



Recent changes in anthropogenic reactive nitrogen compounds

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Significant anthropogenic perturbations of the nitrogen cycle are the result of rapid population growth, with mounting need for food and energy production. The increase of reactive nitrogen compounds (such as NO_x , HNO_3 , NH_3 , and N_2O) has a significant impact on human health, environment, and climate. NO_x emissions contribute to O_3 chemistry, aerosol formation and acidic precipitation. Ammonia is a notable atmospheric pollutant that may deteriorate ecosystems and contribute to respiratory problems. It reacts with acidic gases to form aerosols or is deposited back to ecosystems. The application of fertilizers accounts for most of the N_2O production, adding to greenhouse gas emissions. We analyze the change of some reactive nitrogen compounds based on observations, in eastern United States. Results show that the control of NO_x and SO_2 emissions over the last decades caused a significant decrease of acidic deposition. The nitrate deposition is highest in eastern US, while the ammonium ion concentration is highest in central US regions. Overall, the inorganic nitrogen wet deposition from nitrate and ammonium is enhanced in central, and eastern US. Research shows that sensitive ecosystems in northeastern regions exhibit a slow recovery from the accumulated effects of acidic deposition. Given the growing demand for nitrogen in agriculture and industry, we discuss possible pathways to reduce the impact of excess reactive nitrogen on the environment.