



DAMAST

Dams and Seismicity - Technologies for risk reduction

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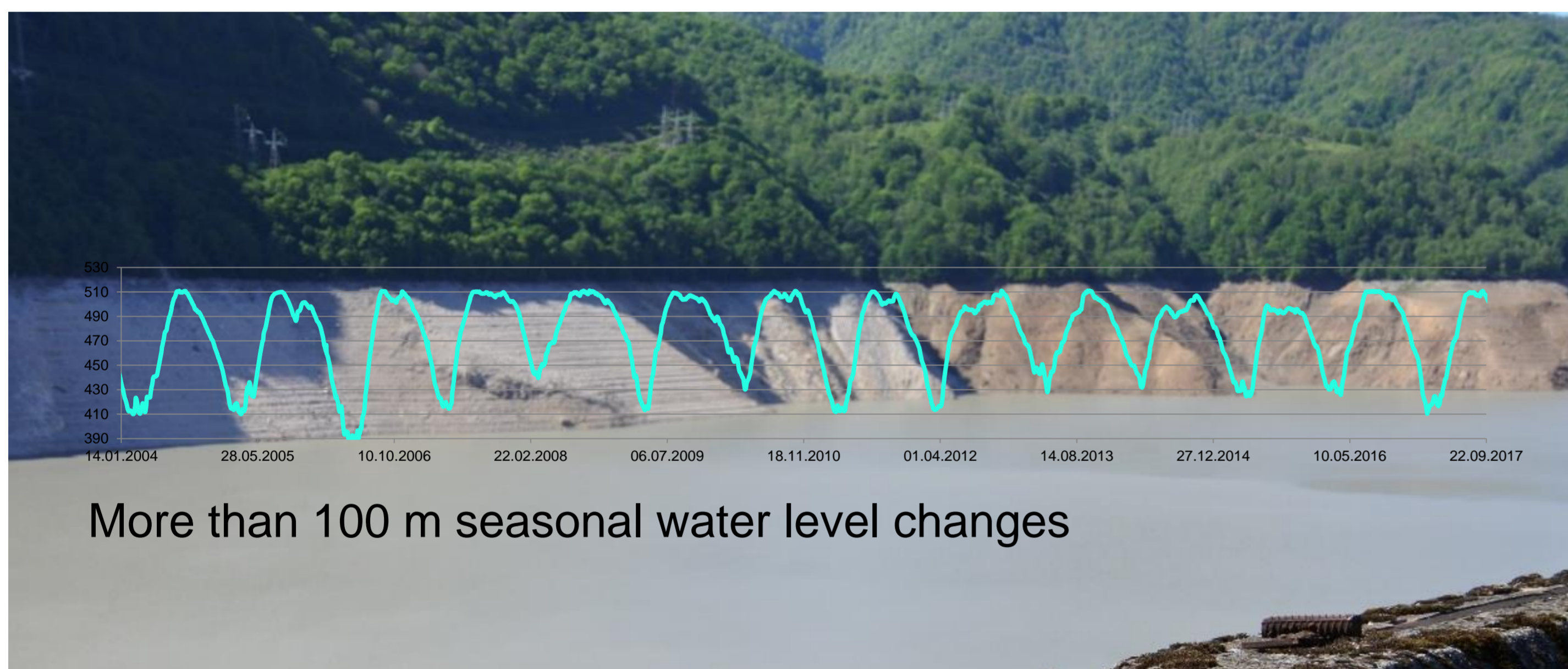
Motivation

Operation of hydropower reservoirs can trigger seismicity - especially in connection with extreme events such as heavy precipitation, landslides and natural earthquakes. However, for the Caucasus water reservoirs mean significant and sustainable contributions to energy self-sufficiency, irrigation, drinking water supply and passive flood protection. Due to morphology and precipitation in the Caucasus, hydropower has considerable expansion potential - also for green energy exports, thus numerous hydroelectric power plants are planned. The 271 m high Enguri Dam provides 38% of the electricity of Georgia. The Enguri is located in the Alp-Himalaya collision zone with high relief energy and erosion rates. The Alp-Himalaya collision zone is also seismically active. The recent seismicity shows that many faults are critically stressed. Sediment accumulation is a threat to the dam and reduces the efficiency of the reservoir operations. However, sediment accumulation occurs at variable and often unknown rates. So far the loads resulting from sediments are not part of the standard design of dams.

