

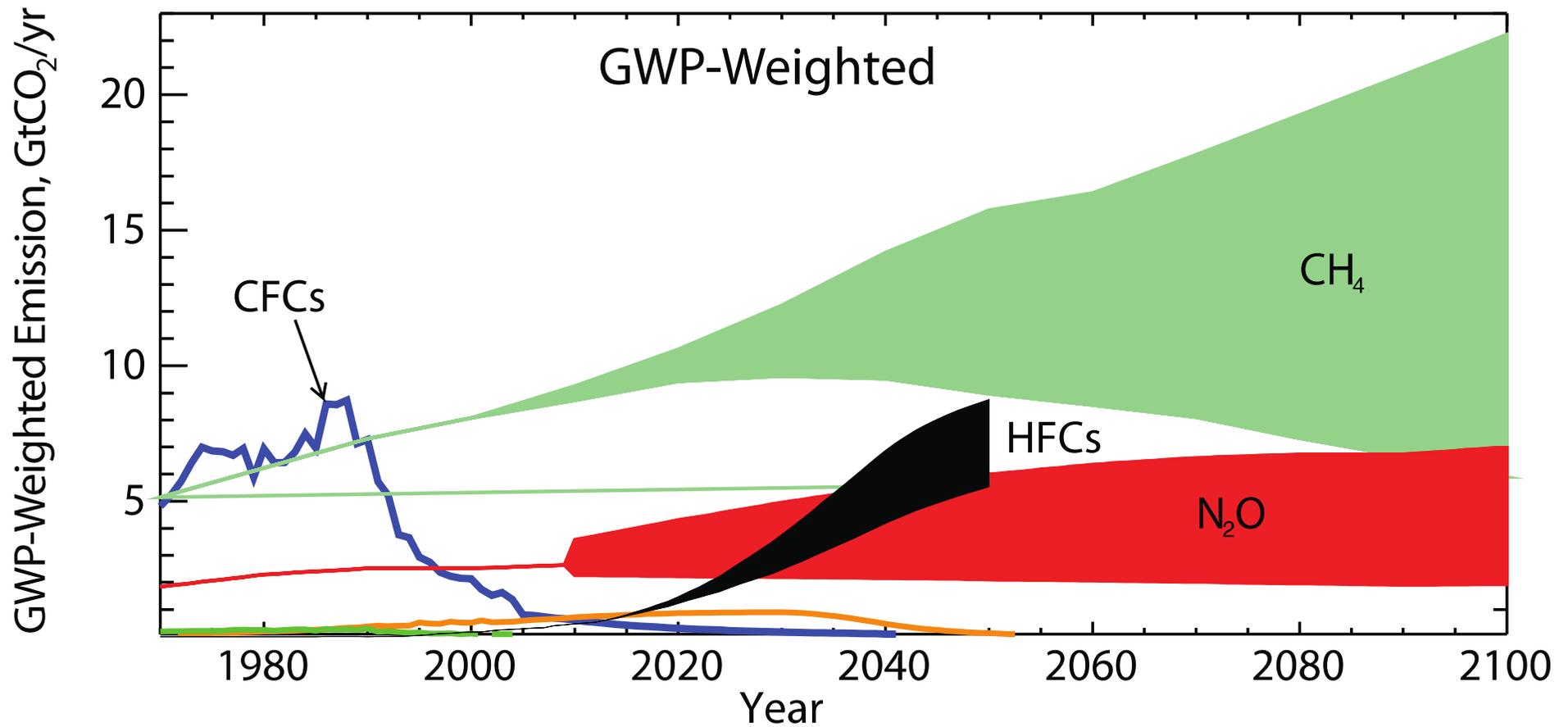


Nitrous oxide's ozone destructiveness under different climate scenarios

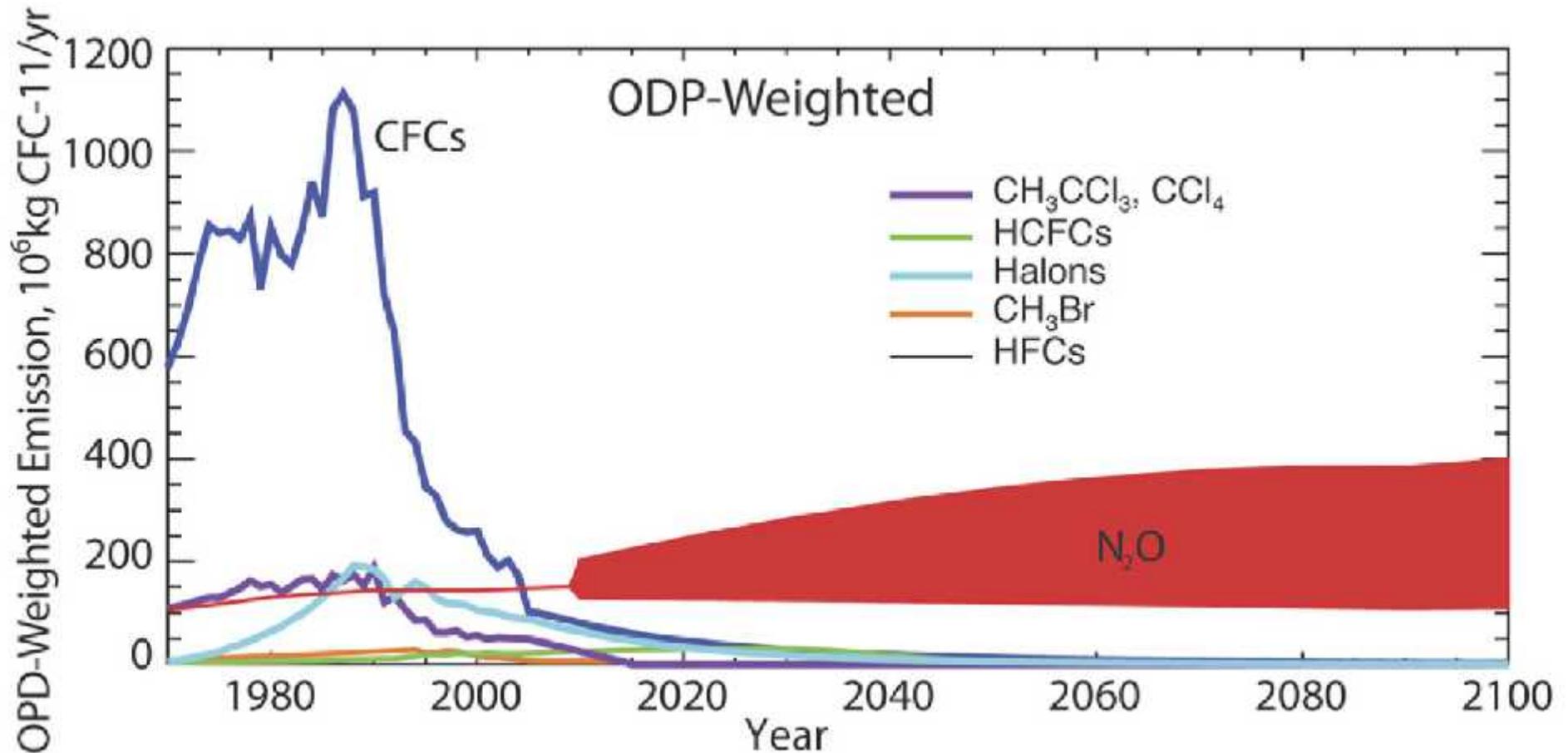
David R. Kanter¹, Sonali P. McDermid^{1,2}, Larissa Nazarenko²

