

FOIA MARKER

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Folder Title:
Ozone Hearing - Katie's Notes

Stack:	Row:	Section:	Shelf:	Position:
S	61	5	6	2

My Notes - file w/ some
big mtl.

Albritton - played, some details
St. Louis - new data

- Watson - -

- Rowland - effects - what does it mean.

- Doniger - policy implications.

Questions on policy. Doniger, Rowland, Watson
Mike will do the sum of some questions.

Hollings will allow AI check.

Sci Assessment of Stratosphere 1989
WMO Report #20
NASA, UNEP

Dr. John Fredrick

Not a surprise

- Not predicted theoretically
current

used total column ozone from Dobson $\rightarrow$ ground-based

$\downarrow$ trend in ozone could have started in 1970 $\rightarrow$

1970-88 trend line thru this & saying this
would be your downward trend

~~***~~ [Unless here is assumes that Str
ozone is linear
1970-5 84-9

this part
of the
report
was higher
than

~~at end of report~~ if look at trend by in '79 $\rightarrow$ substantially
close to satellite data

Vol. 1 Chapter 2 $\rightarrow$

~~p. 209~~ p. 219 $\rightarrow$ new trends in column
ozone for Table 2.2.8

look at last 8 & 10 yrs of data
this is the 1st Satellite data problem if
satellites $\rightarrow$ can now correct for
satellite failures over time

* Can't tell if this is a not a fleckhead $\rightarrow$
statisticians say need to look at whole

March 7 Notes -

data set.

- * we really can't predict.
- * EPA #'s v. shaky.

- dived trend in winter much more pronounced than summer

- dived trend in summer is the critical thing
→ angle of sun → UV much more intense

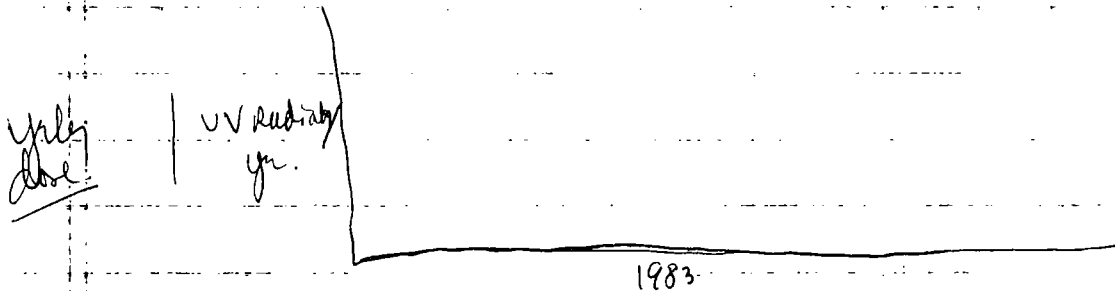
Q - how long extending?

peak radiation levels up. ~~from~~ early July
1960 - outside for an hr. } some radiation dose.

today - " " 55 mins

assume trend begins 1990.

annually averaged UV radiation measure over 3 yrs.



rad. levels started to be a little higher

⇒ in mid 1980's smthg

1983-8

info from Dobson

* good agreement between Dobson & satellite

Adrienne Tuck NOAA

most Cl atoms or CO →

Observation from aircraft

- more ClO than models predicted
why? $\leftarrow$ heterogeneous chem. on aerosols.
moves air then No. polar vortex $\rightarrow$
juggle rel'n.

S. pole - ran on psc.

net effect - Cl taken out of

HCl or $\text{chlorine nitrate} \rightarrow \text{chlorine atoms}$

$\text{ClO} \rightarrow$ destroy O_3 .

analog. could happen at No. Pole, too.

Air out of vortex $\rightarrow$ air moves south.

[+ transport processes not as efficient at S. Pole.
speed of chemistry v. speed of transport

What would NO_x do to O_3 ? $\frac{1}{2}$

if Cl above some critical amt.

? = what might happen at mid-lats.

modest increases spread over a decade. in mid lats

over Antarctic depletion persisted almost to summer
Soldier 1990 $\rightarrow$ what

hole
isolated
at

Palmer Station 1988 - dissipated in Nov.

