

Regional Nitrogen fluxes, an analysis for Latin America

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Ometto, J. P.; Pacheco, F. S., Sr.; Tejada, G.; Gomes, L.; Cunha Zeri, G. D. S.; Nolasco, C. Ms; Souza, M.; Goncalves Reis, C. R.; Palandi, J. A. D. L. Mrs; Forti, M. C.

The impacts of the fast changes on the nitrogen cycle in LA and the interactions with other altered biogeochemical cycles are still open issues. Understanding the current impact of altered nitrogen fluxes to terrestrial and aquatic ecosystems, with key linkages to food and water security, ecosystems, and human health, is critical in the region. We developed spatial explicit maps of the components of the soil N budget, at 300 meters resolution aiming on supporting the identification of regions where inefficient nitrogen use may represent a threat to the production and environmental systems. The soil N budget was calculated considering the difference between total nutrient inputs and total outputs on agricultural and natural lands. Additionally, we investigated the Nutrient Use Efficiency (NUE) of the Latin America as an indicator of the performance of cropping system using the Partial Nitrogen Balance method. Agriculture strongly affects the nitrogen flux to the system by BNF in the Brazilian Cerrado and Argentinian Chaco, due to soybean production, while higher N-fertilizer application rate per area unit is observed mainly in Chile, Colombia and in the Southern region in Brazil. N-output through harvest are low in most agricultural regions in Latin American. Values $>130 \text{ kg ha}^{-1}\text{yr}^{-1}$ are observed only in the high productive areas of Brazil, mainly in the state of Mato Grosso and Goiás. The spatial variability of the Nr emission and volatilization showed that production system in Chile and in Southeastern Brazil emit large amount of nitrogen to the atmosphere (max of $50.1 \text{ kg ha}^{-1}\text{yr}^{-1}$). Although these values are relatively high for Latin America, they are low when compared to other productive areas around the world where the emission can reach about $150 \text{ kg ha}^{-1}\text{yr}^{-1}$. The NUE values showed to be spatially heterogeneous in Latin America. Low NUE occurs in Chile, Colombia, Venezuela, Uruguay, in the Northeastern Brazil and Central America. Most part of the Argentinian Pampas and part of the Brazilian Cerrado showed to have high NUE with high risks of soil nutrient mining. The spatial analysis of the N budget components and NUE may contribute, as well, to support policy makers to act for a more sustainable food production system assuring food and water security in Latin America.

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