1. Department of Environmental Studies, NYU
2. NASA Godard Institute for Space Studies

N₂O: A climate threat



A stratospheric ozone threat



Earth's Ozone Shield May Be Imperiled By More Fertilizer Use, Scientist Says

By JERRY E. BISHOP Staff Reporter of THE WALL STREET JOURNAL

Wall Street Journal (1923 - Current file); Nov 13, 1975;

ProQuest Historical Newspapers: The Wall Street Journal (1889-1994)

pg. 22

Earth's Ozone Shield May Be Imperiled By More Fertilizer Use, Scientist Says

By JERRY E. BISHOP

Staff Reporter of THE WALL STREET JOURNAL

ANN ARBOR, Mich. — The earth's protective shield of ozone high in the atmosphere may be imperiled by man's increasing use of chemical fertilizers as well as by his use of aerosol sprays, a Harvard University scientist suggested.

The ozone layer, composed of heavy molecules of oxygen, lies about 20 miles up and is what prevents some of the sun's more harmful ultraviolet rays from reaching the earth's surface. There is considerable concern and a raging controversy over theories that certain human activities are releasing chemicals that are damaging the ozone layer. If the ozone layer is thinned out it's argued, there will be a rise in ultraviolet radiation reaching the surface, causing an increase in skin cancer and as yet-unknown effects on plants, animals and weather.

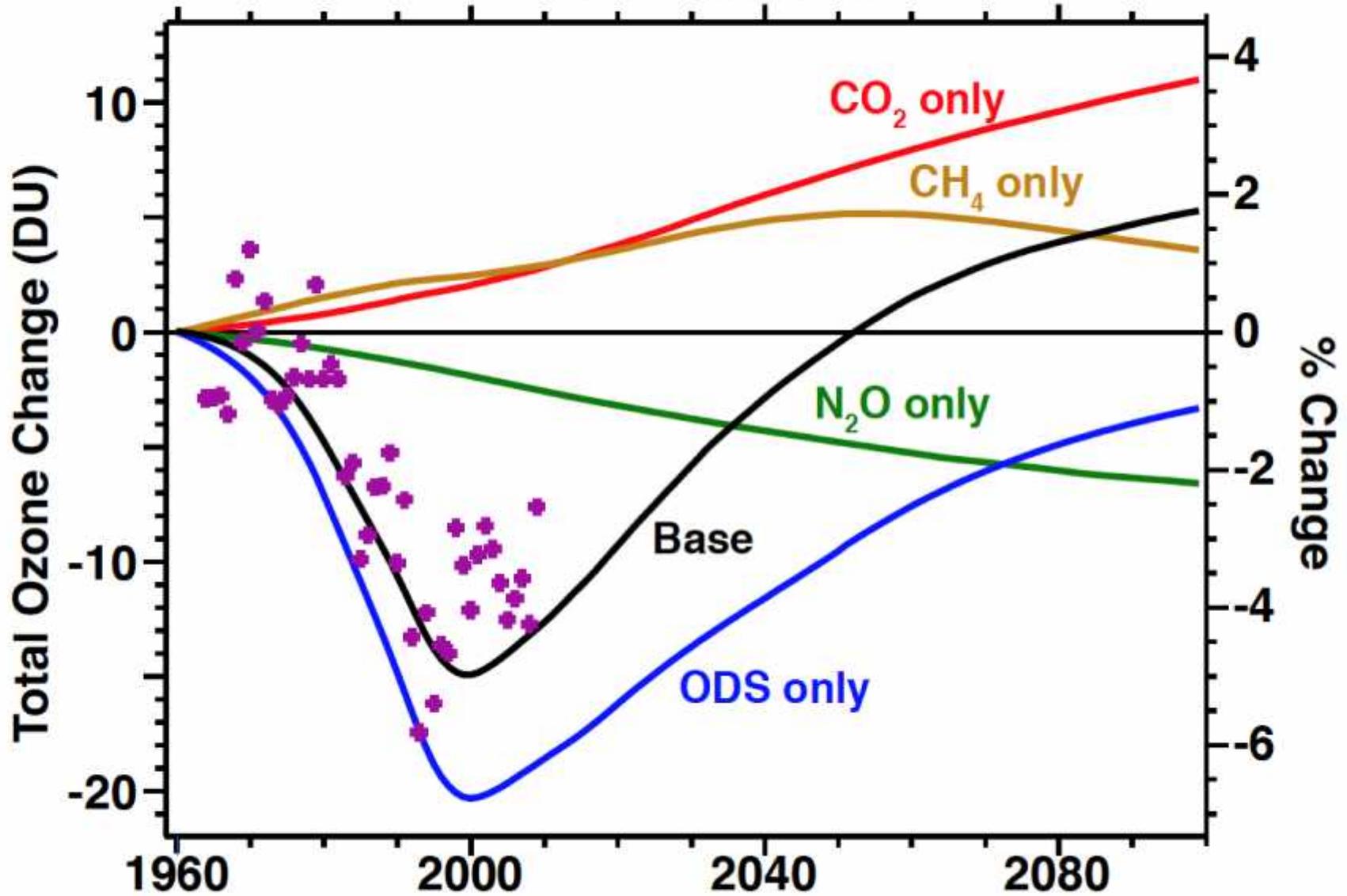
The controversy has focused largely on an argument that the man-made gases released in vast quantities by many pressur-

