Linking Slopes to the Wetland: Water and Nutrient Fluxes in an Inland Valley Wetland in Uganda

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Introduction

In Uganda the GlobE-wetlands in East Africa project explores the potential of inland valley wetlands for agricultural production.

For a sustainable cultivation in capital restricted small scale farming, careful management of naturally occurring nutrients, i.a. nitrate, is crucial.

Surrounding valley slopes are expected to play a vital role in the delivery of water and nutrients to the wetland.

Comprehension and quantification of these slope water processes and affiliated nutrient transport are the central objectives of this study.

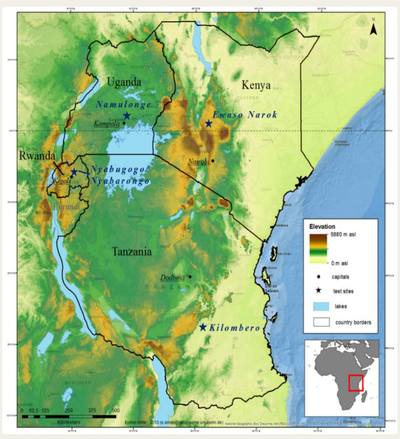




Research questions and study site

- **How is slope hydrology linked to the wetland?**
- **How much water and nitrate do different runoff components (surface runoff, interflow) deliver to the wetland?**
- **What's the situation like for different land uses?**

- Namulonge, Uganda
- Undulating hills, with wetlands in valley bottoms
- Tropical climate, two rainy seasons per year
- Nitisols in the upland and gley sols in the wetland



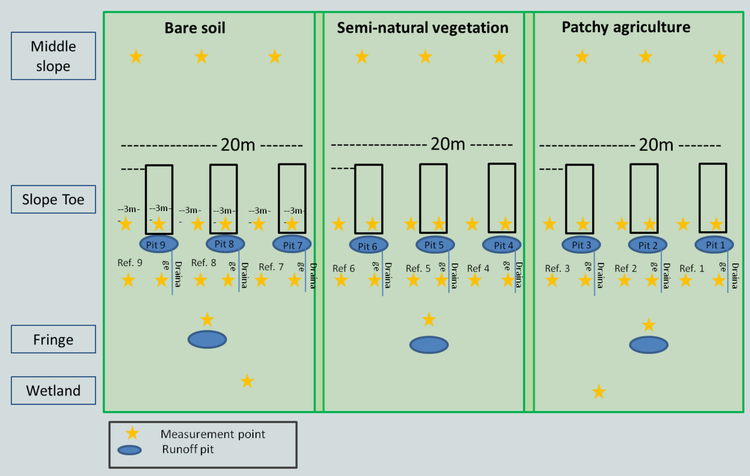
Materials & Methods

- Plot study
- Three land uses: bare, semi-natural, patchy agriculture
- Measurement points at different slope positions
- At each point: PR2 (soil moisture), rhizons (nitrate in soil water), ion exchange resins (nutrient accumulation over growing period)
- Surface runoff plots (10x3 m)
- Interflow collection pits at the wetland fringe
- Geoelectrical measurements (underground structures)
- Drilling campaign along the catena

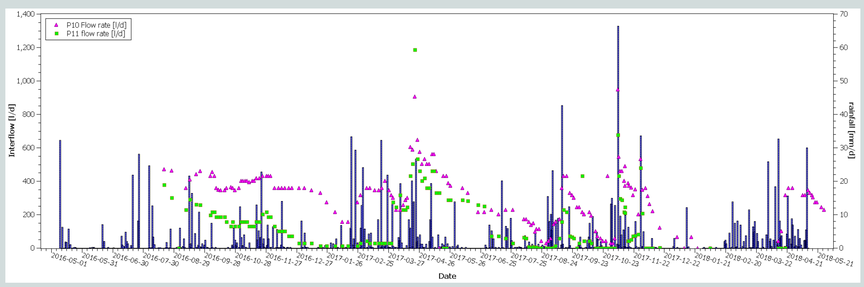
First Findings

- **Landuse has a strong impact on nitrate concentration in soil water, surface runoff and interflow**
- **Very low nitrate concentration in the wetland compared to the upland**
- **Interflow probably passes underneath the saprolith**
- **Returnflow in a colluvial sandy loam layer at the wetland fringe**
- **Interflow connected to rainfall events, but persists at least until mid-dry season**

