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Copernicus data and services for flash flood management

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THE CHALLENGE: FLASH FLOODS

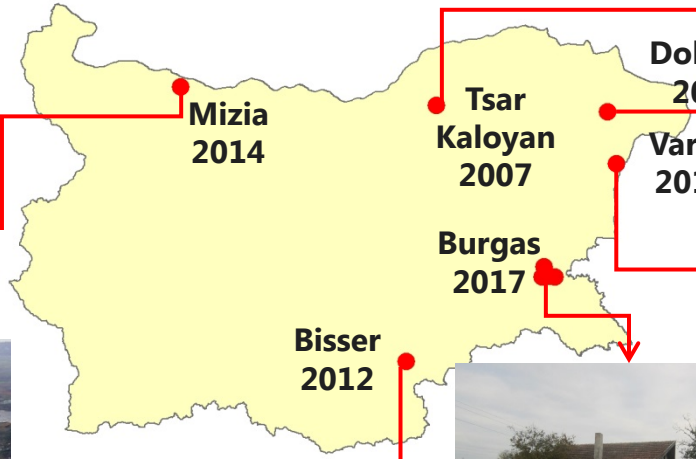
- Flash floods are:
  - Difficult to predict;
  - Last for a short period of time;
  - Causing serious damages.
- Increased number of flash floods over the last 20 years;
- The challenge is:
  - Integrated spatial information before, during and after the flood;
  - Selection of appropriate measures to reduce the effects of floods

Establish a standard service to manage flash flood risk to support better decision making

"…we only miss this complex, hydrotechnical, geophysical and meteorological expertise which will tell us which are the real objective reasons for the flood…" – state administration 5 months after the last devastating flood in BG (March 2018)

FLASH FLOODS IN BULGARIA

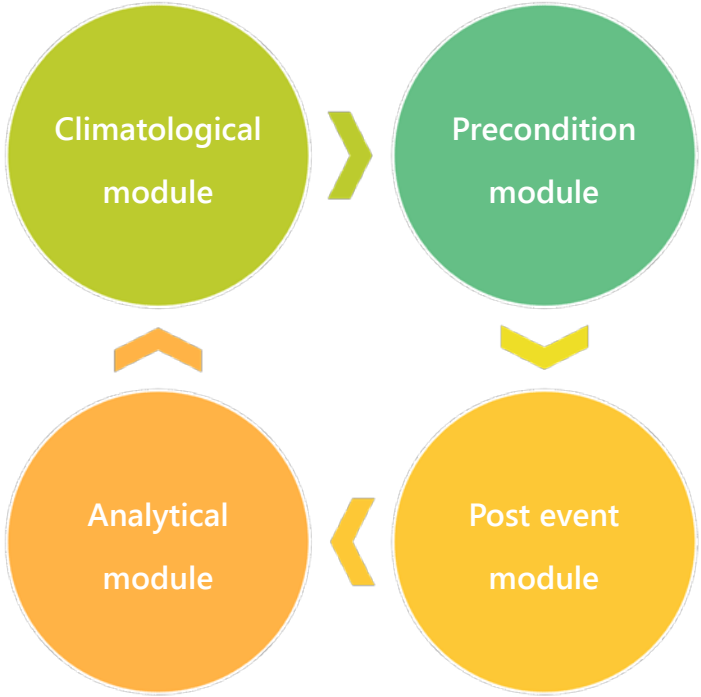
- Flash flood events become a significant natural disaster for many regions in Bulgaria during the last two decades.
- Critical complex analyses after events is missing.
- Can we avoid such events or to mitigate their effect without complex analyses?



INTEGRATED APPROACH TO FLASH FLOOD

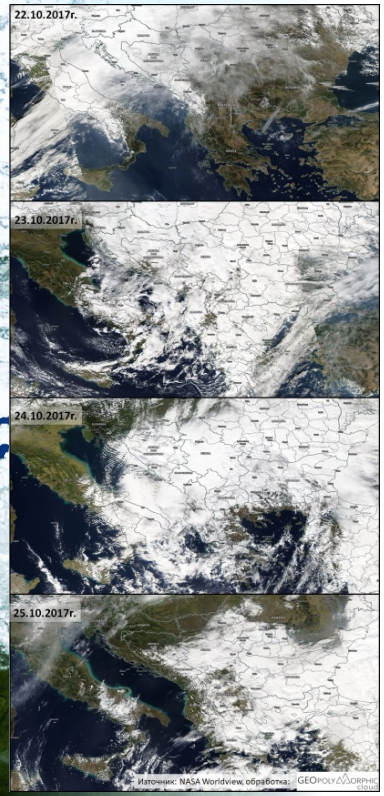
The flood floods are a hydrometeorological phenomenon, which occurs when specific meteorological and hydrological conditions exist.