and started extracting too much nitrogen from the atmosphere, the natural denitrification process to return the nitrogen would be stepped up. In the process, the ozone layer would be decreased, permitting more of the destructive ultraviolet radiation to reach the surface and bring plant life under check, restoring the balance.

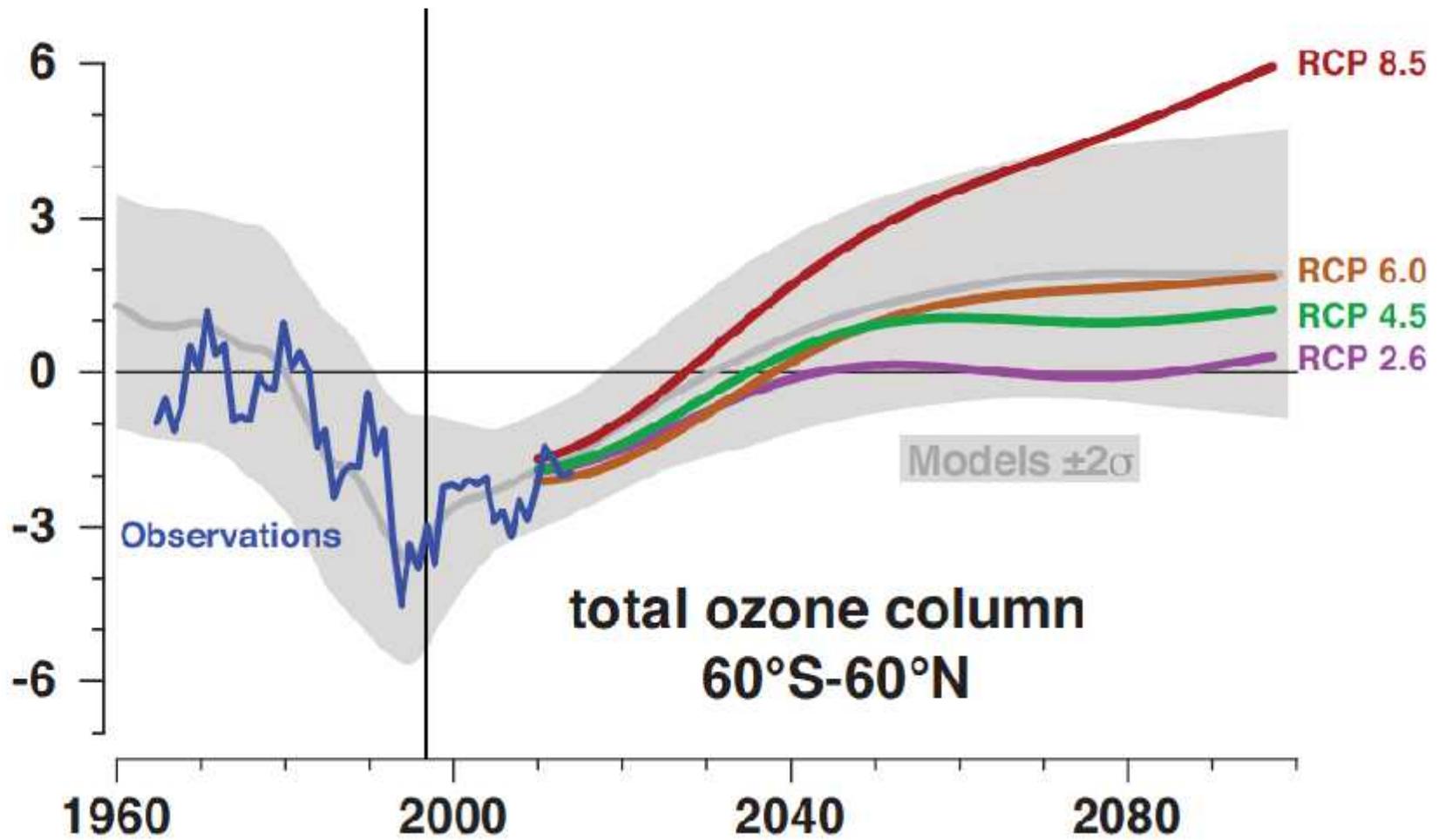
The new factor, Mr. McElroy argued, is the massive manufacture and use of man-made nitrogen fertilizers. To make the fertilizers, such as the nitrogen-rich ammonia fertilizers, the chemical factories extract nitrogen from the air. This nitrogen, of course, eventually goes into plant life.

