European Flood Awareness System
17th EFAS annual meeting (hybrid)
27-28 September 2022
Emergency
Copernicus Emergency Management Service

Development of National Flood Forecasting and Early Warning System in Georgia

Department of Hydrometeorology

National Environmental Agency

Presenter: Ioseb Kinkladze

27 September 2022

National Environmental Agency

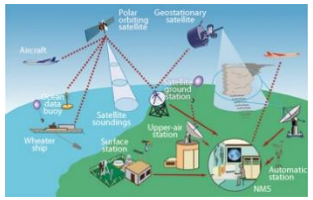
THE AGENCY IS LEGAL SUCCESSOR OF THE NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICE OF GEORGIA WHICH WAS FOUNDED IN 1884

NEA WAS ESTEBLISHED AS LEGAL ENTITY OF PUBLIC LAW IN 2008

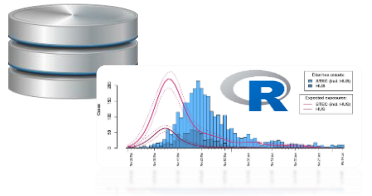
Department of Hydrometeorology

Meteorological and Hydrological Observation

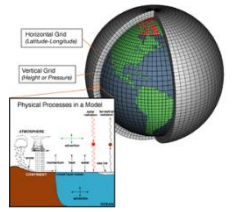
Data collection and dissemination at national and international level



Historical data management and statistical analysis



Weather and hydrological modelling



Weather and hydrological short, medium and long term forecasting

Forecasting and warning dissemination

History of hydrometeorological observation

1832 – fragmented observation started;

1844 – established Tbilisi magnetic-meteorological (geophisical) observatory

1850 –Glaciological expeditions;

1883 – Agrometeorological observation;

1904 – actinometric observation;

1905 – hydrological observation;

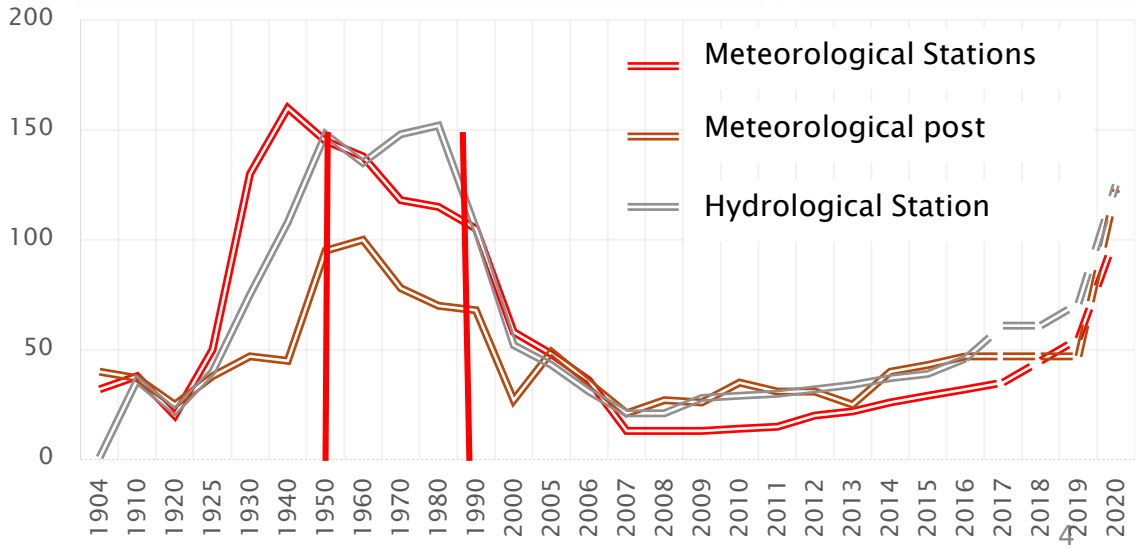
1932 – Snow depth observation by field expeditions;

1937 – air soundings;

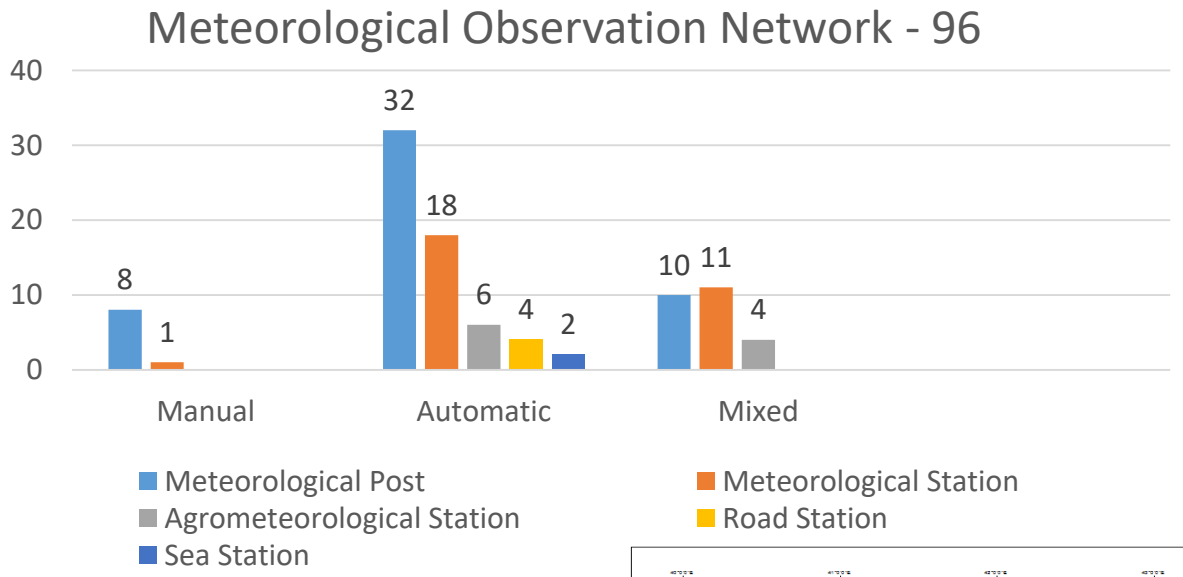
1964 – Black Sea water level and meteorological observations;

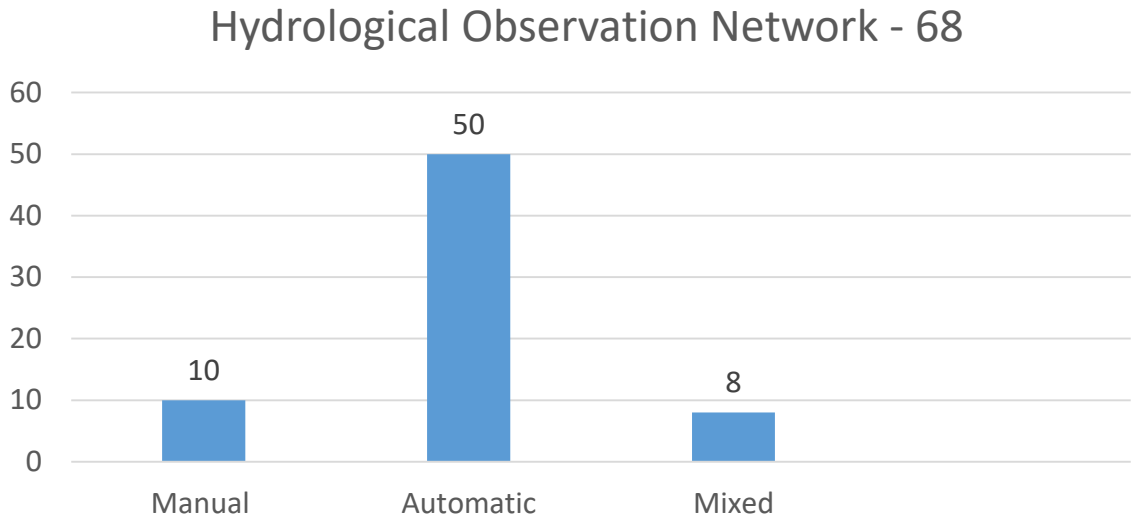
1967 – Cloud seeding;

