| March 2023 |

WorldWater

NoR status report

ID 26214c

DHI gisat GeoVille GRID ARENDAL A Centre Collaborating with UNEP DTU

WorldWater
SURFACE WATER DYNAMICS FROM SPACE

WorldWater

Surface Water Dynamics

Empower national and regional stakeholders with EO data and tools
to better monitor their water resources and report on the global water agenda.

Project objectives

- **DEVELOP innovative and scientifically robust EO methods and tools** on data streams of free satellite imagery at high spatial & temporal resolution (S1, S2, L8) and inland water level observations from RA, for the monitoring of the **intra-annual and inter-annual variations of surface waters, in extent and volume.**
- **DEMONSTRATE the robustness and scalability** of the EO algorithmic approaches and software tools for **large scale water monitoring systems**.
- **SHOWCASE the utility of the WorldWater products** by conducting a number of use case studies related to **sustainable water management**;
- **INTEGRATE** the WorldWater tools and products in **web-based Surface Water Data Analytics Portals** with data visualisation, statistical and analytics tools;
- **SUPPORT countries developing / strengthening their technical capacities** to monitor the extent and changes of surface waters

Two phases

Phase 1: Prototyping (2020/21)

Phase 2: Implementation (2022/23)

Phase 1: Gabon, Zambia, Mexico, Colombia, Greenland

Phase 2: 5 additional countries/river basins (Denmark, Thailand, Tajikistan, West Africa (Burkina Faso, Niger Volta basin)

Advisory Committee:
UN Environment, UN Water, UN Statistical Division, EC JRC, IUCN, GEO, IAEG-SDGs WGGI

The products

Surface Water Extent (SWE)

EO input data: Sentinel-1, Sentinel-2, Landsat-8

Other input data: Digital Elevation Model (<30m resolution) [optional]

Method: WorldWater will develop and test a surface water extent mapping algorithm based on continuous observations from multi-sensor EO satellite data of high-resolution radar (Sentinel-1) as well as optical (Landsat 8 and Sentinel-2) data to fully cover the dynamics of open surface water. Using a hybrid sensor approach, i.e. combining optical and radar observations, will provide a more robust delineation of water surfaces compared to traditional (either optical or radar) approaches with SAR imagery providing all-weather capabilities and optical data helping to address difficult surface types (i.e. flat, sandy, or frozen surfaces, rough waters) as well as providing a more com plete picture of the water dynamics due to the higher observation frequency.

Output indicators: i) surface water extent [seasonal and permanent water; water occurrence]; ii) changes in surface water extent (between 2 years) and iii) changes in surface water extent (for 4 years).

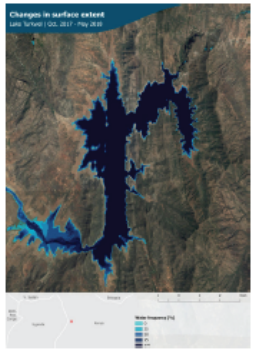
Spatial resolution: 10 meters

Temporal resolution: Monthly, 2017-2020

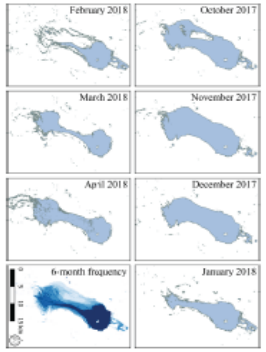
Delivery format: GeoTiff, QGIS style file, additional information or other data for mats upon request

Thematic Accuracy: >85% overall accuracy

Relevance: Assessing surface water dynamics is crucial for water resource management, and decision-making in water-sensitive sectors e.g. supporting water supply planning, irrigation management, mitigation of flood and drought f risk, and identification of climate trends.



