relates to convective event which cause heavy rainfall in immensely short duration. Such convective event forecast is important for city area in order to prevent obvious damages to infrastructure such as road, buildings and power plants etc.,

The case we chosen here showed that heavy rainfall event on 4th August, 2019 **in capital city of Mongolia**, and the rainfall amount was recorded between **14.0 mm and 28.0 mm** within **less than 2 hours**.

FY-2G And Radar Reflection Comparison



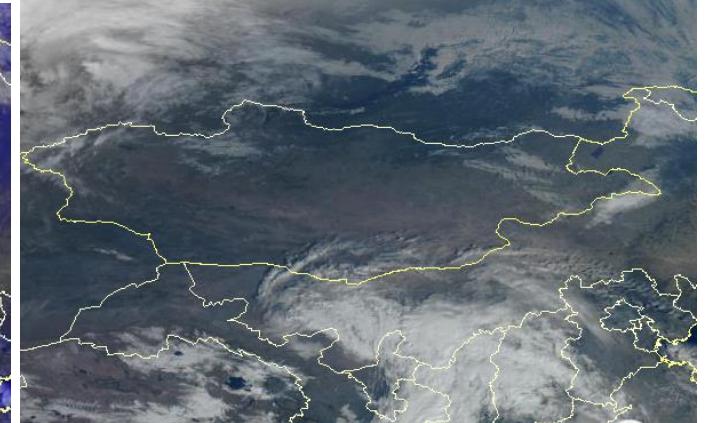
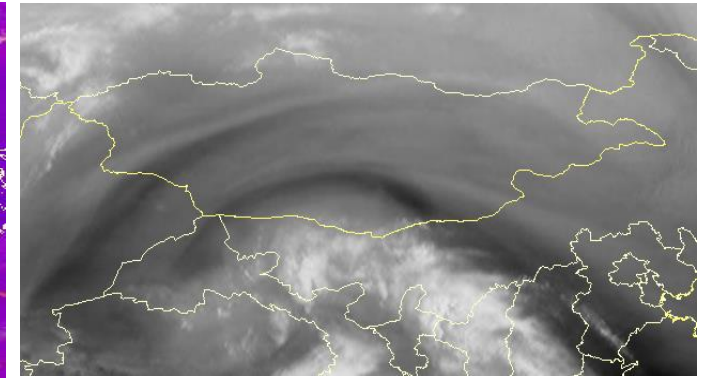
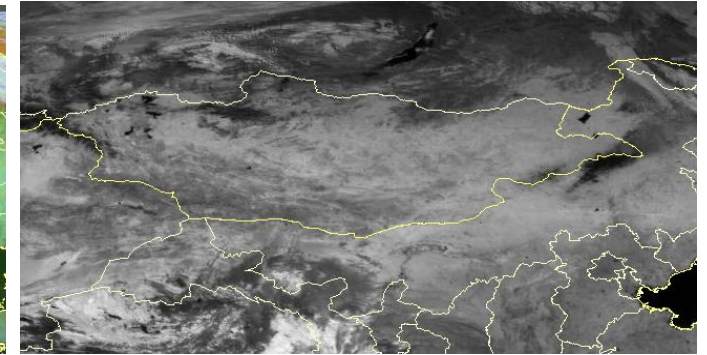
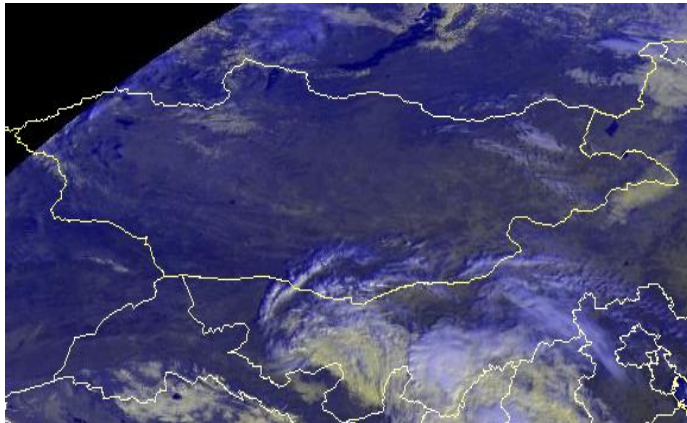
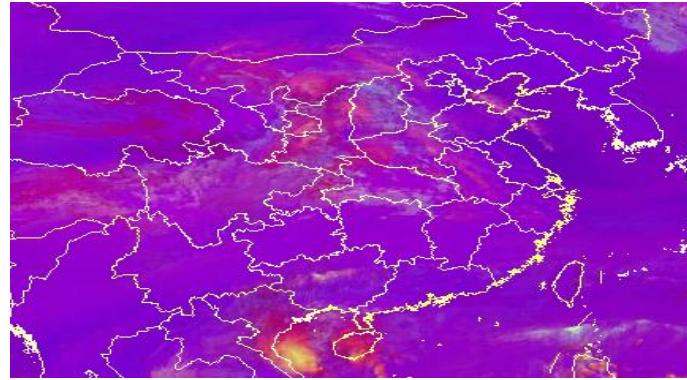
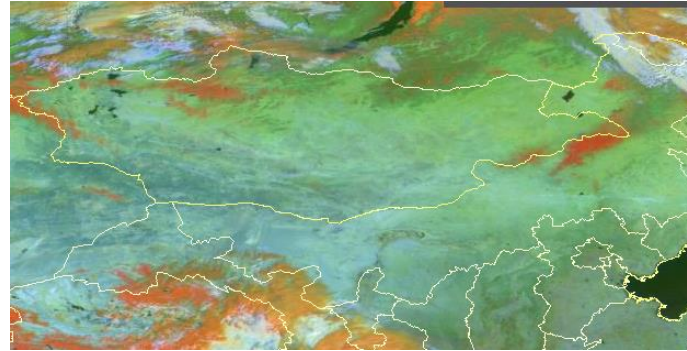
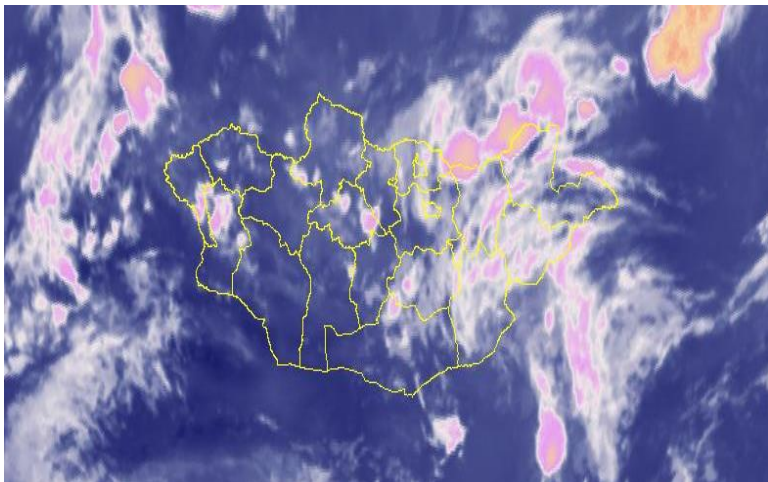
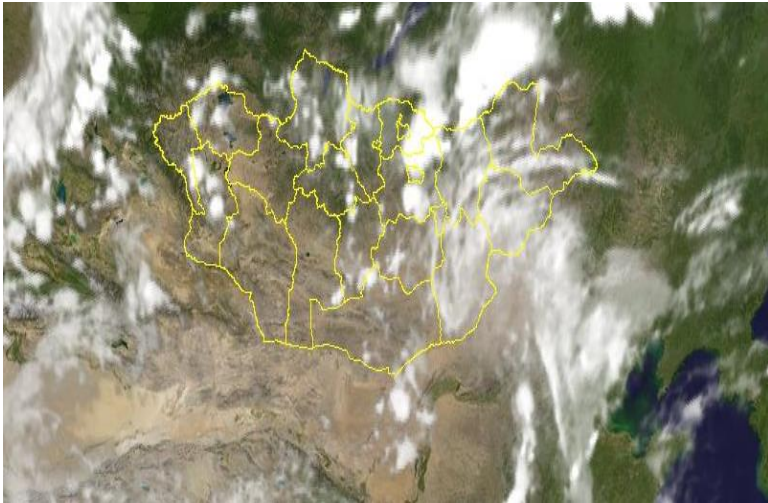
Day convective storms RGB product of FY-4A



Product Comparison Between FY-2 And FY-A4

FY-4A Single channel and RGB products and imagery

FY-2G products including VIS and IR imagery



Summary

- Previous generation FY-2 series satellites provide few channel images. We were used common channels such as VIS, IR and WV for FY-2 series, however it was useful.
- FY-4A enables and opens more opportunity as it has multi advanced spectral instruments that have overall 14 channels. There are many comparisons can be made between the products that enhance forecast skills.
- Advantages of FY-4A is firstly improved thoroughly, secondly it is open for everyone who wants to track the atmospheric condition with Web based version and finally multi-spectral high resolution channels can be used to study not only earth's atmosphere but environment and climate change studies.

Special thanks to CMA, WMO and Hainan university for their great and kind assist.

Comment

As I aforementioned, one of the severe condition which can be occur during summer in Mongolia is that “Convective” related events. Therefore, in terms of improving our weather forecast in short range, we would like to use more accurate convective cloud products generated by FY-4A for early warning from possible disaster including flash flood, hail and lightning.

THANK YOU FOR YOUR ATTENTION!