TECHNISCHE HOCHSCHULE DEGGENDORF

from flood protection ...

...to draught prevention

SMART-SWS

TECHNICAL MONITORING OF SMART STORM WATER STORAGE SYSTEMS USING LOW-COST SENSORS

Weitere Infos:

- **Title:** Smart-SWS – Smart multifunctional water storage

- **Short title**: Technical Monitoring of Smart Storm-water Storage Systems Using Low-cost Sensors.

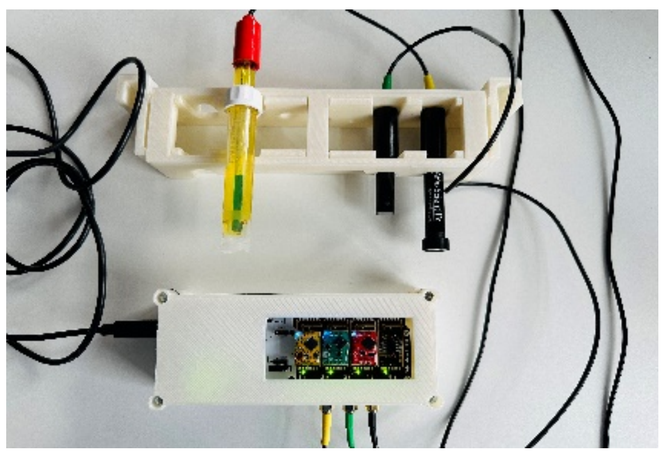
- **Introduction:** The combination of prolonged dry periods, excessive rainfall over short durations, and increased surface run-off has led to a significant decline in groundwater levels, reaching an all-time low. To address this issue, integrated strategies for storm-water protection and groundwater recharge are essential. Measures such as constructing retention basins, intermediate storage facilities, water infiltration shafts, and intensified water quality and quantity monitoring are necessary. While traditional monitoring strategies rely on a sparse network of stationary sensors, infiltrating excess water run-off into groundwater to compensate for drought effects requires dense monitoring. As part of the project Smart-SWS, a monitoring system comprising a set of local sensors for quantitative and qualitative water parameters combined with remote sensing data has been developed at a test installation site. This system is based on the fusion of spatially and temporarily covering data with a low-cost sensor network that adheres to industrial communication standards, thereby allowing installations in small rural catchments to infiltrate flood water at high volumetric flow rates without risking upwelling groundwater tables.

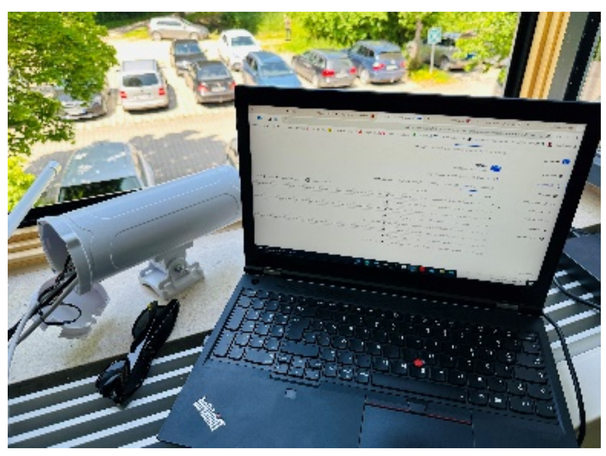
- **Aims:** The project aim is to develop a low-cost sensor monitoring concept for water reservoirs to ensure long-term ecological balance. The technical system must monitor water before it infiltrates into the groundwater. The system should be reliable, enable remote monitoring of installations, and operate autonomously most of the time.

- **Methods:** The low-cost sensor concept, based on sensors from Atlas Scientific and DFRobot, is designed to measure dissolved oxygen, electrical conductivity, pH (potential of hydrogen), temperature, and water level. An Arduino-based sensor box transmits data to a LoRaWAN gateway using the Wio-E5 mini LoRaWAN module, which then integrates the data into a monitoring system built with Node-RED software. The monitoring system deployed at the test site is evaluated together with the project partners. In the context of remote sensing, publicly available satellite images are used to estimate surface soil moisture values at the site and its surroundings, to facilitate the prediction of run-off and access groundwater recharge.

