Status of satellite data access and use in Georgia

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EUMETSAT Information Day for Eastern European, Caucasian and Central Asia NMHS

21- 22 April,2021


Stavropol
RUSSIAN FEDERATION
Dagestan
BLACK SEA
GEORGIA
CASPIAN SEA
T'bilisi, Georgia
Trabzon
ARMENIA
AZERBAIJAN
(Baku)
Baky
Yerevan
Erzurum
TURKEY
Van
IRAN

History of Meteorological Service in Georgia

In Georgia the first observation carried out in 1828. Regular meteorological observation in Georgia originate in 1844 and it has more than 177 years' history.

Georgian weather service started to form in 1914.

HYDROMETEOROLOGICAL DEPARTMENT

NATIONAL ENVIRONMENTAL AGENCY

Functions and Current Activities

- **Preparation and dissemination of short, medium and long-term weather and hydrological generalized and special forecasts (www.meteo.gov.ge)**

- **Preparation and dissemination of early warnings about possible hydrometeorological hazards**
- **Formation of databases of long-term hydrometeorological data and definition of climatic and hydrological patterns of the county's territory on its base**
- **Specialized hydrometeorological service for users**

- ❑ **Extension of observation Network**
- ❑ **Restoration &modernization agrometeorological network**
- ❑ **Establishing of upper-air & radar systems**

- ❖ **Automatization of standard observation**
- ❖ **Introduced: (Transmet, Synergy, Clidata), satellite meteorological information receiving system, modern system for visualization of synoptic production, weather forecasting models with relatively high resolution**
- ❖ **Substantial part of multi-year hydrometeorological data was digitalized**
- ❖ **Introduction of floods/flash floods hydraulic model in river Rioni basin; Implementation of bank protection measures and elaboration of respective construction projects**

Radar and satellite observations

- Crucial for carring out the necessary activities in modern meteorology, hydrology and other sciences about Earth;
- Allow us to recognize structures and phenomena which are below mesh grid of standard in-situ observation network;
- Provide data also from unpopulated areas without infrastructure like deserts, forests and oceans;
- Usage of remote sensing data in numerical weather prediction models reduced their errors to almost half.