- The flash flood reasons and consequences are complex equation
- The decision depend on detailed information for affected area before and after event
- The solution has several integrated modules
- All of them relay on Copernicus data and core services updated and refined using local knowledge

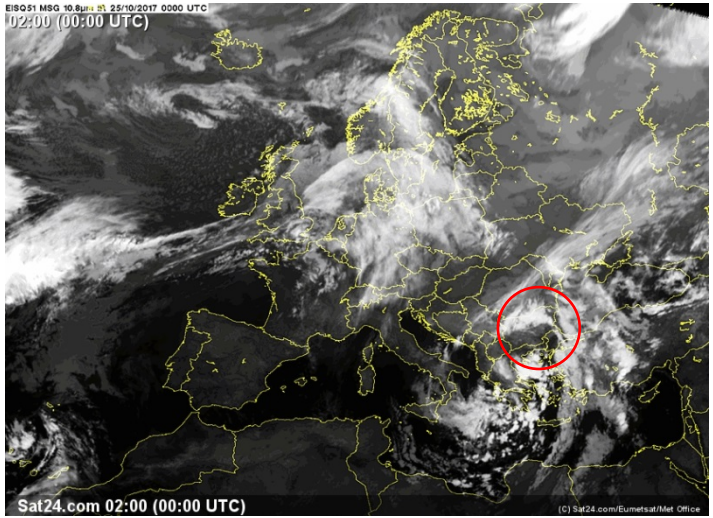


FLASH FLOOD: CLIMATOLOGICAL MODULE

- The climatological module relies on data from meteorological satellites, in-situ data, meteorological radars, Sentinel 3
- Module output: an understanding of the flash flood mechanism
  - Past events database for flash flood forecasting model



Evolution of the cyclone

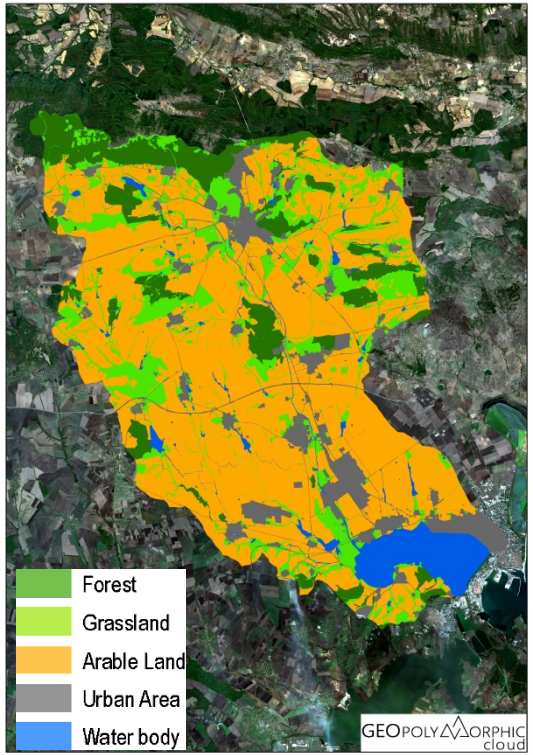


Weather conditions at the time of disaster

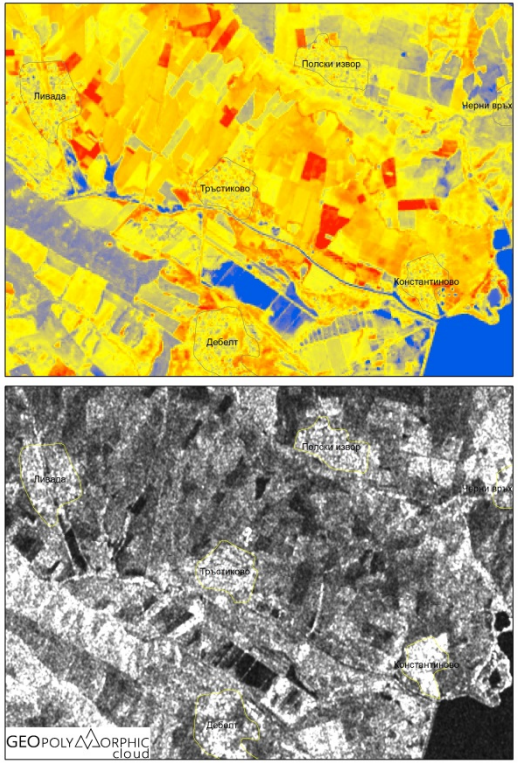
FLASH FLOOD: PRECONDITION MODULE

- Precondition module provides a picture of the affected area before the flash flood
- Input data:
  - Physical characteristics of the watershed and hydrographic network
  - Soil hydrophysical characteristics, soil moisture
  - Land cover/use
  - Condition of the water reservoirs
- Data sources
  - National databases
  - Sentinel-1 and 2 are of great importance due to high revisit time
  - Land Core Services
  - Copernicus Contributing missions

