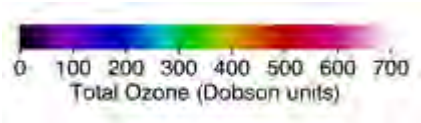
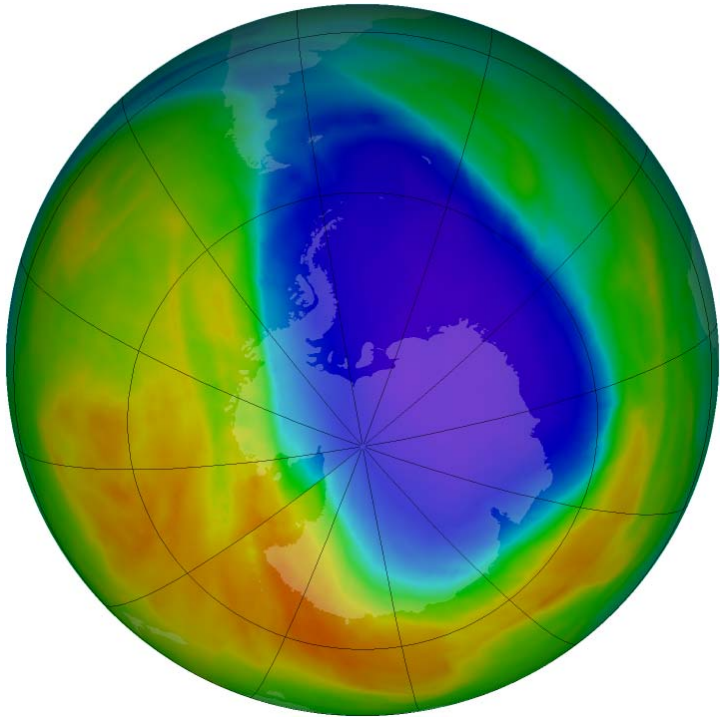
The new 2014 Ozone Assessment

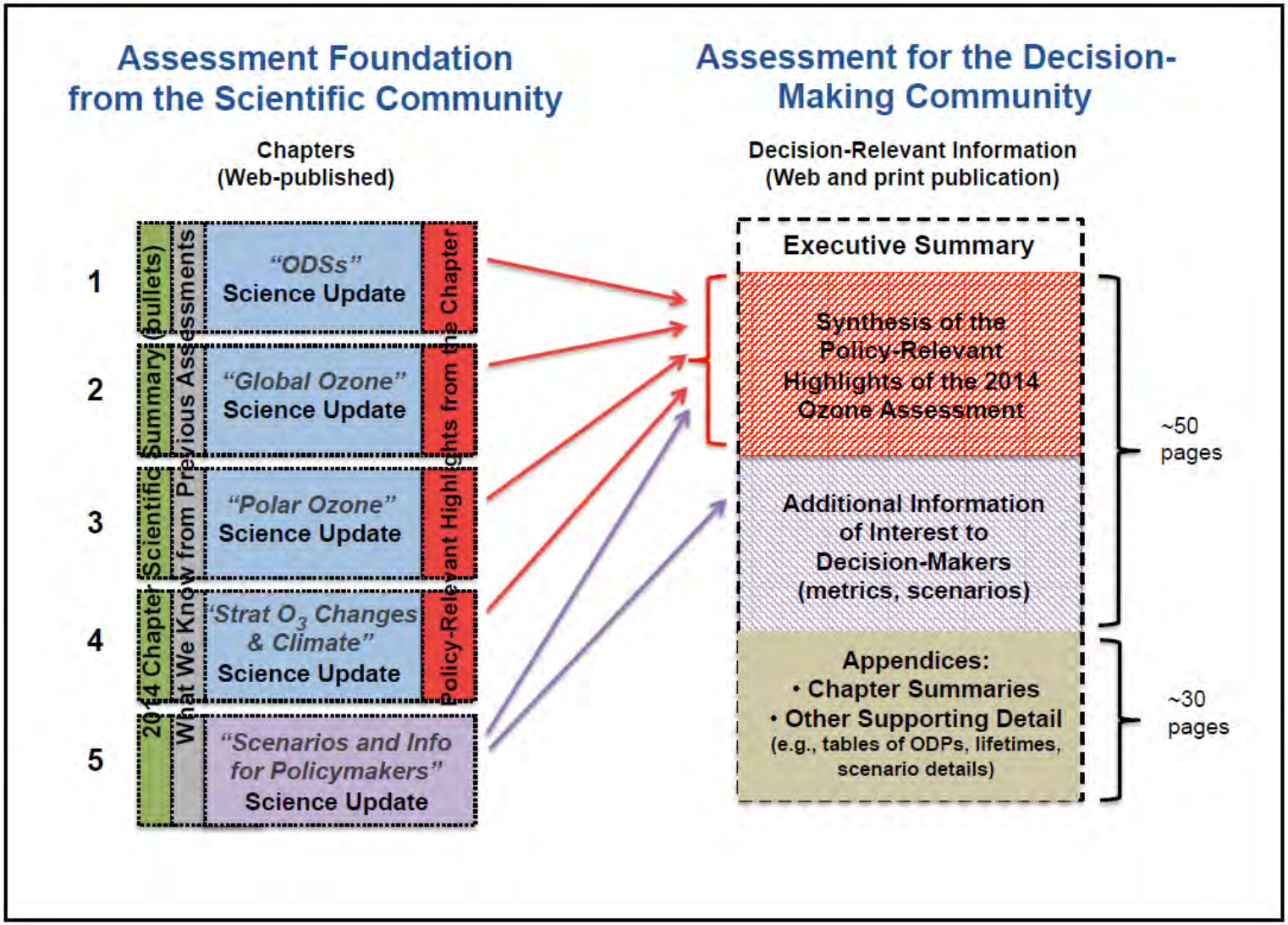
Stefan Reimann





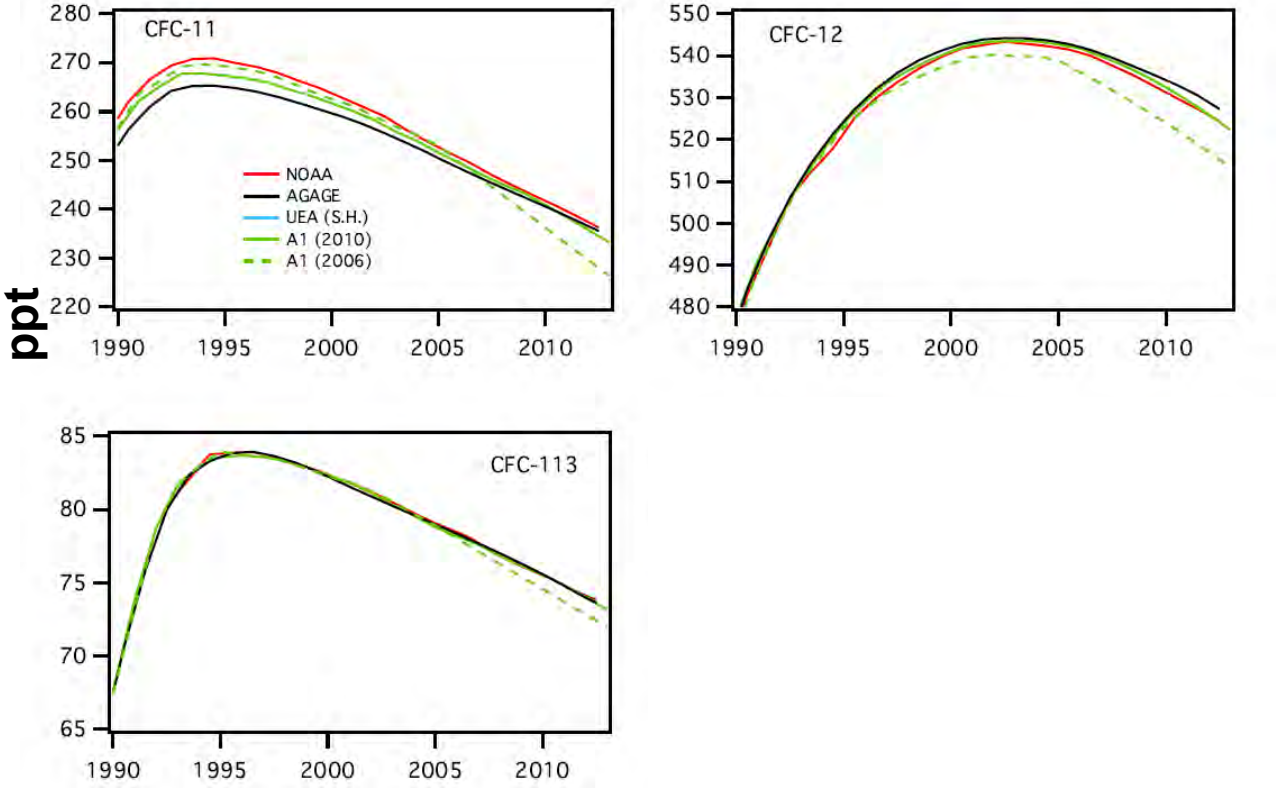
Ozone in the stratosphere over Antarctica 11.10.14

Overview

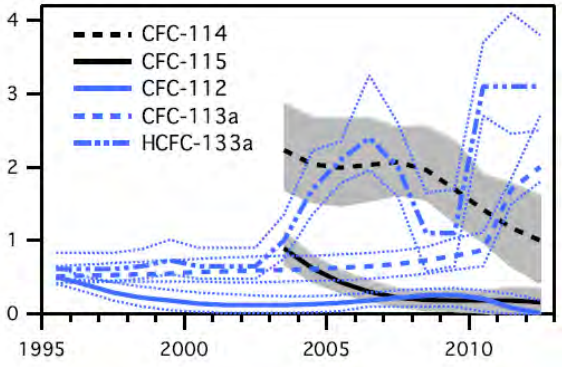

Assessment Foundation from the Scientific Community
Chapters (Web-published)
1
2
3
4
5
2014 Chapter Scientific Summary (bullets)
What We Know from Previous Assessments
"ODSs" Science Update
"Global Ozone" Science Update
"Polar Ozone" Science Update
"Strat O_3 Changes & Climate" Science Update
"Scenarios and Info for Policymakers" Science Update
Policy-Relevant Highlights from the Chapter
Assessment for the Decision-Making Community
Decision-Relevant Information (Web and print publication)
Executive Summary
Synthesis of the Policy-Relevant Highlights of the 2014 Ozone Assessment
Additional Information of Interest to Decision-Makers (metrics, scenarios)
~50 pages
Appendices:
• Chapter Summaries
• Other Supporting Detail
(e.g., tables of ODPs, lifetimes, scenario details)
~30 pages

World-wide measurements of ozone-depleting substances

CFCs



ktons/year



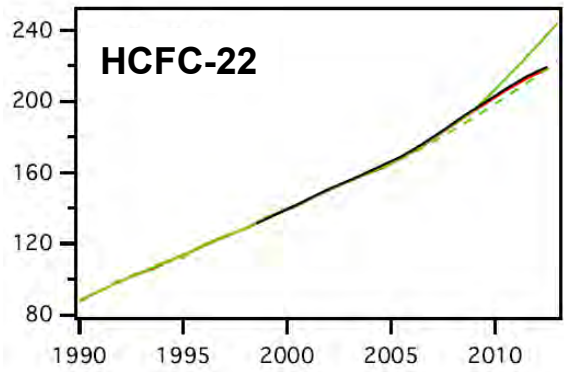
nature geoscience
LETTERS
PUBLISHED ONLINE: 9 MARCH 2014 | DOI: 10.1038/NGEO2109

Newly detected ozone-depleting substances in the atmosphere

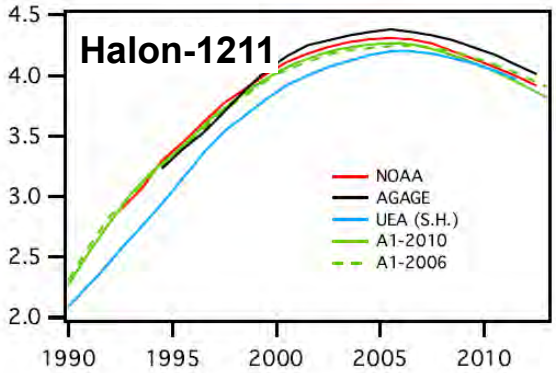
Johannes C. Laube[1*], Mike J. Newland[1†], Christopher Hogan[1], Carl A. M. Brenninkmeijer[2], Paul J. Fraser[3], Patricia Martinerie[4,5], David E. Oram[6], Claire E. Reeves[1], Thomas Röckmann[7], Jakob Schwander[8], Emmanuel Witrant[9] and William T. Sturges[1]

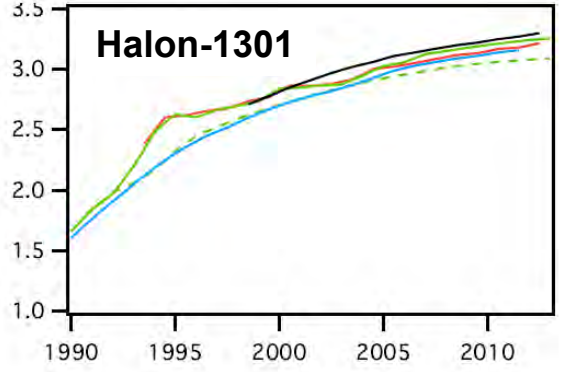
World-wide measurements of ozone-depleting substances