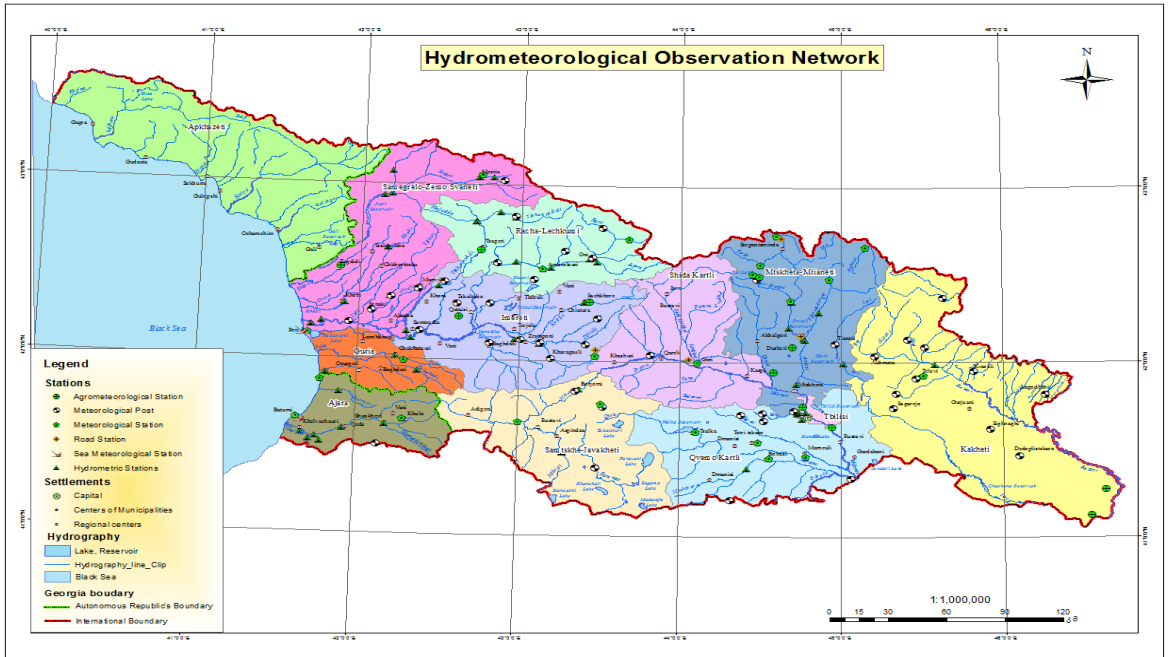
1988 – Snow avalanche artificial triggering



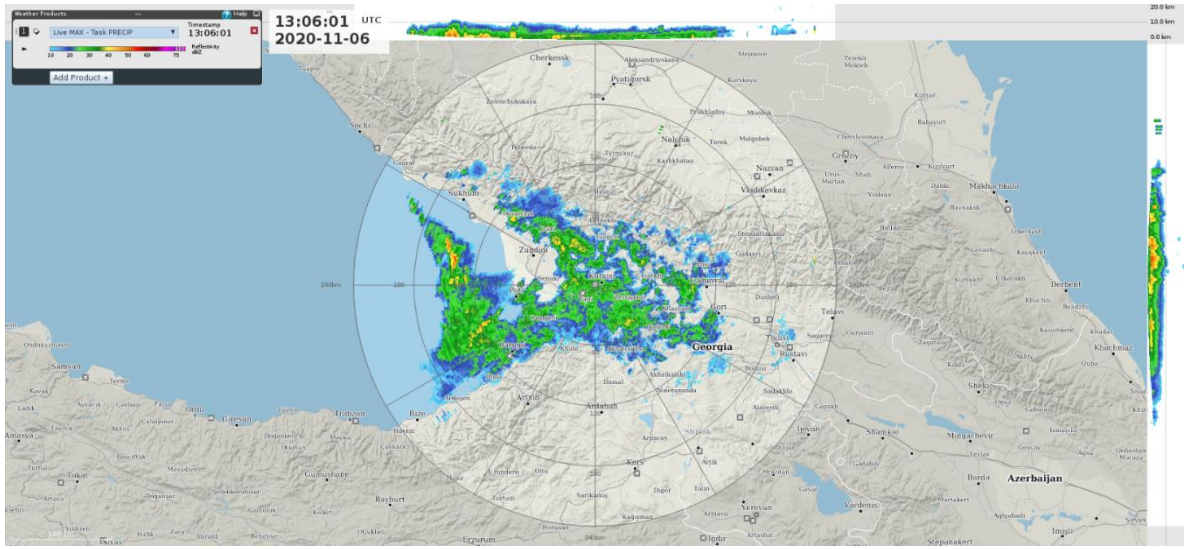
Existing Hydrometeorological Observation Network

