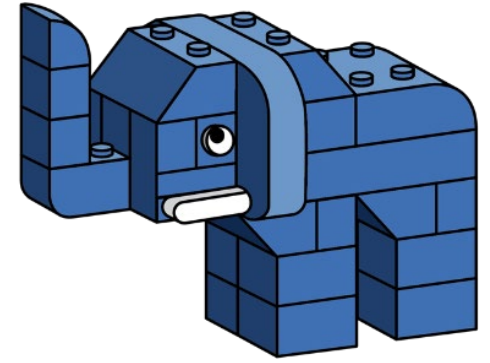


TEMBO Africa

Transformative Environmental Monitoring to
Boost Observations in Africa



Transforming Reservoir Management in Sub-Saharan Africa

Frank O. Annor, Nick van de Giesen, Eugenio Realini,
Andrea Gatti, Hessel Winsemius, Salvador Peña, Kawawa Banda,
Stephen Mather, Gianko Michailidis, Mark Noort

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Seven innovative sensors (10% Total Cost of Ownership)

Commercial Microwave Links for rainfall estimates

X-Band radar for spatial rainfall estimates

Intervalometers for rainfall detection and typification

Cost-effective neutron counters for large scale soil moisture (BLOSM)

Low cost GPS/GNSS receivers for multiple applications

Camera-based river discharge measurements

UAVs, fish-finders, and GNSS

BLOSM: Boron-based Large-scale Observation of Soil Moisture



Two detectors: fast + thermal neutrons
Soil moisture content estimation
Real-time, hourly measurements



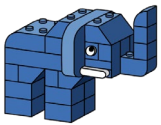
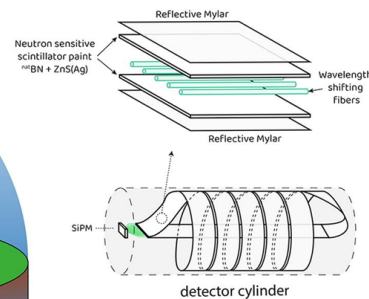
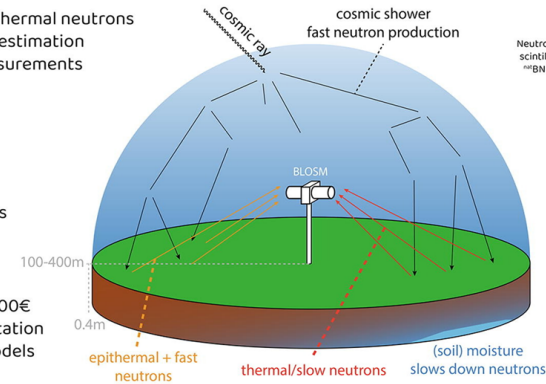
Low-cost, unenriched,
non-toxic, accessible
materials



Economical electronics
Simple Pulse Shape -
Discrimination (PSD)



Total material cost < 800€
Large scale implementation
Improve hydrology models



Five products, free

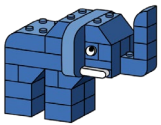
Rainfall Maps

Soil Moisture Maps

Open Water

River discharge

Floodplain Mapping & Bathymetry

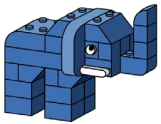
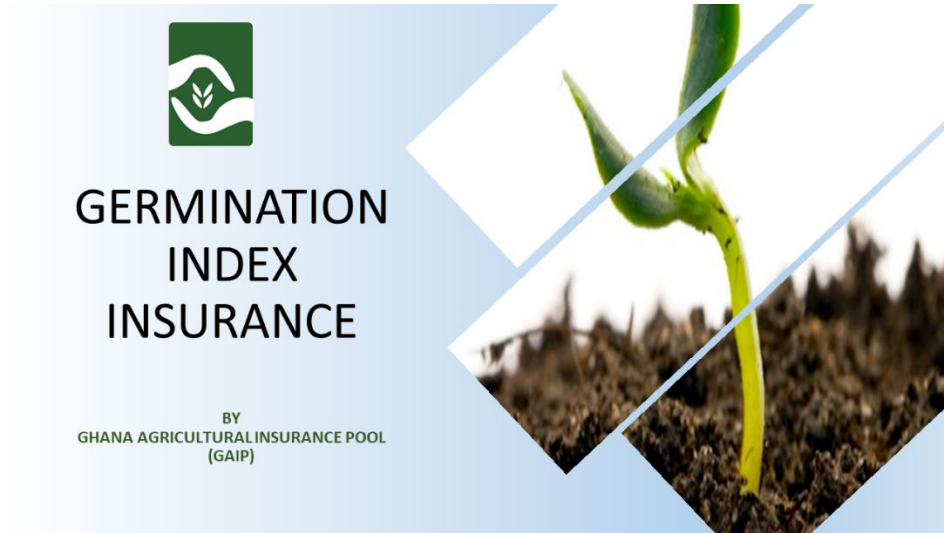