Water frequency map of individual water body



Monthly surface water extent of a selected water body in Africa from Oct 2017 – April 2018, including water frequency map

For additional information please contact project lead Christian Tøttrup: cto@dhigroup.com

Water Surface Elevation (WSE)

EO input data: Jason-2, Jason-3, Sentinel-3A/B, Cryosat-2

Other input data: Surface water mask (GSWE + Service 1)

Method: WorldWater will deliver water surface elevation from time series from multi-mission satellite altimetry (i.e. Sentinel 3 SRAL, JASON 3 and Cryosat) The surface water volume workflows will determine the intra and inter annual changes in volume of water bodies by using allome try, rating curves or hydrologic-hydrodynamic simulators to convert the water levels into volumetric estimates of reservoir storage and river discharge

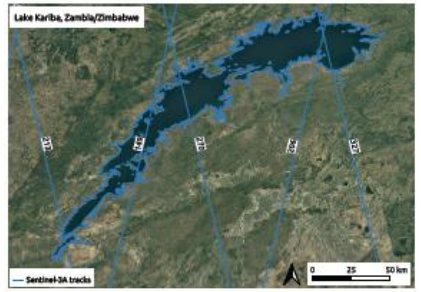
Output indicators: Seasonal and yearly (min/max) changes in volume of water bodies

Units: m

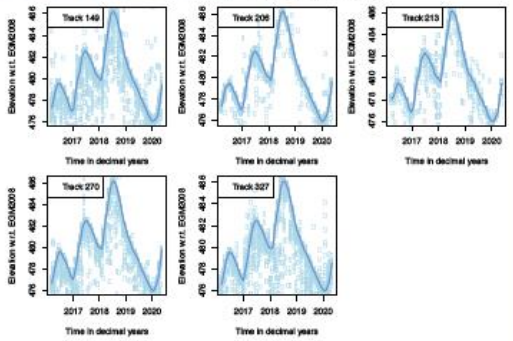
Spatial resolution: Virtual stations

Temporal resolution: Roughly monthly 2017-2020

Delivery format: Ascii (.txt), Excel, shapefile (.shp)



