Uncertainty of nitrogen budget in China

Xiuming Zhang[1], Chenchen Ren[2], Baojing Gu[2], and Deli Chen[1]

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November 22, 2022

Abstract

Rapid economic development and expansion of the human population in China have made China currently the world's largest producer and consumer of reactive Nitrogen (N_r), leading to severe damage to human and ecosystem health. In this context, managing N is fundamental to sustainable development in China. An accurate N budget is a basis for effective N management and evidence-based decision-making to tackle both food security and environmental protection challenges. However, significant disparities exist among previous estimates of N budgets and fluxes flow. This study attempts to advance understanding of uncertainties in China's N budget using the Coupled Human And Natural Systems (CHANS) model and Monte Carlo simulation from 1980 to 2018. Results show that the spatial and temporal variations in agricultural and industrial activities and insufficient knowledge on N cycling parameterization are the two dominant causes of uncertainties in the N budget in China. Uncertainties of N inputs generally are <10%, while they are <30% for N outputs and >30% for N accumulations. Uncertainty of nitrogen oxides emission is more sensitive to energy consumption due to the large contributions from industry and transportation, while the uncertainty of ammonia emission is predominantly affected by agricultural activity. Combining surface measurements, satellite observations, and atmospheric simulation models enables cross-check of N fluxes in multiple systems and reduce uncertainties of the N budget.

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Abstract Text:

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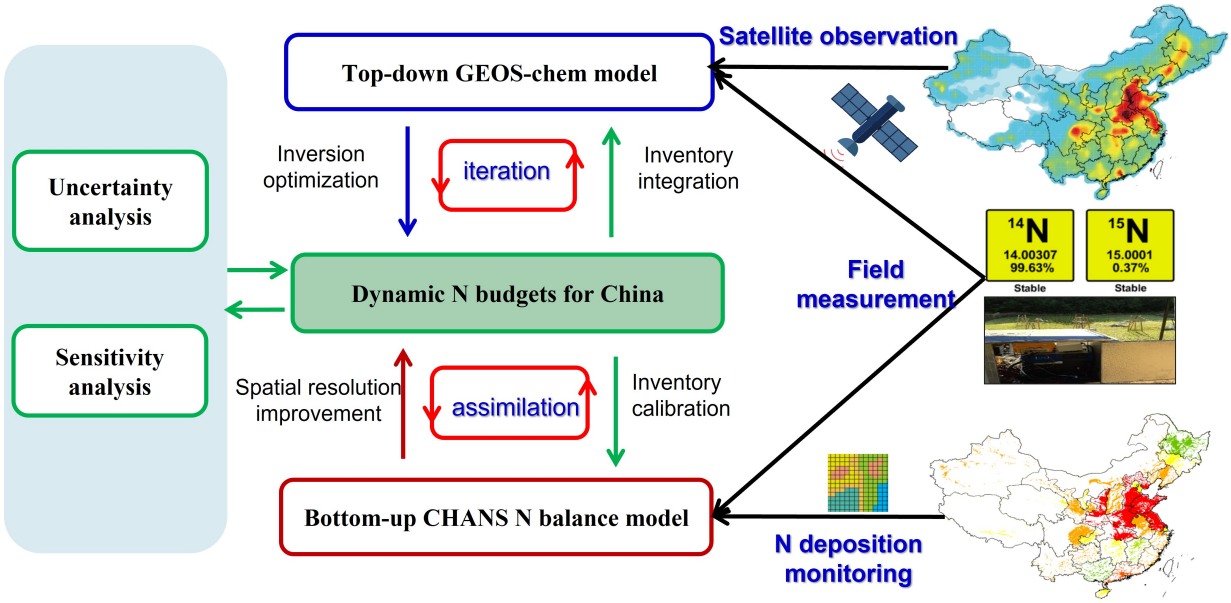

Session Selection:
GC073. Quantifying Nutrient Budgets for sustainable nutrient management

Submitter's E-mail Address:
xiumingz@student.unimelb.edu.au

Abstract Title:
Uncertainty of nitrogen budget in China

Requested Presentation Type:
Assigned by Program Committee (oral, eLightning or poster discussion session)

Previously Published?:
Yes

Previously Published Material:
This work has been accepted by the *Environmental Pollution* on 20 April 2021 and published online on 4 May 2021. This work has not been reported in scientific meeting.

Abstract Payment:
Paid (agu-fm21-879520-8701-8444-4429-4718)

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