Three services to pay for system

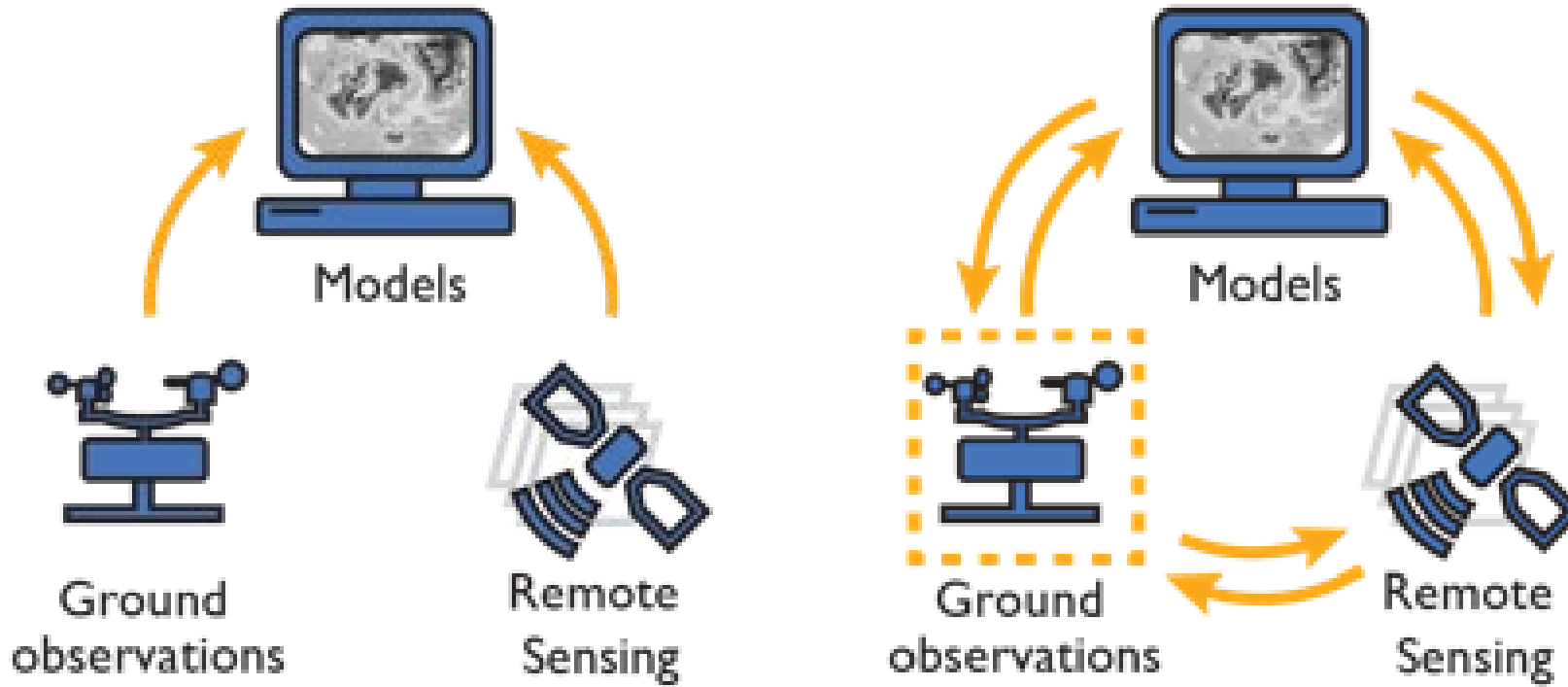
Flood Early Warning Systems

Reservoir Management

Agriculture Insurance

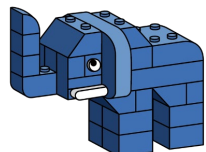
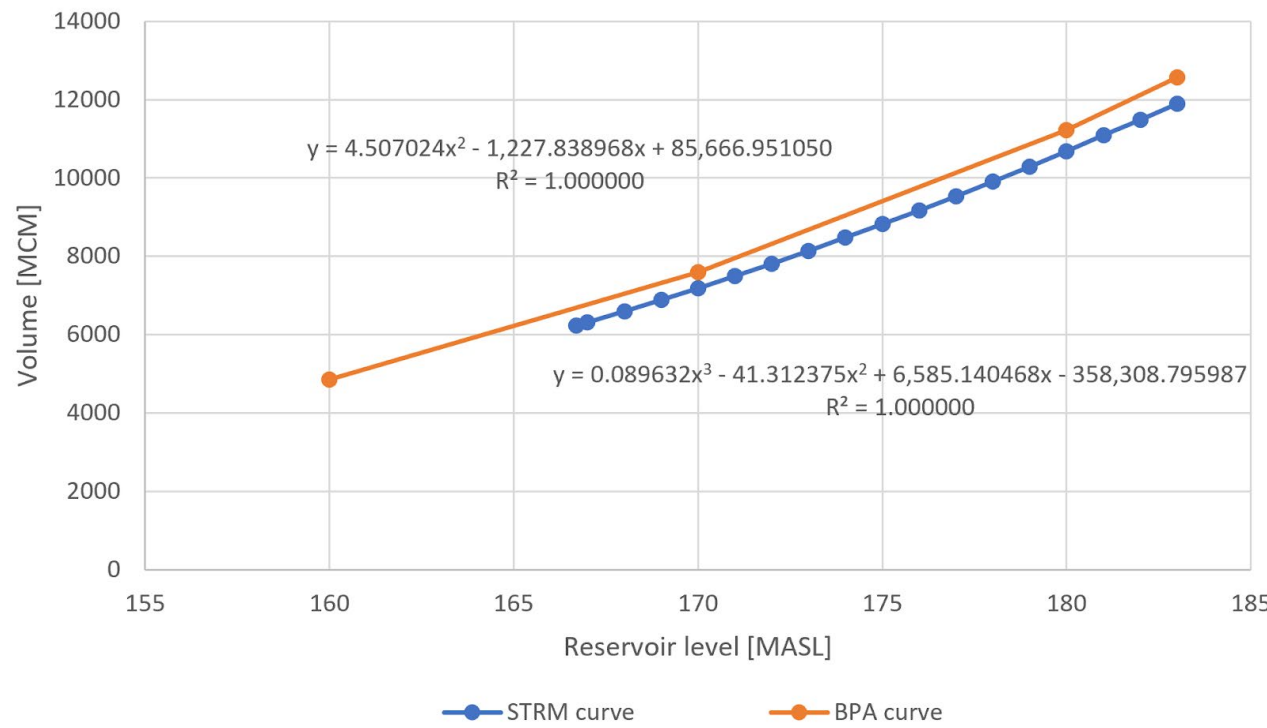
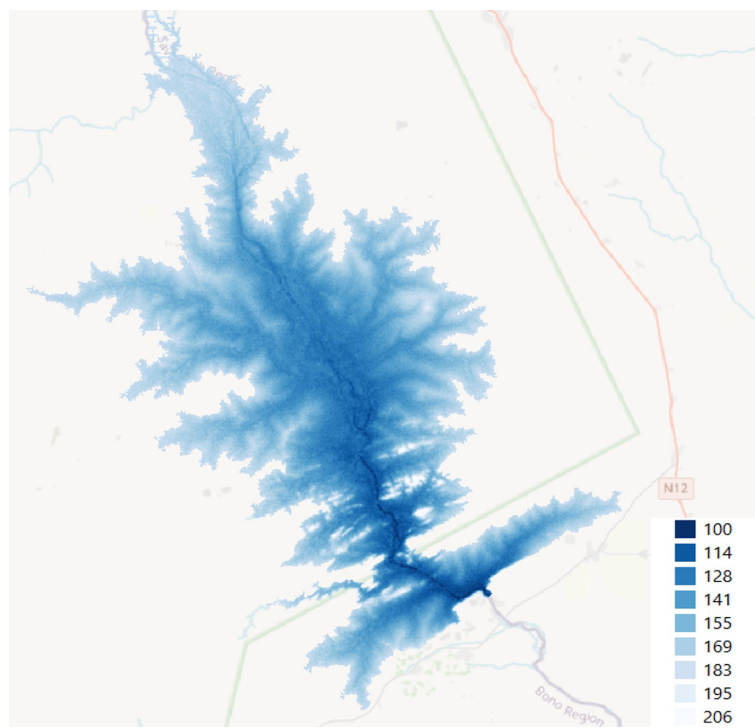