FLASH FLOOD: PRECONDITION MODULE



Land cover / use



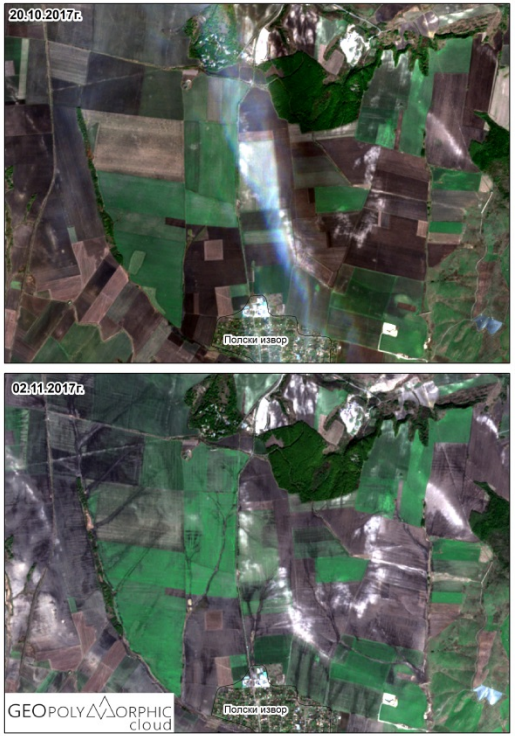
Soil moisture

Soil ceiling

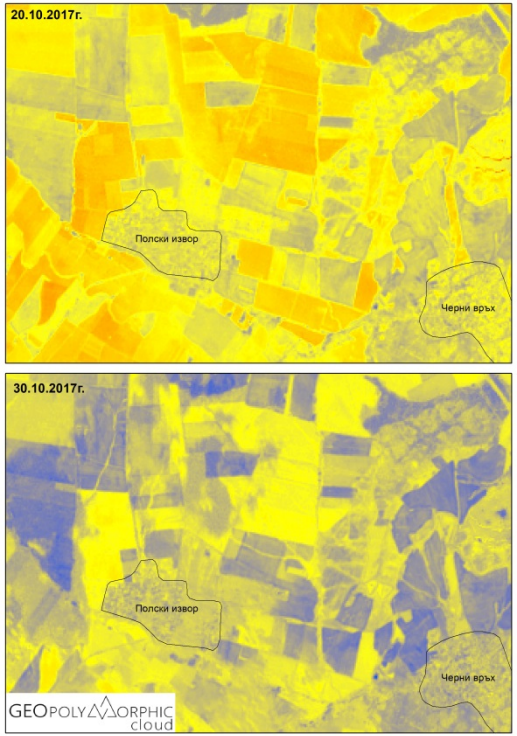
FLASH FLOOD: POST EVENT MODULE

- Post event module provides a picture of the affected area after the flood
- The same parameters are analysed
- Detect the change

Dam failure

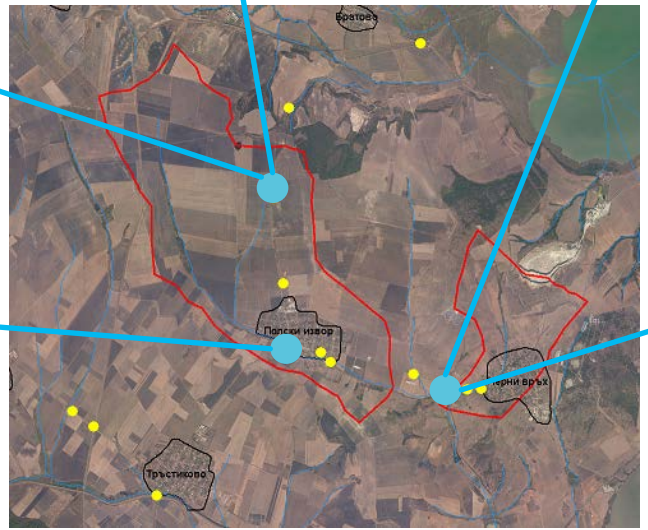


Erosion



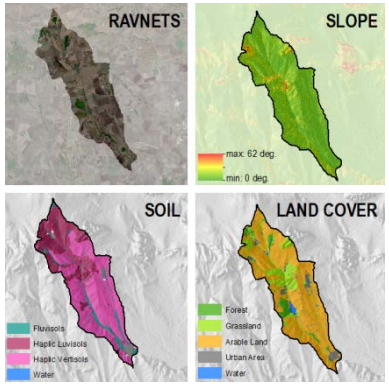
Soil moisture

FLASH FLOOD: POST EVENT MODULE



FLASH FLOOD: ANALYTICAL MODULE

- Analytical module - complex analyses in GIS environment
- Identification of the most affected areas
- Where specific measures should be taken