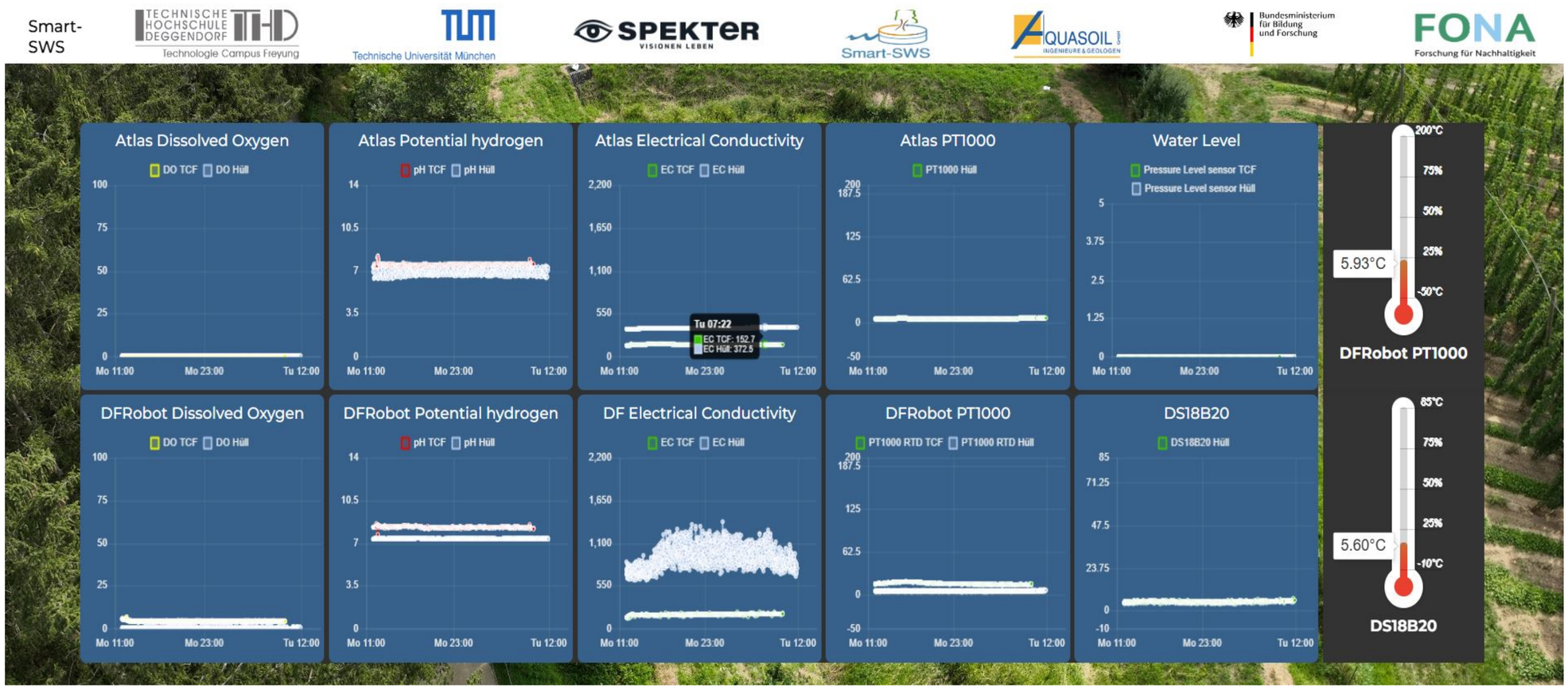
- **Results:**

1. Deployment of the low-cost sensors at the site in Hüll (Wolnzach).

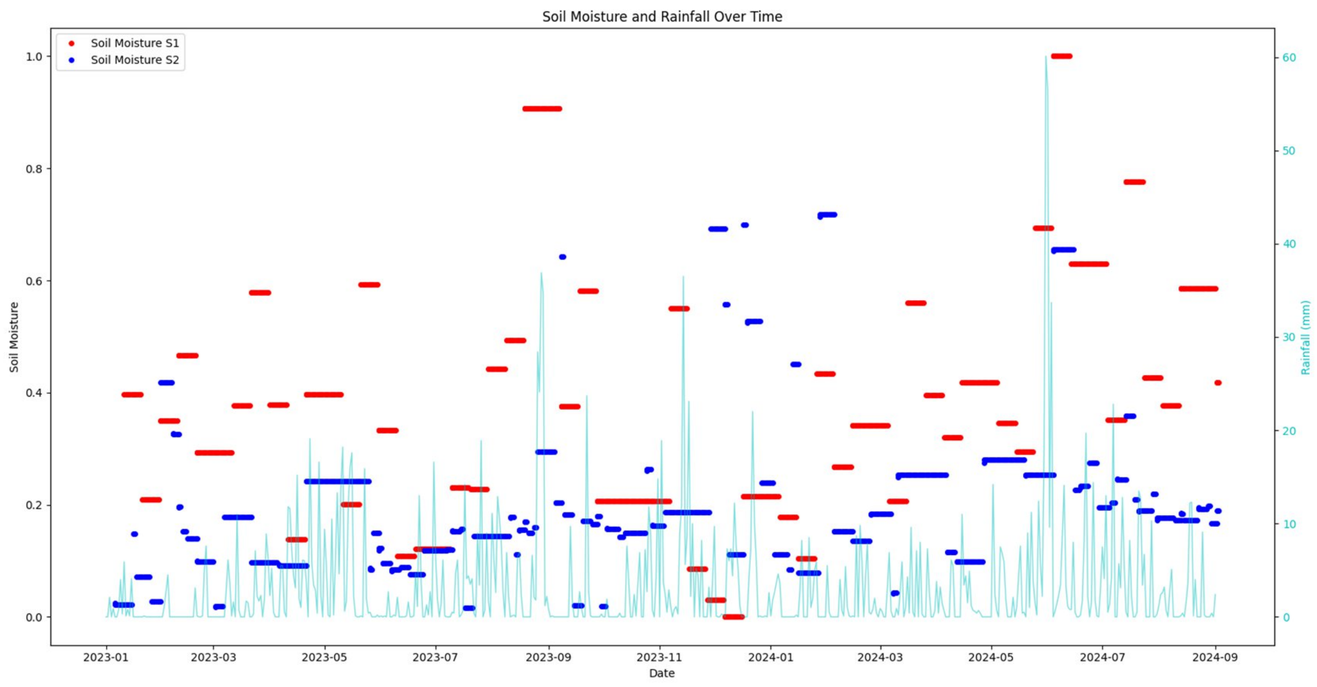




2. Development of the dashboard for the sensor monitoring.



3. Surface soil moisture estimation using Sentinel 1 and Sentinel 2 satellite images.



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- **Project partners:**

Technical University of Munich, SPEKTER GmbH, AQUASOIL Ingenieure & Geologen GmbH

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- **logos**

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