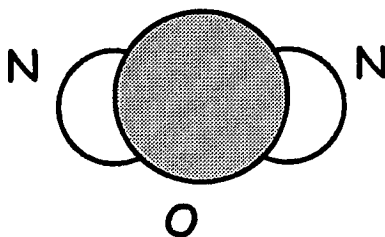


Teacher Background Information: Nitrous Oxide

Nitrous oxide is another significant greenhouse trace gas and is also known as "laughing gas". It contains one oxygen atom bonded with two nitrogen atoms. Its chemical formula is N_2O , and it absorbs most of its IR light in the band at 8.6 nm.



Per molecule, N_2O is 270 times as effective as CO_2 in causing global warming. Like methane, the concentrations of this gas were constant until about 300 years ago, at which time it began to increase. The level today has grown by only a total of 9% and the present growth rate is about 0.25% per year. While this rate may appear relatively low, it will actually yield a greater increase in the level of atmospheric N_2O in less than 40 years, than in the last 3 centuries. The increased amounts of nitrous oxide that have accumulated in the air since pre-industrial times have produced about 1/3 the magnitude of the additional warming induced by methane.

The majority of the natural supply of N_2O comes from release by the oceans. Most of the remainder is contributed by processes occurring in the soils of tropical regions. N_2O is a by-product of the biological *denitrification process* in aerobic (oxygen rich) environments and in the biological *nitrification process* in anaerobic (oxygen poor) environments. Of the two, nitrification appears to be the more important as a global source of nitrous oxide. Nitrous oxide released from new grasslands is particularly significant in the years following the burning of forested regions, and some portion of the fertilizers used in agriculture, particularly in tropical regions, is similarly converted to N_2O and released into the air.

It was originally thought that fossil fuel combustion released N_2O as a by-product of the chemical combination of the nitrogen and oxygen in the air. This idea was based on faulty experiments and it is now known that only when the fuel itself contains nitrogen, as does coal and biomass (not gasoline and natural gas), does N_2O form. Nitrogen (N_2) from the air is not part of the process at all. During the combustion of gasoline in automobiles, N_2O is produced in 3-way catalytic converters currently and then released into the air. Some of the newer catalytic converters developed for use in automobiles do not release N_2O as a result of design improvements.

There are no known sinks for nitrous oxide in the troposphere. Instead, all of it rises eventually to the stratosphere, where each molecule absorbs ultraviolet UV light and decomposes usually to N_2 and O_2 .