Understanding riverine wetland-catchment processes using remote sensing data and modelling

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Catchment modelling

- Hill slope hydrology
- Inclusion of agricultural processes
Water quality: from river reach to river basin

- Hill slope hydrology
- Inclusion of agricultural aspects
- Importance of natural landscape elements

Wetland processes
- Water retention
- Sediment/Nutrient trapping
- Anaerobic processes
- Groundwater recharge
- Habitats
How to represent wetland-catchment hydrology?

- What is the value of remote sensing data?
- How to model wetlands at catchment scale?
How to represent wetland-catchment hydrology?

- What is the value of remote sensing data?
- How to model wetlands at catchment scale?
Kagera basin

Study area
GIS/RS Data

- DEM: Watershed delineation
GIS/RS Data

- DEM: wetland delineation
GIS/RS Data

- DEM: wetland delineation
GIS/RS Data

- Soil data
- Land use data

Useful for catchment modelling
Not well representing wetlands
GIS/RS Data: soil water

- 25 km x 25 km
- University of Amsterdam
GIS/RS Data: soil water

- Wetland identification?
- Spatial resolution too low
GIS/RS Data: soil water

- Wetland identification?
- Spatial resolution too low

Daily soil water for 2 Nyabarongo grids

- Agricultural
- Wetland
Rainfall data
How to represent wetland-catchment hydrology?

- What is the value of remote sensing data?
- How to model wetlands at catchment scale?
Soil and Water Assessment Tool

- Simulation of processes at land and water phase
- Spatially distributed (different scales)
- Semi physically based / empirical approaches
- Simulation of changes (climate, land use, management etc.)
- **Water quantities**, incl. different runoff components
- **Water quality**: Nutrients, Sediments, Pesticides, Bacteria, (algae and oxygen), etc.

... all that on a daily time step and at different spatial scales and (more or less) readily available data sets!!
Wetland representation

- As reservoirs
- As irrigated potholes
- Ponds or wetlands
New land use map

- Slope (DEM)
- Google earth
SWAT model

- Wetlands located in the south part of Rwanda, and north of Burundi, eastern part of Rwanda and West of Tanzania
- Total number of Subbasin is 35, and HRU number is 323
Preliminary results

**Surface Q Assessment for wetland modeling comparison**

- Surface Q (No Wetlands)
- Surface Q (As ponds)
- Surface Q (As Wetlands)
- Surface Q (As Reservoirs)
- Surface Q (As Potholes)

Different scenarios for modeling wetlands

**Groundwater (GW) Assessment for wetland modeling**

- Groundwater (Gw): No Wetlands
- Groundwater (Gw): As Ponds
- Groundwater (Gw): As Wetlands
- Groundwater (Gw): As Reservoirs
- Groundwater (Gw): As Potholes

Different scenarios for modeling wetlands

**Water Yield (YLD) Assessment for wetland modeling**

- Total water Yield (YLD): No Wetlands
- Total water Yield (YLD): As Ponds
- Total water Yield (YLD): As Wetlands
- Total water Yield (YLD): As Reservoirs
- Total water Yield (YLD): As Potholes

Different scenarios for modeling wetlands

**Average flow Assessment for wetland modeling**

- Average flow: No Wetlands
- Average flow: As Ponds
- Average flow: As Wetlands
- Average flow: As Reservoirs
- Average flow: As Potholes

Different scenarios for modeling wetlands
Conclusion (1): RS Data

<table>
<thead>
<tr>
<th>Data</th>
<th>Catchment</th>
<th>Wetland</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEM</td>
<td>YES</td>
<td>YES (slopes)</td>
</tr>
<tr>
<td>Land use map</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Soil map</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Soil water (25 km x 25 km)</td>
<td>YES/NO?</td>
<td>NO</td>
</tr>
<tr>
<td>Satellite rainfall data</td>
<td>YES/NO</td>
<td>-</td>
</tr>
</tbody>
</table>
Conclusion (2): modelling

- Many different types of wetlands
- Different modeling concepts
- Need to link concept-type
HOW TO PAY

Bank: ABN AMRO
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Deadline for payment is September 15, 2008

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UNESCO-IHE Student Hostel offers lodging at a rate of Euro 27/night + Euro 50/person registration cost (limited availability).
If interested, please make arrangements as soon as possible: accommodation@unesco-ihe.org

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