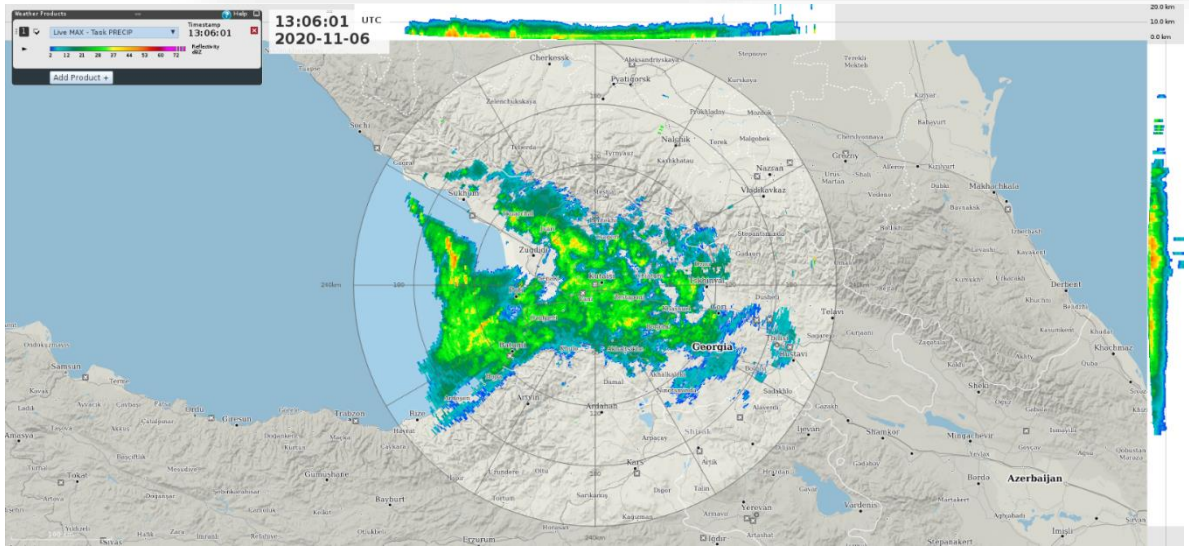




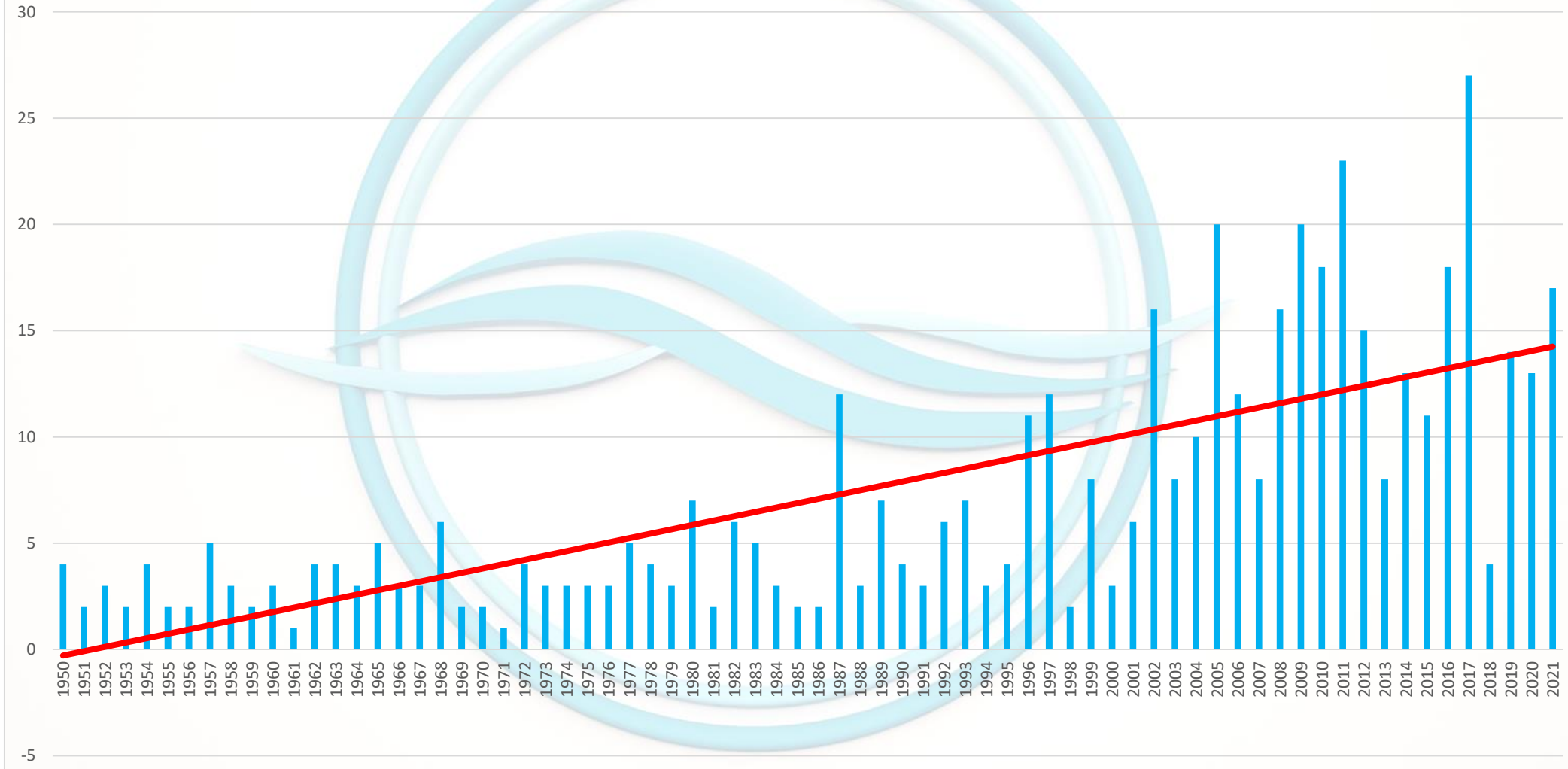


Weather Radar Network





Recorded Floods - 1950-2021



Weather and Climate Related Disasters in Georgia

Tbilisi flooding - 2015 year
Casualties - 24

Debris Flow on national highway - 2011 year
Casualties - 6

Glacier Collapse/Debris Flow – military road - 2014 year
Casualties - 6

Glacial Lake Outburst Flood (GLOF), Chuberi community – 2018 year

GREEN CLIMATE FUND

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

შვედეთი
Sverige

UNDP

Reducing the risk of climate-driven disasters

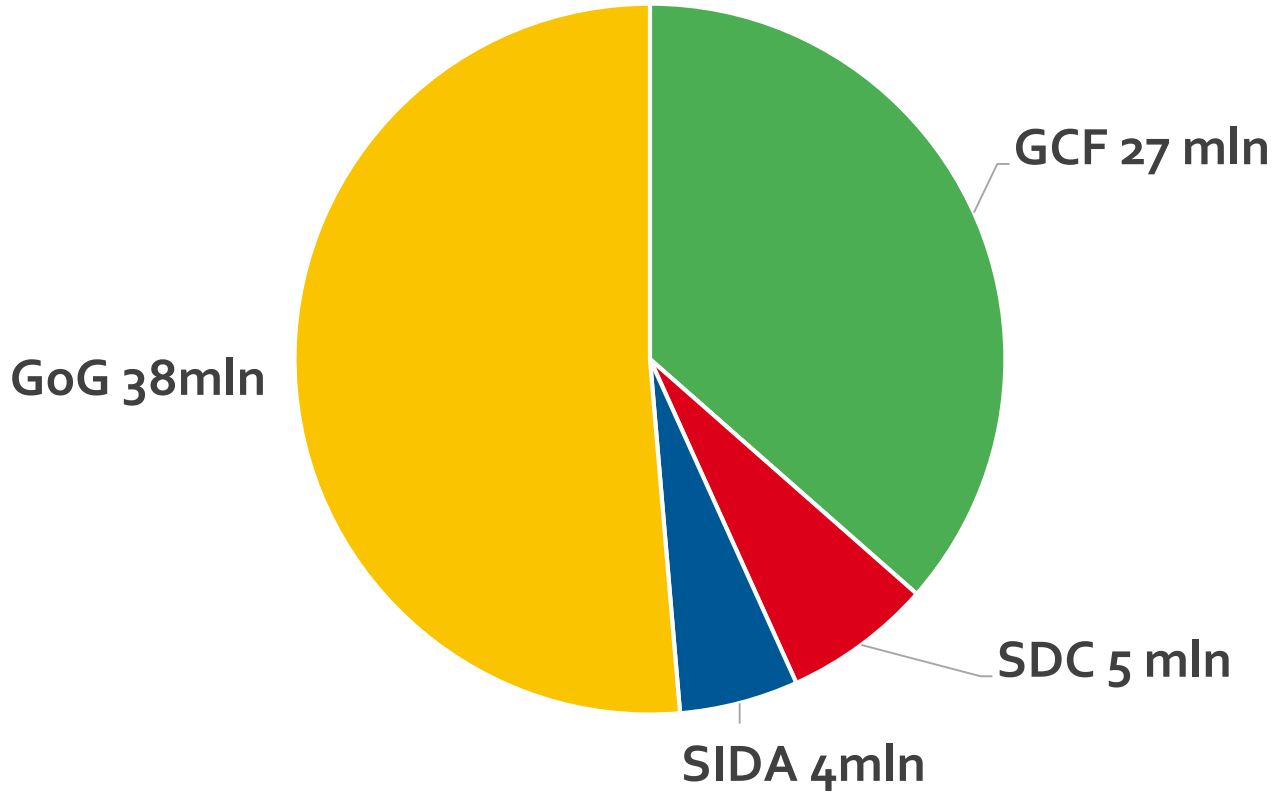
7 Hazards

Flood, Snow Avalanche, Drought, Windstorm, Hailstorm, Landslide, Debris Flow/Mudflow

Program Factsheet

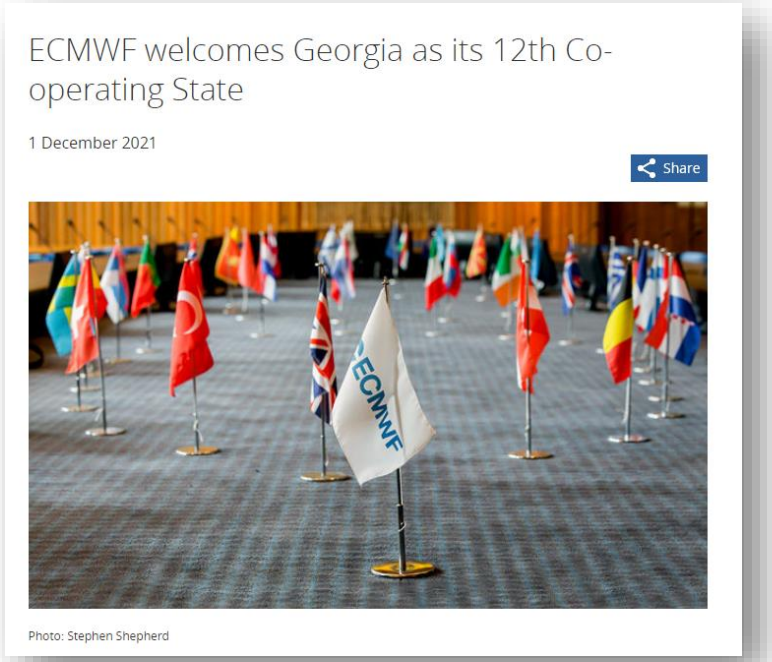
7 years

Total budget: 74 Million



Key Activities

- ~ 150 Hydrometeorological Stations (2021-2023)
- High Performance Computing System (2021)
- Financial support to become a co-operating state ECMWF (2021)
- Upgrade of ICT systems (2021-2023)
- 2 Air Sounding Systems (2023-2024)