HCFCs

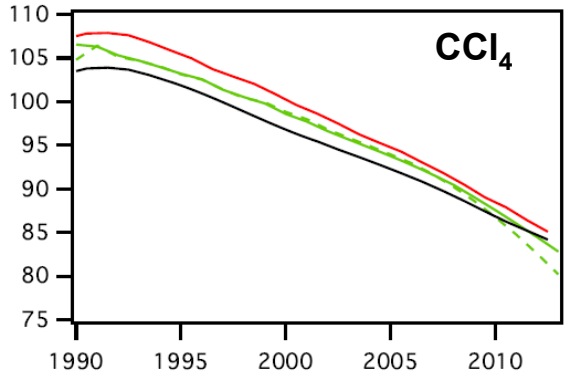


Halons

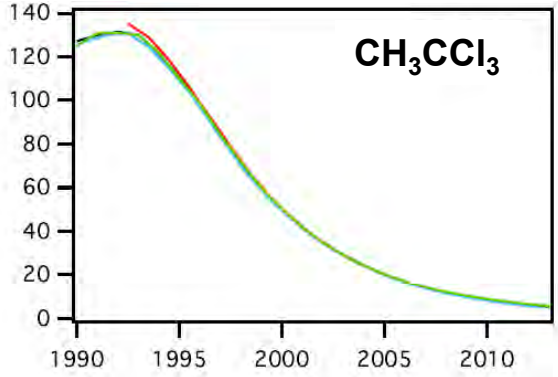




Chlorinated solvents

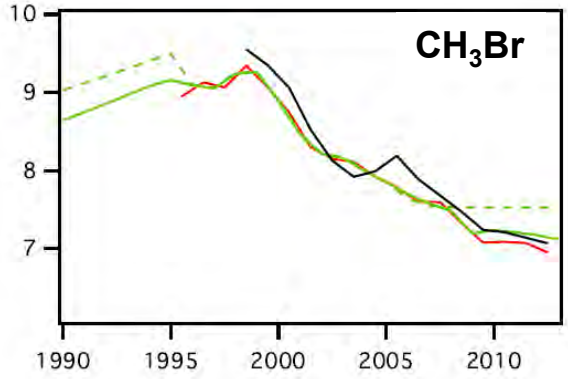


Lifetime: 26 years?



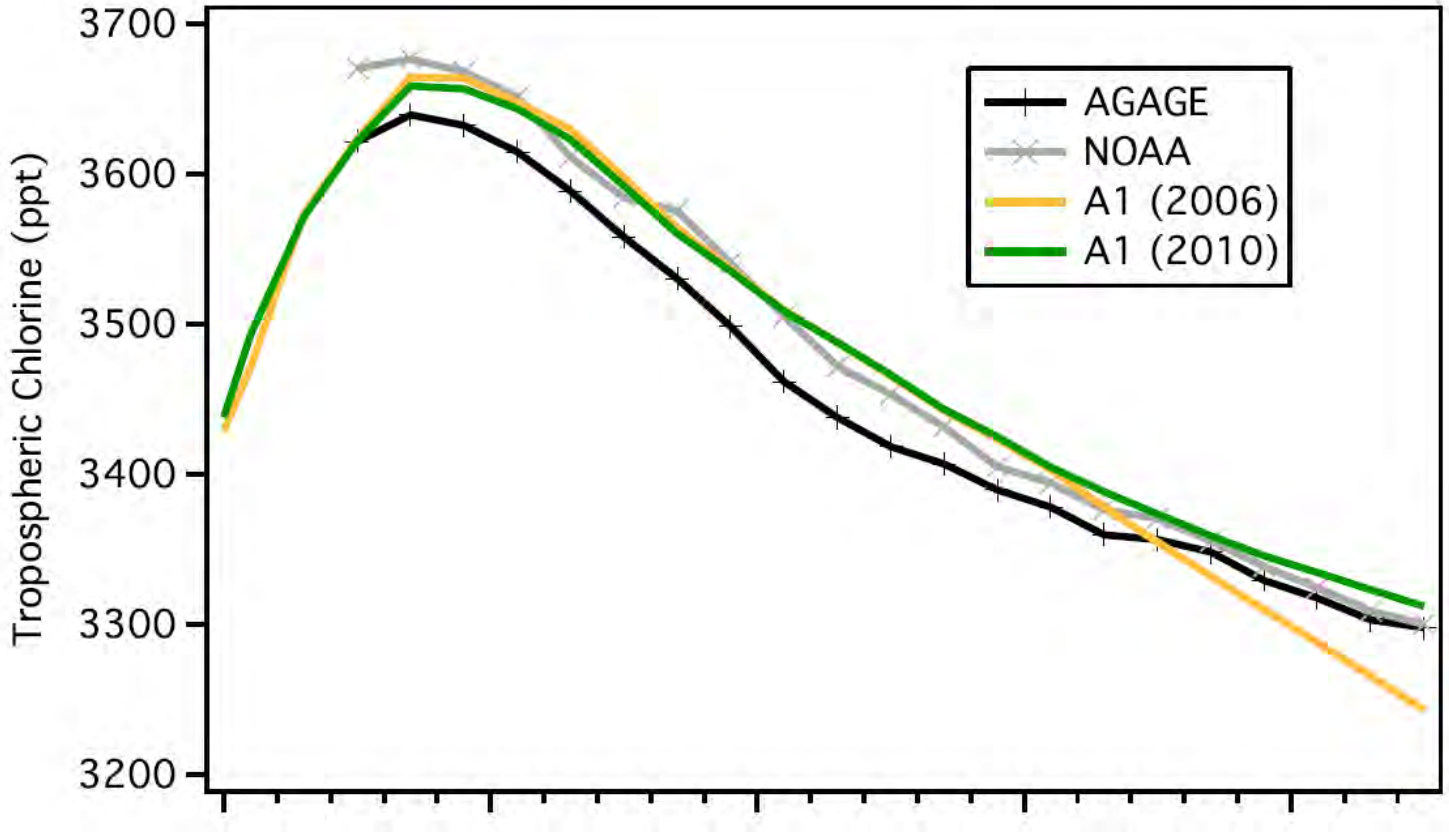
Lifetime: 6 years

Agriculture/Transport

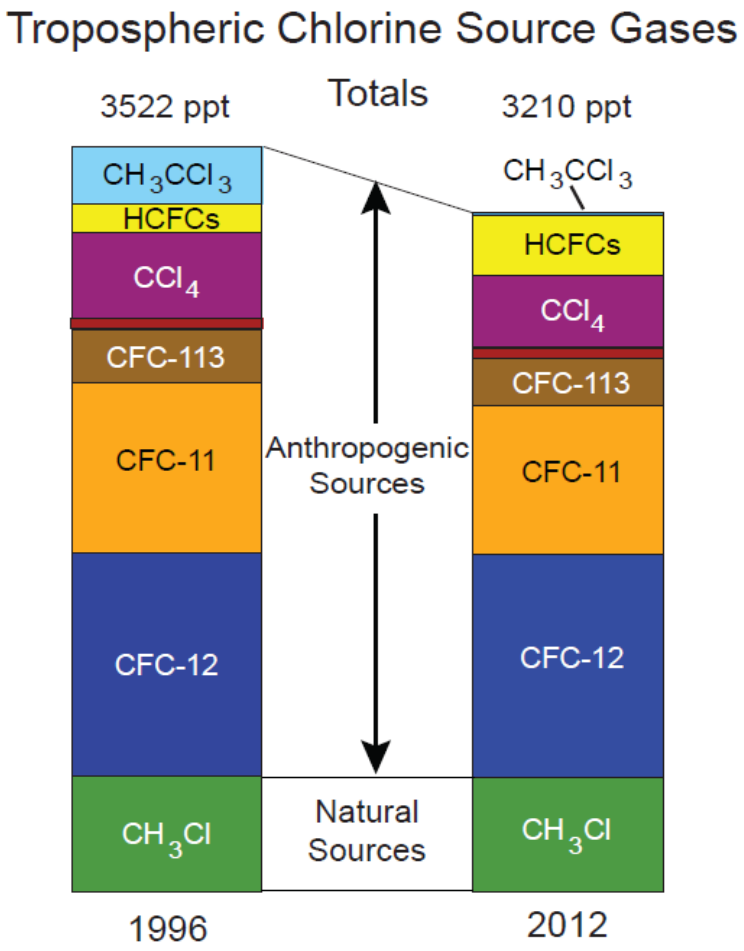


Lifetime: 0.8 years

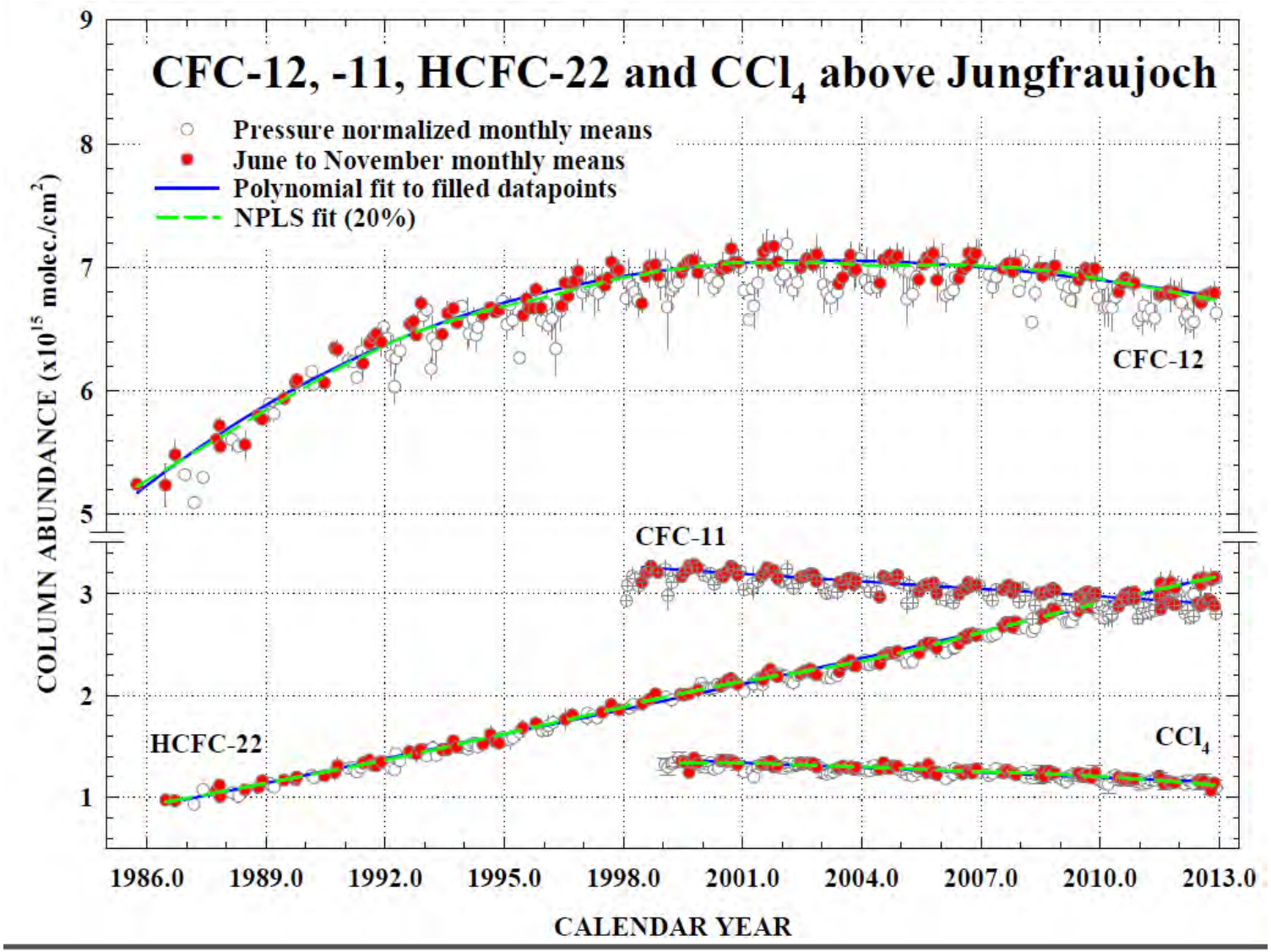
World-wide measurements of ozone-depleting substances



World-wide measurements of ozone-depleting substances



World-wide measurements of ozone-depleting substances
The 3. dimension FTIR at Jungfraujoch