Man currently is extracting nitrogen from the air and putting it into plants on a scale rivaling nature, Mr. McElroy said. Nitrogen for fertilizers jumped to 40 million tons a year in 1974 from one million tons in 1950. Production of nitrogen fertilizers by the year 2000 will reach 200 million tons a year, he said, equaling the amount extracted from the air by nature. In other

Global Total Ozone

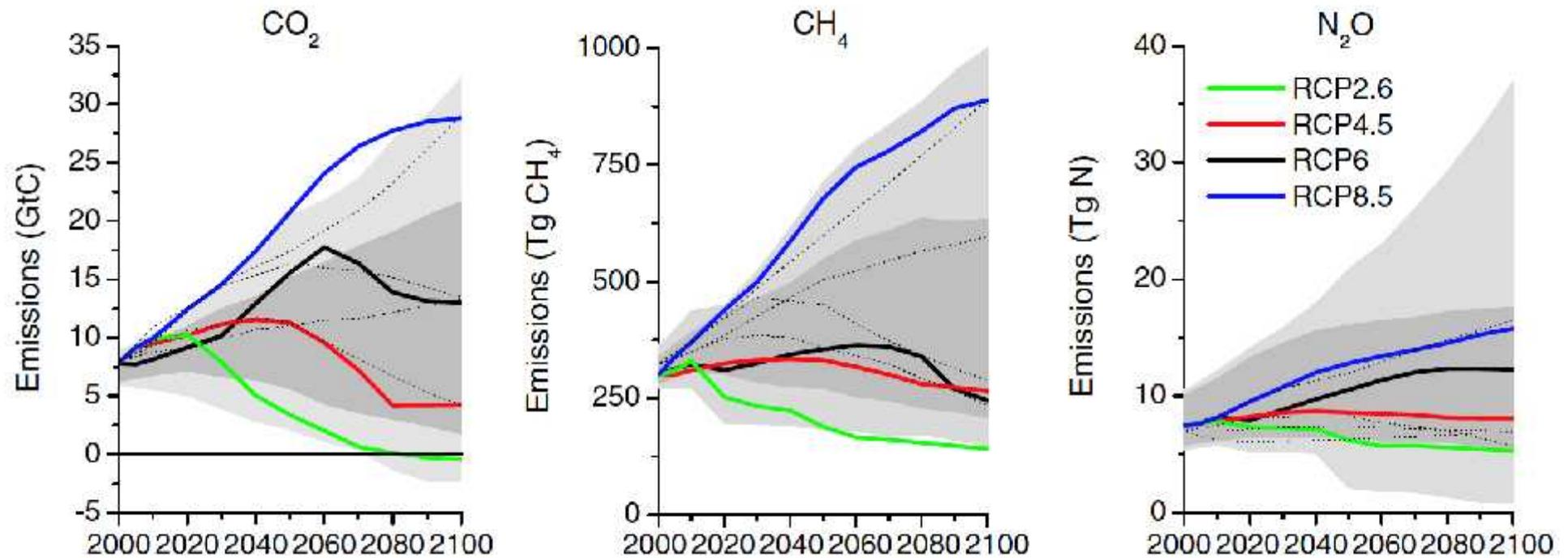


Total Ozone Column Change (%)



total ozone column
60°S-60°N

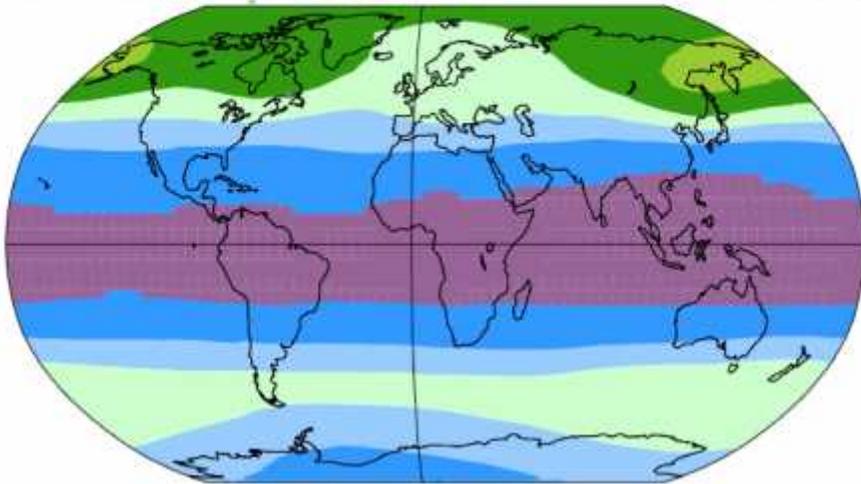
A range of climate futures



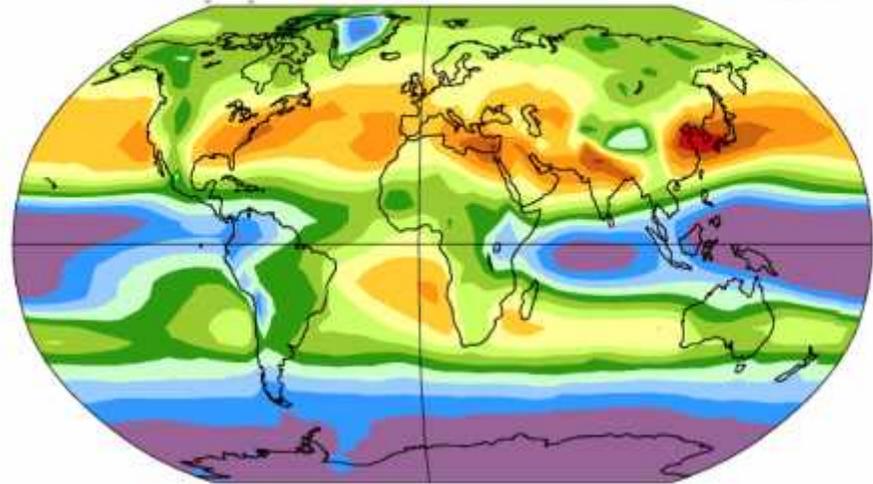
Experiment	N₂O	CO₂
1	RCP 2.6	RCP 2.6
2	RCP 2.6	RCP 4.5
3	RCP 2.6	RCP 6.0
4	RCP 2.6	RCP 8.5
5	RCP 4.5	RCP 2.6
6	RCP 4.5	RCP 4.5
7	RCP 4.5	RCP 6.0
8	RCP 4.5	RCP 8.5
9	RCP 6.0	RCP 2.6
10	RCP 6.0	RCP 4.5
11	RCP 6.0	RCP 6.0
12	RCP 6.0	RCP 8.5
13	RCP 8.5	RCP 2.6
14	RCP 8.5	RCP 4.5
15	RCP 8.5	RCP 6.0
16	RCP 8.5	RCP 8.5