Summer radiation levels 2 wks. earlier.

biologically effective rad.

as late as Dec 6, 7 at Palmer Station -

UV $\rightarrow$ 2X as great ~~than~~ if no perturbations
 $\rightarrow$ highest radiation level this ecosystem ever
exposed to.

UV radiation varies w/ season & latitude.
higher than what you'd get at 40° Nov
S at summer solstice.

Late October ^{Dobson units}
170 / 350
by Nov.
up to 400
 $\rightarrow$ ozone repaired
quickly

1989 - 50% depletion But went away quickly
from biology significant high? = duration.

1990 - big problem is depletion much longer
% depletion.

NASA - all over the world) Frederick Jost
Palmer $\rightarrow$ biology. ~~Went~~ came life there (unlike mid-
continent).

X Paper
Comparing

Lowest $\pm$ = mid Oct. also $\sim$ 170 Dobson units.
didn't go away.
Dec ~~still~~ 220 / 270 (normal 350)

1988 - mid-Nov. Normal Ozone levels

Doesn't know what 1991 will do.

global warming - - cools stratosphere $\rightarrow$ more
etc - - enhanced problem.

ozone
particles splitting off of

gas to particulate conversion rxn.

John Juskis

not 1st time had measurements from the satellite.

5-6 yrs ago.

Godhard. analysis. TOMS data for stratospheric ozone hole. - saw dramatic depletion of ozone at midlevels in atmosphere at midlat. BUT not confirmed by

Dobson (total column - straight up) or ^{unkepton} ~~unkepton~~ (diagonal).

late '86 → Ozone trend panel convened by WHO & UNSP
to see what difference is.

Jan/Feb '88 - report -- find depletion at ~25 km in stratos. during No Hem winter months & into spring - worse in winter; less in spring.

→ at 53-64°N lat. avg. annual depletion 2.3
re-analyzed Total Column Dobson measurements 40-52°N " " " 3
30-39°N summer avg - 2.5
summer - 1.5

Satellites way off due to instrument degradation. → allowed instrument to read more than had occurred.

winter 4	40-50	4.7
	50-60	6.2

total 11/78 - 10/85

Some of the problem total column ozone means not indicating there any depletion whereas satellites were reading - reason was some depletion w/

verts columns ^{at high alts.} but compensated by ρ in at lower due to pollution
depletion primarily occurring

needed schedule
global warming
potential lower

HFC

CFC-22 - ozone depleting potential much lower
0.8 or 0.05 compared w/ 11 & 12.

also, it viewed by a/c index as the fluid of
choice if have to plan in subs. also much
capacity that uses CFC 22.

→ Subject to normal atmospheric removal processes.
once have H in molecule → p

CH₃OH

use of methyl chloroform → added in M.P. demands

* Q - overlap of ozone trends panel & if overlap
was ozone trends panel wrong or is added
from yrs. since
if so, were have we gone wrong again?

What other
natural surprises
in store in not
describing process, etc.
perhaps there is more
heterogeneous chemistry
going on than we
thought

Solar maximum → most ozone found in equatorial
regions because more photolysis there

old nitrogen cycle dominated solar max pbs.
NASA largely - ^{& some} events

old lead to
ozone hole with
antibiotic

Even's old he -- but not suff. for entire hole.
every 5 yrs get a reversal - last yr. completed a solar max
cycle.

Solar max

p. 219 →

SBUV & TOMS are consistent

→ NOAA polar orbiter

→ TOMBUS VII (polar orbit)
NASA satellite

? are SBUV & TOMS consistent differ from expectations

if look at Dobson

scanned in total column observed from SBUV do
differ a separate

"solar"

Not sonically -- Bright line
emission spectra

a back-scatterer
- looks at
out of UV
reflects
back-scattered
from upper layers
of stratosphere.
if higher backscatter
→ ozone depletion
as of the ozone there
involve it
in destruction.
etc.

Figure 2.2-2

List of Dobson
station
data 22N & 64N

changes in ozone after '78 in Dobson record.
difference in 5-10 yr results.

after statistical correction atmospheric behavior more complex than
linear trend.
upturn in summer ozone after 1986 No Am. Europe, Japan.

Lars Etcorn

* Danger → availability of substitutes

429-3958

Replacement

Documents showing U.S. resistance to 1997) rest of world ready.

