Perspectives on lakes

Proclias water quality webinar

Annette B.G. Janssen & Maddalena Tigli
Key sectors in this story

Water Quality (in development)*
Maryna Strokal

* Previous talk by Arthur Beusen

How can we benefit from each other?

Lakes
Rafael Marce
Don Pierson
Daniel Mercado-Bettín
Wim Thiery
Lake sector (ISIMIP 2a/b)

- **Lake water temperature** (Vanderkelen et al, *Geophysical Research Letters* 2020, 47, (12))

- **Ice formation** (Grant et al, *Nature Geoscience* 2021, 14, (11), 849-854.)

- **Stratification** (Woolway et al, *Nature Communications* 2021, 12, (1), 2318.)

- **GHG emissions** (Jansen et al *Global Change Biology*, 2022)

FOCUS ON PHYSICAL INDICATORS MAINLY

Lakes
- Rafael Marce
- Don Pierson
- Daniel Mercado-Bettín
- Wim Thiery
Key sectors in this story

NUTRIENT LOADS

* Previous talk by Arthur Beusen

NUTRIENT RETENTIONS

Water Quality (in development)*
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Lakes
- Rafael Marce
- Don Pierson
- Daniel Mercado-Bettin
- Wim Thiery

WAGENINGEN UNIVERSITY & RESEARCH
First Attempt:
How will algal blooms develop in the future globally?
Model approach

Input

- WATER BALANCE
- NUTRIENTS
- TEMPERATURE
- LAKE SECTOR (ISIMIP2b)

Output

- ALGAE
- NUTRIENT OUT
Representative lakes

lat – 360 cells

lon – 720 cells

0.5°

GRID cell (e.g. 0.5x0.5)

New downscaling techniques

lat – 360 cells

lon – 720 cells

0.5°

0.5°

cell 1

cell 2

A

B

C
Trophic state index

\[ TSI(Chl) = 9.81 \times \ln(Chl) + 30.6 \]

<table>
<thead>
<tr>
<th>TSI</th>
<th>Trophic State</th>
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<tbody>
<tr>
<td>&lt; 30</td>
<td>OLIGOTROPHIC</td>
</tr>
<tr>
<td>30-40</td>
<td>OLIGOTROPHIC / MESOTROPHIC</td>
</tr>
<tr>
<td>40-50</td>
<td>MESOTROPHIC</td>
</tr>
<tr>
<td>50-60</td>
<td>EUTROPHIC</td>
</tr>
<tr>
<td>60-70</td>
<td>EUTROPHIC / HYPEREUTROPHIC</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>HYPEREUTROPHIC</td>
</tr>
</tbody>
</table>
Conclusions

2050 RCP2.6-SSP1 compared to 2010

2050 RCP8.5-SSP5 compared to 2010
VISION

Cause

PLASTICS
CARBON
HEAVY METALS
NUTRIENT LOADS

Impact

uncertainty

Water Quality (in development)

Lakes

NUTRIENT RETENTIONS
OTHER RETENTIONS
BIOPOLUTANTS (CYANOTOXINS)
If the lake sector and water quality sector collaborate...

What great research ideas would we able to work out?

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