World-wide measurements of ozone-depleting substances
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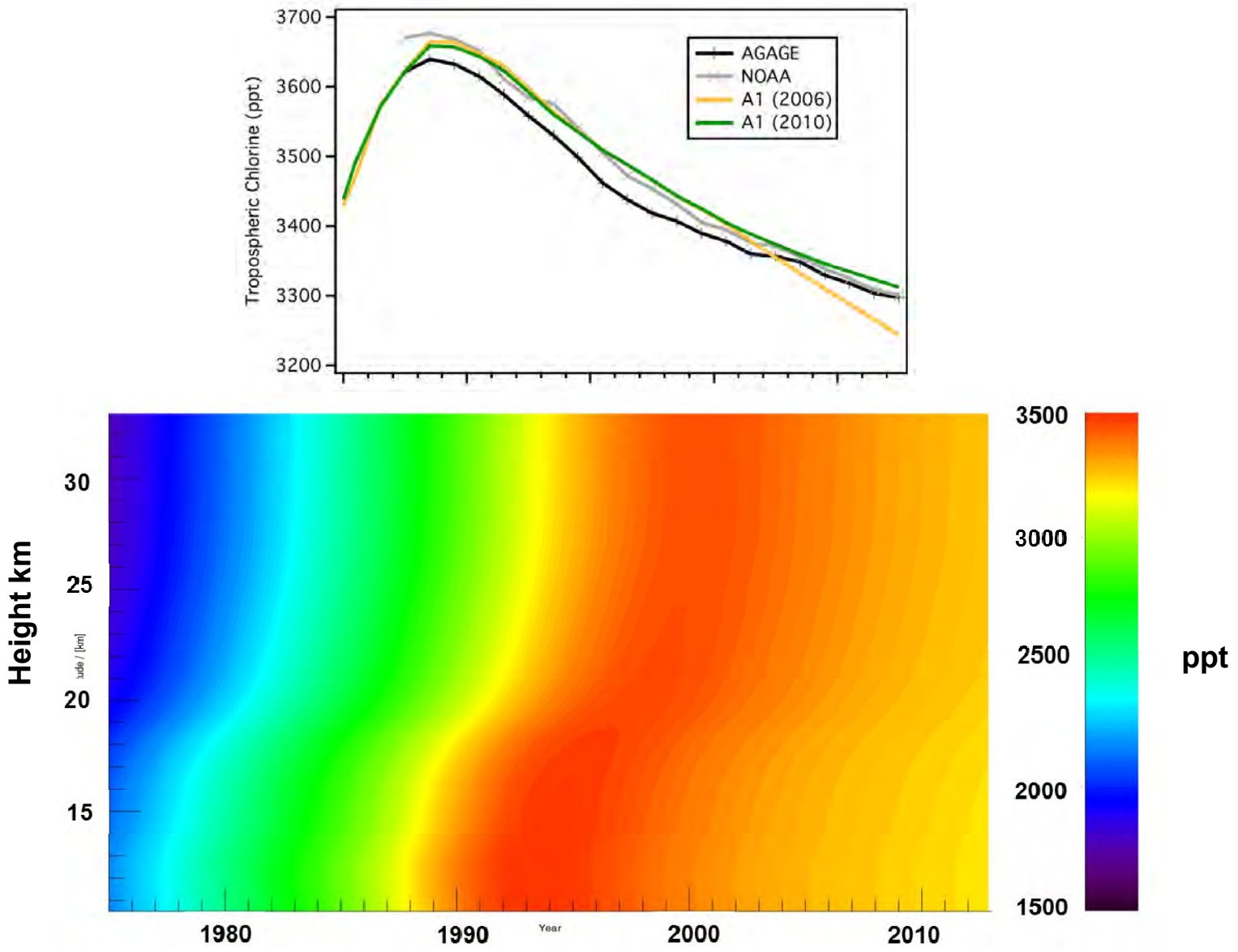
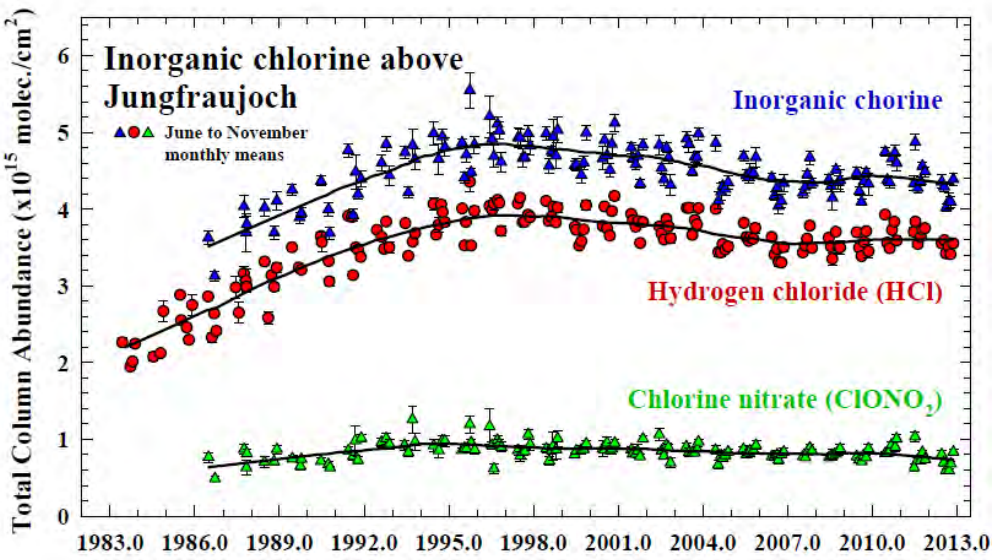
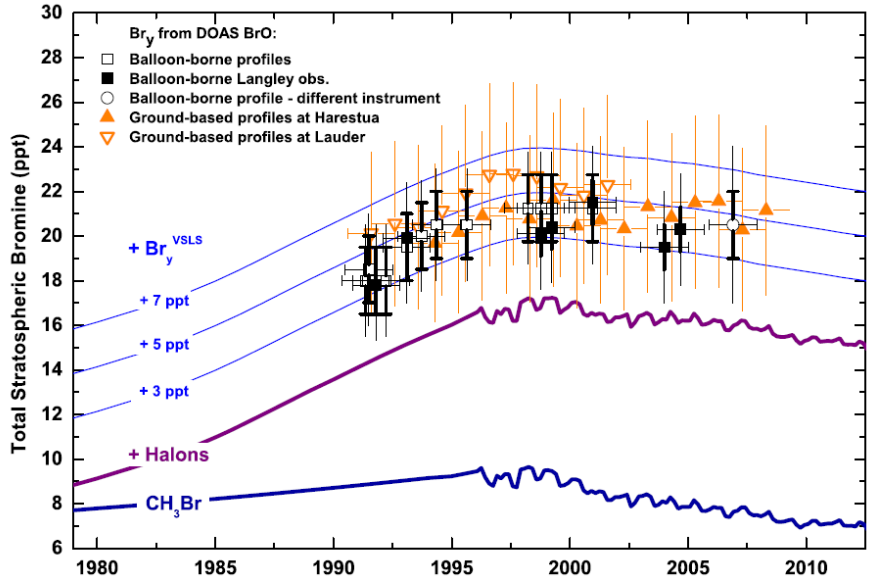


World-wide measurements of ozone-depleting substances
The decay products



Chlorine from :

- **CFCs**
- **HCFCs**
- **Cl-solvents**
- **CH_3Cl (natural)**



Bromine from:

- **Halons**
- **CH3Br**
- **CH2Br, CHBr3 (natural)**

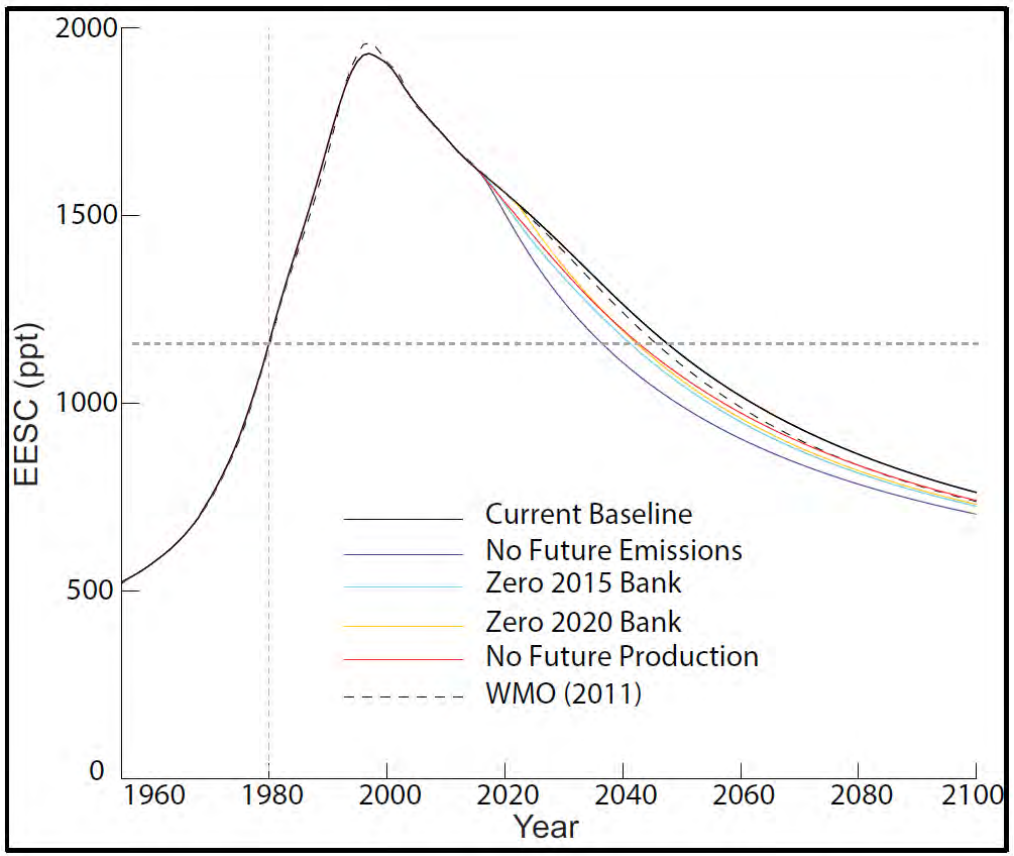
EESC: Equivalent Effective Stratospheric Chlorine

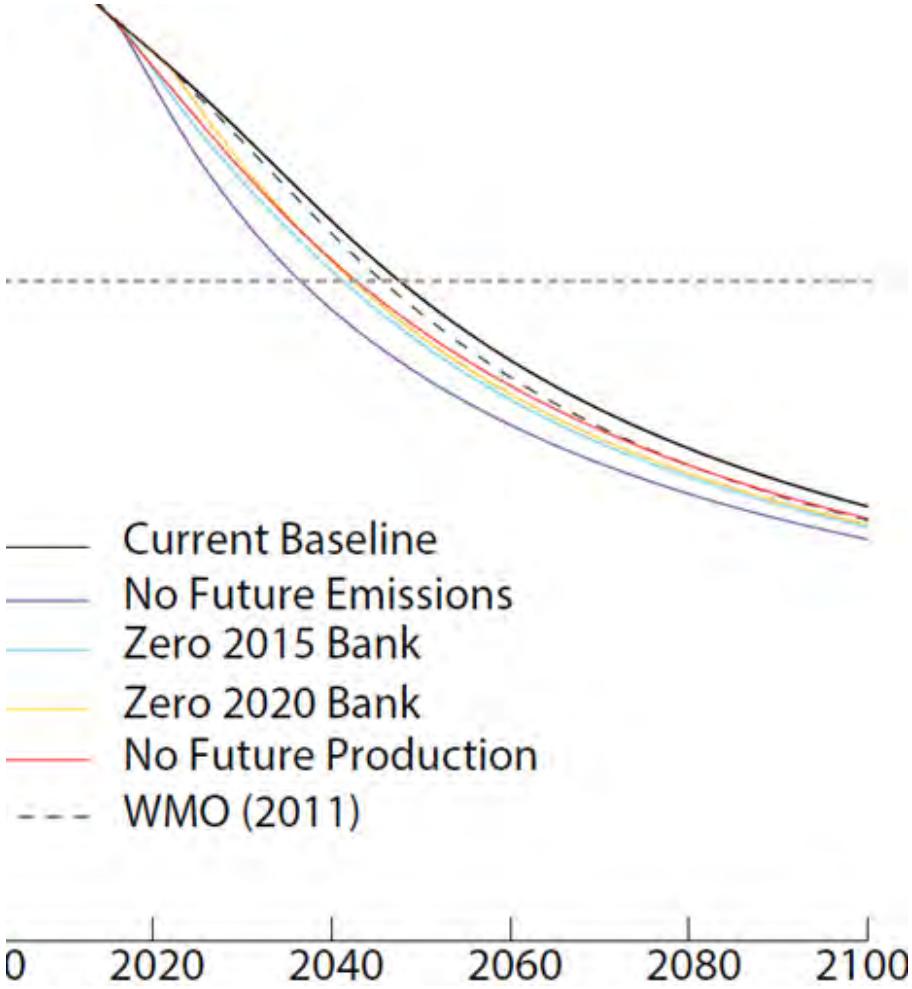
estimation of the effect of ozone depleting substances on ozone in the stratosphere

Br in comparison with Cl (Brx45)