HFC-22?

not of funding

* Fax Ltr & Reso

Long-term

EPA has info. Re: where you can get some more reductions.
can

37 ppb more Chlorine

speed phaseout

speed HCFC phaseout.

speed developing country compliance.

* Who contributed to the Fund re: ozone.

up to 15% of its calculated level of production in 1990

theories re: what's happening

? = ↑ [CFC]

→ Nitrogen oxides
air transport
aerosols.

? = old ice clouds be forming
outside the poles as strat.
cools??

* need to bring out:

even more significant
cause we are observing
solar max which
increases O_3 .

Q = comparably
rate of RN. vs.
CH₄, etc.

Q = do ice
clouds form
only at the
poles.

- latest data on 1990 Antarctic ozone hole.

- ↑ concentrations of CFC, PFC

- need to plan out HFC's cause of hydroxyl radicals

- ↓ ozone leads to ↓ in stratospheric temp. which
could lead to further ↓ in ozone

- not certain we have a linear system & 'surprise'
indicators may not -- important to act now.

• plankton?

Q = relationship global warming & ozone depletion
in terms of stratospheric cooling.

Q = ozone trends & solar cycle (why come & w/
solar min.?)

Q = does NO_x directly eat ozone (or) just forms particulates
to provide a surface?

Q = have models now been able to take into account.

QBO, ENSO, Volcanoes? → old lack of this

info be reason models not predicting correctly.

→ old ice clouds be forming away from the poles due
to stratospheric cooling.

Models - Small & image Globally between 1969-1986

Dobson - Larger & detected.

Satellite - instrument degradation.

* Ask re: Ozone loss detected over Arctic?

* ~~the~~ ^{airplane} effort to figure out.

highly perturbed
mixed air.

Anderson work:

OTF → have midlat. depletion.

Q = Mechanism

② ClO liberated in the vortex then spun out to mid lats. (where much ~~from~~) then $O_3 \downarrow$

③ is O_3 only destroyed at poles, but then, ~~that~~ since $O_3 \downarrow$ is so severe, ~~the~~ mixed air is overall O_3 -poor.

③ is chemistry at midlats completely unknown?

④ because N ↓

Q - why (odd reactive) nitrogen ↓?

⑤ still being chem, but in solid state
⑥ Cl be produced on other aerosol surfaces

LOH - allowing HCl to deliver more chlorine to stratosphere

Q = has the satellite data been normalized v. DO data

Q = ~~satellite~~ have all lat fluctuations been accounted for?

* even more significant in light of stratospheric solar maximum??

? Oxides of Nitrogen (ex from volcanoes) cause $ClNO_2$ cause of aerosol surface but "odd nitrogen"?
causes capture of ClO & Cl in stratosphere?

Q: significant of the hetero. chemical reactions? ClO can also be produced in gas phase?
Q: MAXIMUM
Q: MINIMUM

Q: ^{minim} biologists tell us pollution. ^{overall & highly impact of} UV exposure & heavily.
~~impact~~ NOT linear.
 similar full name Cl body & moved.

as a f of life time & # of
 life time less than 5 yrs
 10-20 yrs →
 123, 124 → less changing

Are there substitutes
 4 hrs. of La Port on Fri.

amt of HFC & of idation potential - zero impact
 & on oxidation potential. v. other hydrocarbons.

Volume # 2

Lower photoreaction effect.

20%	50%	85%	100%
1993,	1995	1997	2000

* get global compliance of

but in
 top but have ~~Enthalpy~~ chloroform as important one
 large EJP
 3rd or 4th spot control.
 Mike Plummer → plan from

move to HFC's $\rightarrow$? = what abt efficiency of appliances??
improve protection of ozone layer

if remove 22 $\rightarrow$ refrigerant
frans ?? $\rightarrow$ what are the substitutes??
air condit??

force use phase-out fixed HFCs & cap on emission
rate.

any more

~~Stokert~~ -- determine exactly what the data say

Watson -- airplane expedition, compare w/ 1988 & 1989 analyses.

Rowland -- what going on here? suggesting a non-linearity in system
didn't expect? models completely inadequate?
reaching some critical concentrations??