E2-MERRA

253

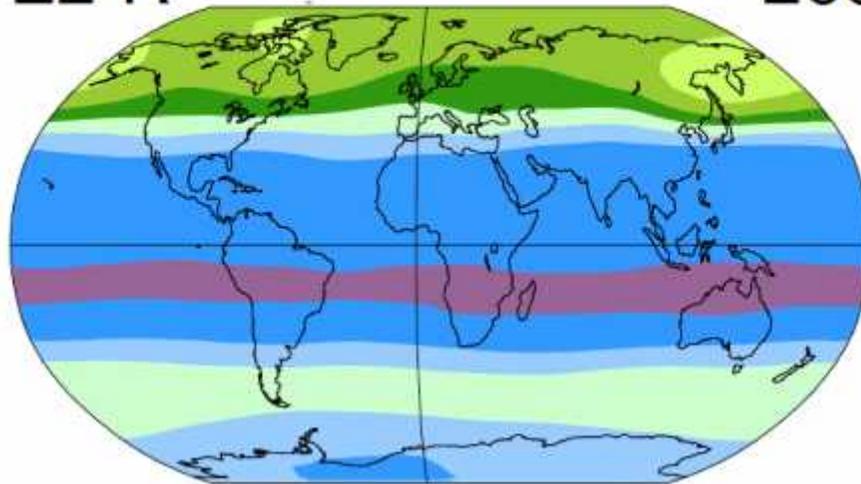


31.7

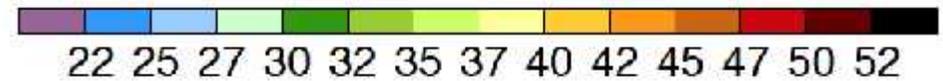
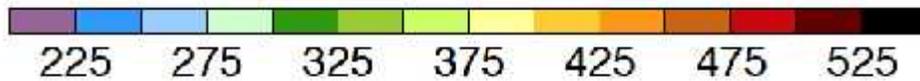
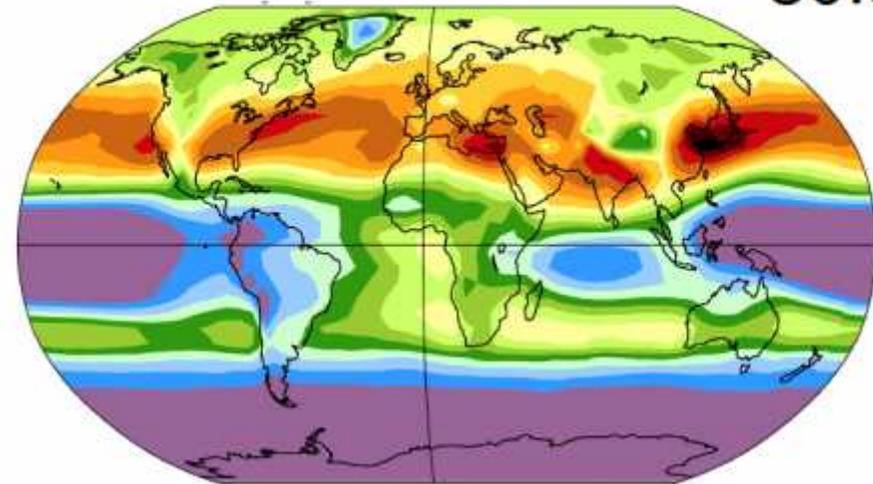