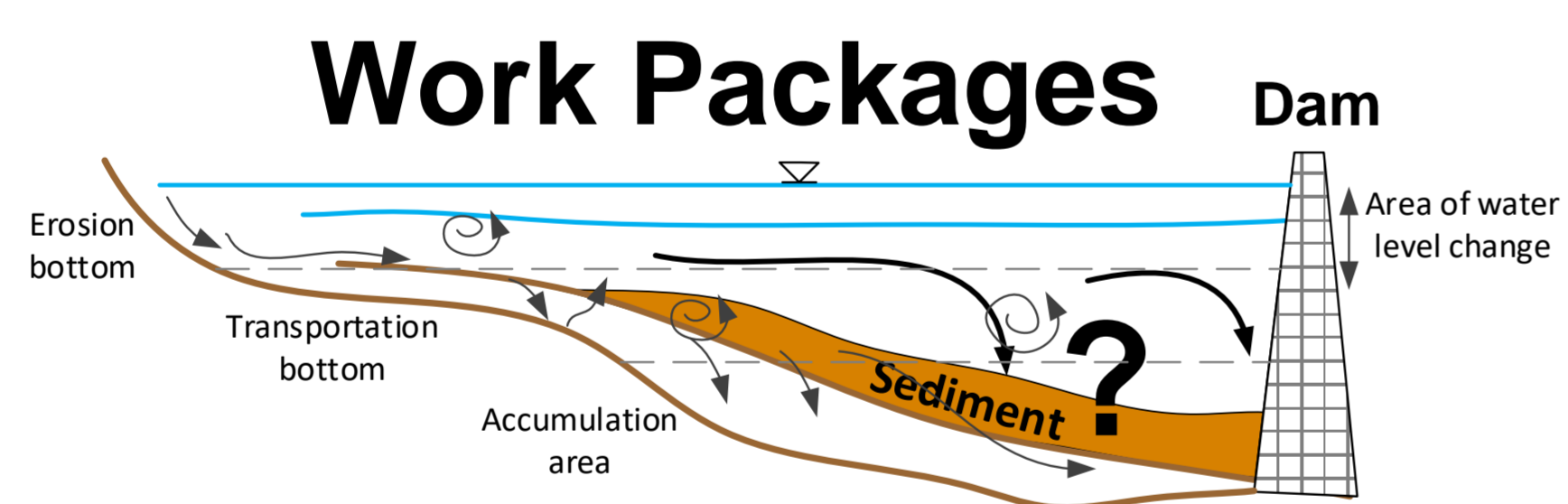


The major goal

is to systematically and efficiently reduce the hazards to water reservoirs and to enable sustainable, efficient operation. The results should lead to increased safety in the construction of new dams. The effect of the superposition of extreme events (heavy precipitation, seismicity, landslides) shall be considered and quantitatively described.



Work Packages



A) Instrumentation, data acquisition and analysis

- in situ well data
- seismic array
- deformation monitoring (GNSS, InSAR)
- structural monitoring GB-SAR+ others

Data

B) Interpretation, processes, mechanisms and models of induced seismicity

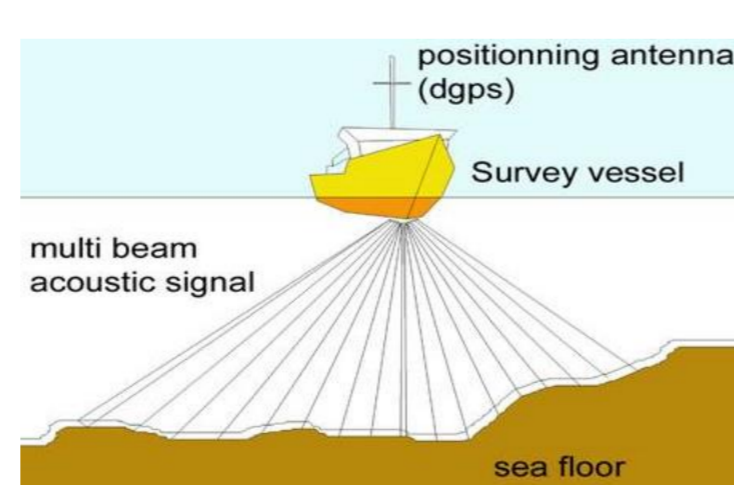
- analysis of active structures
- spatiotemporal variation of seismicity
- interpretation of deformation and structural monitoring, well data
- modelling of reservoir volumen and sediments

