Project Title

Understanding Flood Dynamics in East African Wetlands: Insights from Observational and Model Comparisons

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Project Supervisors

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Role Description

Wetlands play a crucial role in hydrological and ecological systems, providing essential services such as flood regulation, and biodiversity support. Accurate predictions of seasonal wetland flooding are critical for managing these valuable resources and understanding their response to climatic and hydrological variability.

Numerical hydrological models can capture some aspects of wetland flooding well, but have room for improvement. At the same time, more and more satellite-based observations of wetlands, are becoming available. This project will compare outputs from an existing flood model with various satellite-derived observations, to help assess strengths and weaknesses of the model in capturing observed wetland dynamics.

The intern will work with a multidisciplinary team to evaluate the performance of hydrological model in simulating inundation over East Africa and explore observation-based methods to refine model outputs. The research will serve as a foundational step toward improving inundation models, helping to address challenges in representing large, persistently inundated wetlands. This project is an excellent opportunity for students with a background in environmental science, physics, mathematics, computer science, or engineering to develop practical skills in model analysis, satellite data use, and scientific communication.

Intern Tasks and Outcomes

Tasks:

- Analyse and visualize pre-prepared model output datasets for a selected wetland region in Africa.
- Compare model predictions of wetland water extent with satellite-derived flood extent data (e.g., from Sentinel-1 or MODIS satellites).
- Test a variety of metrics for evaluating the agreement between model outputs and satellite observations.
- Perform sensitivity analyses to identify key parameters or factors influencing the model's performance.
- Prepare a presentation and a concise technical report summarizing the methodologies, results, and recommendations.

Expected Outcomes:

- A better understanding of the strengths and weaknesses of modelled inundation outputs for the selected case study, along with recommendations for optimizing the model for future applications in regional inundation forecasting.
- The candidate will gain hands-on experience using satellite-derived flood extent products to evaluate and validate a hydrological model, developing critical skills in satellite data analysis.
- A comprehensive presentation summarizing the methodologies, results, and implications for improved flood and inundation management.

Required Skills and Background

The ideal intern will possess the following:

- Strong numerical skills, analytical and communication skills
- An interest in hydrology, environmental science, or a related field
- Experience with data analysis
- Familiarity with programming languages such as Python or R. Experience with a Linux environment would also be beneficial but is not essential.

Alignment with Hydro-JULES Goals

This project directly supports Hydro-JULES' objectives by advancing the development of robust hydrological forecasting tools, specifically in underrepresented regions such as Africa. The insights gained from this case study will strengthen predictive modelling for flood management, improving disaster readiness and resilience in vulnerable areas. Furthermore, the project will enhance Hydro-JULES' capacity to create scalable, transferable methodologies that contribute to global hydrological research and environmental sustainability. By engaging with this project, the intern will contribute to Hydro-JULES' mission of fostering interdisciplinary research and addressing critical challenges in water resource management. The HJ internship will take place over a period of 6 weeks during summer 2025.