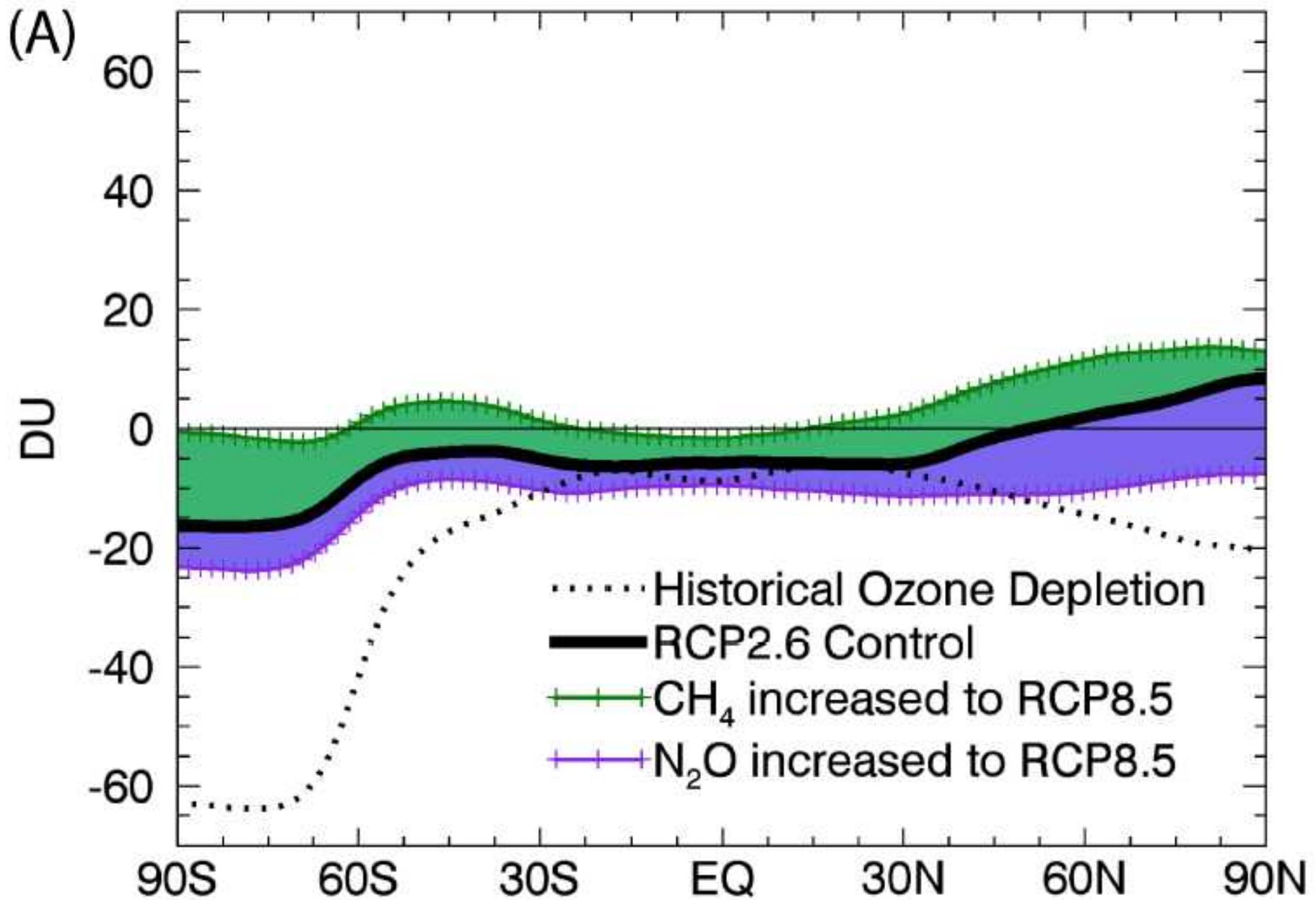
E2-R

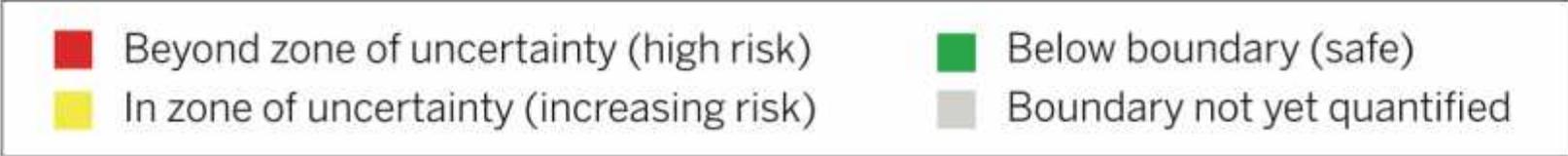
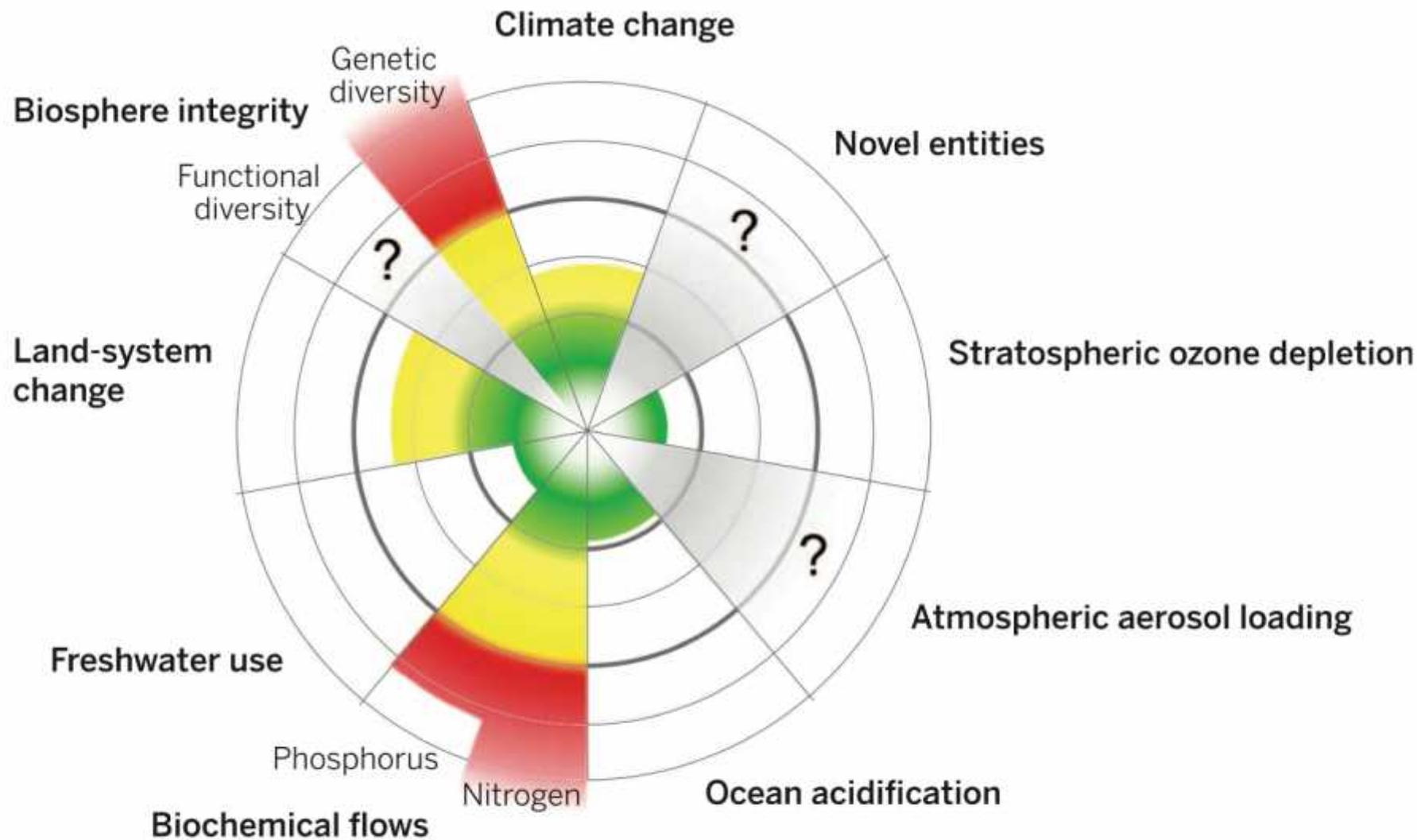