Current and future emissions

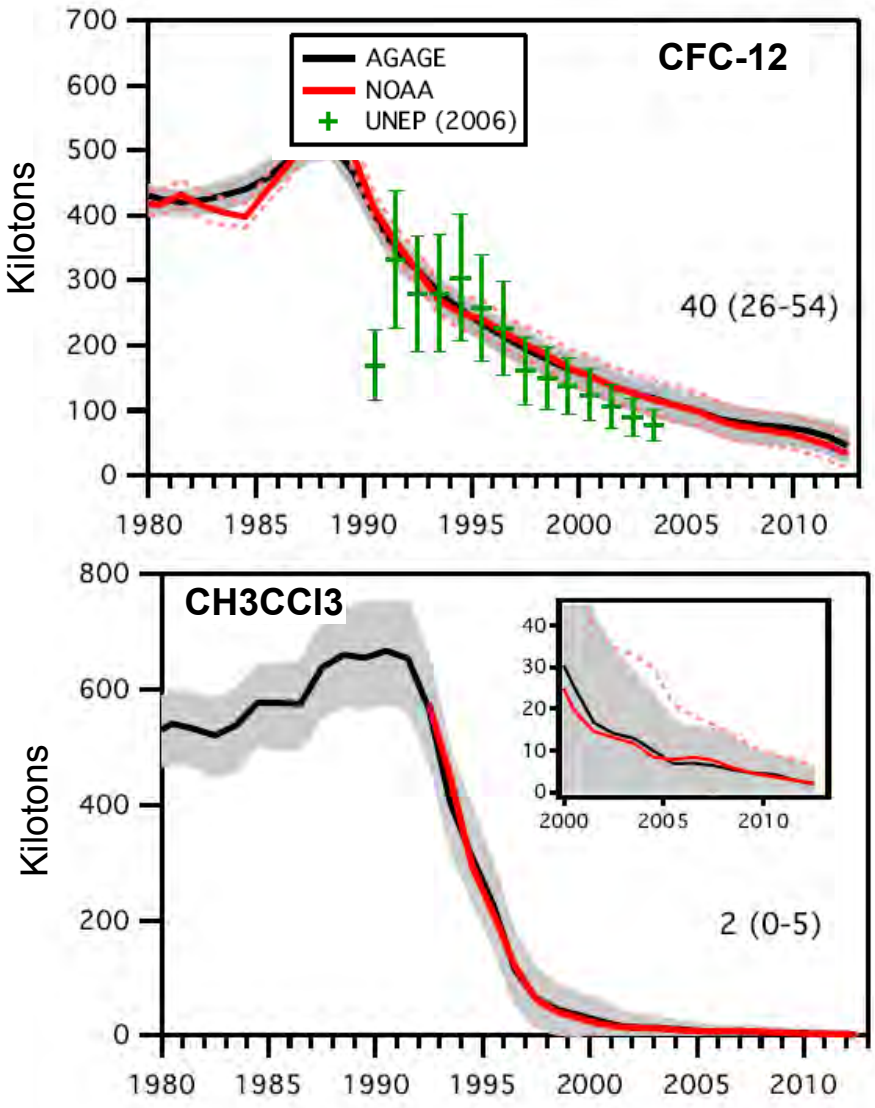
Lifetime



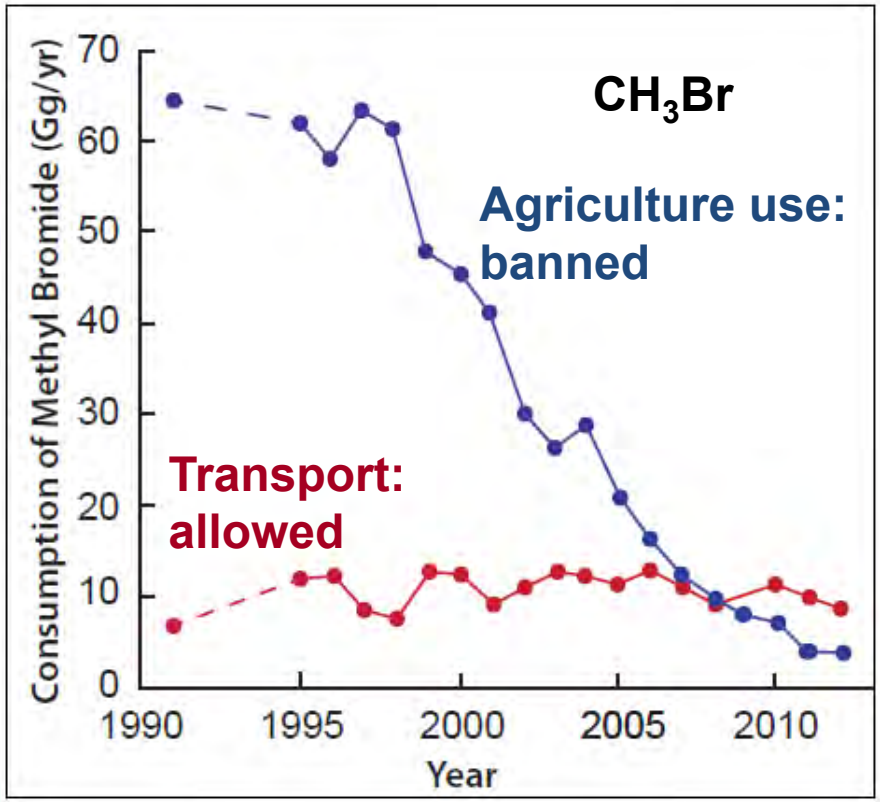


Emissions of Cl- and Br- containing substances

banned



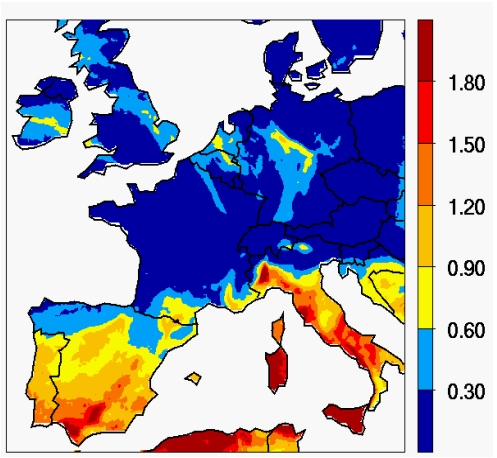
Partially banned



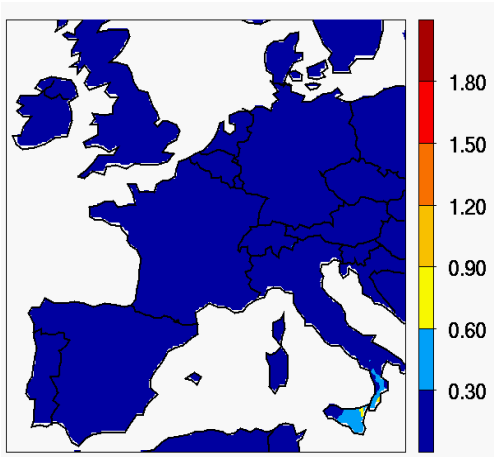
Source Identification of CH3Br in Europe
Forbidden since 2008

Work of Empa

2004-06

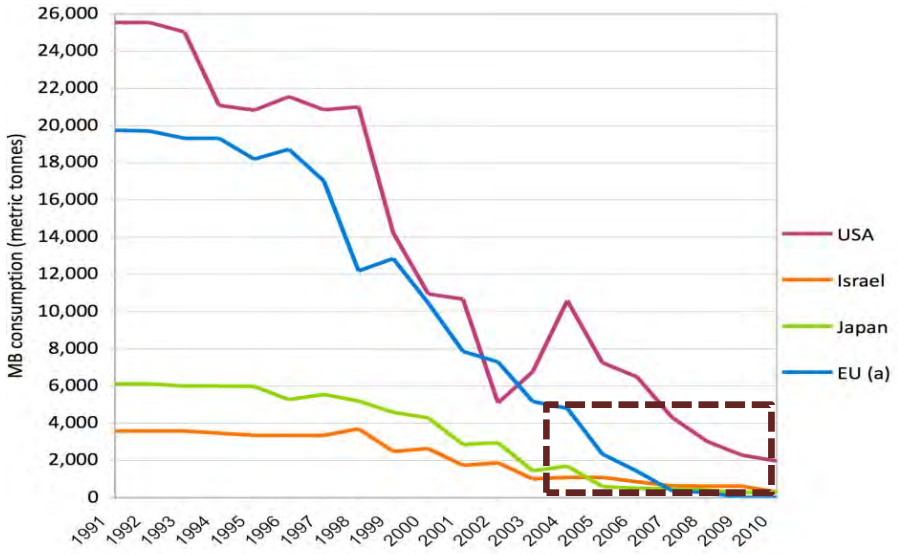


2010-12



CH_3Br in agriculture: global sources

MBTOC/TEAP, 2010



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Current and future emissions

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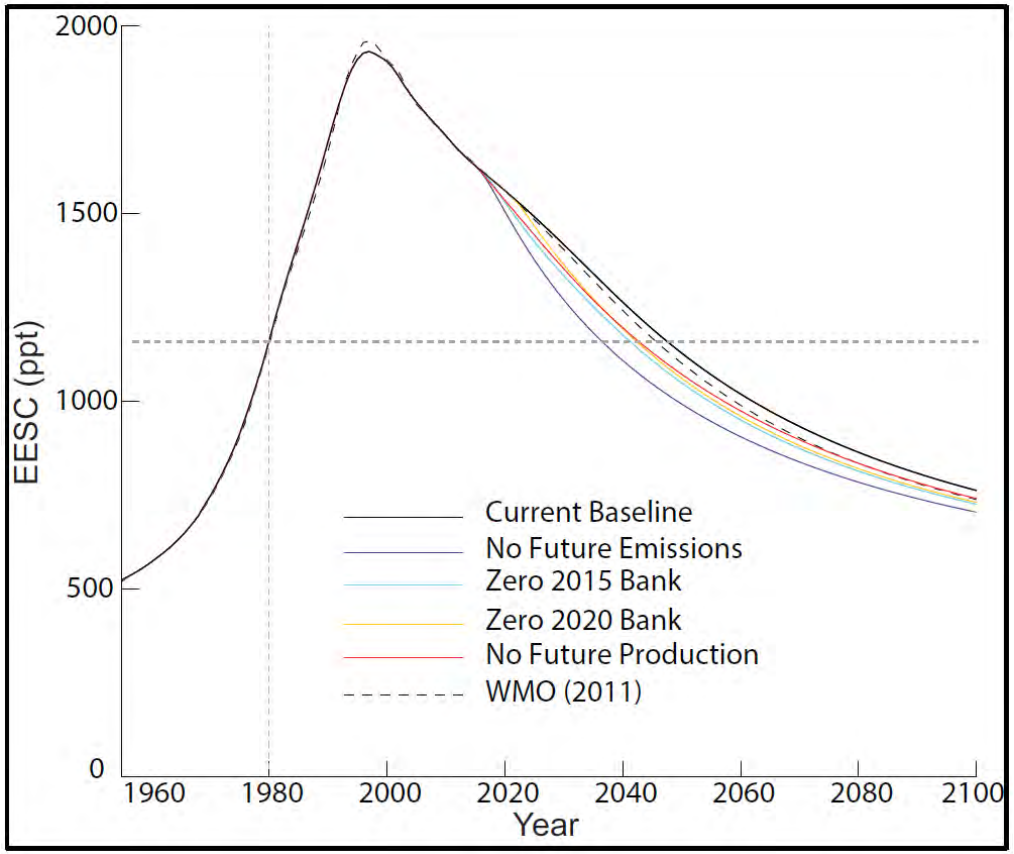
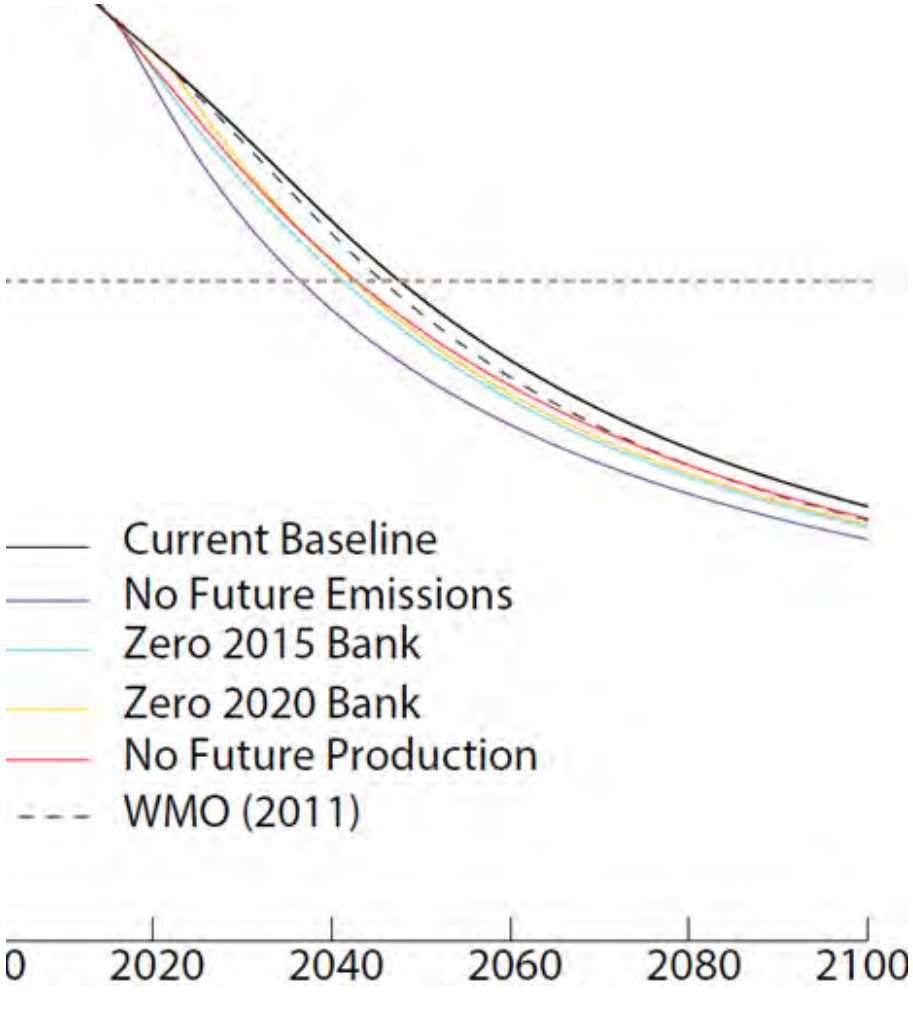
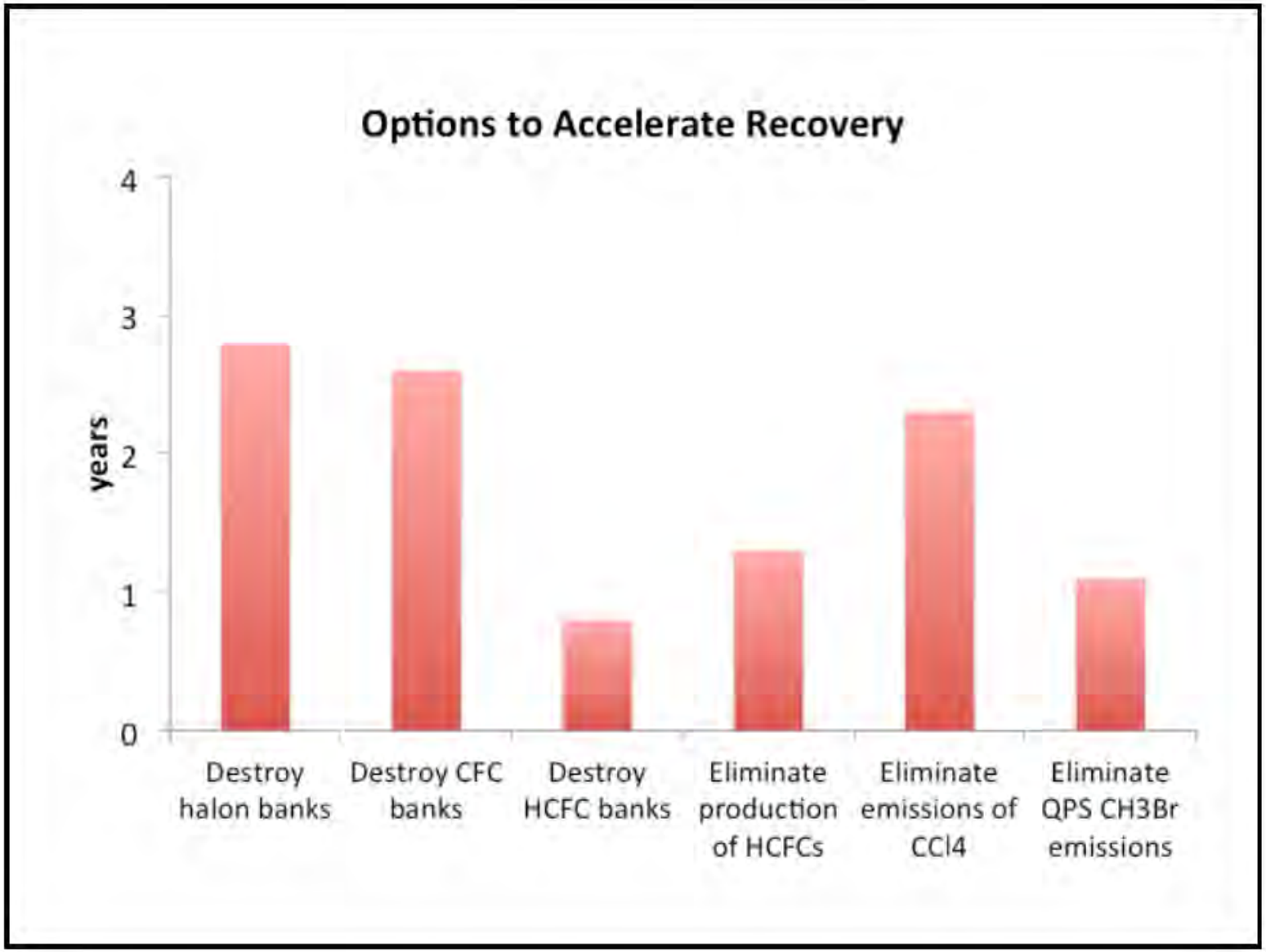