EUMETSAT DATA

- INTERNET
- SYNERGIE
- EUMETCAST- DAWBEE

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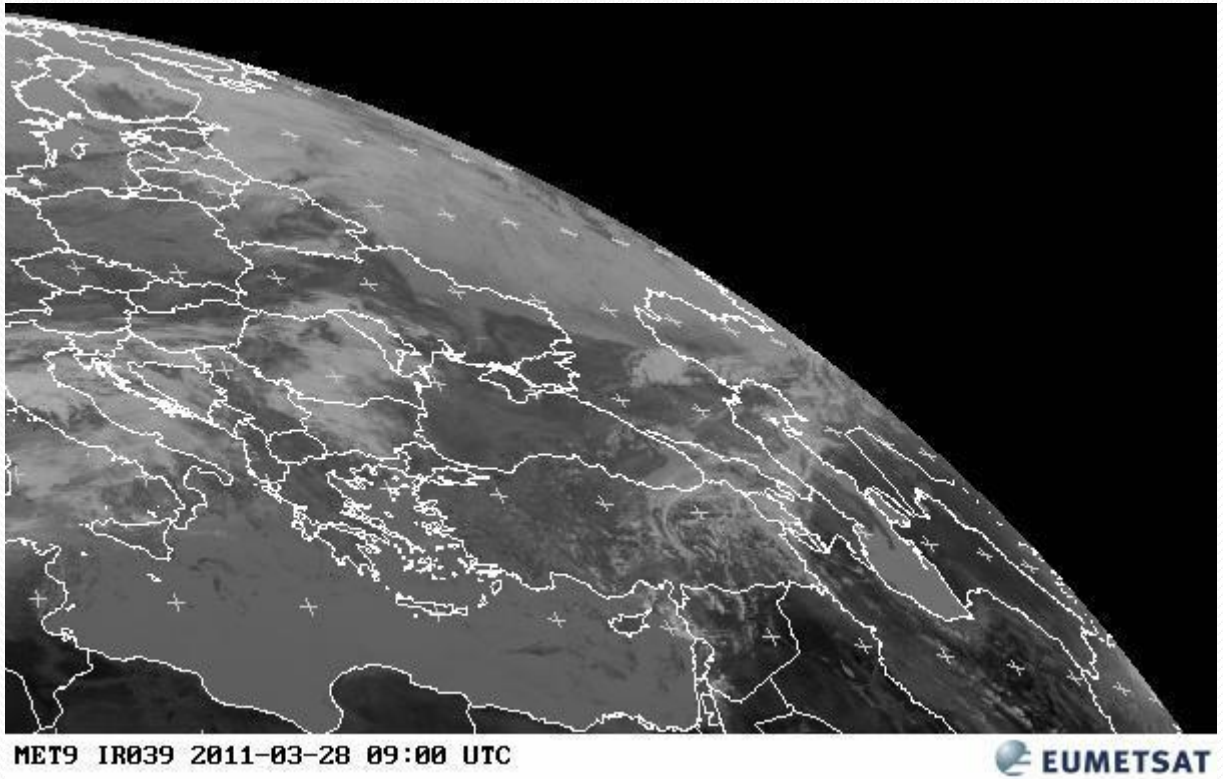
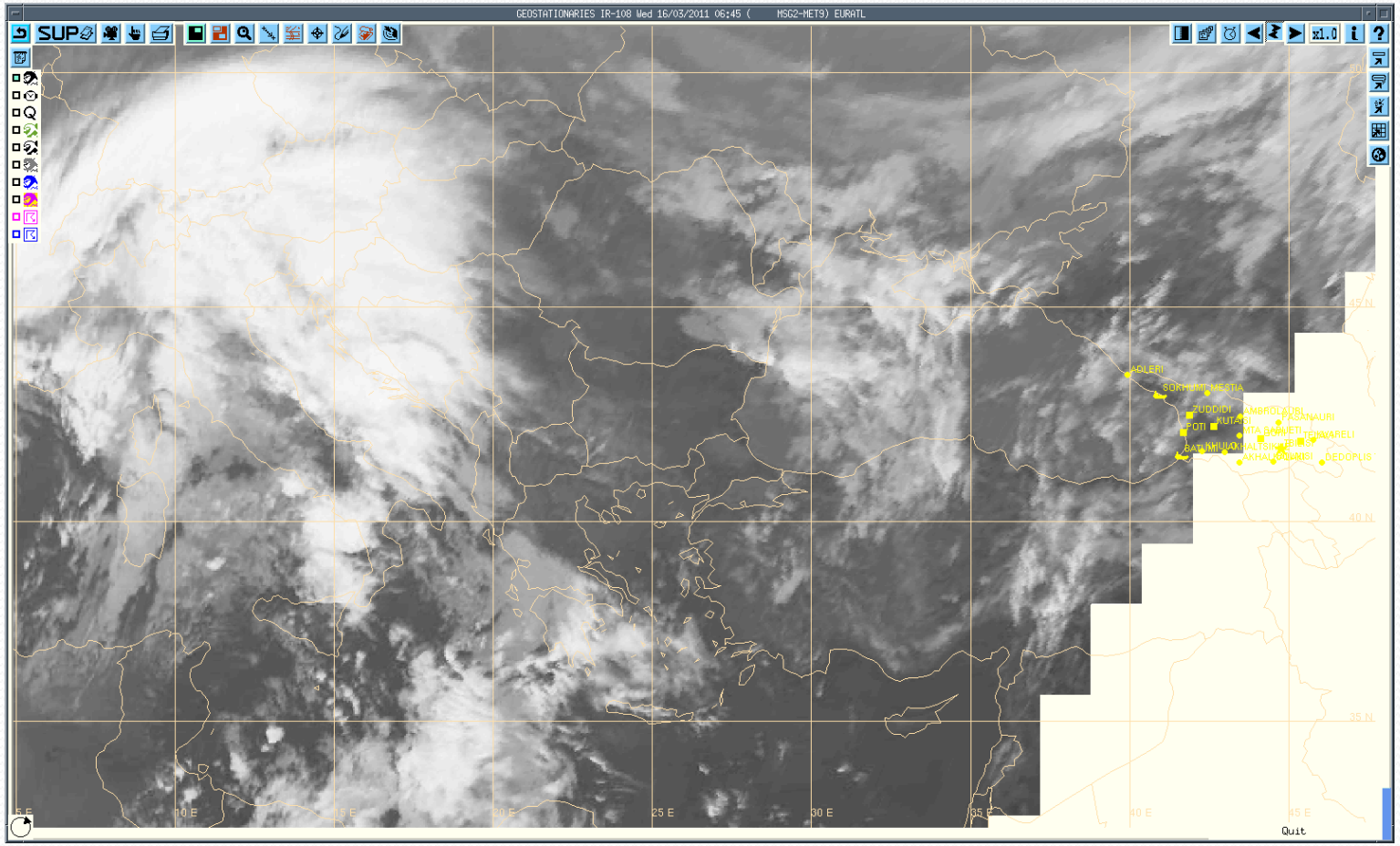
EUMETSAT DATA IN INTERNET



