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China's Air Pollution

China's Pollution Stats:

- Greatest pollution occurs in the east but significant levels are widespread
- Sources of pollution are intense in northeast corridor that extends from Shanghai to Beijing.
- Average exposure to $PM_{2.5}$ was 52 $\mu g/m^3$
- Highest particulate concentrations are south of Beijing
- This contributes to 1.6 million deaths/year.
- Lung cancer is now the leading cause of death in China.
- 92% of China's population experienced unhealthy $PM_{2.5}$
- 46% of China's population have experienced $PM_{2.5}$ above the highest EPA threshold of >250 $\mu g/m^3$
- particulate matter can remain airborne for days to weeks and travel thousands of kilometers
- China is the world's leading source of SO_2 and particulate matter from coal combustion

Sources for Air Pollution in China:

- Species/Compounds involved are O_3, CO_2, NO, NO_2, N_2O, SO_2, VOC's
- Particulate sources include electric power plants, industrial facilities, automobiles, biomass burning, and fossil fuels used in homes and factories for heating.
- Cement factories are one of the leading causes of air pollution in China in which they produce lots of dust in various sizes.
- Cement factories are often built near places that have a lot of coal to reduce coal transportation costs.
- majority of $PM_{2.5}$ comes from photochemical reactions between numerous sulfates, nitrogen oxides, and other inorganic and organic chemicals.
- nitrogen dioxide converts sulfur dioxide to sulfates via an aqueous oxidation mechanism
- this mechanism supposedly played a role in the historic London Fog
- Ground level ozone is created by chemical reactions between NO_x and VOC's in the presence of sunlight

Loss of Ozone via NO

- N_2O is transported to the stratosphere and broken down via photolysis by the following reactions below.
- NO is produced which is primary source of reactive nitrogen (NO_x)
- Nitrogen oxides, hydrogen oxides and chlorine radicals destroy ozone via catalytic cycles below where X = {NO, HO, Cl}
- Recycling of X molecules allows just ONE X to destroy many ozone molecules typically of the range from 10^3-10^5

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$$N_2O + h\nu \rightarrow N_2 + O(^1D)$$

$$N_2O + O(^1D) \rightarrow N_2 + O_2$$

$$N_2O + O(^1D) \rightarrow 2NO.$$

$$X + O_3 \rightarrow XO + O_2$$

$$XO + O \rightarrow X + O_2$$

$$\text{net} : O_3 + O \rightarrow 2O_2,$$

Sources:

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