ECMWF welcomes Georgia as its 12th Co-operating State

1 December 2021

Share

Photo: Stephen Shepherd

Flood Hazard/Risk Mapping

FLOOD HAZARD

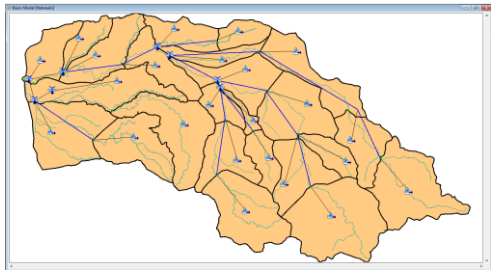
Methodologies and procedures for hydrological analysis for the purpose of flood hazard mapping data analysis for Georgia

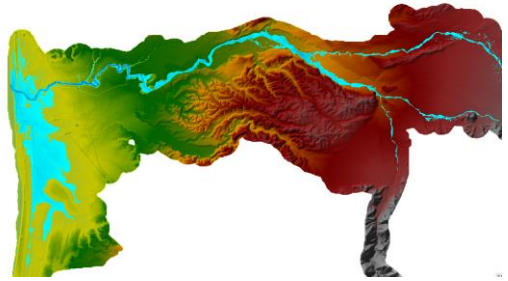
Methodology for

Flood Hazard

modelling and mapping
for georgia
(hydraulic modelling)

