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# Atmospheric Chemistry Transport Modeling of Organic Nitrogen Input to the Ocean

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Human activities for energy and food production have substantially perturbed the biogeochemical cycle of nitrogen (N) since the industrial revolution. The atmospheric emissions of N-containing compounds from fossil-fuel combustion, intensive agricultural activities, and other anthropogenic processes have substantially increased the supply of reactive N over the oceans downwind of major industrialized regions since 1860. The dominant reactive N species are emitted in the form of nitrogen oxide (NO) and ammonia (NH3) from fossil fuel combustion and agricultural practices, are transformed to a number of other nitrogen oxides (NOy) and ammonium (NHx) during the long-range transport, and then deposited to the oceans. Little is known about the chemical composition of organic N (ON) in the atmosphere or its spatial distribution, due to the limitations of available analytical methods. Over the North Atlantic, a significant fraction of the wet deposition of total soluble N has been measured in the form of soluble ON at coastal and marine locations. The effect of atmospheric ON input on marine ecosystems can either be helpful or harmful depending on the deposition rate and chemical form of ON. Dissolved ON such as urea, amino acids and humic substances can provide an important nutrient source to marine environments These studies suggest that atmospheric models need to predict the chemical speciation of reactive N species to accurately predict the effects of changes in N inputs on marine ecosystems and climate. Here we use a process-based chemical transport model to investigate global supply of soluble organic nitrogen (ON) from continental sources to the ocean.

Keywords: atmospheric deposition, soluble organic nitrogen, environmental changes