Impacts of Future Land-Use Change on Nitrogen Leaching and Global Water Quality

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MOTIVATION AND OBJECTIVES

- Humans have more than doubled the rate at which nitrogen enters the terrestrial biosphere due to agricultural land expansion, fossil fuel burning and fertilizer application (Galloway et al., 2004)
- Water quality degradation associated with nitrogen leaching is an important environmental issue worldwide (Davis and Koop, 2006)
- To date, very few national to global scale studies exist (Dumont et al., 2005) and estimates of nitrogen leaching is still insufficient (Seitzinger et al., 2005)
- The goal of this study is to estimate the impact of future (until 2050) land-use change activities on nitrogen leaching and global water quality based on two IPCC AR5 RCP's (RCP4.5 and RCP 8.5)

RESULTS

GLOBAL NITROGEN BUDGET

<table>
<thead>
<tr>
<th></th>
<th>Impacts/Dissipate 2000 - 2005</th>
<th>RCP 4.5</th>
<th>RCP 8.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNF</td>
<td>180.0</td>
<td>180.0</td>
<td>172.8</td>
</tr>
<tr>
<td>N deposition</td>
<td></td>
<td>45.7</td>
<td>23.7</td>
</tr>
<tr>
<td>N deposition</td>
<td></td>
<td>51.9</td>
<td>57.2</td>
</tr>
<tr>
<td>Dedistillation</td>
<td>128.7</td>
<td>141.7</td>
<td>120.7</td>
</tr>
<tr>
<td>Leaching</td>
<td>141.3</td>
<td>121.8</td>
<td>131.3</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- Tropical and Subtropical regions show higher leaching due to moist soil conditions
- Nitrogen leaching in temperate regions have high seasonal variability
- Decreasing N deposition rate has an increasing contribution of land-use change to total N leaching (Table)

FUTURE WORK

- Include biogeophysical impacts of land-use change on nitrogen leaching
- Improve and validate model performance with observational data sets (eg. FLUXNET/ATBD)
- Integrate River Transport Model (RTM) to ISAM-NC to determine nitrogen loading of rivers and validate using measurement data from several sites

REFERENCES