Options for recuding emissions



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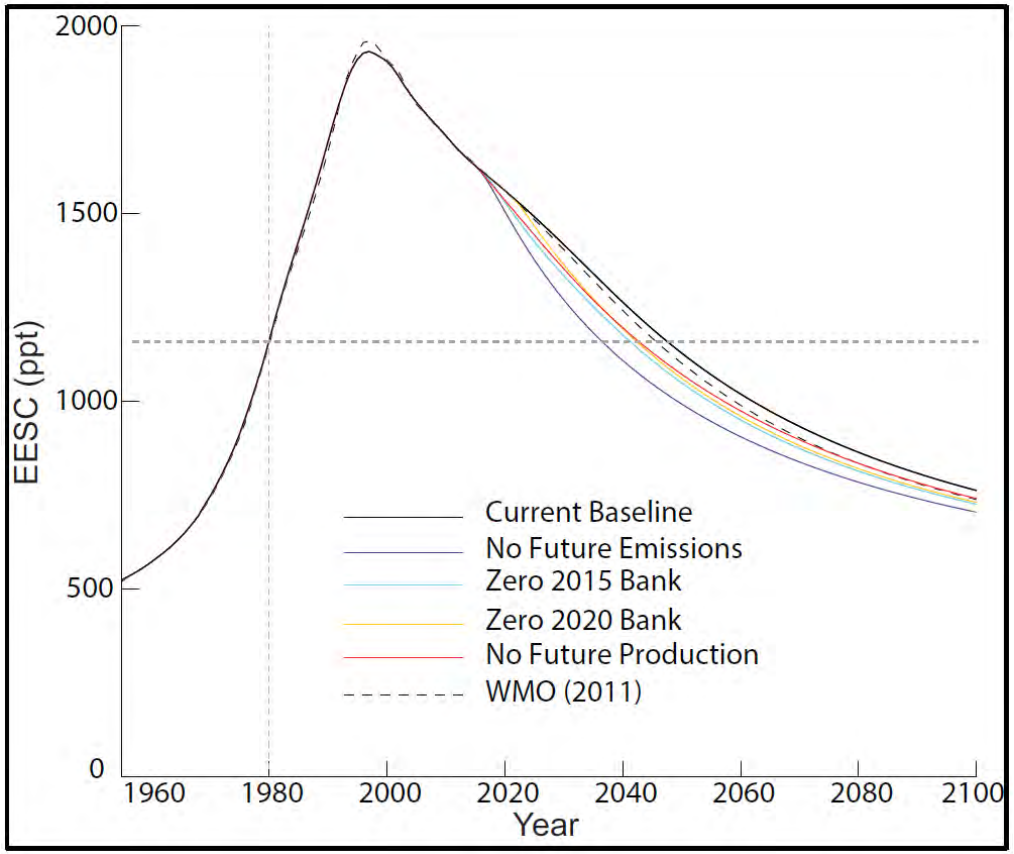
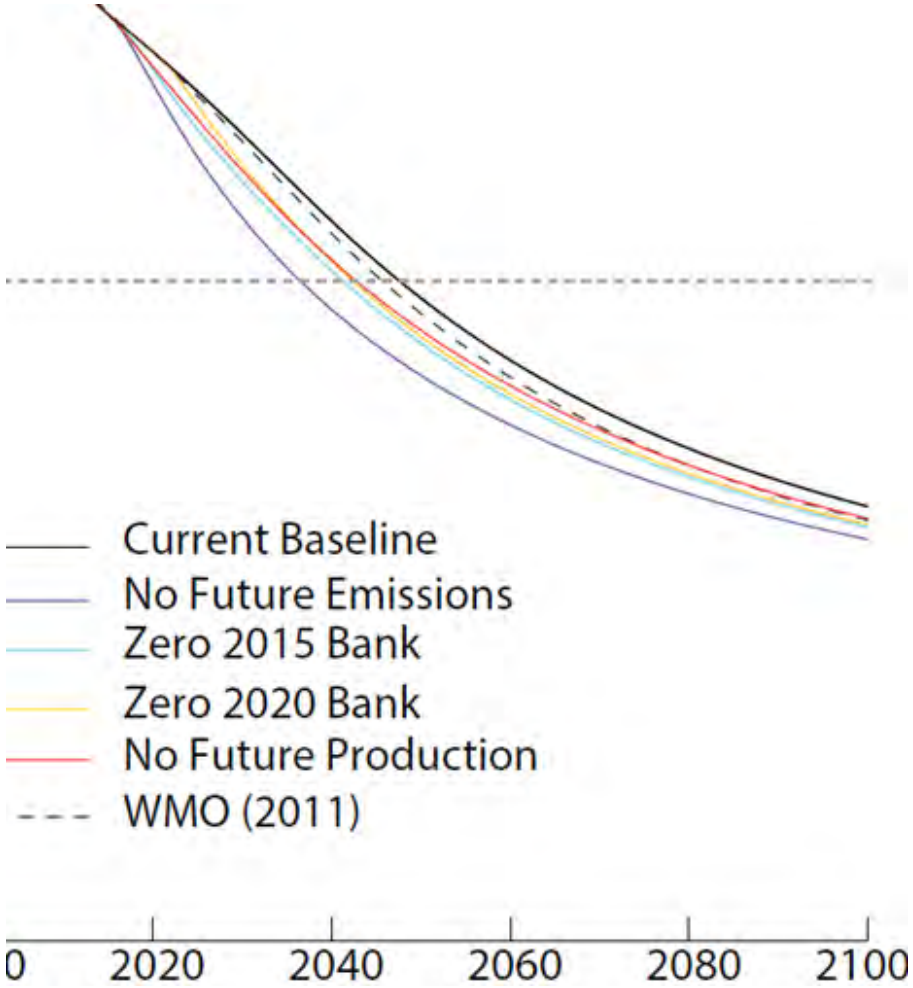
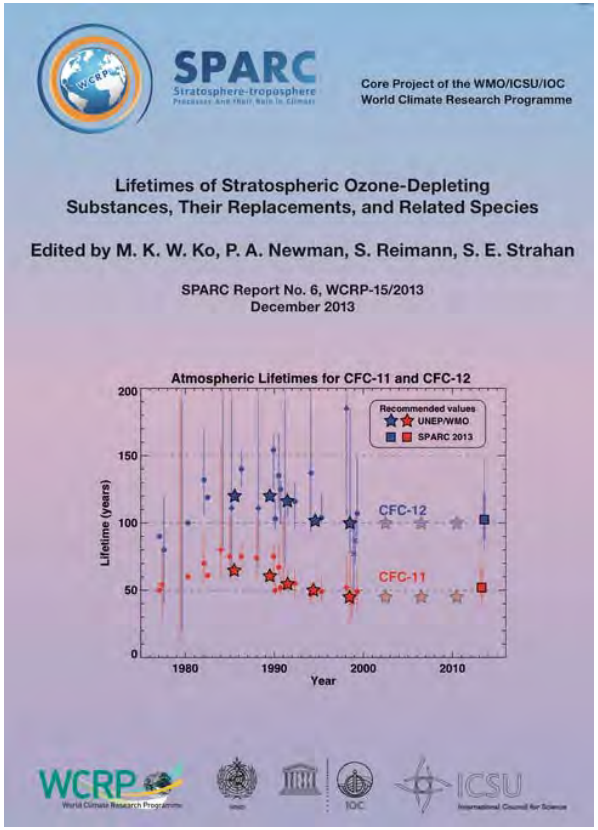
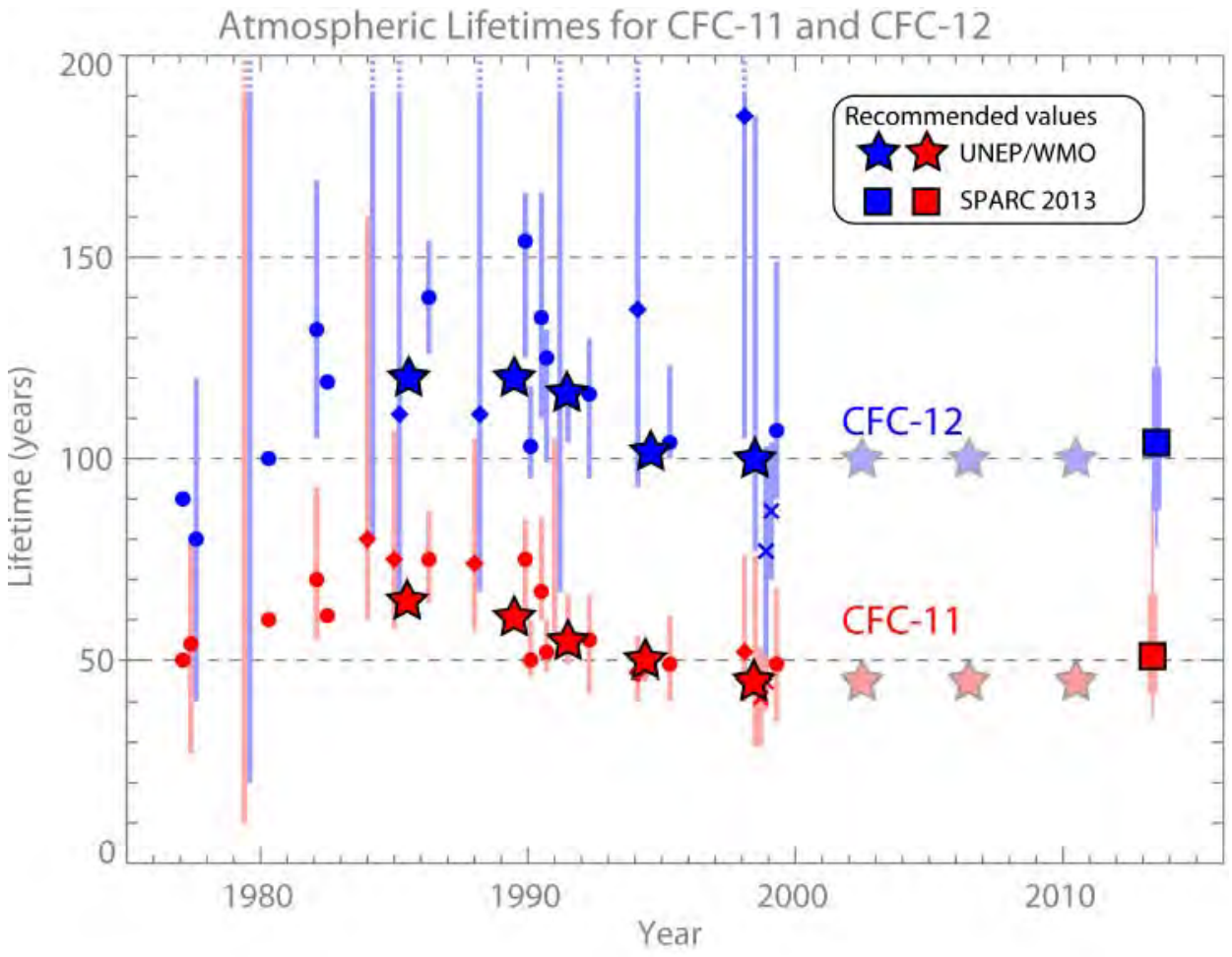