EUMETSAT DATA IN SYNERGIE

- IR (infra red)
- VIS (visible)
- WV (water vapor)
- Cloud Top Temperature
- Sea Surface Temperature
- Cloud Classification
- Top cloud pressure

IR (infra red)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BATUMI
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40 N
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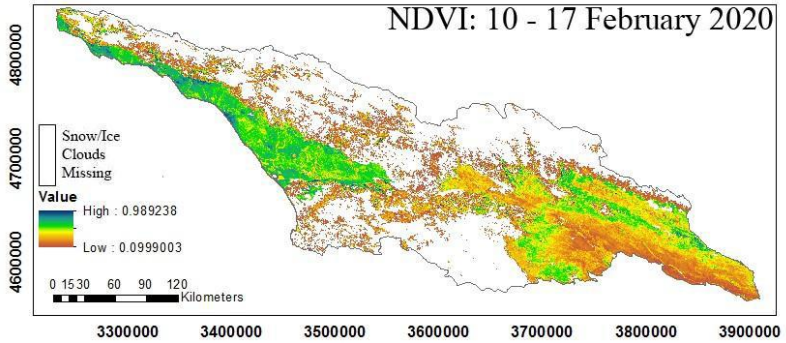
30 E
35 E
40 E
45 E
Quit

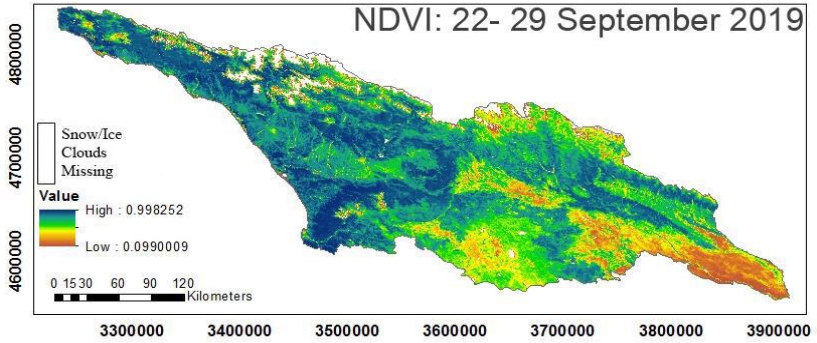
EUMETCAST

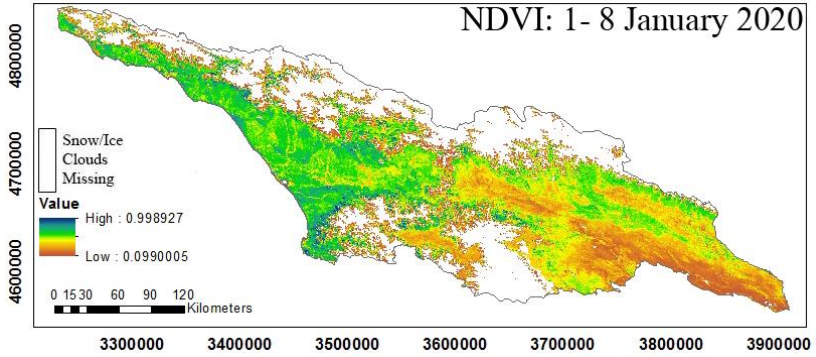
- IR (infra red)
- VIS (visible)
- WV (water vapor)
- Top cloud temperature
- Microphysical
- Air mass