TEMBO Paradigm

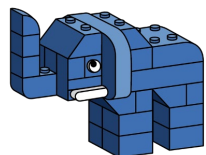
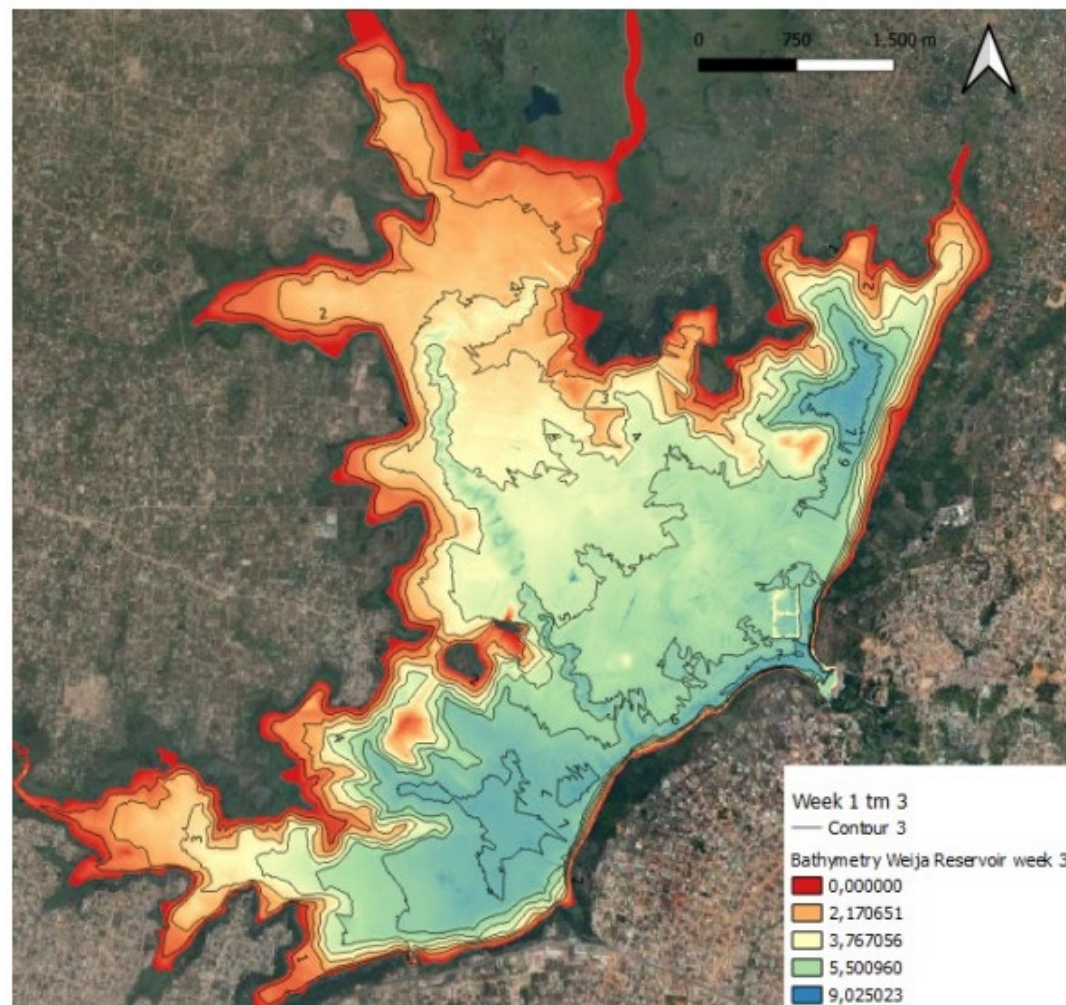


EO - SRTM

QGIS plugin



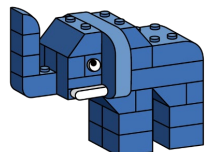
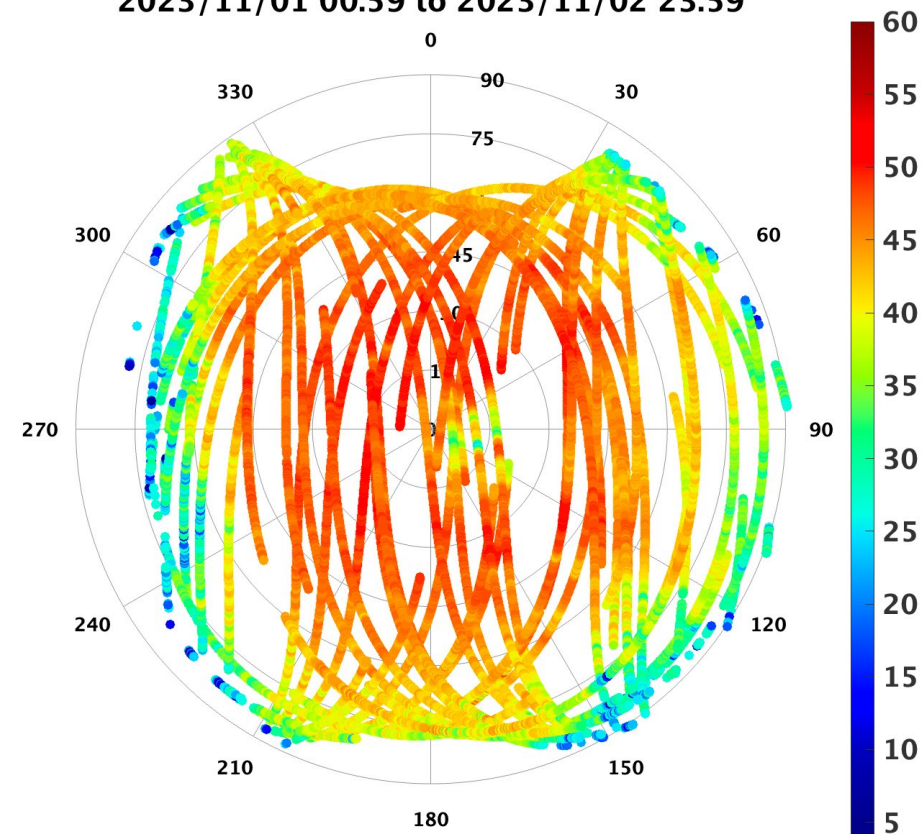
Bathymetry



