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Oxidation Potential

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OXIDATION Potential

pl conf. 4
Jm Anderson
4.9.91.



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GLOBAL ENVIRONMENT

Sulfates,
Nitrates
+
water vapor

in extreme conditions this is
severe -- N. polluted areas,
etc.

$SO_2 \rightarrow H_2SO_4$ (not)
OH SO_2
assuming oxidation potential
we'd expect wipe out
capability.
but in fact recycle --
no impact
OH predominately
methane & CO. & NMHC



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NO_2

highly pollut

SO_2 -- Still a topic of research.

actual observations govt
needed.

concentration is so low $\rightarrow$ v.

need high 1° on defining
actual CT.

never do from a satellite
 $\rightarrow$ way below detect

limit

v. high prep. issues
next 2-4 yrs sh successfully
observe



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Renn State

Pell Brune

- in the lab - design

Capable of mount in NASA
DC 8 or Electra

balloon expts.

ER-2 aircraft -> come
down from the top --
hope to meet Brune.

Unmanned aircraft
critical for global
all this fall seasons.



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$[CO]$ controls OH^-
→ main attack

$NO_2 + OH^- \rightarrow$ nitric acid

but need 600 ppt/liter

before enter regime

H_2O_2
determines pH

$[] \times$ relative pH rate
constant.

Kinetic quantity
Rate and q

Thermodynamics →

just if it is
energetically possible



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SO_2 - patterned. reg

$SO_2 \rightarrow H_2SO_4$

from H_2O

Carl Howard
→ NOAA
Boulder

↓
figured out
 SO_2 cycle & how
it regenerated
Is Al
giving
Ecology
today
on floor

not that f
know f



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Small satellites plus unmanned
aerobots =

10. high rep pulses of
light tuned to energy
transitions of OH^-

absorbs - heats & vaporizes
it orbits 10^{10} times falls
back down & photon back
out.

→ Spectroscopy.

10^{-7} seconds in upper
state. → no time to interact.

334-1362

**PHOTOCOPY
PRESERVATION**

NESS

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SCIENCE NOTEBOOK

Chemistry: Depleting an Atmospheric Scrubber

The atmosphere may be losing a crucial chemical that scrubs the air of methane and other gases that may be warming the planet, according to a preliminary study by Los Alamos National Laboratory researchers.

The depleted atmospheric scavenger is called a hydroxyl radical. It consists of an oxygen and a hydrogen atom and is called OH for short. It breaks down methane, converting it to water and ethane, a less persistent greenhouse gas.

Jim Kao and colleagues report the amount of OH in the Northern Hemisphere is one-third the amount found over the Southern Hemisphere.

Kao contends this "serious depletion" of OH is caused by the fact that more and more methane and other hydrocarbons

are being pumped into the atmosphere. This overdosing of methane is using up the available OH. Atmospheric methane is increasing about 1 percent per year. If the depletion continues, Kao suggests, more methane may remain in the atmosphere longer, magnifying potential global warming.

However, Kao and Ralph Cicerone of the University of California at Irvine caution that their estimates of OH concentration are not based upon direct measurements, but rather an interplay of computer simulations and measurements of another chemical, methylchloroform, which is easier to measure and whose amount is related to that of OH. "It's all still very preliminary," Cicerone warned.

—William Booth

Epidemiology: Hodgkin's Linked to Eps

Hodgkin's disease, a cancer of the lymph nodes that commonly strikes young adults, may be caused by the Epstein-Barr virus, which is thought to infect many people, British and Dutch researchers have found. They suggest it may even be possible to develop a vaccine against it.

The viral protein membrane protein cell growth factor (EBV) MP.

SCIENCE WATCH

New Cause Of Concern On Global Warming

ACHEMICAL that limits heat-trapping methane in the atmosphere has been significantly depleted in the Northern Hemisphere, according to a computerized simulation of atmospheric processes by scientists at the Los Alamos National Laboratory in New Mexico.

The naturally occurring chemical, called a hydroxyl radical, consists of an oxygen atom and a hydrogen atom. It destroys methane, a highly potent "greenhouse" gas that blocks the escape of heat from the atmosphere into space. Methane, along with other greenhouse gases like carbon dioxide and chlorofluorocarbons, has been increasing as a result of human activity, and scientists predict that this will cause the earth's climate to warm.

The findings at Los Alamos suggest that while more methane is being emitted into the atmosphere, less is being destroyed there naturally. Earlier studies showed that there was less of the hydroxyl radical, also called the OH radical, in the Northern Hemisphere than in the Southern. The Los Alamos results suggest that the amount of the chemical in the Northern Hemisphere is less than one-third that in the Southern, a depletion more than twice as extensive as previously thought. Scientists say the depletion is most likely related to industrial activity.

Moreover, the scientists say, there are broader implications. "If we run out of OH, a lot of chemical processes in the atmosphere could change," said Dr. Jim Kao of the Los Alamos laboratory's geoanalysis group.

Dr. Kao and his colleagues arrived at their findings on OH depletion through a computer simulation of the dynamic mixing and chemical processes taking place within the atmosphere. Their original goal was to study the global distribution of methane, the second most important contributor to the greenhouse effect, after carbon dioxide. That part of the study is continuing.

Methane has been increasing in the atmosphere for the last 500 years, but more recent industrial and agricultural activities have caused the rate of increase to speed up.

Carolina Earthquakes

Examination of geologic evidence along the seaboard from New Jersey to Florida has shown that six large earthquakes occurred in South Carolina in the last 2,000 to 5,000 years, five of them near Charleston. But the risk of a big earthquake there in the next several decades is low, researchers said.

The last severe earthquake in the Charleston area, in 1886, was "the most destructive U.S. earthquake of the 19th century," the report said. "Today a similar quake could result in several thousand deaths and property damage in excess of \$400 million."

The study, published in the current issue of the journal *Science*, found that during the last two millennia, large earthquakes have occurred there at intervals of about 500 to 600 years. No evidence of earthquakes outside what is now South Carolina was found. Since not much more than a century has passed since the last big earthquake, the report said, the probability of one "in the next several decades is inferred to be low."

The existence of past quakes was deduced from evidence that at certain times soil deposits liquefied as a result of severe shaking. Such liquefaction is one of the most destructive aspects of a major earthquake. Soil that is waterlogged but normally firm turns into a liquid, losing its capacity to support weight.

The study was done by David Amick and Robert Gelinas of Eba&co Services Inc. of Greensboro, N.C. They dated each deposit of formerly liquefied material by the extent to which radioactive carbon in leaves, pine needles or other organic debris in the formation had diminished.

Along the East Coast there are extensive sand deposits with the potential of liquefying when shaken. During earthquakes, some have erupted as "sand blows" or "sand volcanoes," but this seems to have occurred almost exclusively in the Charleston area.

The evidence has been found in the walls of drainage ditches, sand or gravel quarries and pits excavated for fill. For soil to liquefy it must be saturated, which may depend on the current level of the water table. This, in turn, may be controlled by sea level, which constantly changes. The authors therefore point out that in formations more than a few thousand years old, they may have missed the evidence for some quakes.

The study did not extend north to the Boston area, where large earthquakes occurred in 1727 and 1755.

The authors point out that predicting East Coast earthquakes is especially difficult because, unlike California earthquakes, they do not occur along a boundary between two moving plates of the earth's surface. The reason for the Charleston quakes is still uncertain.