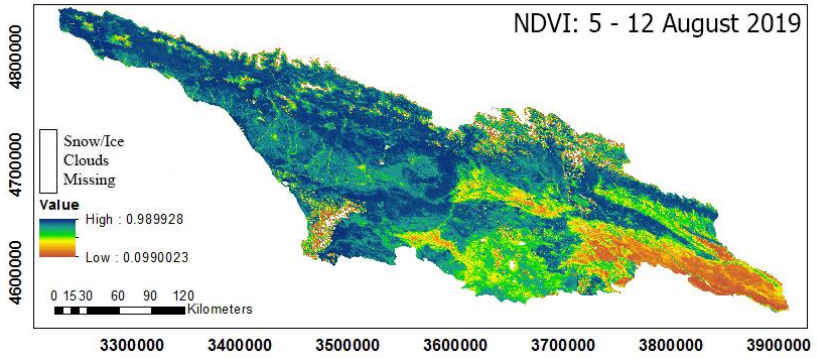
etc

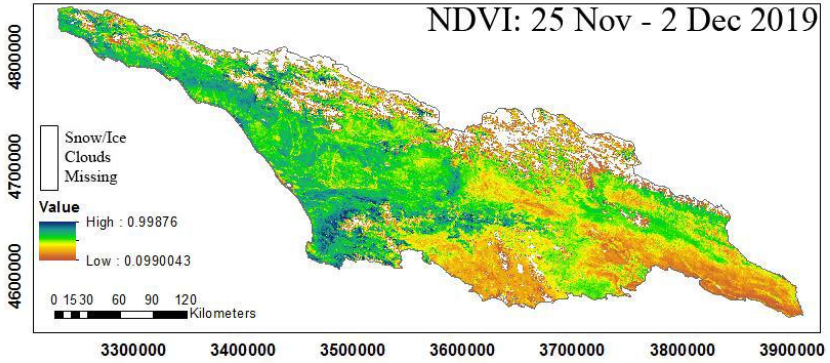
Agrometeorological Bulletins: NDVI maps

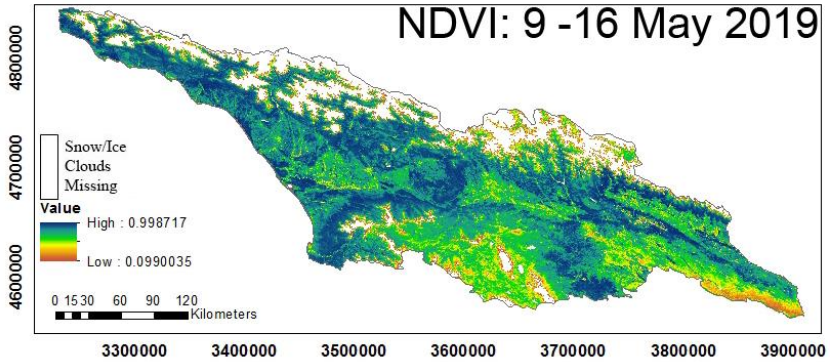












NWC/GEO application for Georgia

Georgia's geographical location and it's complex orography cause diversity and extremity of weather conditions. Convective storms, with attendant phenomena; fog and low clouds; locally forced precipitation events; wintertime weather (snow, ice, glazed frost, avalanches) this is a short list of synoptic processes nowcasting (NWC) and very short range forecast (VSRF) of which has a great importance for Georgia. Currently, nowcasting system from NWCSAF GEO v2016 is operated in Georgia's NHMS using via EUMETCast: Second Generation Meteosat - High Rate SEVIRI Image Data (every 15 minutes) and First Generation Meteosat – Indian Ocean Data Coverage (IODC) (every 30 minutes). As the Country territory is prone to flash floods and mudflows, Quantitative Precipitation Estimation (QPE) and Quantitative Precipitation Forecast (QPF) on any leading time is very valuable we mostly emphasis on precipitation and convention products. Products validation and intercomparison is continuing. We are working on preparation of HRW products for assimilation in WRF model and looking to further development of local nowcasting system by blending opportunities from different software and NWP fields using SAF NWC nowcasting products. For nowcasting we use SAF NWC GEO v2016 software which generates about 15 type of cloud, precipitation, high resolution wind (HRW) and Rapidly Developing Thunderstorms (RDT). Main input data comes from SEVIRI channels via local antenna. Also short range NWP output fields, as well as auxiliary data are necessary.

NWC/GEO application for Georgia

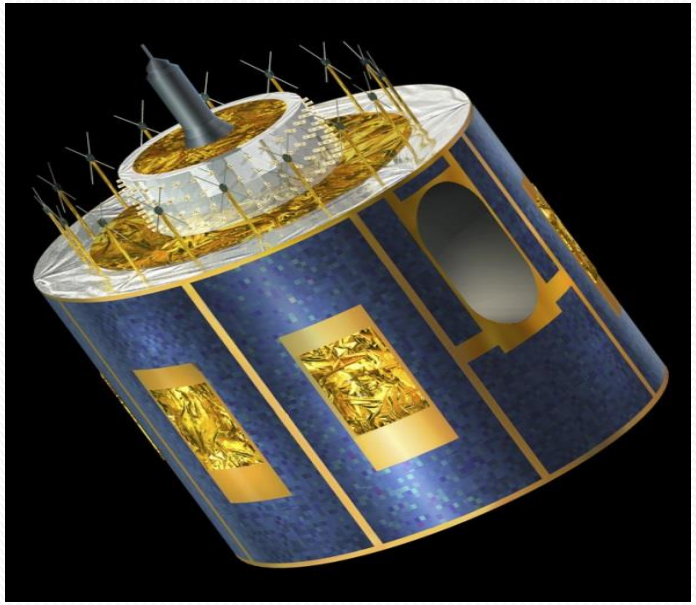