Dam stability

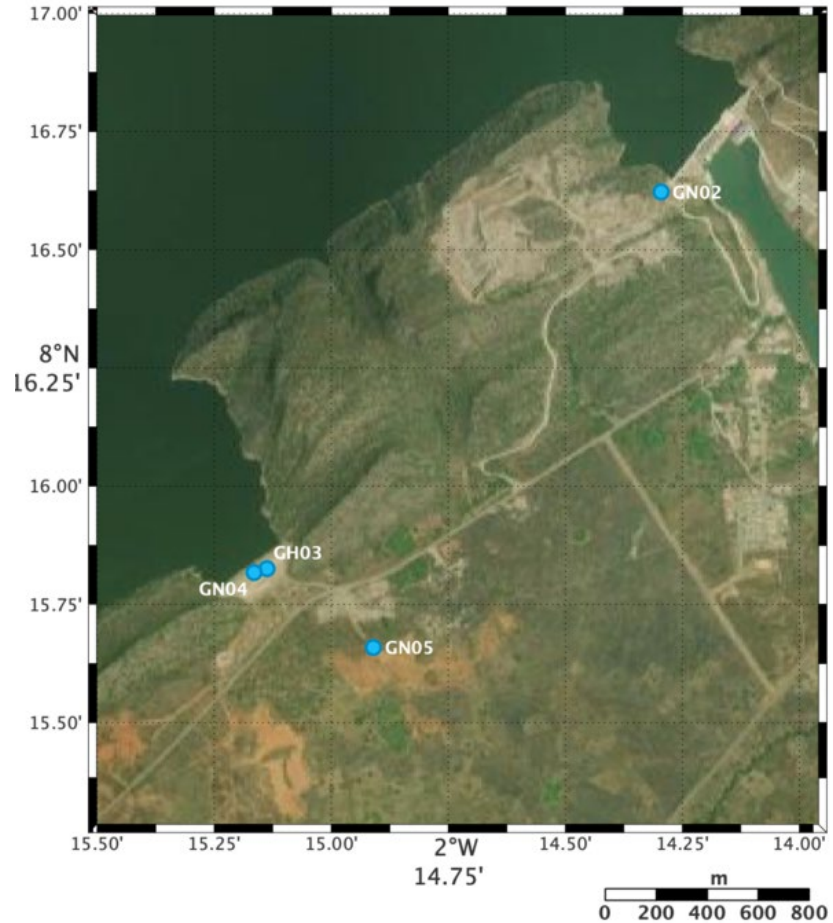


S1C - receiver GN02 - GPS
2023/11/01 00:59 to 2023/11/02 23:59

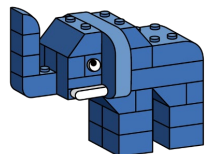
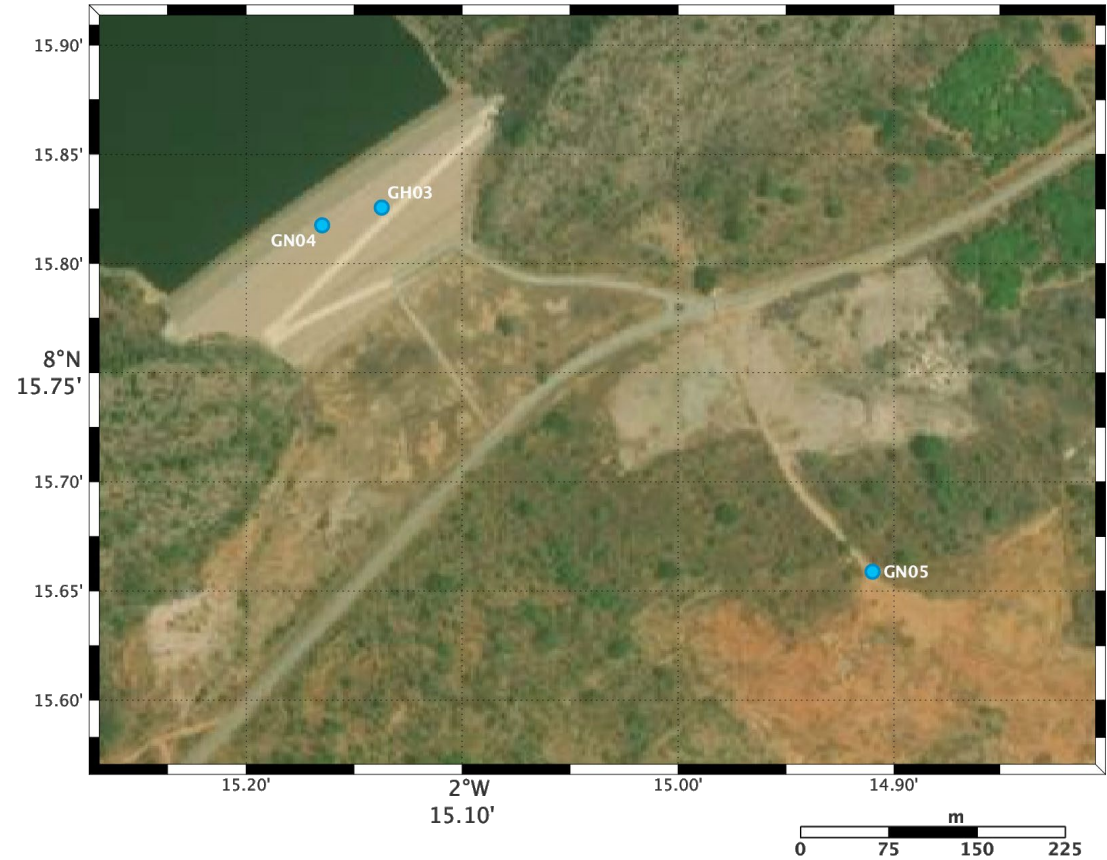


Dam stability

Map of GNSS stations

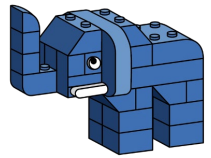
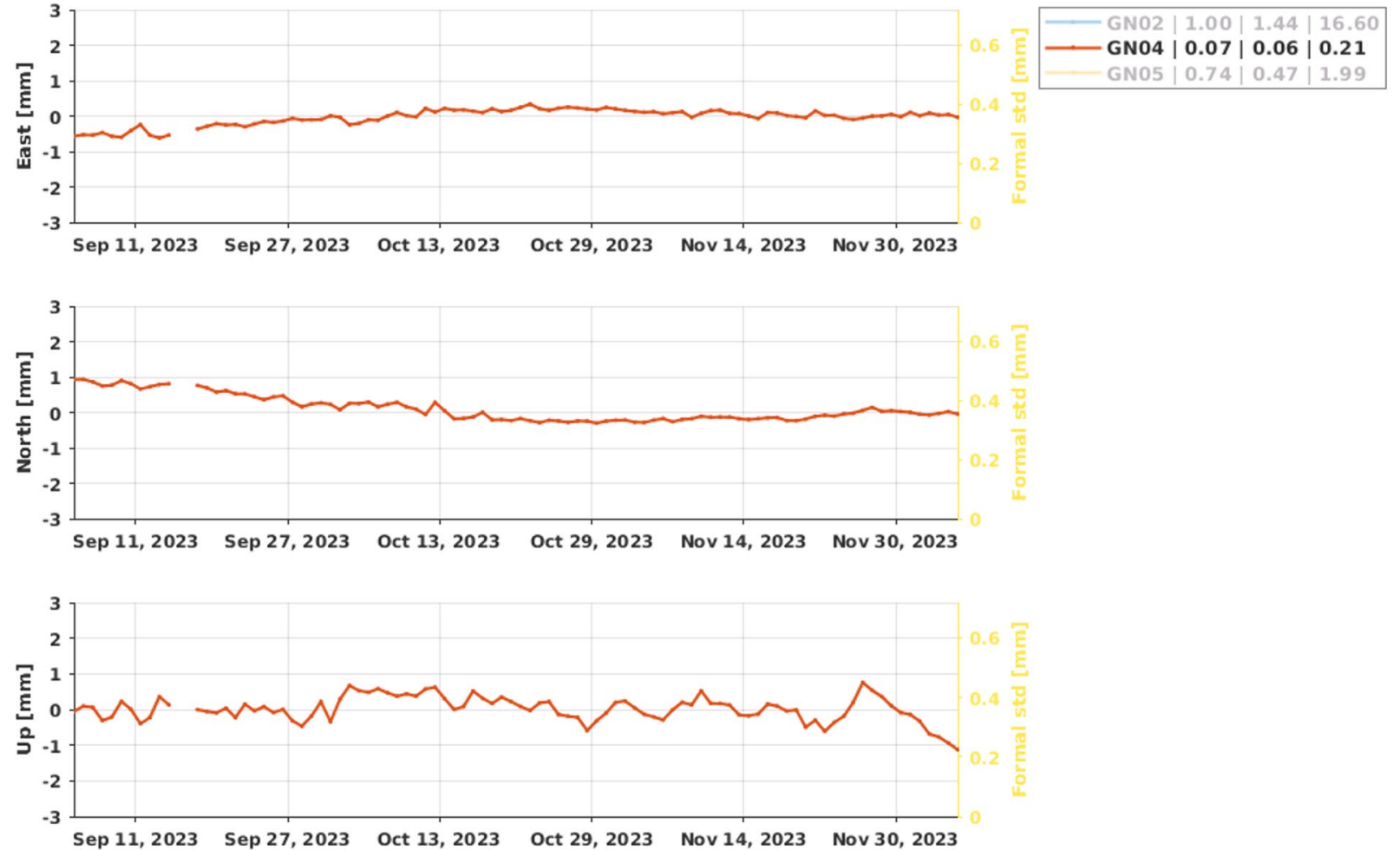


