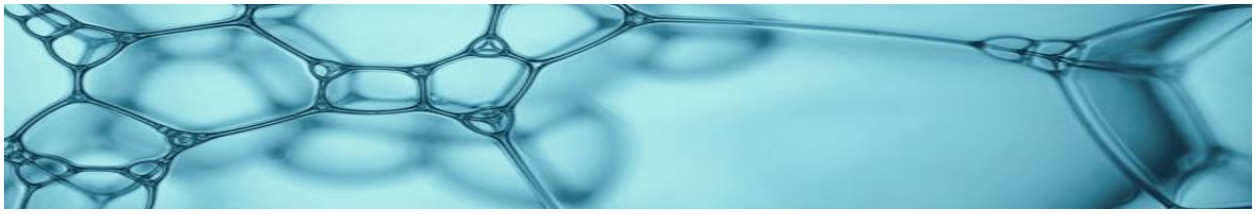

Master Thesis Call

Integrating Water Balance Modeling and Remote Sensing for Estimating Surface Water Utilization in Irrigated Agricultural Regions of Central Asia

1. Introduction: Central Asia faces growing challenges in water management, particularly in irrigated agriculture regions. This master's thesis aims to address this issue by utilizing advanced water balance modeling and remote sensing techniques to estimate surface water utilization in specific regions (grids, rayon or oblast) of Central Asia.

2. Objectives:

- Develop a water balance model tailored for the unique characteristics of irrigated agriculture in Central Asia.
- Utilize GRACE satellite data to estimate changes in total water storage in the target regions.
- Integrate data from other remote sensing datasets and the GLDAS model to enhance the accuracy and comprehensiveness of the water balance model.
- Downscaling the data from various sources to 5x5 km Grid, Rayon and/or Oblast spatial scales.

3. Methodology:

- **Water Balance Model Development:** Develop a spatially explicit water balance model that considers key components such as precipitation, evapotranspiration, soil moisture, and runoff. The model will be customized to the specific conditions of irrigated agriculture in Central Asia.
- **Remote Sensing & GLDAS Model Data Integration:** Utilize GRACE satellite data to estimate changes in total water storage over time. Incorporate data from the Global Land Data Assimilation System (GLDAS) model and other relevant remote sensing datasets, such as soil moisture, surface water storage, snow water equivalent, to enhance the accuracy and spatial resolution of the water balance model, improving the representation of hydrological processes.
- Downscaling various Data products: Data from GRACE and GLDAS comes to varying spatial and temporal scales. Using downscaling approaches is necessary to make data

consistence and also to cater to the local needs of addressing issues at 5x5 km grid, rayon and/or oblast scales.

4**. Expected Outcomes:**

- Quantification of surface water utilization for irrigated agriculture in the selected regions.
- Identification of trends and patterns in total water storage changes based on GRACE satellite data.
- Downscaling of original coarse GRACE data to grid, rayon or Oblast scales.
- Spatio-temporal estimation of different water balance components of irrigated system.

5. Significance and Innovation:

- Contributes valuable insights into water management strategies for irrigated agriculture in Central Asia.
- Integrates cutting-edge remote sensing technologies and water balance modeling for a comprehensive analysis.
- Addresses the current research gap in understanding the complex dynamics of water utilization in the context of climate change.

6. Resources:

- Remote sensing datasets (GRACE, Landsat, MODIS, etc.)
- GLDAS model outputs
- GIS and modeling software
- Access to relevant literature and research publications

7. Supervisory Team:

- Dr. Ing. Muhammad Usman
- Prof. Dr. Christopher Conrad

For further information and guidelines, please contact:
Dr. Muhammad Usman, Department of Geoecology, Room No. 4 1.30

Email: muhammad.usman@geo.uni-halle.de

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