We use MSG1 satellate data (channels: HRV, IR - 016, 039, 087, 097, 108, 120, 134, VIS006, VIS008, WV_062, WV_073) for the region of Georgia (centre 42.19 44.01 and size 100 240). Data from satellite comes every 15 minutes. For NWP data we use 0.25 Degree GFS data. Due to some technical and infrastructural problems nowadays we are focused on generation of following products from Cloud products: The cloud mask (CMA), Product delineates all cloud-free pixels in a satellite scene with a high confidence with different algorithm day and night time. The cloud type (CT) provide a detailed cloud analysis. The CT product is essential for the generation of the cloud top temperature and height product and for the identification of precipitation clouds. Cloud Top Temperature & Height (CTTH) Contains information on the cloud top temperature, pressure and height for all pixels identified as cloudy in the satellite scene. Precipitating Clouds (PC) Probability of precipitation intensities in pre-defined intensity intervals. Calculated with different algorithms for day and night situations and for different cloud type groups using the Cloud Type product as input. Convective Rainfall Rate (CRR) goal is to estimate rainfall rates from convective systems, using IR, WV and VIS MSG SEVIRI channels and lightning information (as optional input).

The RDT-CW product has been developed by Météo-France in the framework of the EUMETSAT SAF in support to Nowcasting. Using mainly geostationnary satellite data, it provides information on clouds related to significant convective systems, from meso scale (200 to 2000 km) down to smaller scales (tenth of km). We use RTD-CW product forecast, up to 1 h with 15 min time step. Product validation has mainly been used only for rainfall intensity, as NEA’s AWS are not equipped with sensors to measure radiation and cloud parameters and from the other hand Quantitative Precipitation Estimation (QPE) and Quantitative Precipitation Forecast (QPF) on any leading time are very important for Georgia.