Illustrations: Surface water elevation in Lake Kariba 2017-2020



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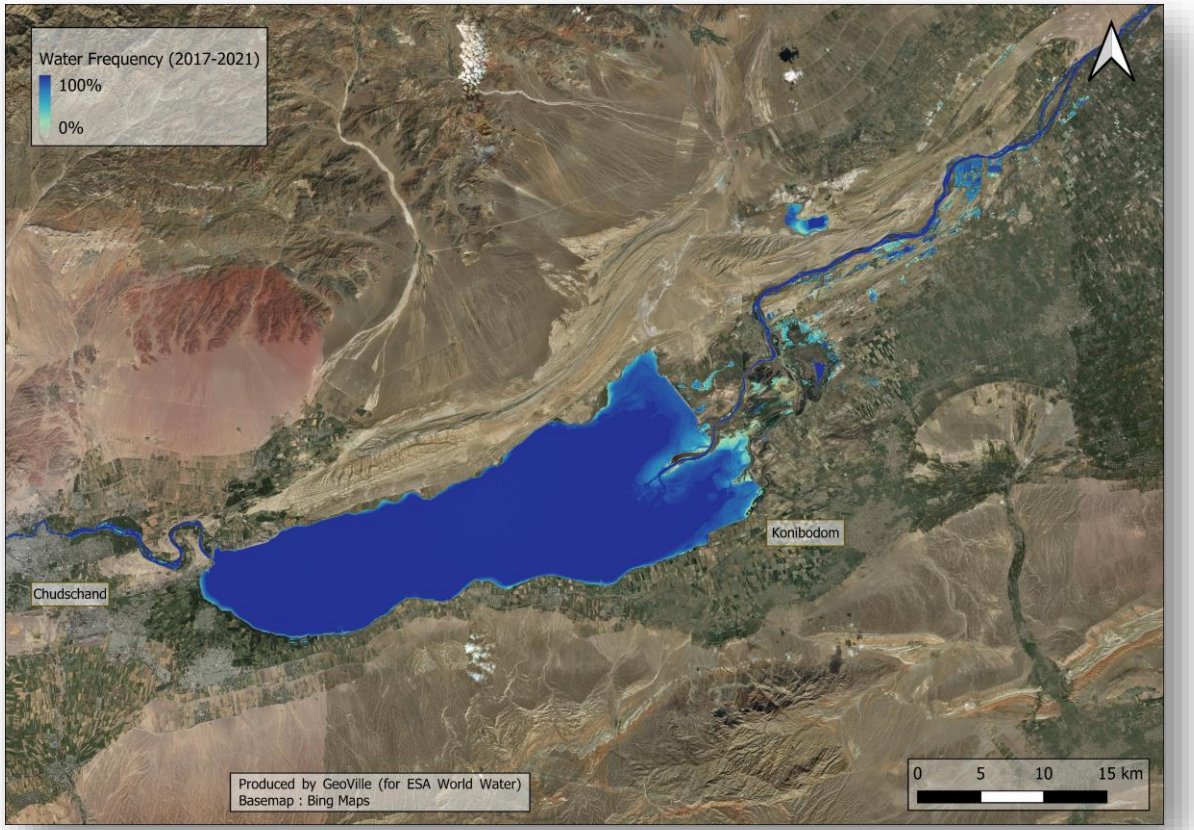
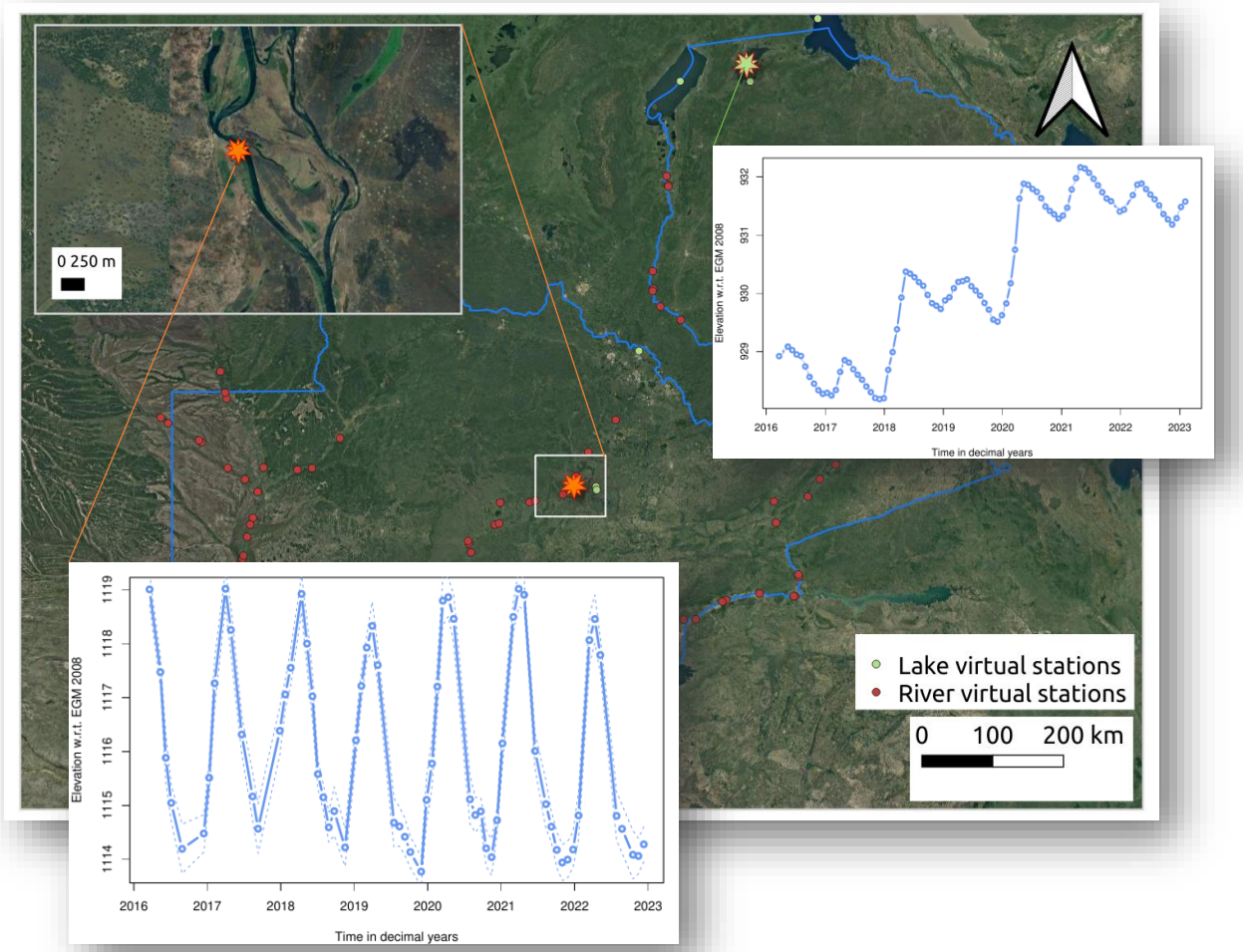
Product examples