2022





Hydrological Modelling
HEC-HMS

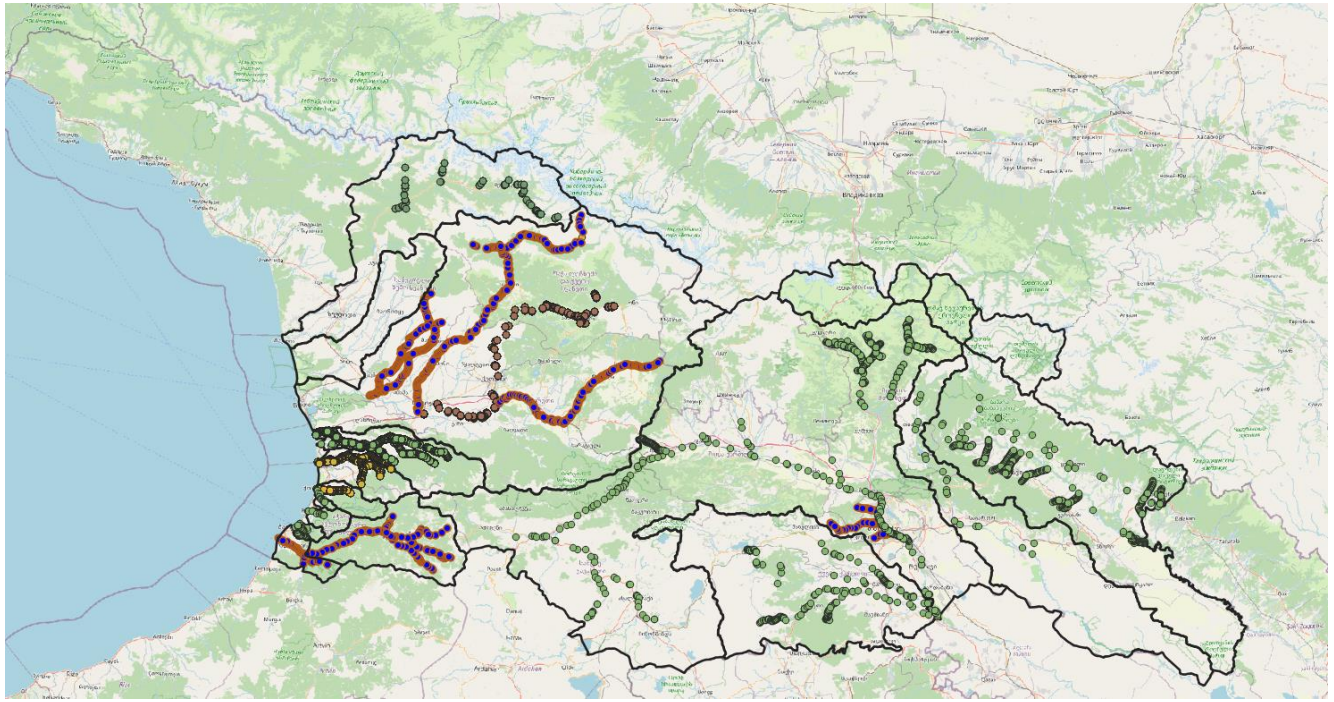
Hydraulic Modelling

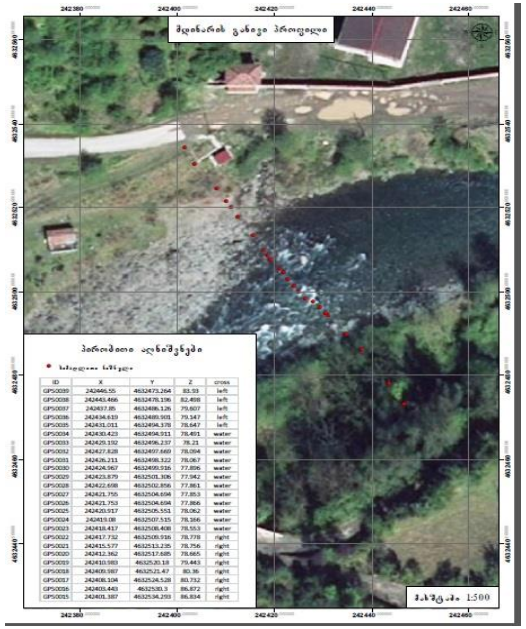
HEC-RAS 2D

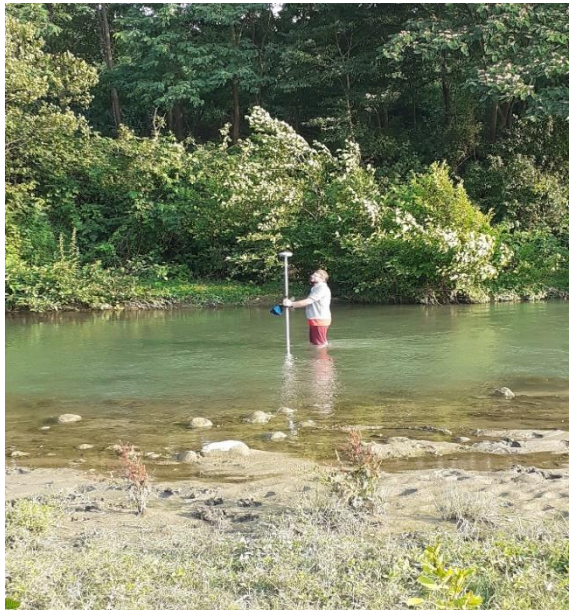
GIS Mapping

Bathymetric Survey

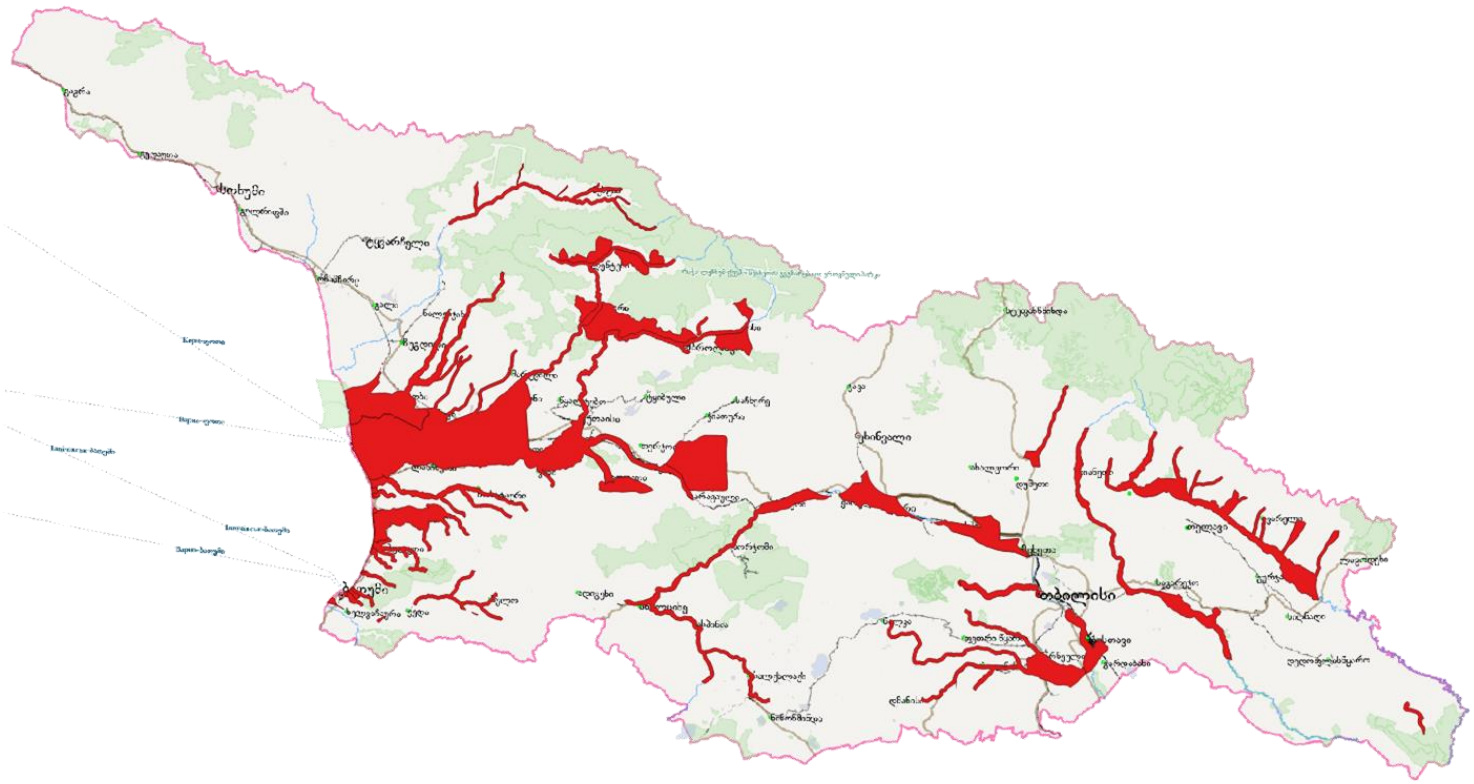
- Bathymetric survey has been conducted for the entire country



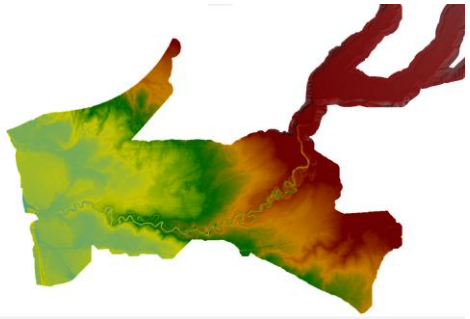




LiDAR Data Collection



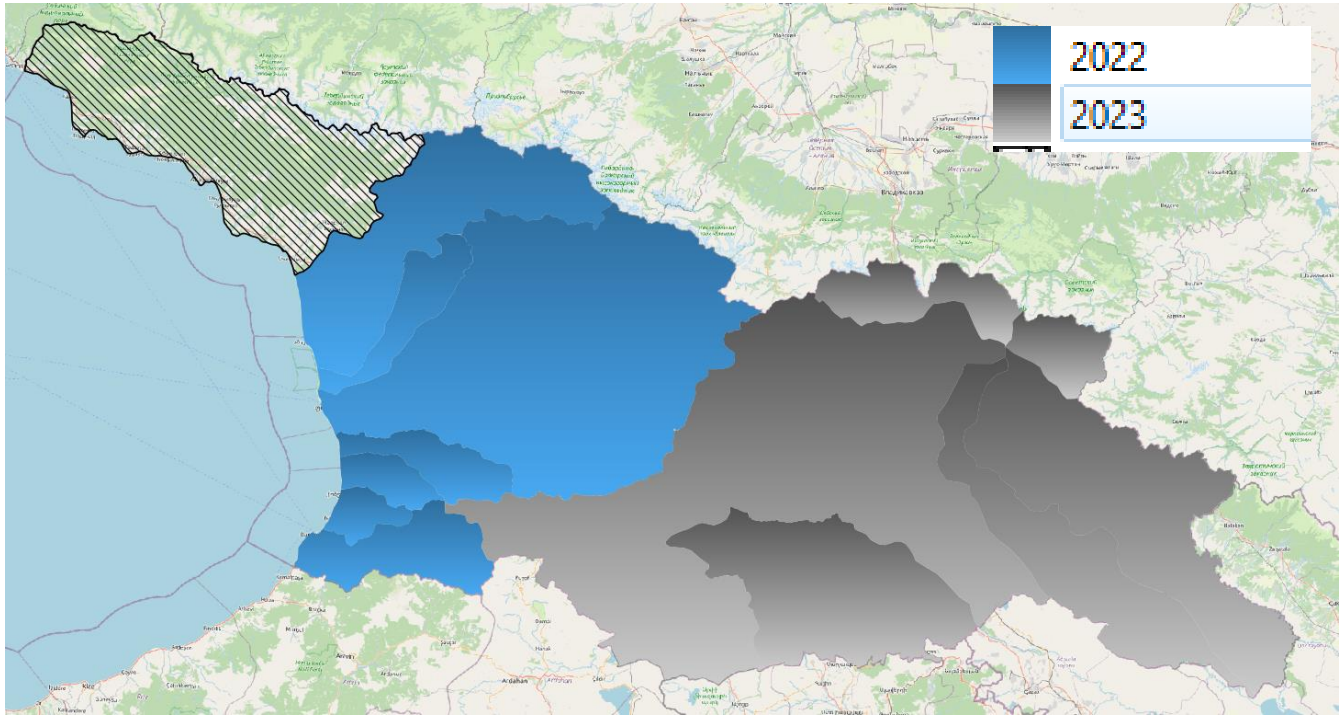
- Survey period: 2020-2021
- Coverage: 6400 km²
- Point cloud : 12 points per 1m²
- DEM Resolution: - 1m



