Jun 26th, 9:00 AM - 10:20 AM

**Simulating Reactive Nitrogen in Canadian Farmland from 1981 to 2011**

Jingyi Yang Dr
*Harrow Research and Development Centre, Agriculture and Agri-Food Canada*, jingyi.yang@agr.gc.ca

Craig F. Drury Dr
*Harrow Research and Development Centre, Agriculture and Agri-Food Canada*, craig.drury@agr.gc.ca

Xueming Yang Dr
*Harrow Research and Development Centre, Agriculture and Agri-Food Canada*, xueming.yang@agr.gc.ca

Follow this and additional works at: https://scholarsarchive.byu.edu/iemssconference

https://scholarsarchive.byu.edu/iemssconference/2018/Stream-D/2

This Oral Presentation (in session) is brought to you for free and open access by the Civil and Environmental Engineering at BYU ScholarsArchive. It has been accepted for inclusion in International Congress on Environmental Modelling and Software by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
Simulating Reactive Nitrogen in Canadian Farmland from 1981 to 2011

Jingyi Yang\textsuperscript{a} and Craig F. Drury\textsuperscript{b}, Xueming Yang\textsuperscript{c}

\textsuperscript{a}Harrow Research and Development Centre, Agriculture and Agri-Food Canada, 2585 County Road 20, Harrow, Ontario, Canada N0R 1G0 (jingyi.yang@agr.gc.ca)
\textsuperscript{b}Harrow Research and Development Centre, Agriculture and Agri-Food Canada, 2585 County Road 20, Harrow, Ontario, Canada N0R 1G0 (craig.drury@agr.gc.ca)
\textsuperscript{c}Harrow Research and Development Centre, Agriculture and Agri-Food Canada, 2585 County Road 20, Harrow, Ontario, Canada N0R 1G0 (xueming.yang@agr.gc.ca)

Abstract: A reactive nitrogen (N) model has been developed to estimate reactive N for Canadian agricultural land at a soil landscape of Canada polygon 1:1M scale. The N inputs include fertilizer N, biological N fixation, N deposition and N mineralization from previous organic residues. The N output contains crop N removal for food and feed, N losses from gaseous forms including N\textsubscript{2}O and NH\textsubscript{3}, surface runoff and leaching of NO\textsubscript{3}, and residual inorganic N left in the soil. Manure N was considered as part of the internal N cycle. The inputs of the model were obtained from the agricultural census (crop area & livestock number). Soil data were obtained from the Canadian Soil Information System; weather data was obtained from the Canadian weather framework, and yield data was obtained from Statistics Canada. Fertilizer N data was based upon provincial agricultural publications as well as the Canadian fertilizer industry sales data. Fertilizer N and biological N fixation in Canadian farmland increased by a factor of 2.1 and 1.7, respectively over the 30-year period, while N removal by crop production only increased by a factor of 1.4 at Canada scale. Nitrogen gases emissions from fertilizer N increased by 1.4 (N\textsubscript{2}O) and 2.5 (NH\textsubscript{3}) times. NO\textsubscript{3} leaching losses doubled from 1981 to 2001 then declined linearly from 2001 to 2011. Regional differences were significant with greater losses in the humid regions. Management practices have to be developed to reduce the environmental and economic losses associated with increases in reactive N in Canadian farmland.

Keywords: Reactive nitrogen; fertilizer nitrogen; nitrogen fixation; nitrogen gases emissions; nitrate leaching and runoff