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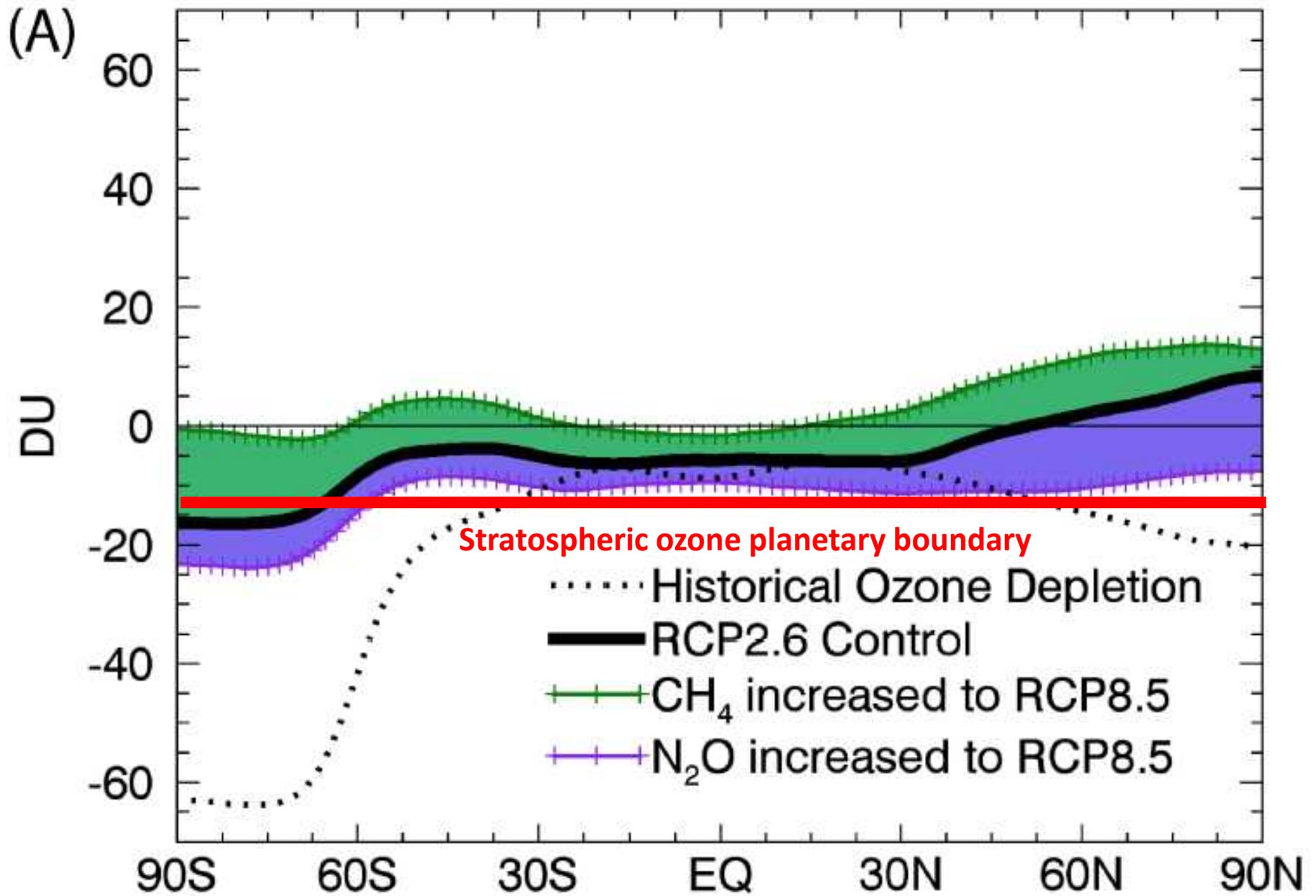