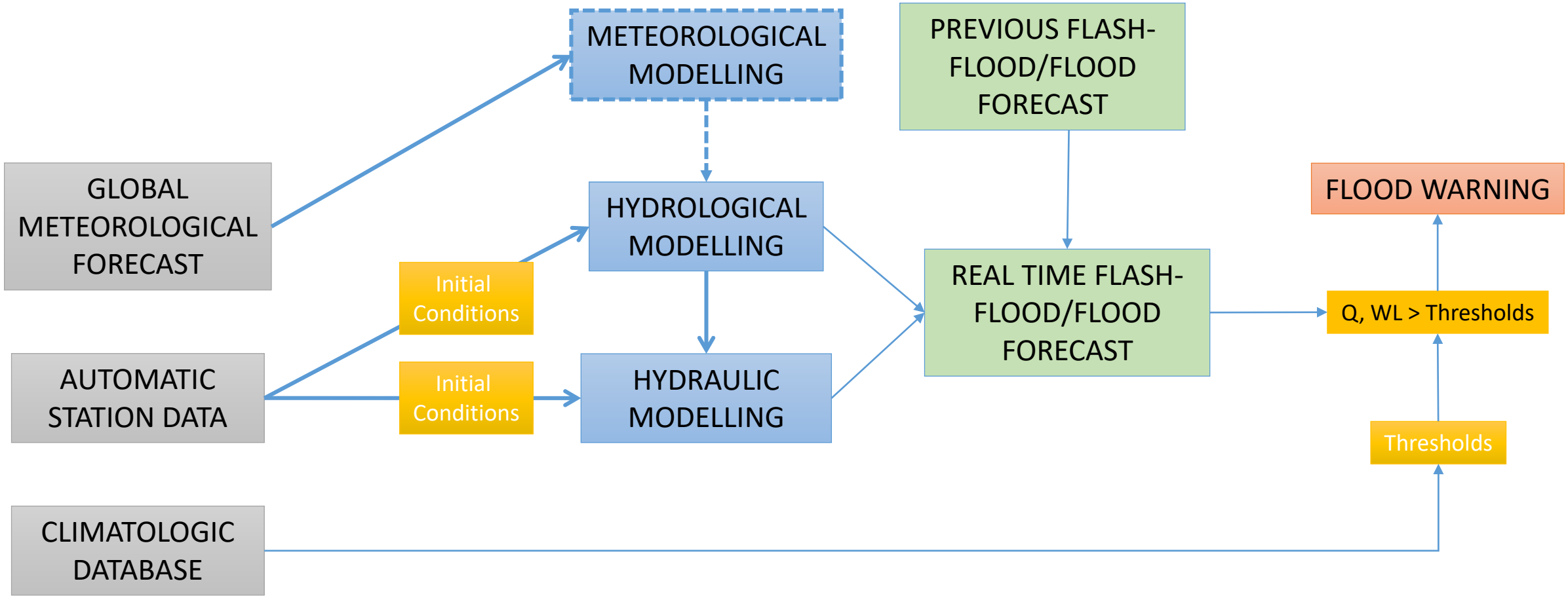
Flood Hazard/Risk Mapping

- Return periods
  2, 5, 25, 50, 100, 500 years

- Maps
  - Inundation
  - Depth
  - SWE
  - Velocity
  - Time of arrival
  - Flood Duration

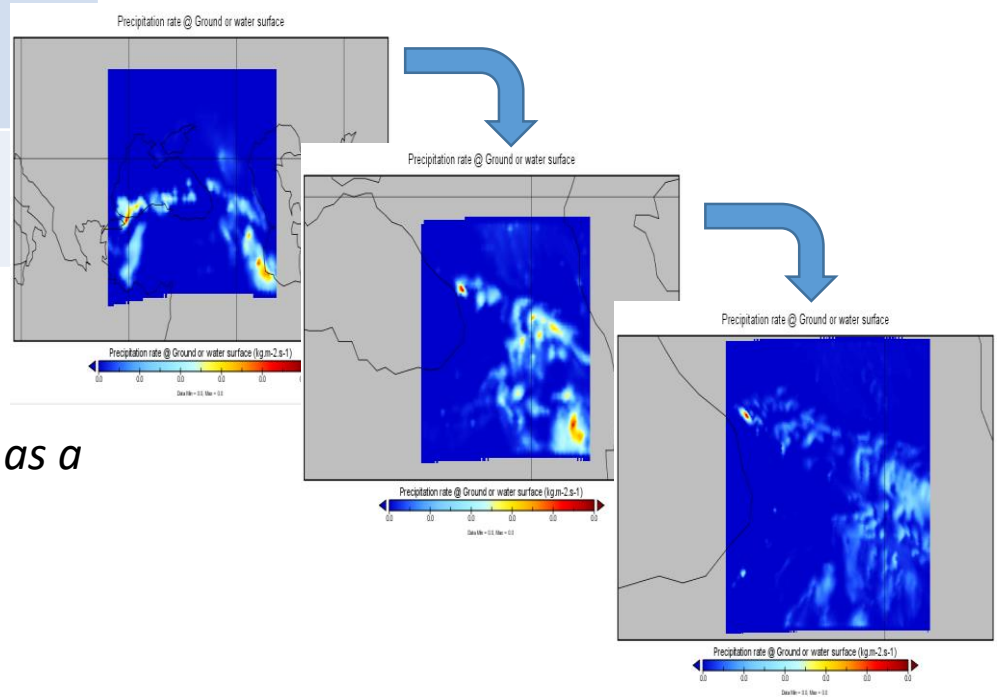


Flood Forecasting - FFEWS approach



Limited Area NWPs

Limited Area Model	Horizontal Resolution (km)	Global NWP/Boundary Conditions	Forecasting time	Runs per day
WRF	~3	GFS	0-4 days	2
Cosmo	~7	ICON	0-4 days	2



Plans for the next few years

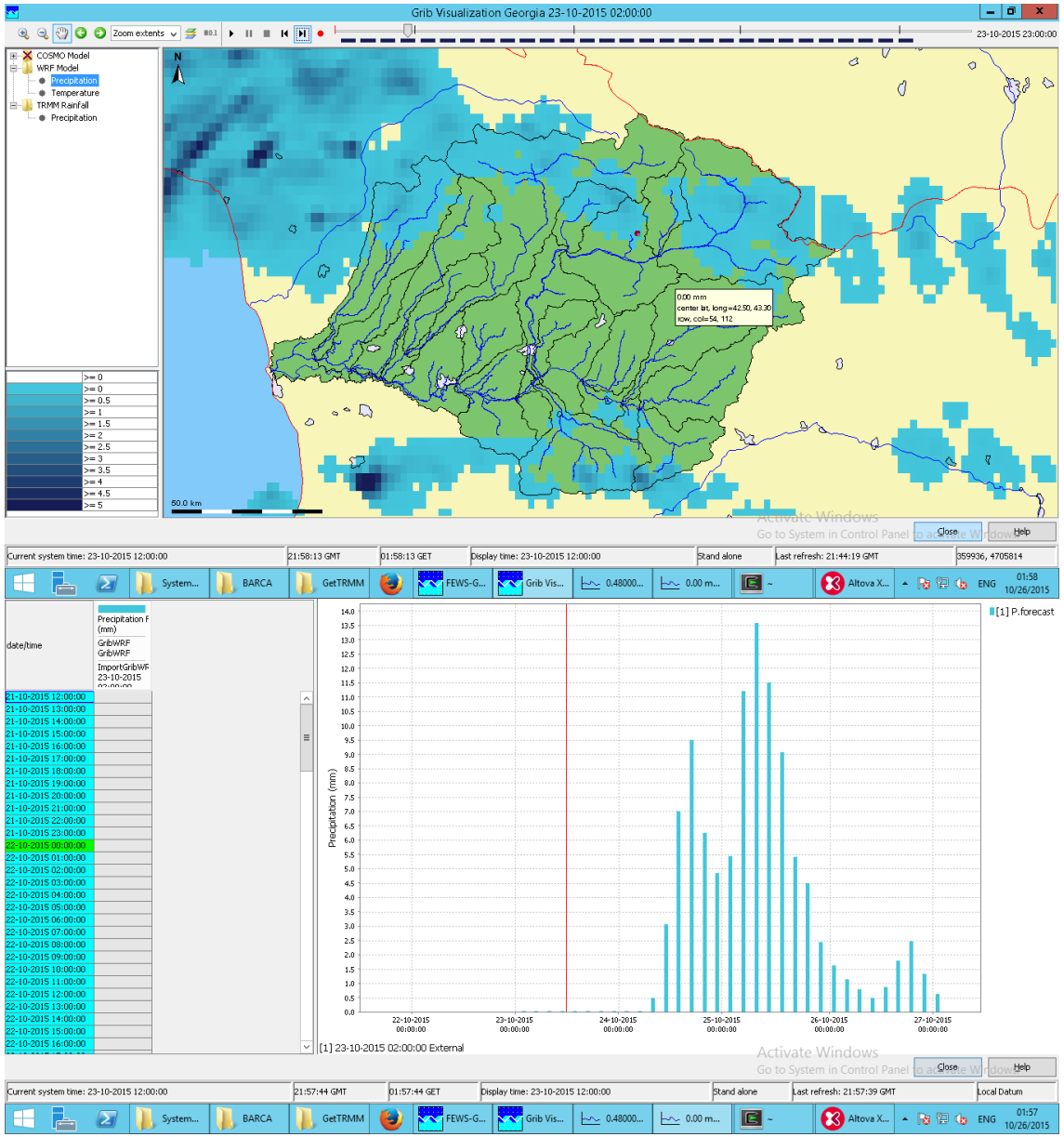
- *Use of ECWMF product Atmospheric Model high resolution (HRES) as a boundary condition is under development*
- *Assimilation of Radar and surface observations*
- *Development of kilometre-Scale NWP system*
- *Precipitation nowcasting by radar tracking*

Meteorological Forecast

There are two different regional NWP models implemented by NEA.