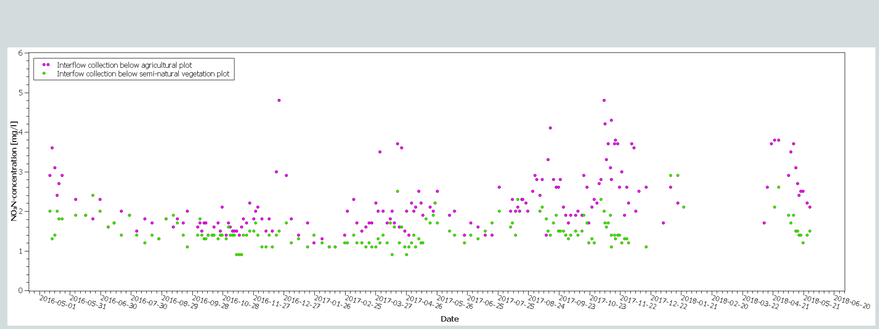
Setup



Results: interflow

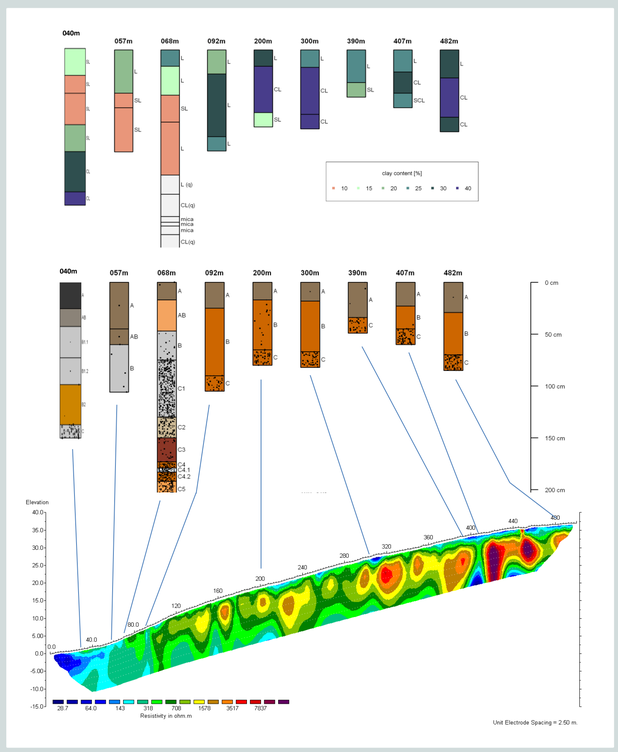


Interflow [l/d] measured at the wetland fringe below the agricultural plot and the semi-natural vegetation plot and daily rainfall [mm/d].



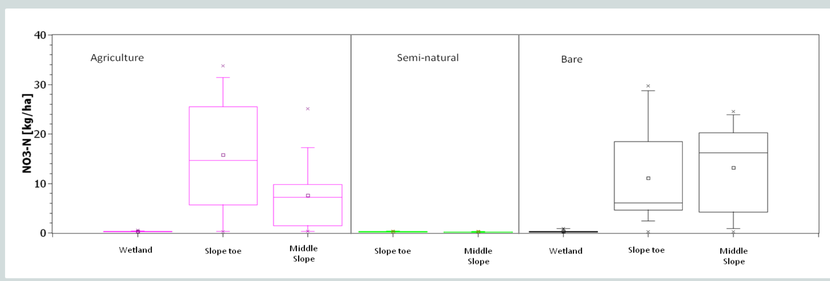
NO3-N concentration [mg/l] in the interflow at the fringe position for two different land use types

Results: ERT and drilling campaign

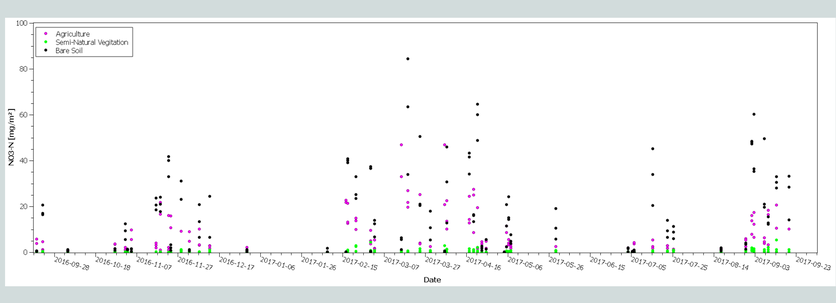


Underground structure and soil texture along the slope transect derived from ERT (first rough inversion, *4th iteration, RMS error 6.6*) and profile drilling

Results: soil water and surface runoff



NO3-N [kg/ha] from soil water at different slope positions for all three landuse types during the first rainy season 2017



NO3-N transport [mg/m²] in surface runoff for three land use types

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