30.9





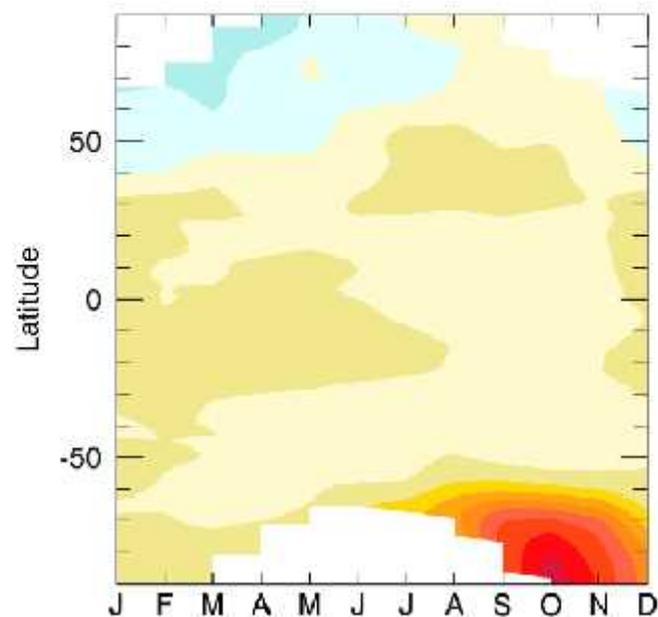




$N_2O = 344$ ppbv

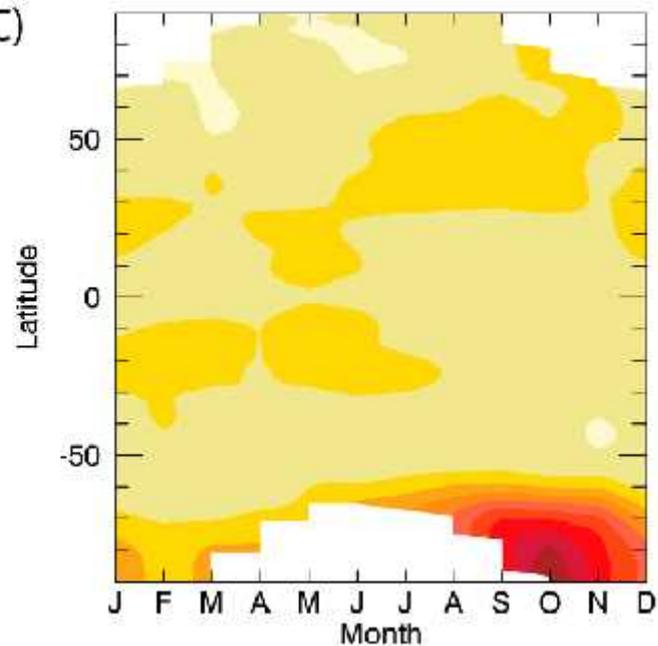
(A)

RCP 2.6



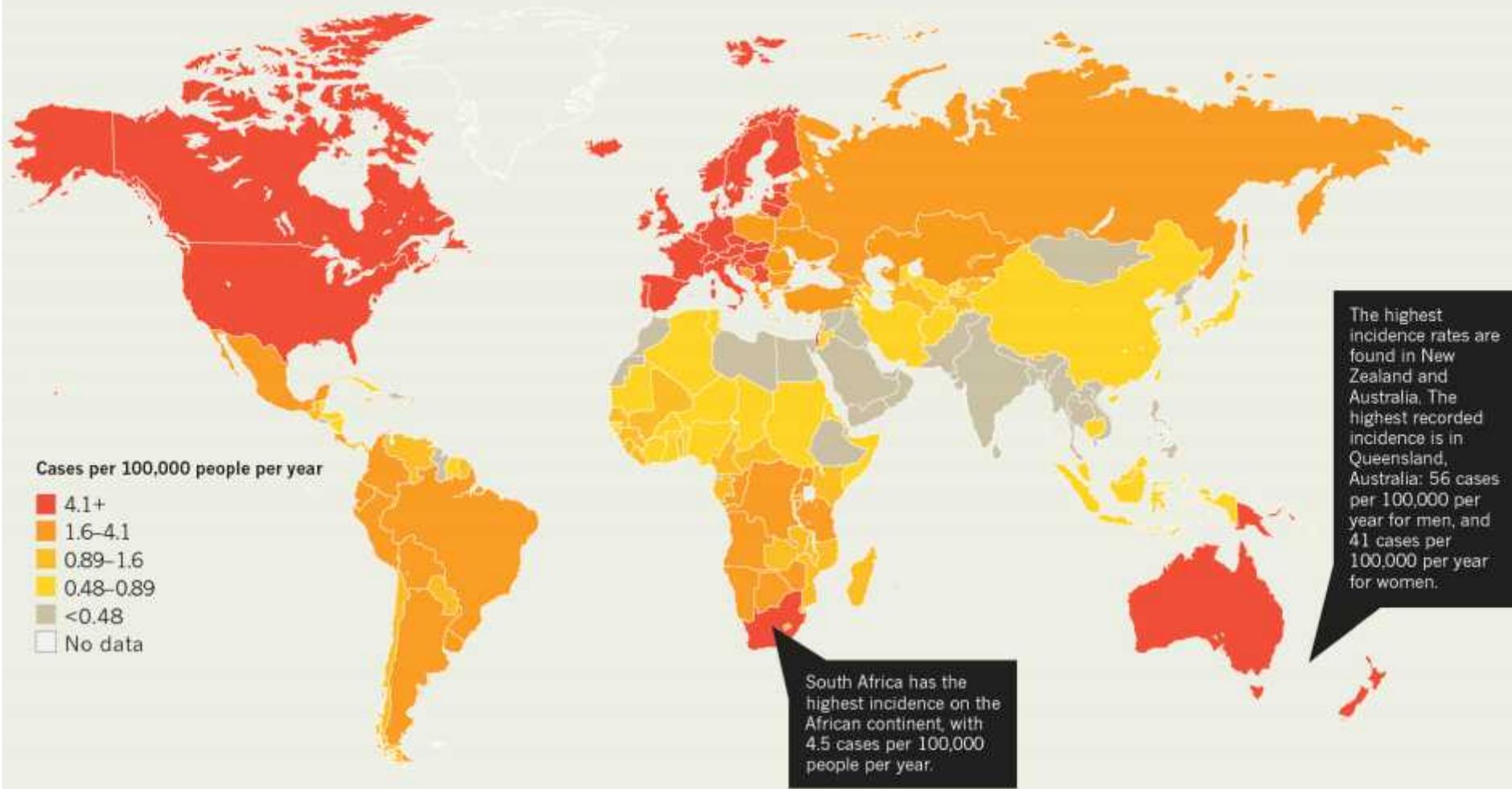
$N_2O = 428$ ppbv

(C)



22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
-2.5
-5.0
-7.5
-10.0
-12.5
-15.0
-17.5
-20.0
-22.5

THE CANCER THAT RISES WITH THE SUN



Conclusions

- N₂O's ozone destructiveness affected by a changing climate
- If climate policy focus is on CO₂ and CH₄, but not N₂O, could be worst possible outcome for stratospheric ozone layer
- In this scenario, planetary boundary for stratospheric ozone could be exceeded in certain regions
- Highlights importance of “all-of-the-above” climate mitigation strategies