Map of GNSS stations

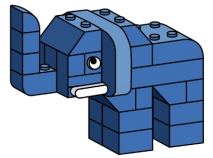


Dam stability

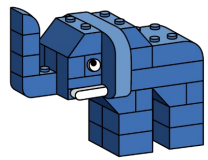
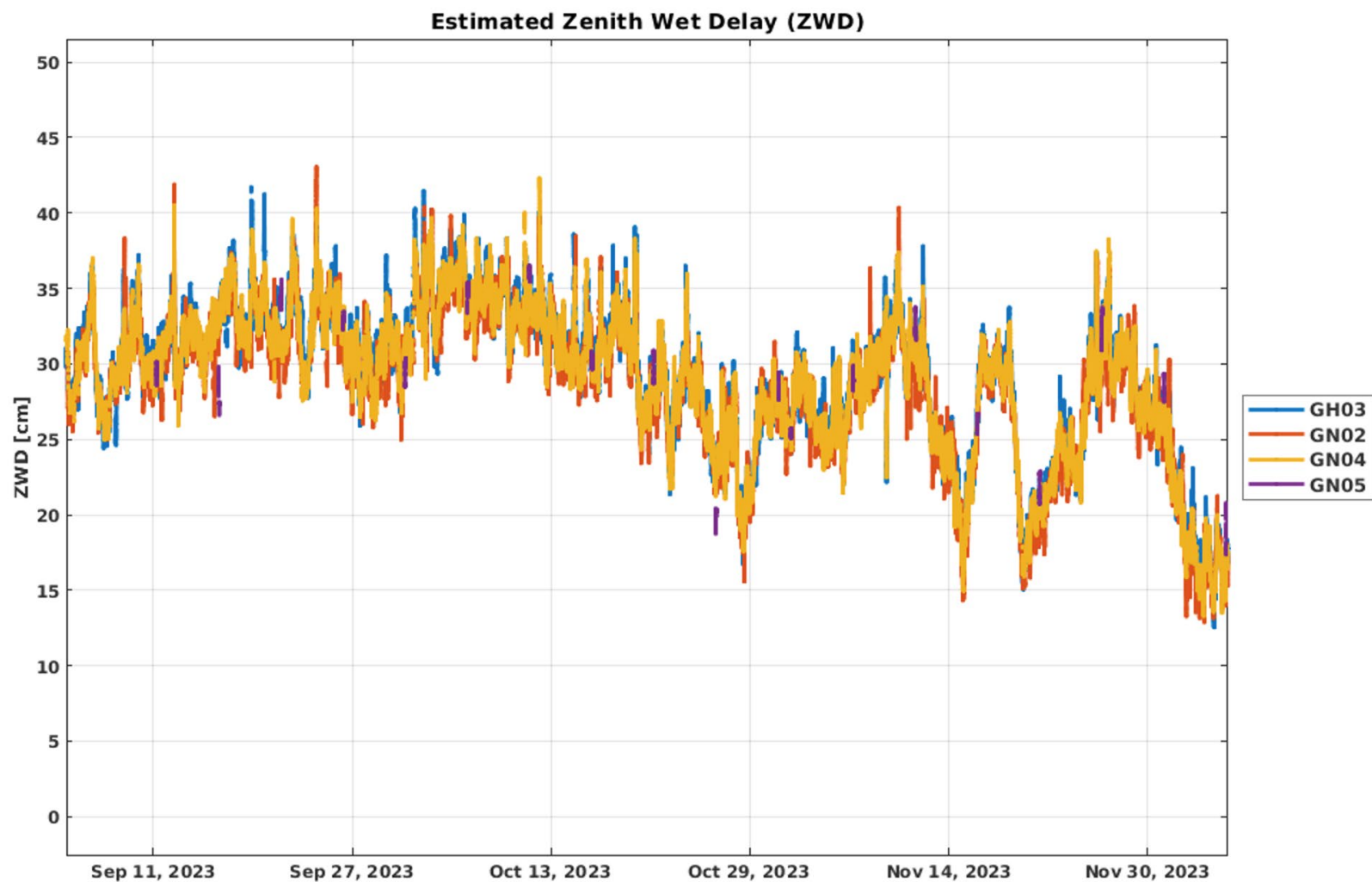
Baseline stability ENU vs GH03 [mm] @ 86400s
STD (vs smoothed signal)



Swiss Army Knife



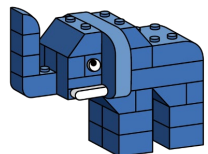
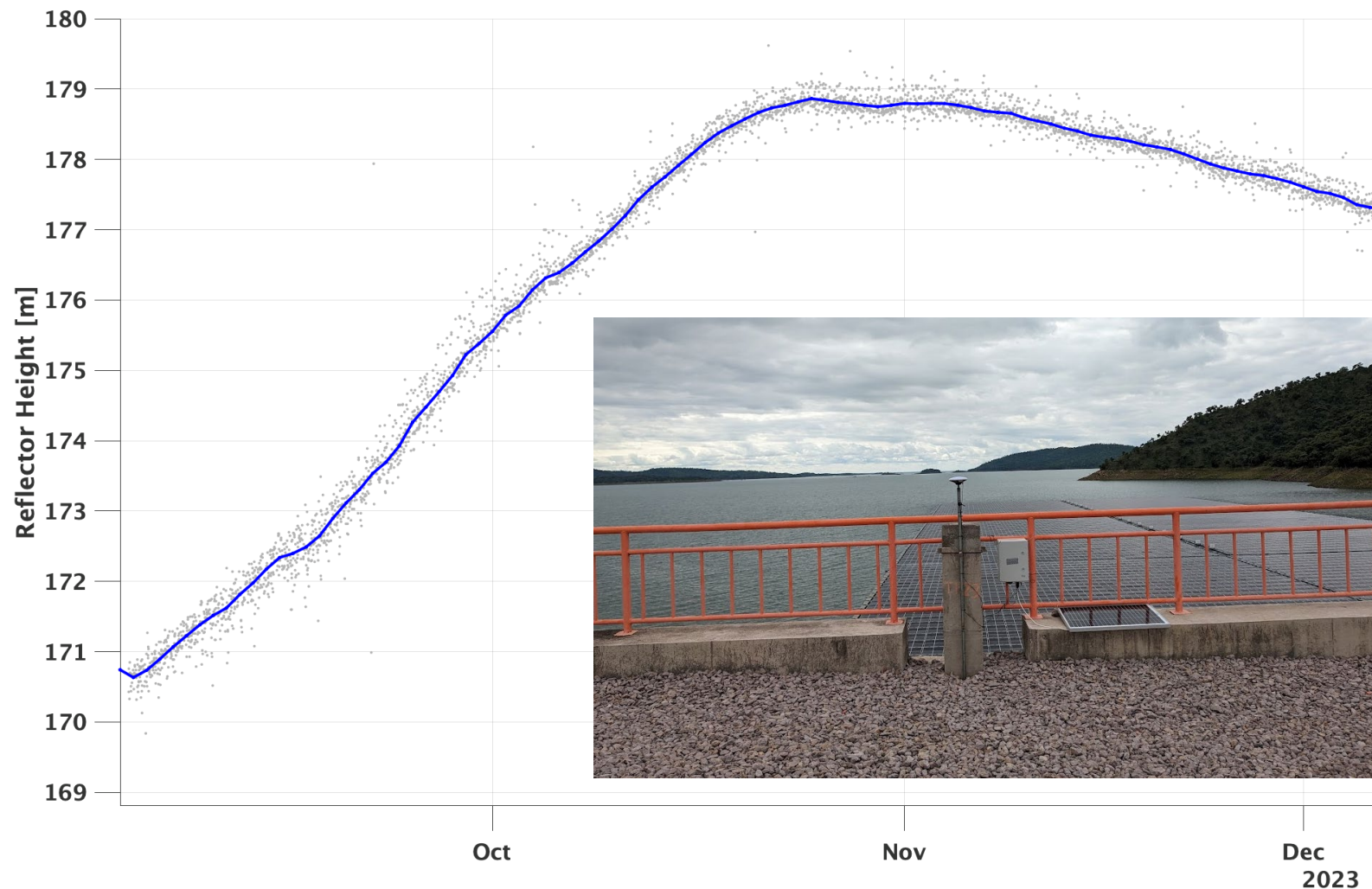
Zenith wet delay



