

Jeff Koebbe
Chem 3151

Nitrous Oxide

Nitrous Oxide stats:

N₂O is a colorless non-flammable gas with a sweet odor and taste

It is not a health hazardous atmospheric gas

The third leading greenhouse gas under CO₂ and CH₄

Accounts for 6% of the heating caused by greenhouse gasses

2/3 of the worlds N₂O gas is from deforestation, animal wastes, bacterial decomposition in soil and streams

1/3 of nitrogen entering the ocean is man made and can cause dead areas in farming areas where oxygen levels fall too low for fish to survive.

denitrification depletes 3 CO₂ and results in 2 N₂O

1/3 of total atmospheric nitrous oxide is anthropogenic

20% of human emissions of N₂O are from industry emissions

30% are from ships (in ocean source of nitrogen)

60% in our atmosphere occurs naturally from mainly rainforests and plant matter decomp.

10% of human caused nitrous oxide emissions from streams and rivers

Atmospheric N₂O increased by 20% over the past century

N₂O concentration increases by 0.2-0.3% per year or 1% every four years

N₂O history; 270 ppb in 1900 to 292 ppb in 1961 to 319 ppb in 2005 to 321 ppb in 2008

310 times stronger global warmer than CO₂

Sources of N₂O:

Industrial fertilization, fossil fuel emissions, melting permafrost

Nitrates used in most fertilizers are highly soluble which makes them easily transported through irrigation of farmland into streams to rivers to eventually the ocean.

Microbial facilitated denitrification which takes nitrates to nitrous oxide as it breaks them down to molecular nitrogen

Denitrification increases with concentration of nitrates

Yield of nitrous oxide is 0.03% at high oxygen levels and 10% at low oxygen levels

Rivers and streams a major part of human emission for nitrous oxide from fossil fuel emissions and intensive agriculture nitrates ending up in the water sources where bacteria reduces them to molecular nitrogen and the gasses that result.

Permafrost that covers 25% of the northern hemispheres land mass is thawing because of global warming and gives off large levels of nitrous oxide gas

Permafrost in warm conditions can release as much nitrous oxide as the world's rainforests

Ozone killer:

NOAA found N₂O is 1/15 as effective as CFC-11 at killing stratospheric ozone

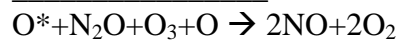
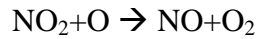
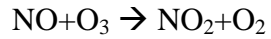
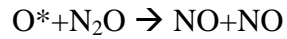
100 year lifetime (comparable to CFC's) give nitrous oxide ability to reach the stratosphere

It is leading stratospheric ozone depleting emission and predicted to be for the next century

Nitrous oxide does not directly hurt ozone levels but in the stratosphere it breaks apart to Nitric oxide(NO) and also nitrogen dioxide(NO₂) which then reacts to reduce ozone

N₂O competes with ClO where if CFC levels were pre-1960 it would be a 50% better ozone depleting emission

Nitrous Oxide Ozone depletion cycle



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