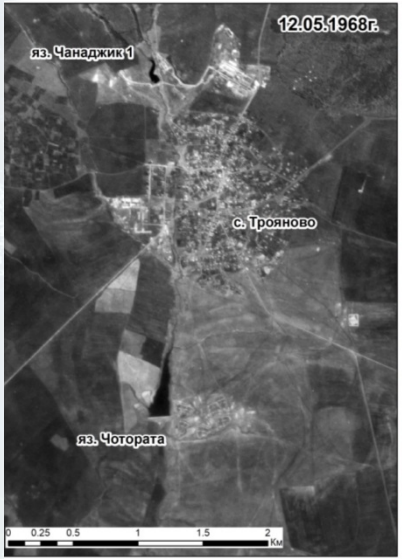
The derived high resolution thematic layers supports performance of a complex analyses for the flash flood management.

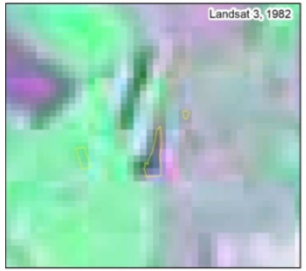
Processed data may support the update and regulation of cadastre and land registers, especially in the flood prone areas.

The analyses are integrated into the FMP, and could be used for defining concrete flood mitigation measures.

POINT OUT THE PROBLEMS: RESERVOIRS

The creation of a reference database of reservoirs using very high resolution satellite imagery or aerial photography and the subsequent monitoring of satellite imagery by Sentinel 1, 2 is an optimal solution for compiling a complete picture of the reservoirs in Bulgaria.





POINT OUT THE PROBLEMS: EROSION

- Flash floods cause activation of erosion;
- Affected areas - arable land, destruction of roads
- Satellite images, taken just before/after the flood event, are valuable source of information on the extent of erosion.
- Satellite images can be used to plan anti-erosion measures in the catchment area.

POINT OUT THE PROBLEMS: FLOODPLAINS

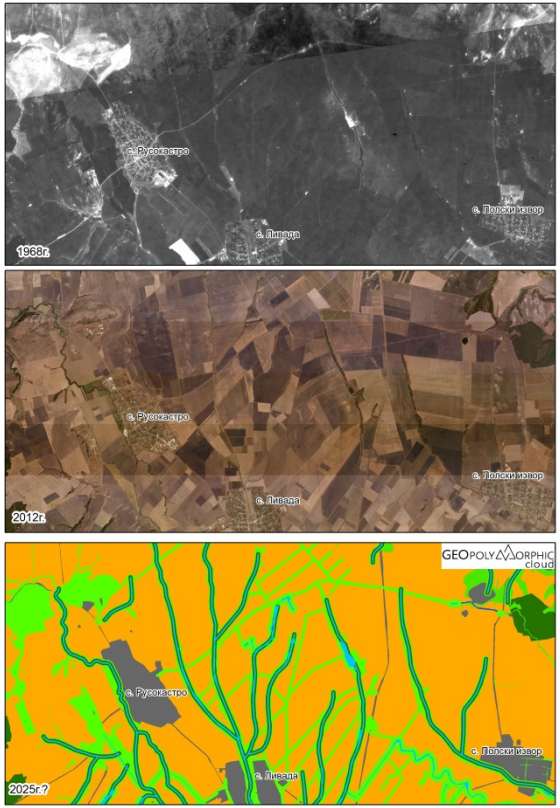
Cherni vrah

Polski izvor

- According to the cadastre, one of the most damaged parts in the village of Cherni vrah, are for "agricultural labour and recreation".
- There is no cadastral map for Polski izvor.

CONCLUSION

- Planning measures only at high wave sites is not enough
- Take measures where water accumulates
- Optimal land use and zoning
- Solutions integrated in interrelated programs for land use management – FRD, CAP, WFD, Territorial management



Check the full report on EO for Flash Flood Management – Burgas Flood Case Study on:
http://geopolymorphic-cloud.org/publications/2018_02_FloodBurgas.pdf

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Thank you for your attention

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