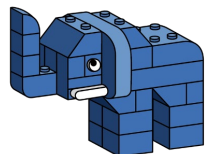
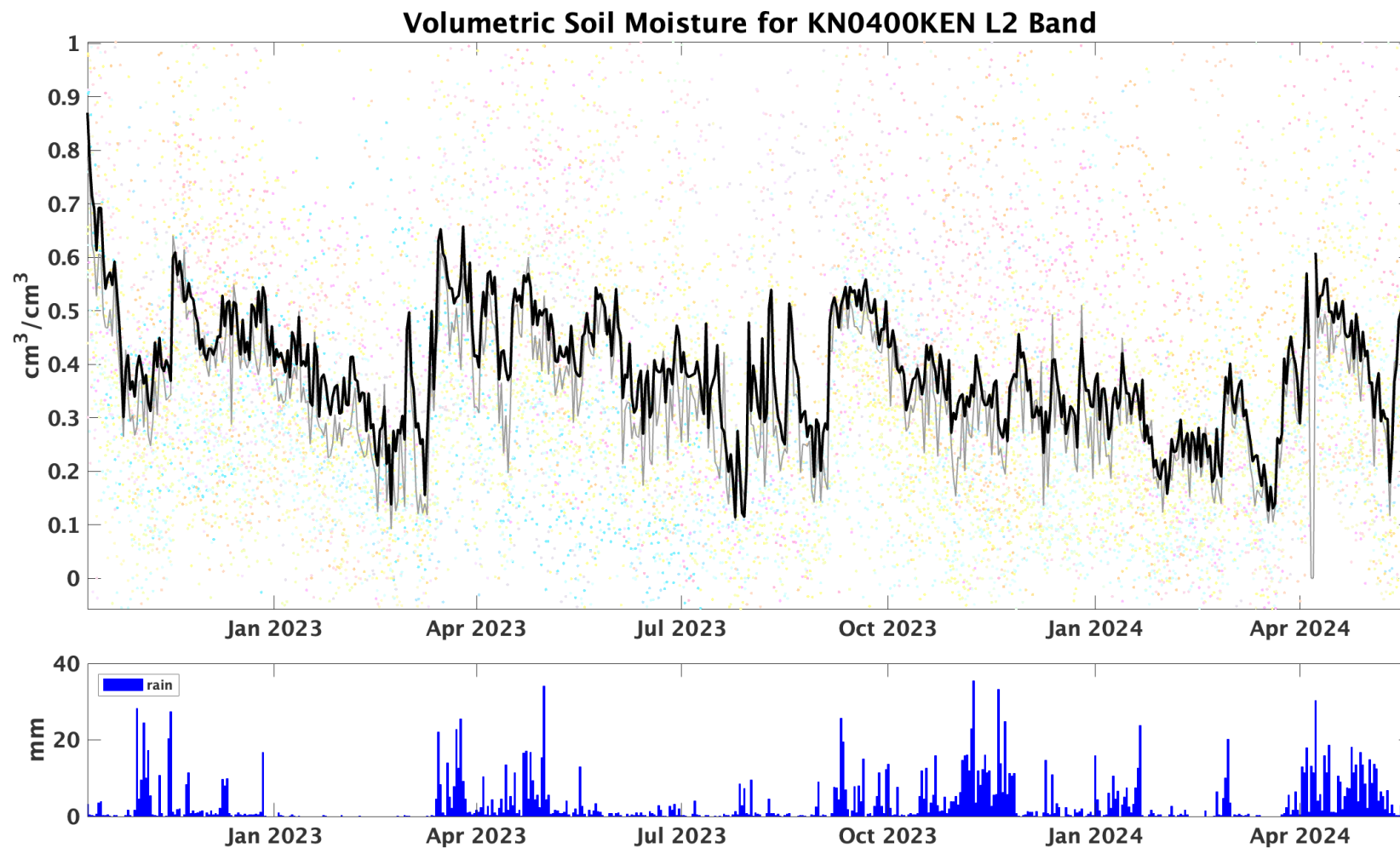
Water level



GNSS-IR results: GN0400GHA

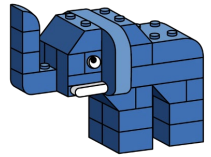
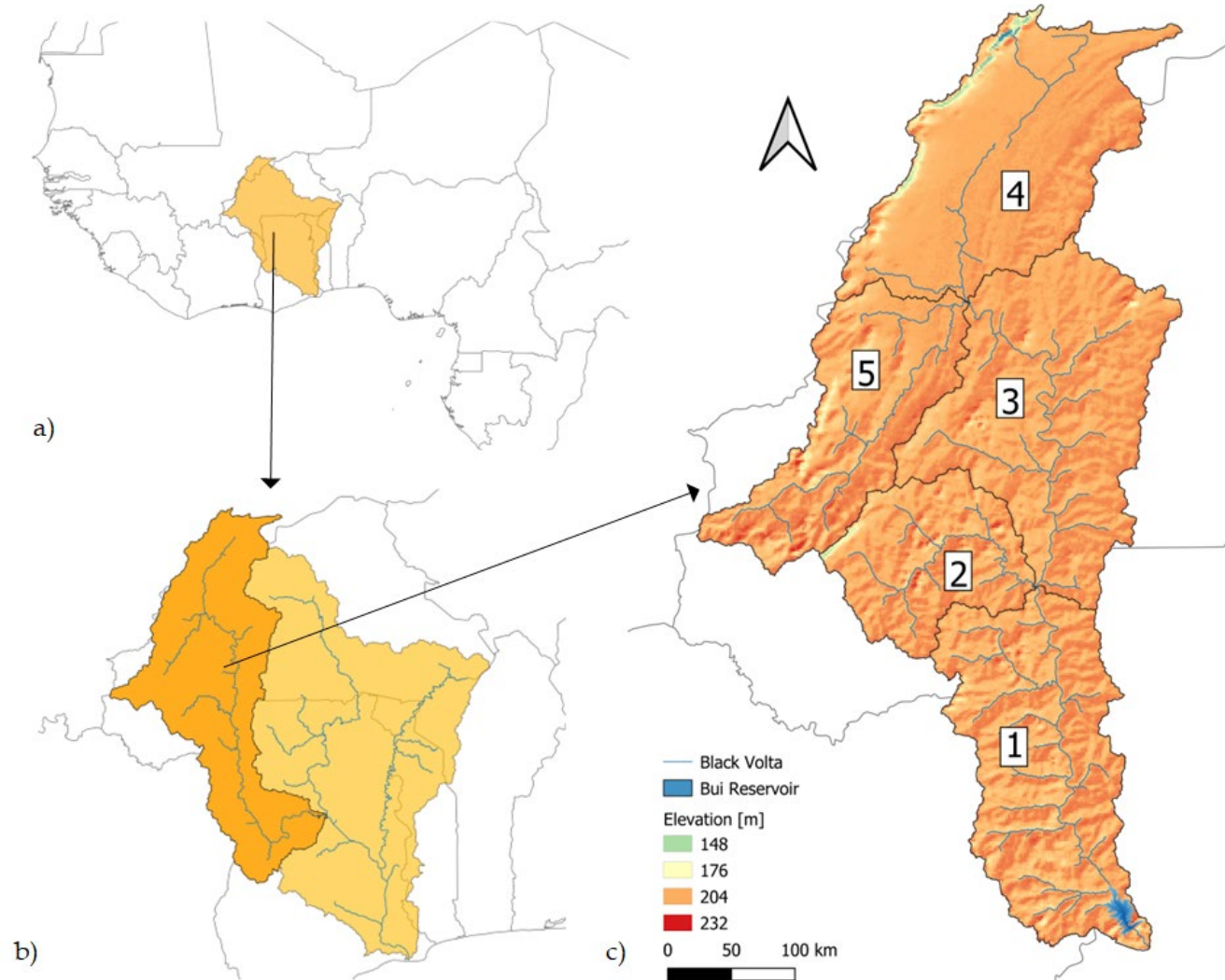


