Global Biogeochemical Cycles

Supporting Information for

Global estimates of inorganic nitrogen deposition across four decades

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Captions for Dataset S1

Introduction

The supporting information below contains figures to provide additional context and background for the reader. These figures were generated using output from the GEOS-Chem model. In addition, we provide a dataset (ds01) which contains values of dry and wet inorganic nitrogen deposition for each grid cell and year simulated in the model. Additional data related to this project can be accessed through the Data Repository for the University of Minnesota (https://conservancy.umn.edu/handle/11299/166578).
Figure S1. Wet IN deposition as a fraction of total (wet + dry) IN deposition as simulated for 2016.

Figure S2. Mean annual change in nitrogen emissions from 1984 to 2016. Nitrogen emissions due to biomass burning, including agricultural fires (a) and emissions from fossil fuel combustion (b) show variable rates of change across the globe. Total nitrogen emissions (c) constitute the
The sum of emissions from biomass burning, fossil fuel combustion, agriculture, and natural sources (including soils, lightning, and biogenic compounds).

**Figure S3.** Modeled interdecadal trends in IN deposition. Table to the left of each interdecadal period compares the modeled change with observed change in IN deposition over the same time period for four long-term monitoring sites (NADP 2018).
**Figure S4.** Proportion of IN deposited as reduced molecules (NH$_3$ and NH$_4$) as simulated for each decade.

**Figure S5.** Mean annual total nitrogen emissions as simulated for each decade.
Figure S6. Mean annual nitrogen emissions due to biomass burning as simulated for each decade.

Figure S7. Mean annual nitrogen emissions from fossil fuel combustion as simulated for each decade.
Figure S8. Mean annual nitrogen emissions from soils (natural and agricultural) simulated for each decade.

Figure S9. Mean annual deposition of nitrogen in organic compounds, as simulated for each decade. Compounds included in the simulation are propanone nitrate, isoprene hydroxynitrate,
methyl vinyl ketone + methacrolein nitrates, ≥C4 alkynitrates, methyl peroxy nitrate, peroxyacetyl nitrate, peroxypropionyl nitrate, and peroxymethacryloyl nitrate.

**Figure S10.** Organic nitrogen deposition as a proportion of total nitrogen deposition, as simulated for 2016. These values represent lower-bound estimates, as some nitrogen-containing organic compounds, such as amino acids and urea, are not represented in the GEOS-Chem simulations.

**Data Set S1.** Values of dry, wet, and total (dry + wet) inorganic nitrogen deposition for each grid cell in each year simulated (1984-1986, 1994-1996, 2004-2006, 2014-2016). The first two columns respectively contain the latitude and longitude of each grid cell (decimal degrees). The third column contains the area of each grid cell (km$^2$). The remaining columns contain the type of deposition and the year, separated by an underscore (kg of nitrogen per km$^2$ per year). For example, the column “dry_1984” contains the amount of inorganic nitrogen deposited as dry deposition in the year 1984.