Data

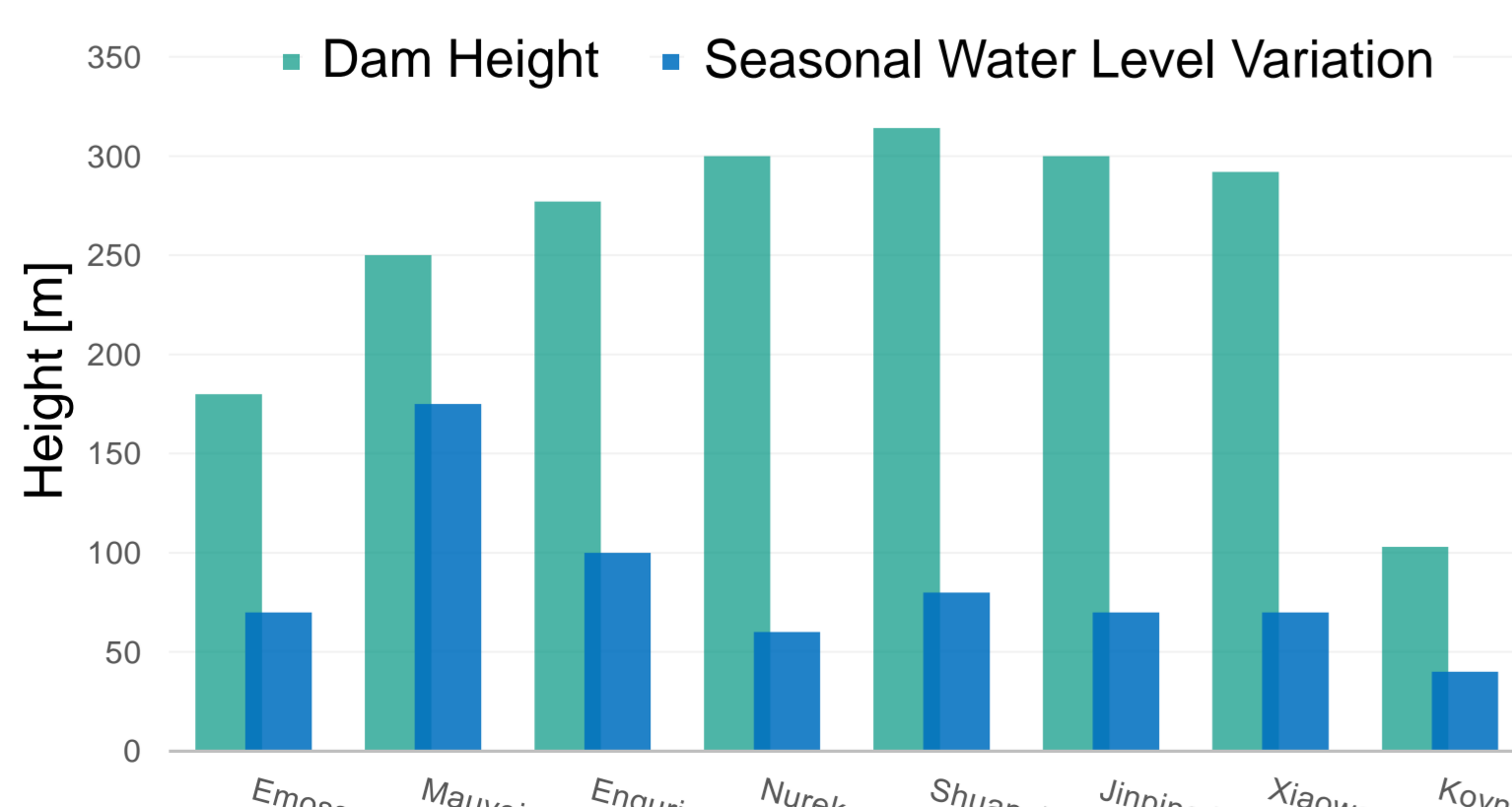
Results

C) Early Warning Concept & Knowledge Transfer

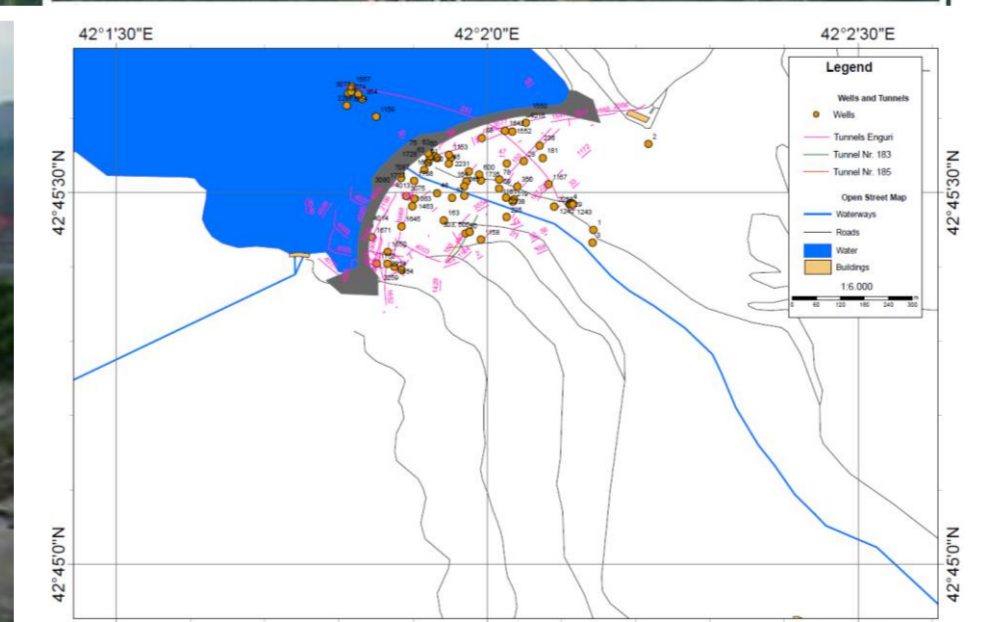
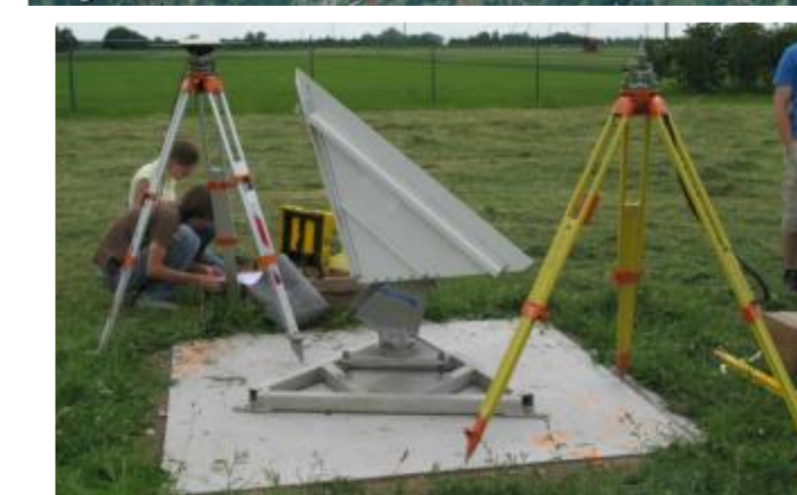
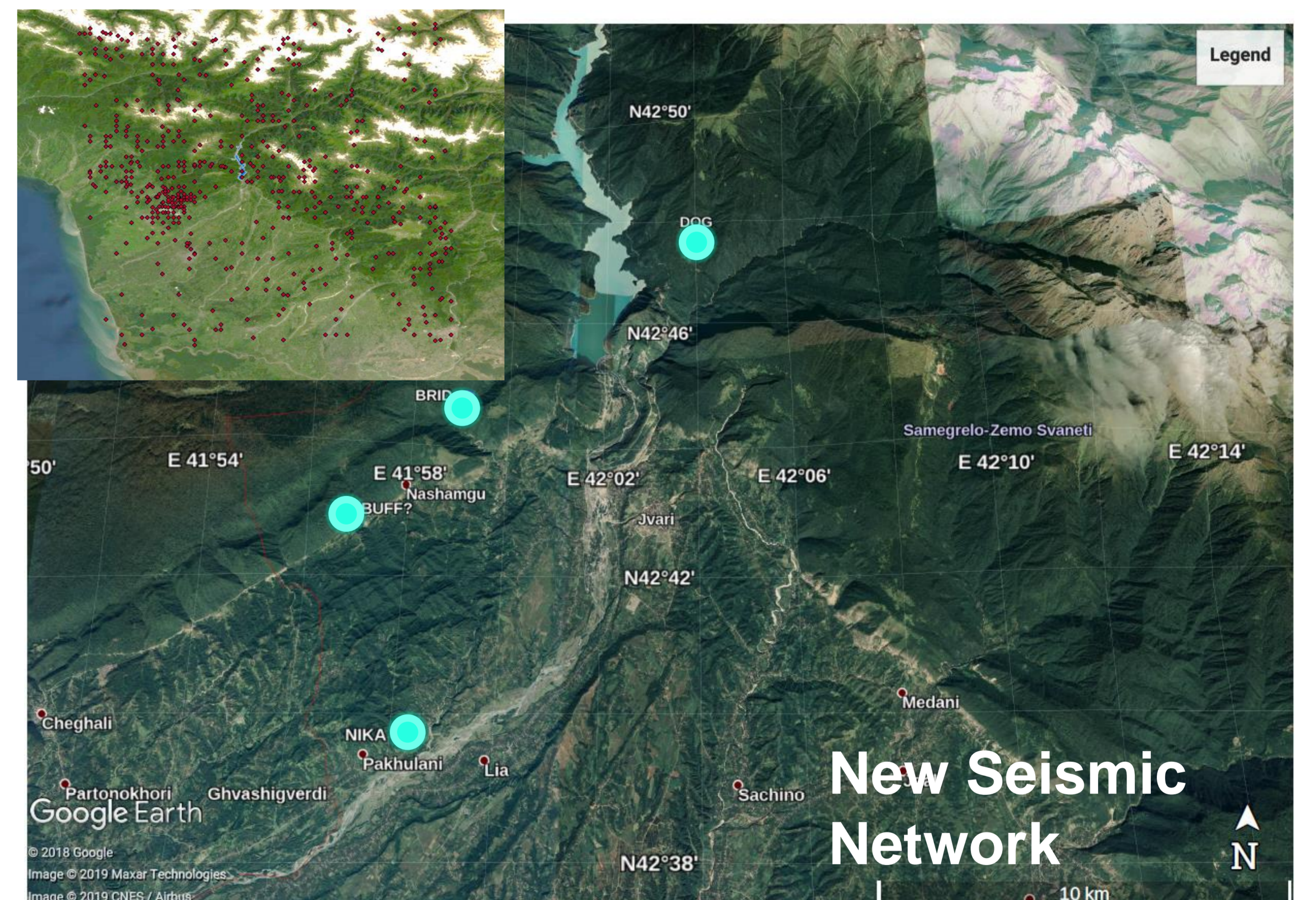
- rainfall statistics in context of climate change
- hazard assessment of extreme events
- concept of modular early warning system
- knowledge transfer



■ Dam Height ■ Seasonal Water Level Variation



Bare shore lines and riparian stripes are demanding SAR targets with stable backscatter, but changing area → improvement of partial scatterer methods



Approach

1. Modular monitoring concept (remote sensing, borehole measurements, structure monitoring).
2. Development of concepts for safe and efficient reservoir operation for different scenarios (initial filling, different sedimentation rates, reduction of water level and refill e.g. after repair work).
3. Development of a transferable tool for sediment input estimation and sedimentation prediction with focus on alpine and seismic active regions.