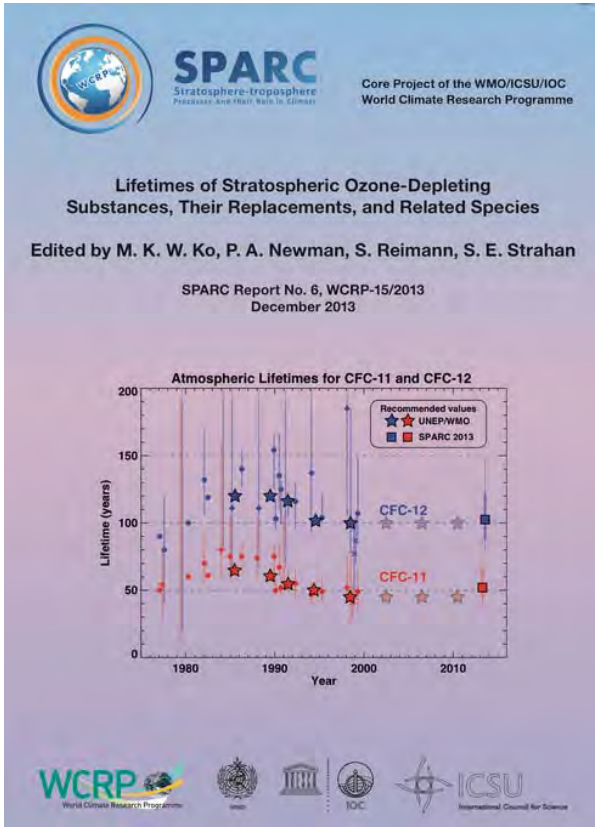


Lifetimes reassessed
SPARC lifetime report 2013





SPARC lifetime report 2013

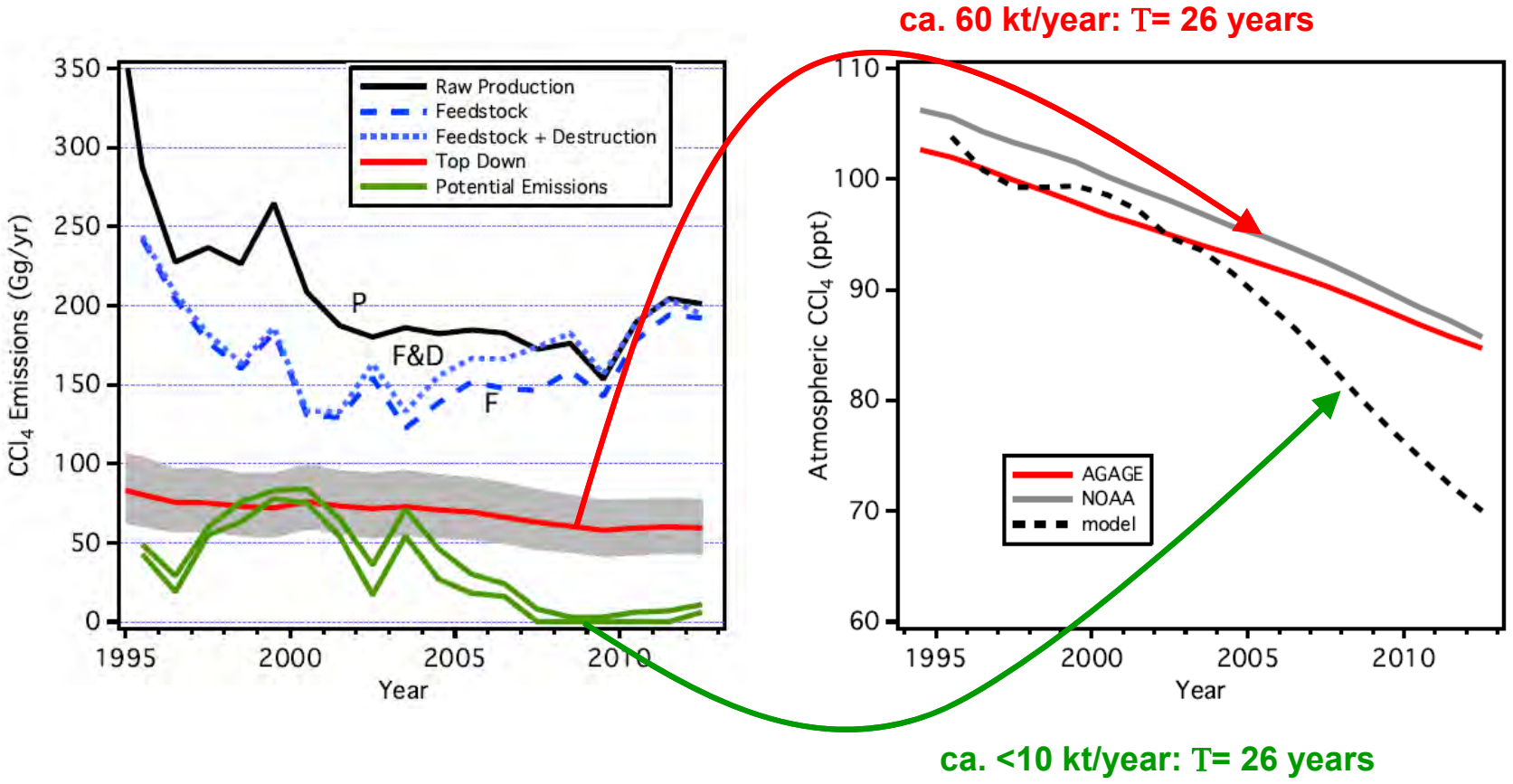


Species	WMO (2011)	Recommended Lifetime				
	τ (Yr)	τ (Yr)	Possible range			
				Most likely range		
CFC-11	45	**52**	35	43	67	89
CFC-12	100	**102**	78	88	122	151
CFC-113	85	**93**	69	82	109	138
CCl_4 [a]	35	**44**	33	36	58	67
Nitrous Oxide	114	**123**	91	104	152	192
Halon-1301	65	**72**	58	61	89	97
CFC-114	190	**189**	153			247
CFC-115 [b]	1020	**540**	404			813

CCl_4: the biggest problem

Total atmospheric lifetime of CCl_4 = 26 years

44 years Stratosphäre + 94 years ocean + 195 years soil



New estimate of CCl4 Lifetime (Liang, et al., 2014)

AGU PUBLICATIONS

Geophysical Research Letters

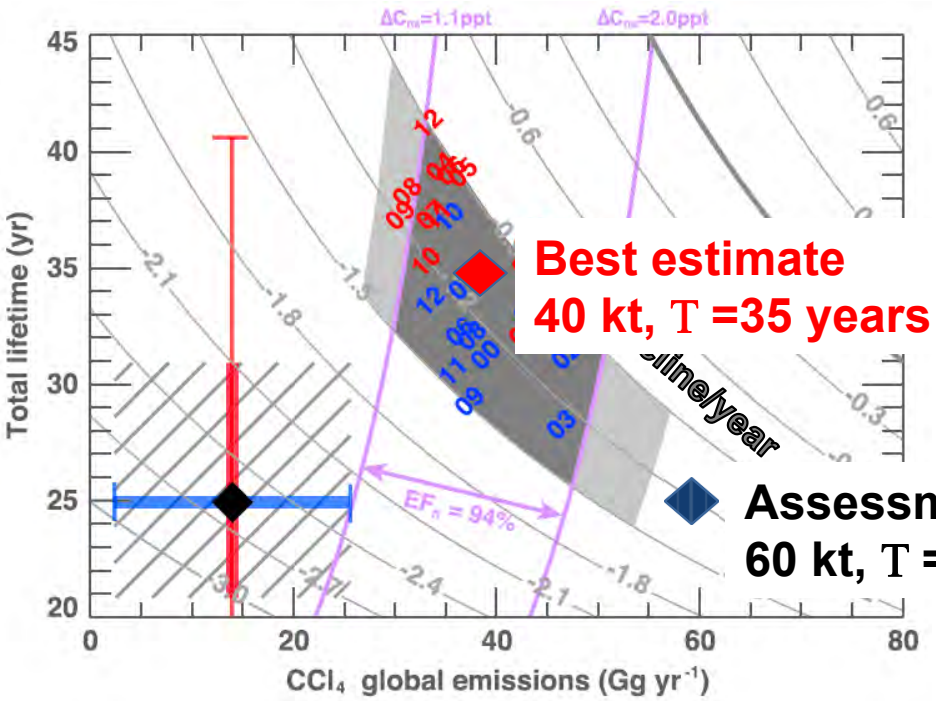
RESEARCH LETTER
10.1002/2014GL060754

Key Points:
- Near-zero CCl_4 bottom-up emissions cannot be reconciled with observations
- The observed inter-hemispheric gradient can be used to quantify

Constraining the carbon tetrachloride (CCl_4) budget using its global trend and inter-hemispheric gradient

Qing Liang[1,2], Paul A. Newman[1], John S. Daniel[3], Stefan Reimann[4], Bradley D. Hall[5], Geoff Dutton[5,6], and Lambert J. M. Kuijpers[7]