- Surface water extent

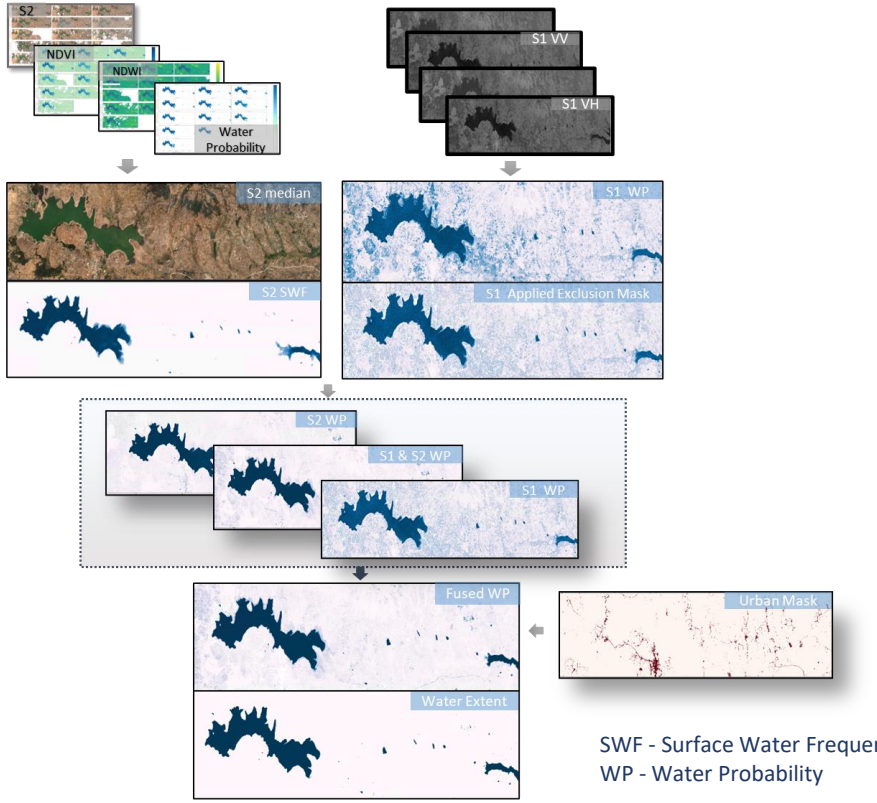


- Water suface elevation



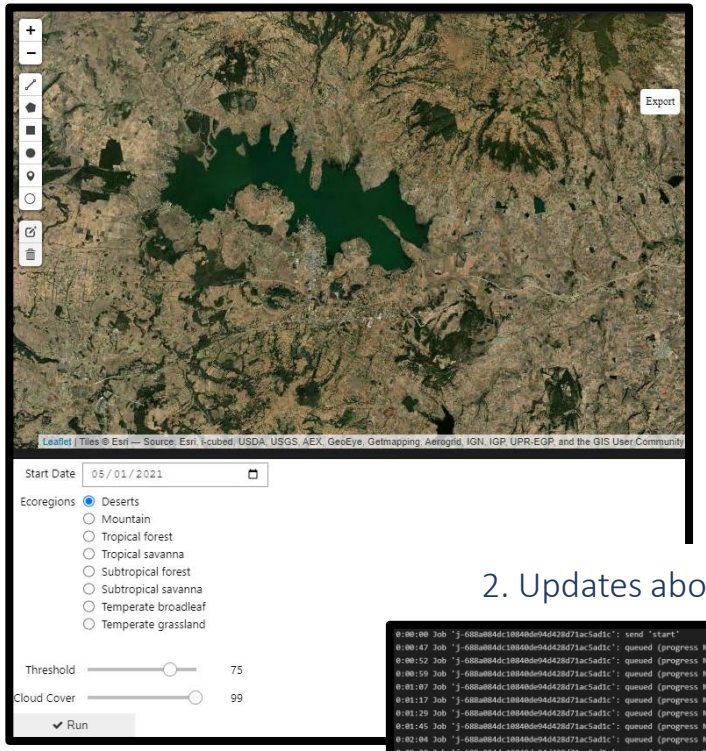
World Water Toolbox

- Unified access to EO data (S1, S2, DEM and World Cover)
- Scalable - processing resources consumed on cloud services
- If a pre-defined process is not covered on openEO, process can be defined by a UDF (e.g., the hillshade UDF)
- EODC forum (issue reporting) speeds up the integration WW functionality
- Supportive openEO dev teams
- Easy access and transfer with openEO (authenticate via GitHub, Google, etc.)

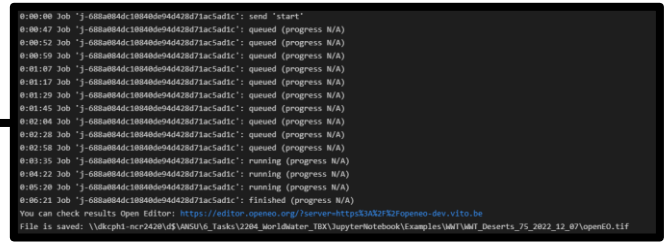


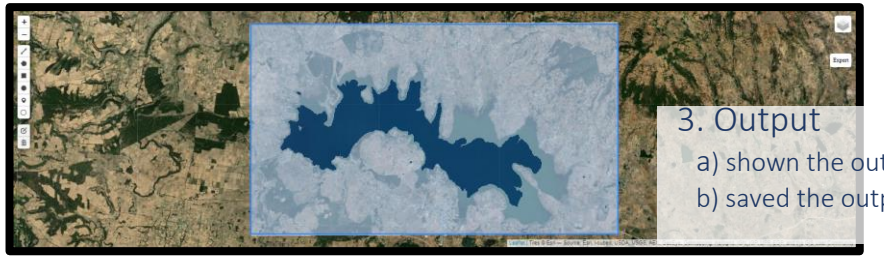
SWF - Surface Water Frequency
WP - Water Probability

1. Interface in Jupiter notebook



2. Updates about processing the job





3. Output

a) shown the output in an interactive map

b) saved the output locally

NoR support

- The NoR support has been used to acquire assistance for the WorldWater team to integrate he surface water extent mapping workflow on openEO with great success https://github.com/DHI-GRAS/worldwater-toolbox)
- This will help serve the objective of the WorldWater software toolbox deliverable to serve a wide user community which may have specific preferences for their preferred back-end solution. openEO helps to bridge this gap and allow users a transparent, and simple solution to process raster data at continental scales with various back ends.
- The WorldWater project is expected to run until Sep. 2023 and at which time a final NoR report will be prepared and submitted.