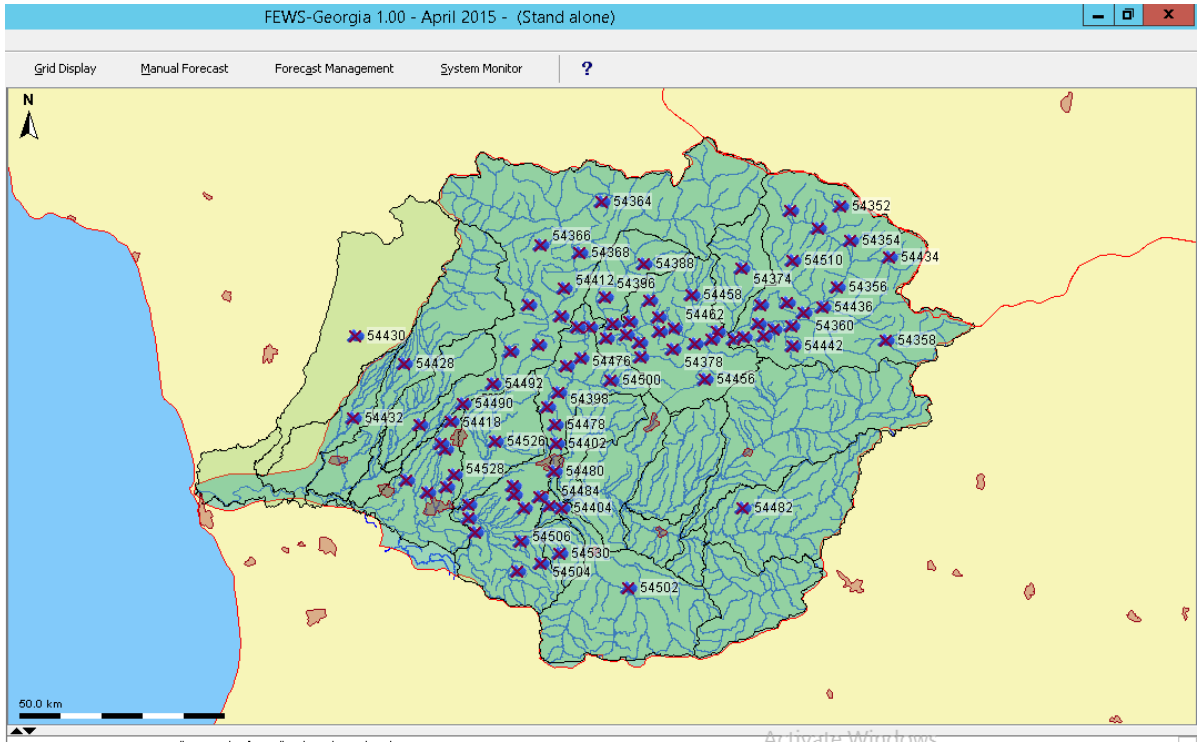
- WRF
- COSMO

The COSMO model has not been operational in the system currently.



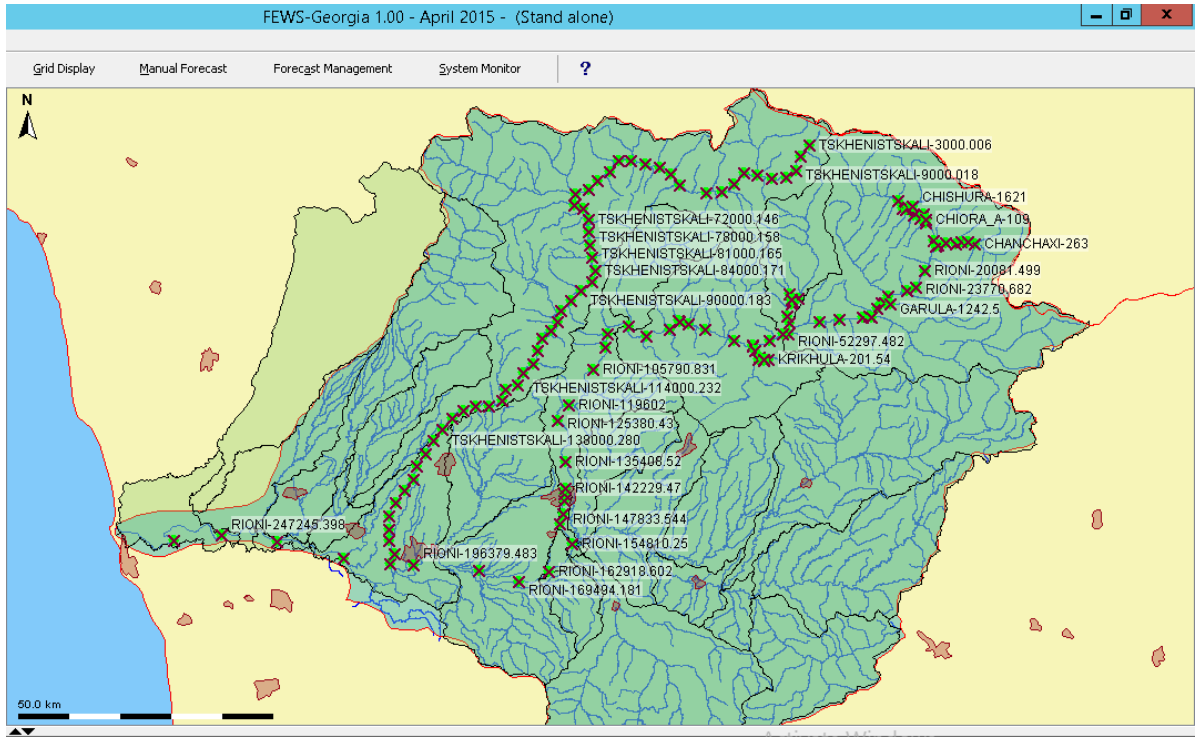
Hydrological model

- HEC-HMS is the hydrological model used
- Precipitation data from the previous exercise used
- Precipitation input in pre-defined catchment locations
- Initial conditions from antecedent runs
- Gridded precipitation option being explored
- Model adaptor in DELFT-FEWS