Conc. Difference hemispheres



Lifetime

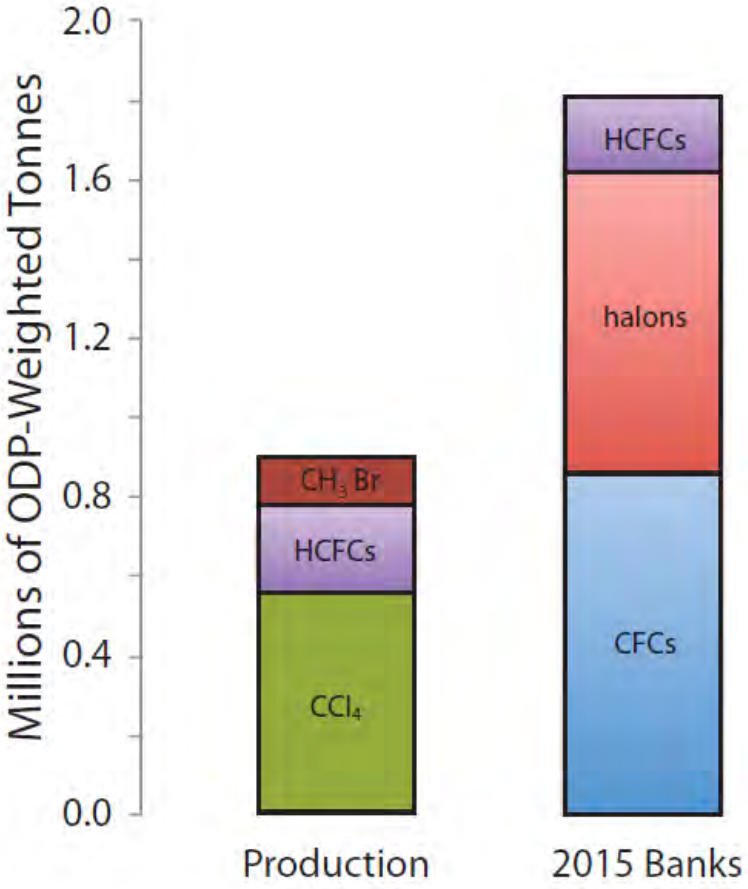
Best estimate
40 kt, T =35 years

Assessment
60 kt, T =26 years

Industry

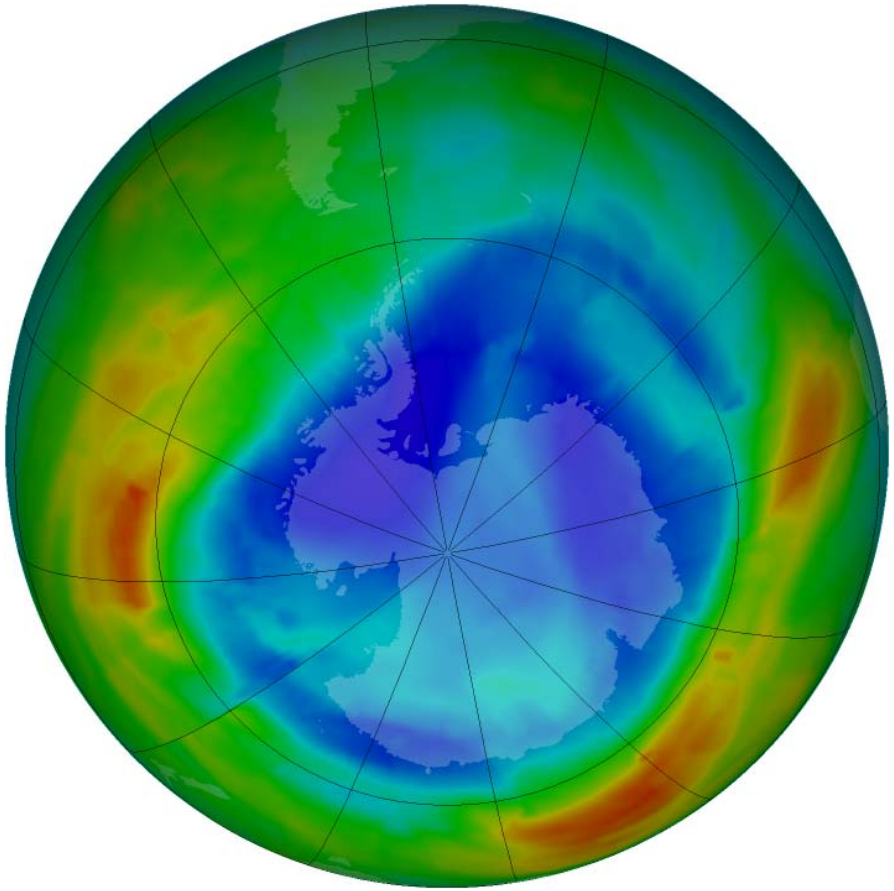
Expected emissions until 2050

Summed Emissions (2015 – 2050)
From Production and Banks



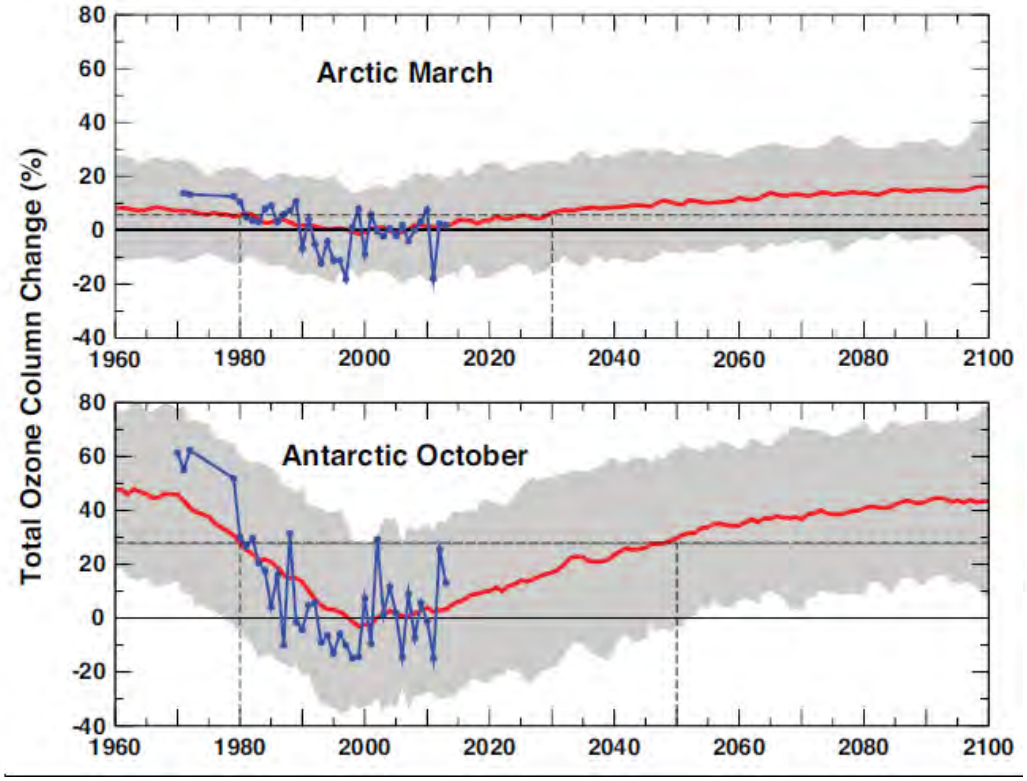
ODP= effect relativ to CFC-11 (ODP=1)

Ozone hole prediction
Take the long way home

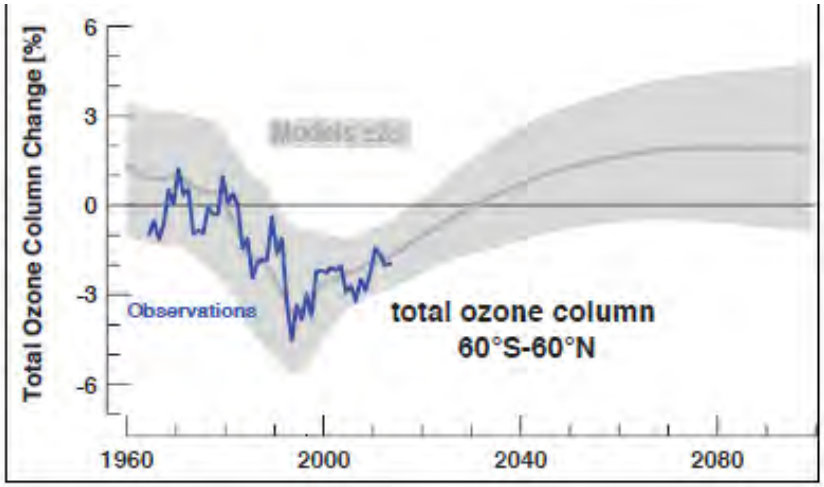


Ozone hole prediction to be back in 1980?

Polar Regions



Extrapolar Regions

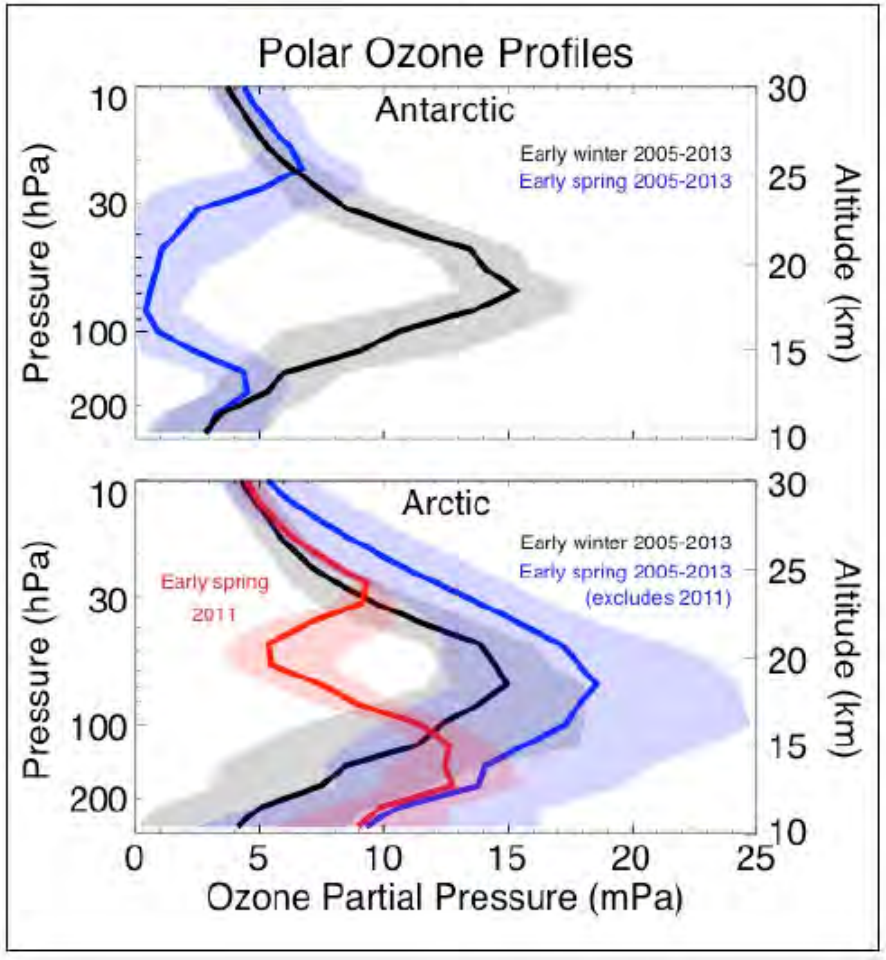


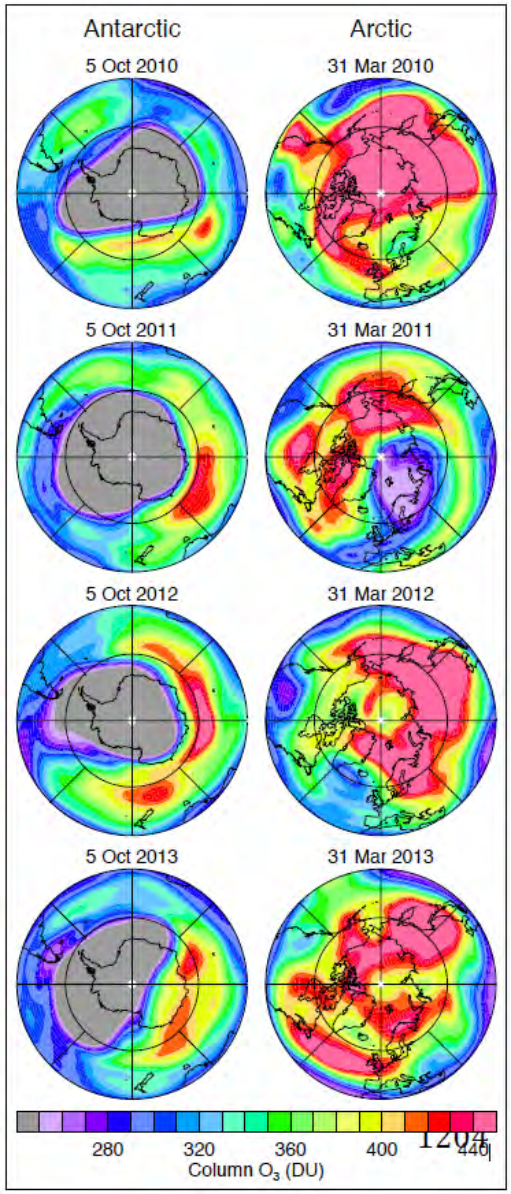
Ozone hoel over the Arctic?