Soil moisture



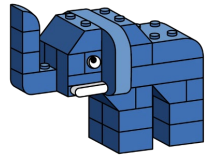
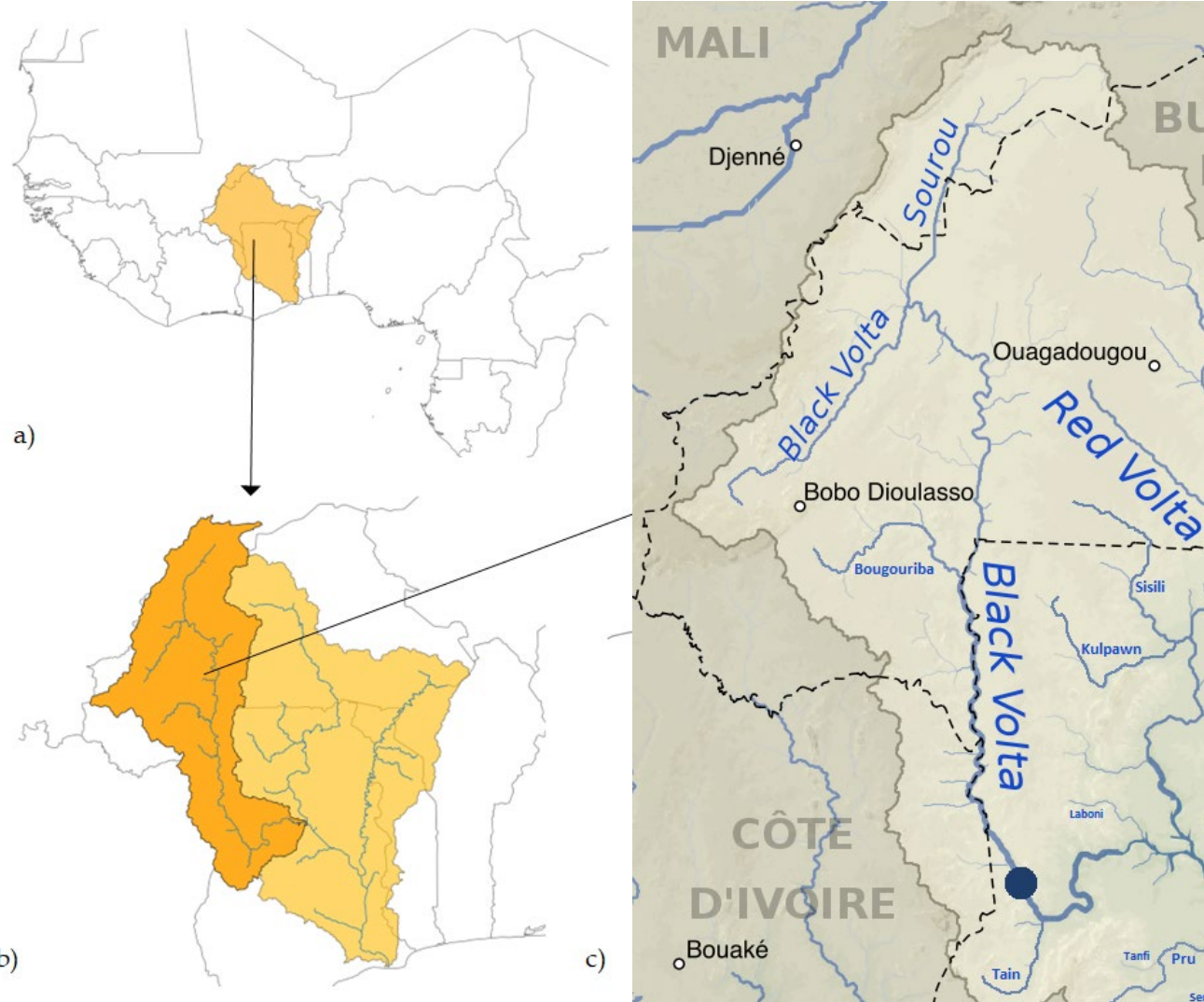
EO - Hydrology

Bui Dam Sourou



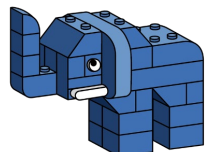
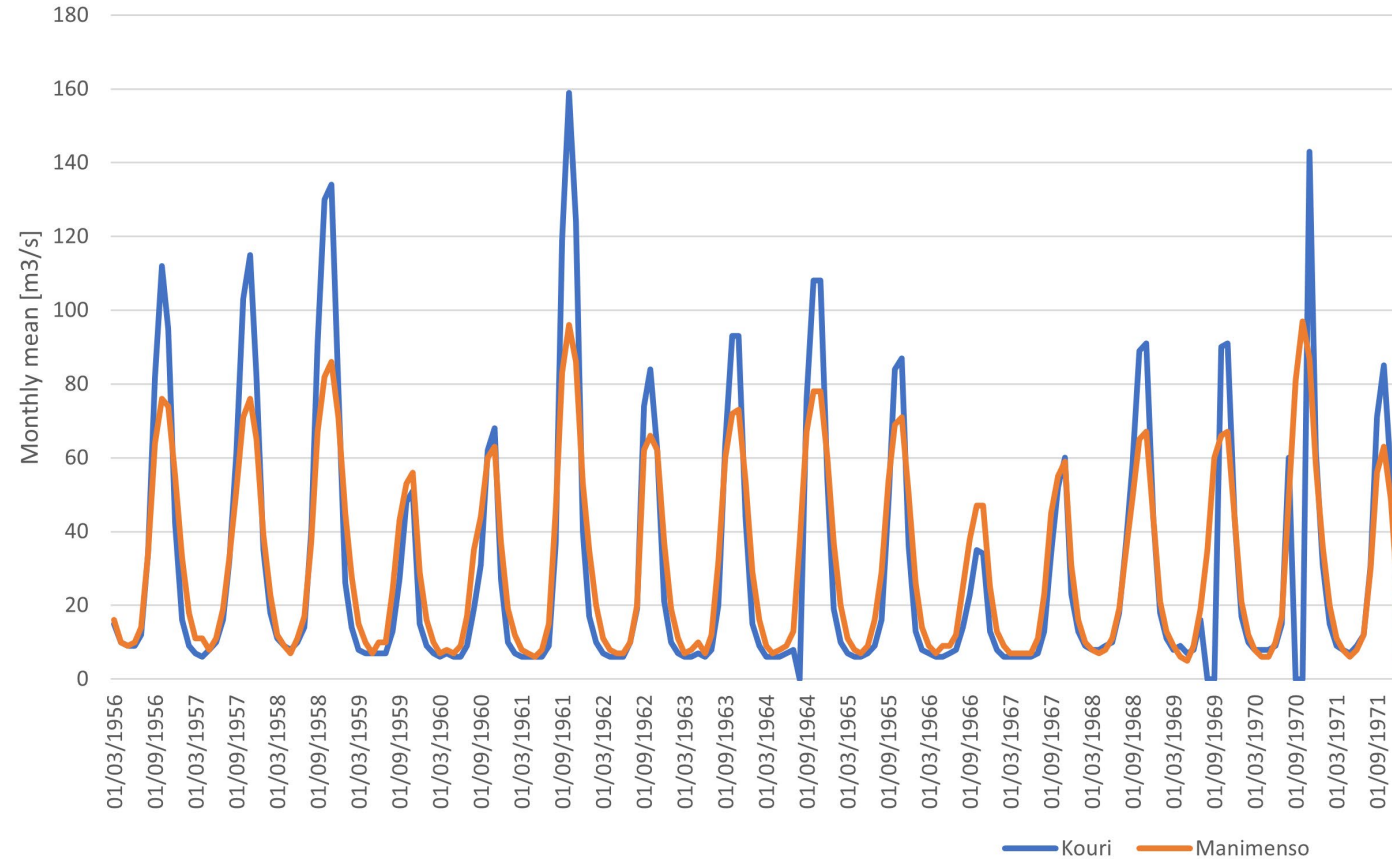
EO - Hydrology