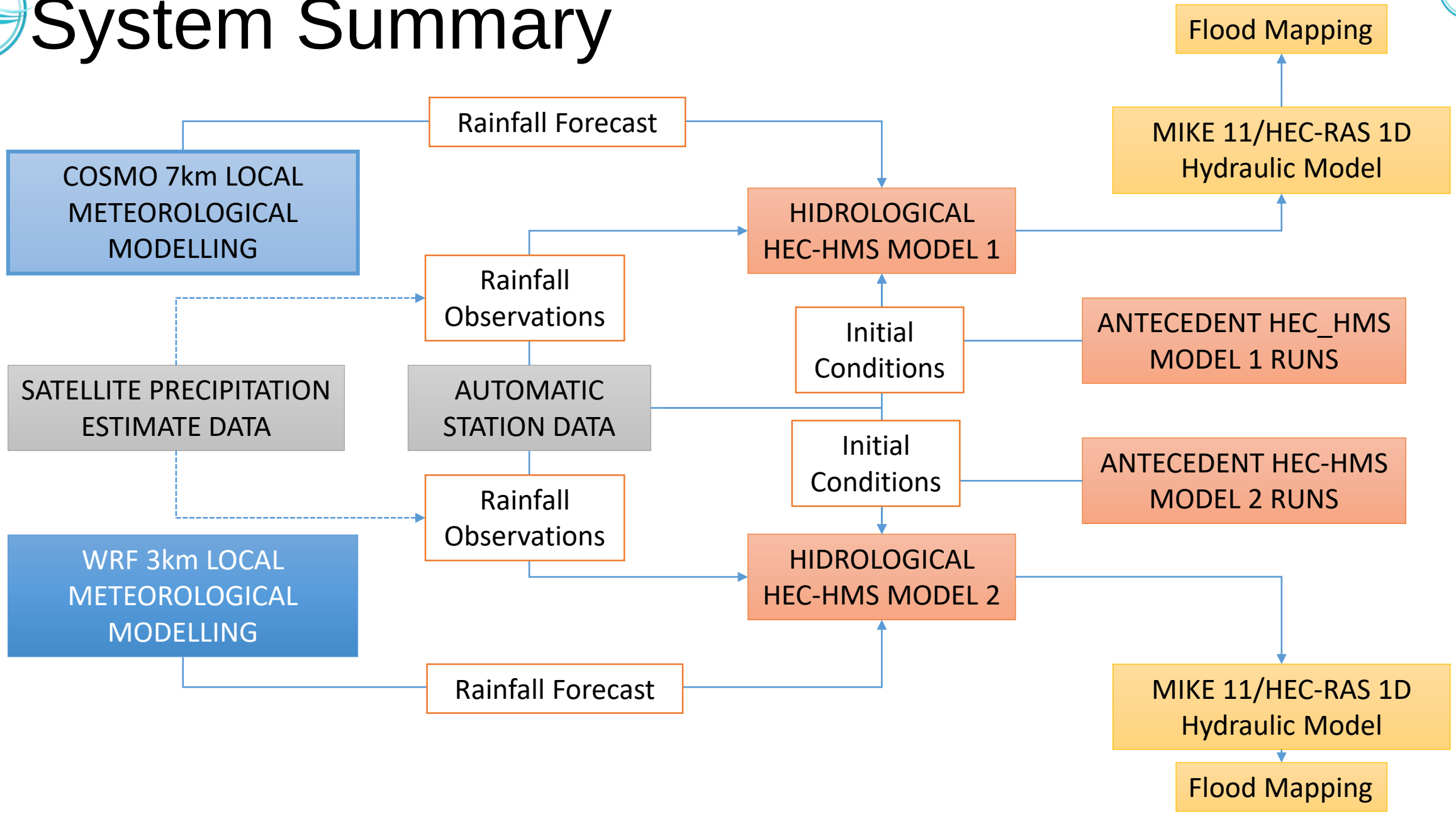


Hydrodynamic model

- MIKE 11 is the hydrodynamic model within the platform (HEC-RAS 1D models will be adopted soon)
- Model adaptor in delft-fews
- Water level information from telemetry being used for initial conditions
- Water levels calculated at specified locations



System Summary

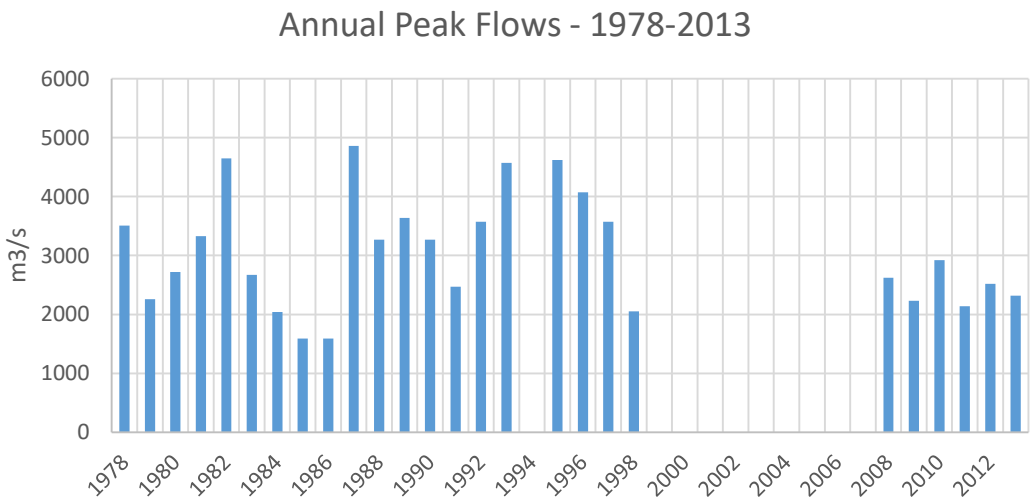


Upgrade of HEC-HMS Model

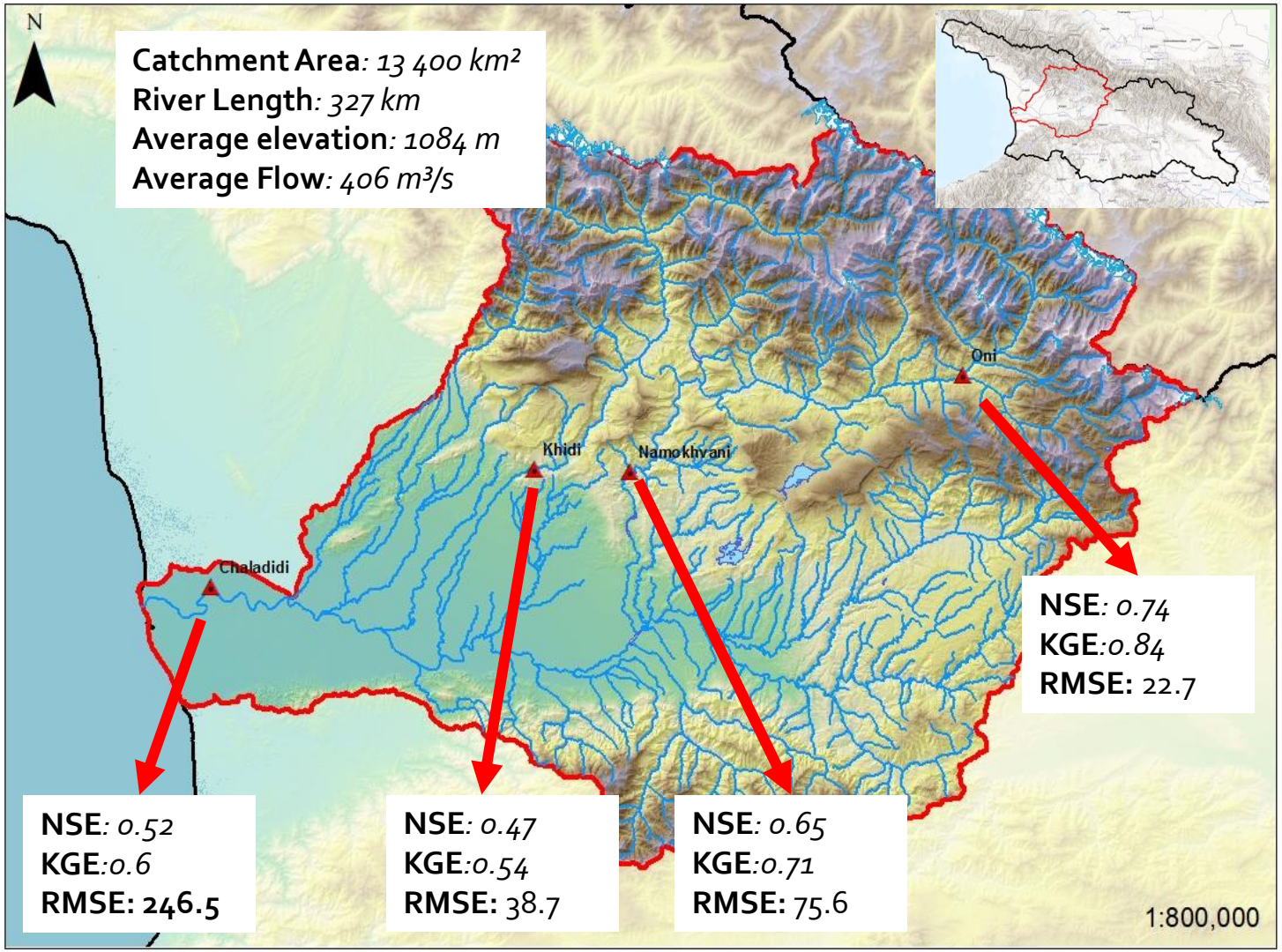
Data used in HEC-HMS

Precipitation & Temperature:
ERA5 hourly gridded data

Discharge:
Observations daily flow



Simulation period: 1985-1988



Key Challenges in FFEWS' Development

- **Lack of the data (e.g. no recent sub-daily) for the calibration & validation of models**
  - *Recently available sub-daily data*
  - *Unreliable rating curves*
  - *No sufficient flow measurements due to the human resources*
- **Lack of the experience in hydrological and hydraulic modelling**
- **Limited number of modellers**

Thank you for your attention!