ARTICLE **Nature, 2011**

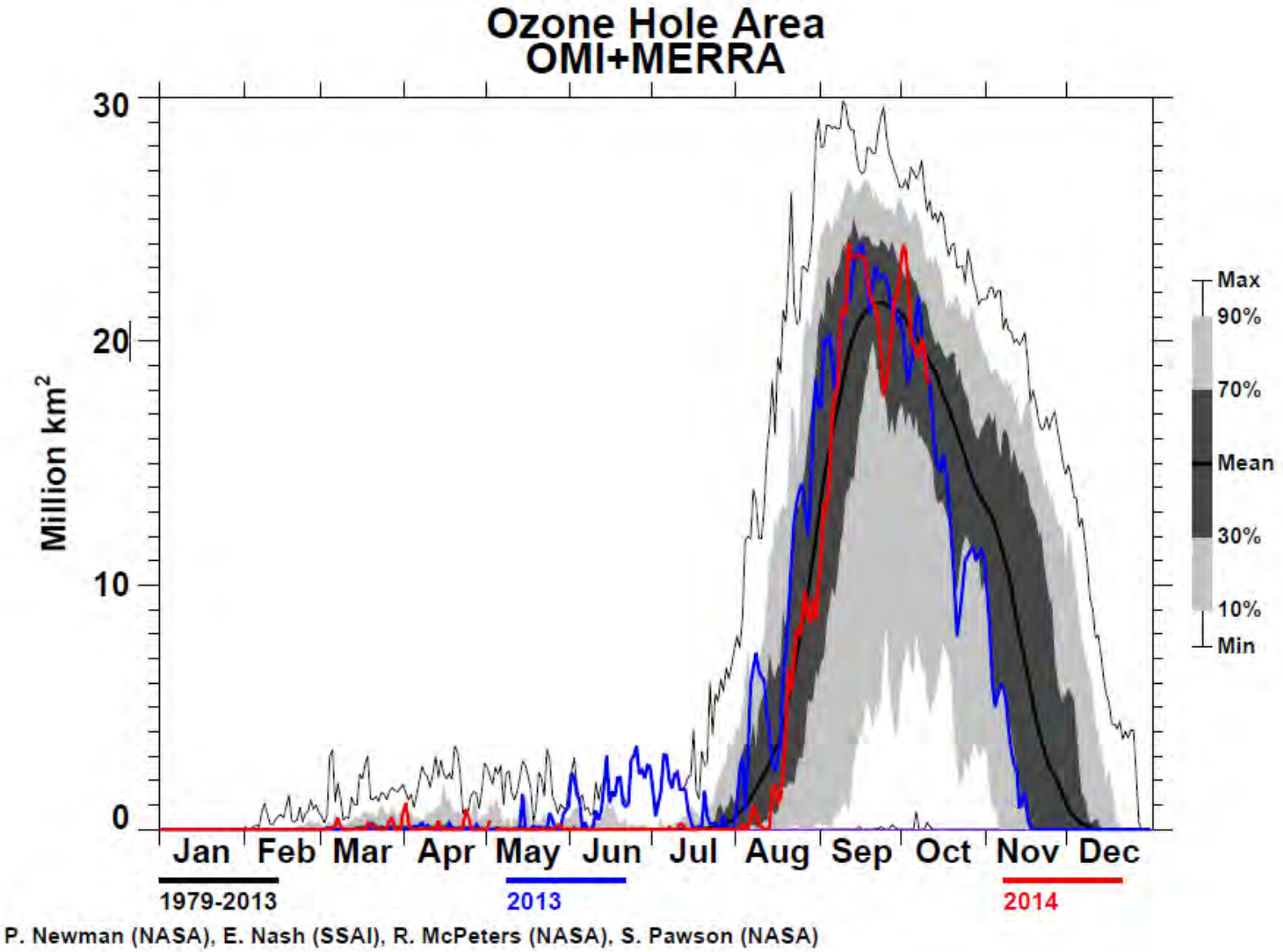
doi:10.1038/nature10556

Unprecedented Arctic ozone loss in 2011

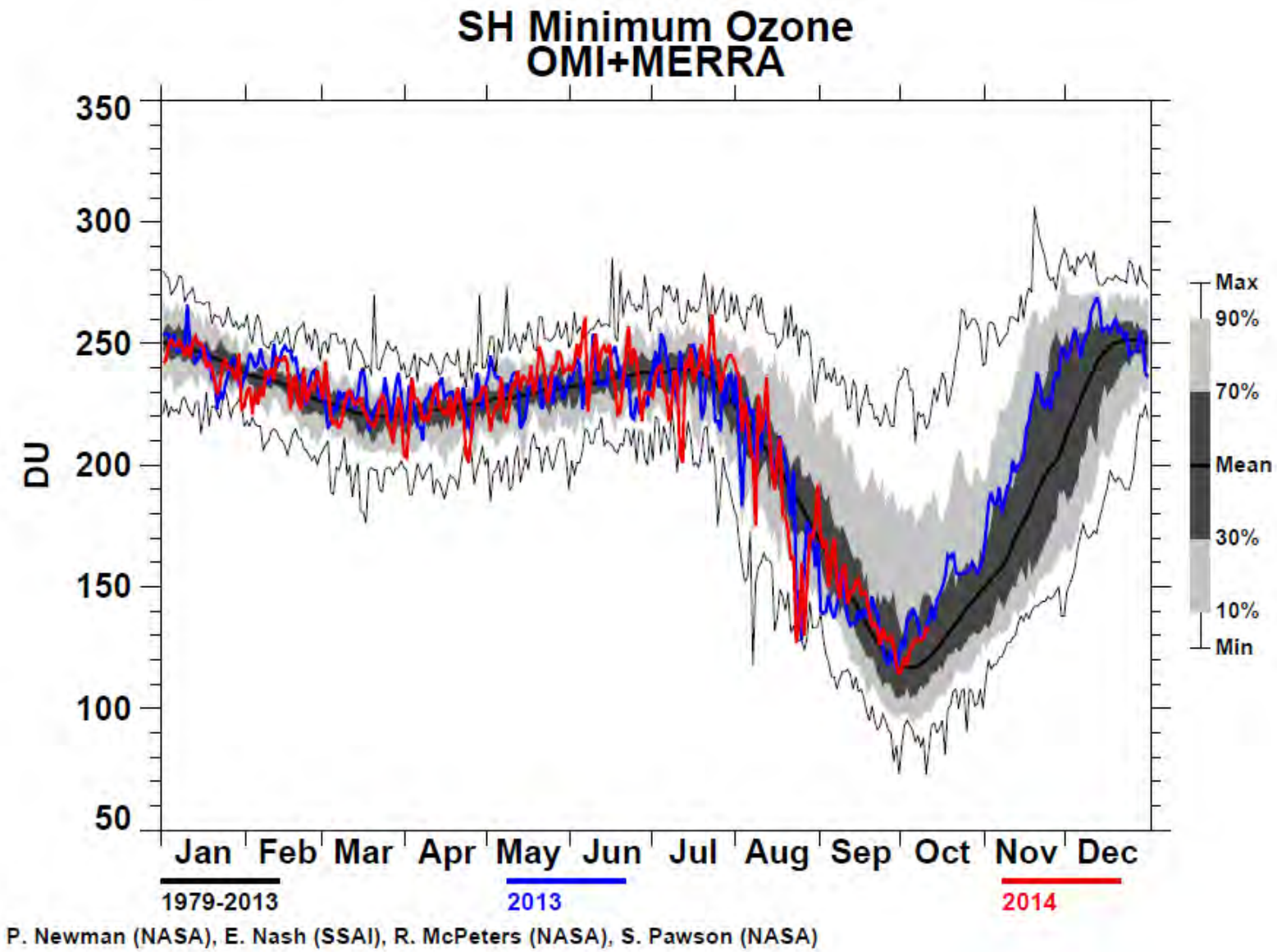




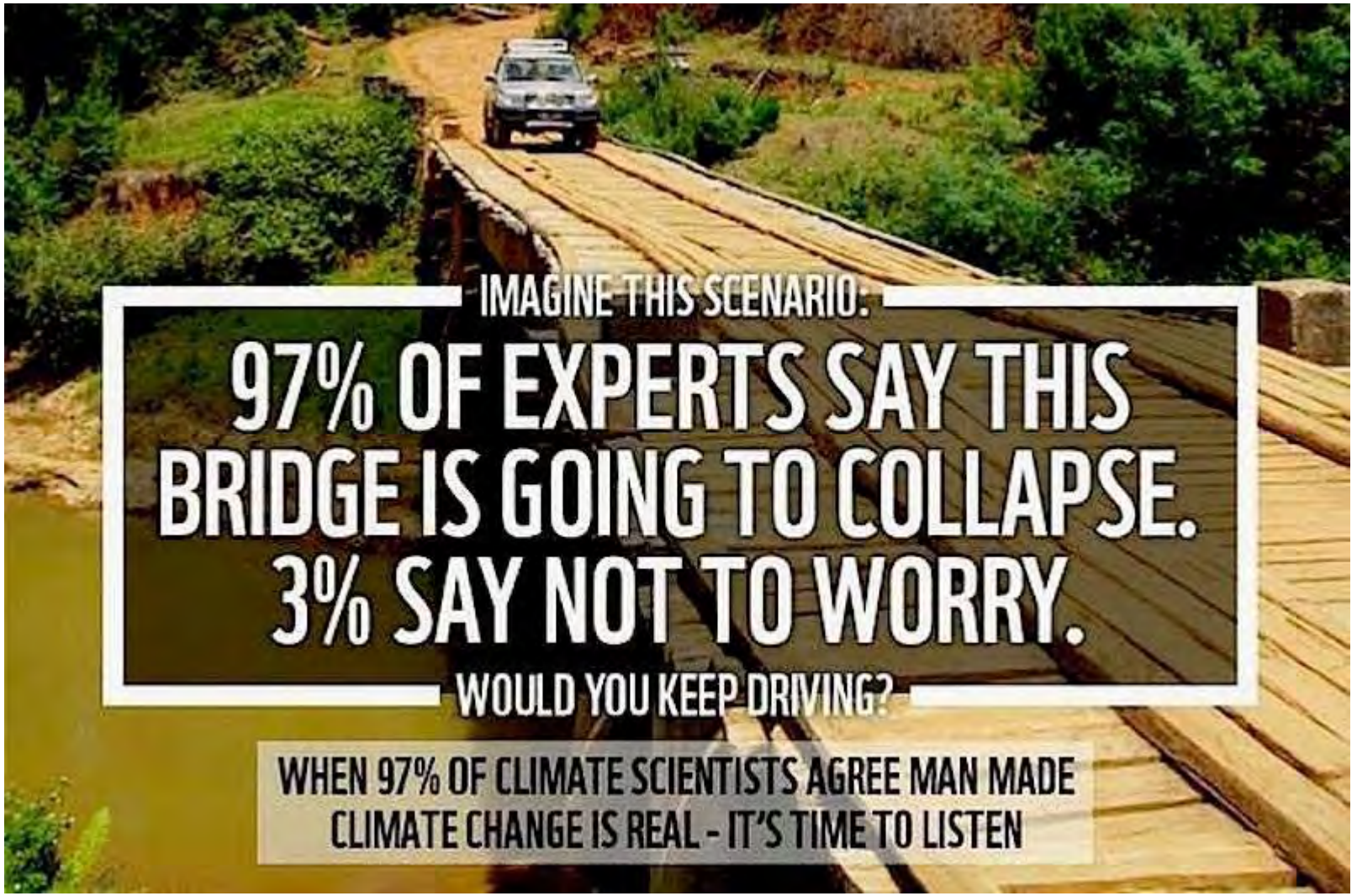
The Ozone Hole 2014

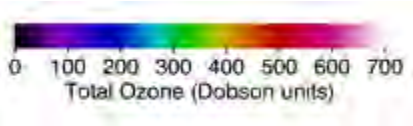


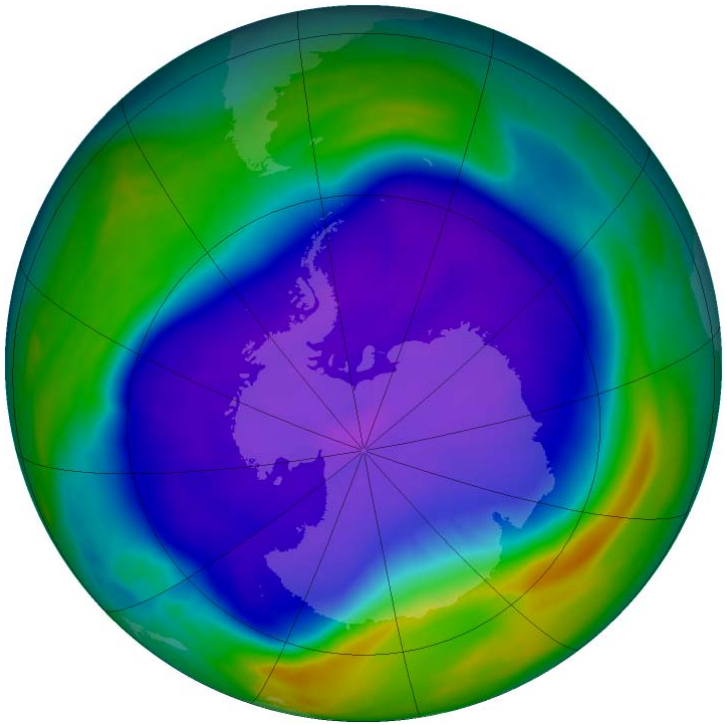
The Ozone Hole 2014

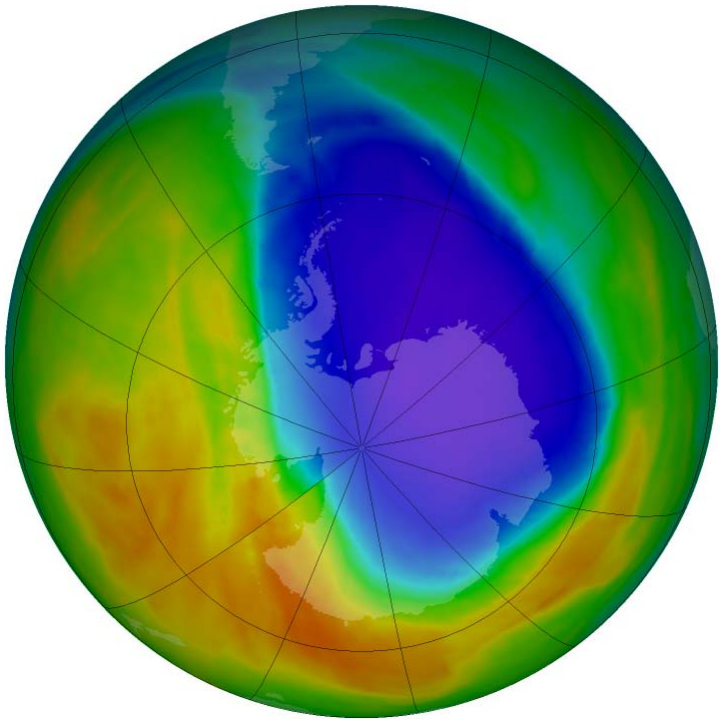


Ozone depletion solved and now on to climate change!









24.09.06
Largest ozone hole ever

11.10.14

Thanks