Project ”Adaptation of the remote sensing methods in water resources management and assessment of extreme hydrometeorological situations in Georgia” SAMRS/2017/VP/01/03

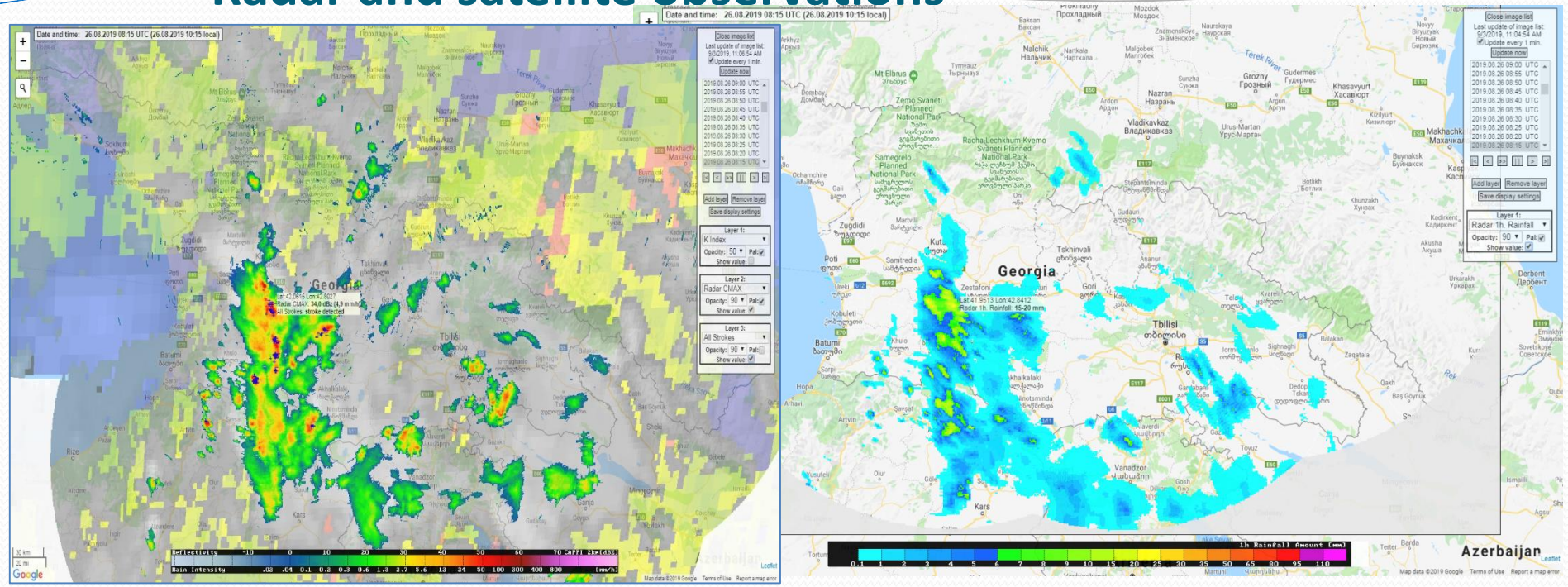
- **Satellite and radar data and their usability for the assessment of the hydrometeorological situations**

Dual-polarization weather radar. Transmit and receive signal in horizontal and vertical polarization.



European geostacionary weather satellite from MSG family. Earth monitoring from 0° and 41.5° E.

Radar and satellite observations



Modern visualization tool allow to display severel data layers over map underlay.

Left image: Radar data shows convective rain and storms confirmed by detected lightning over K-index derived from satellite data.

Right image: Radar data converted to accumulated 1 hour rainfall amount.

The main objective of the Project is :

- Enhancement of the system for providing operational information from remote sensing for relevant water management institutions and civil protection in Georgia

Following activities were conducted during the project implementation:

- Detailed analysis of the current state in availability of satellite and radar data and their usability for the assessment of the hydrometeorological situations in Georgia;
- Methodology for development of the remote sensing indicators for the estimation of hydrometeorological events on water resources and affected vulnerable zones;
- Software for adaptation of the remote sensing indicators for monitoring and assessment of hydrometeorological situations;
- Proposal of the advanced national system for the monitoring and assessment of hydrometeorological situation combining remote sensing data and field measurements for water management in Georgia.

Thank you!

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