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Assessment of Global Nitrogen Load by an Integrated Biogeochemical Modeling Frame

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Human activities have greatly accelerated and enlarged the natural cycles of nutrients nitrogen (N) from their long-term geological and biological stocks and release them in soil, water, and the atmosphere. The losses of N in the atmosphere and aquatic systems result not only in impacts on human health and global warming, but also on natural and agricultural, terrestrial and aquatic ecosystems. The objective of this study is to analyze the N load, which includes atmospheric deposition, direct discharges and the terrestrial load from domestic sources generated by households, industrial and agricultural sources. The N load from different sources such as crops, livestock, industrial plants, urban and rural residents were calculated by using datasets of fertilizer utilization, population distribution, land use map and social census. A terrestrial nitrogen cycle model was developed to estimate nitrogen leaching from soil layers in farmland, grassland and natural conditions with a daily time step and a spatial resolution of 0.5 degree. The N-cycle in this model includes the major processes associated with nitrogen (nitrogen fixation, nitrification, denitrification, immobilization, mineralization, leaching, and vegetation nitrogen uptake). The model performance was evaluated with flow and nutrient data at several locations in major world rivers. Using this proposed modeling system, it is possible to calculate the effects of differences in agricultural practice or the reduction in point and non-point sources, and the future climate change scenarios on global N load.

Keywords: Global, Biogeochemical Modeling, Nitrogen Load