Bui Dam Sourou



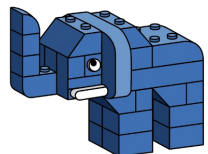
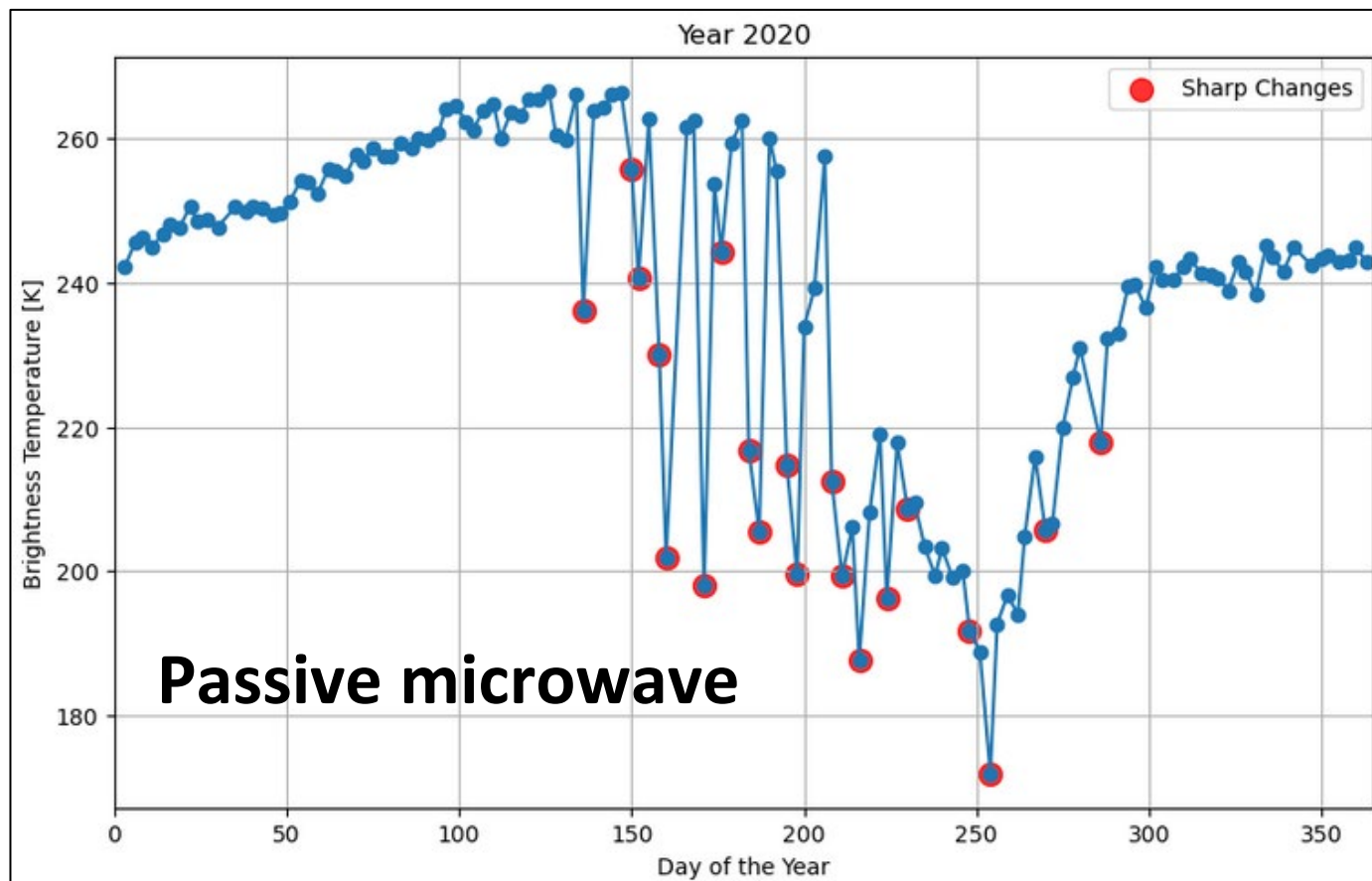
EO - Hydrology

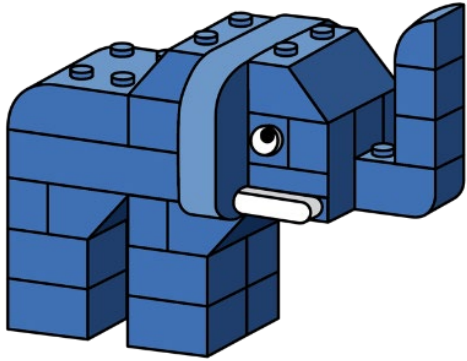
Bui Dam Sourou



EO - Hydrology

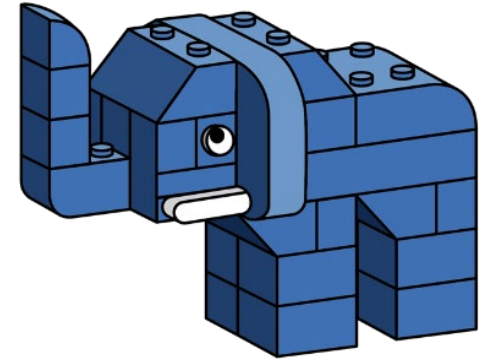
Bui Dam Sourou





TEMBO Africa

Transformative Environmental Monitoring to Boost Observations in Africa



THANK YOU!

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