Oxygen Earth Protocol: 2016 Overview of Coming Update for a Natural Remediation of the Ozone Layer and a Natural Restoration of Local Weather Patterns Leading to Cloud Cycling and Earth Cooling.

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Abstract

Two important issues not being addressed by current geoengineering activities which will continue to worsen are:
1. water vapor stagnation in the troposphere causing overheating, droughts and inclement weather impacts[1,2], and
2. intensive aerial operations emitting NOx, and CO, which deplete Ozone and Hydroxyl radicals which make up the important Chapman Cycle -and depletion of any allotrope or ion of oxygen at higher altitudes decreases UVB and UVC light blocking provided by Oxygen[1,2,4].

The following paper will discuss logistics of the application of a O ion and Di Oxygen restoration[1,3,] to the Polar Stratospheric regions from Canada and Australia and also regional air shed restorations of cloud cycling, promoting natural moisture nucleation, pollution scavenging, and heat removal which will alleviate drought, extreme weather events, and initiate climate cooling.

This remediation science was developed in 1997, published in a peer-reviewed journal in 2003, but the logistics for sourcing oxygen have been elusive until 2009. Prototype work has confirmed now that industrial CO_2 is the best bulk source of O ions and thus the economics of producing them, while capping the CO_2 and all other emissions while harvesting the O ions has been the focus of recent design work. Finally, initiating this protocol will cap CO_2 emissions in addition to providing this natural restoration infrastructure.

Introduction

Geochemistry that supported life on Earth has historically been biome friendly, leaving out toxic metals because of their obvious biotoxicity[6] and the natural geochemistry constraint is suggested as the only key to real and lasting climate stability. Natural geochemistry will have direct effects as opposed to proxy or partial effects and unwanted side effects like biotoxicity, partial warming feedbacks, and ozone layer damage[1,2]. Natural geochemistry has combined with meteorological phenomenon in reliable and predictable feedback cycles that are shown in the fossil record.

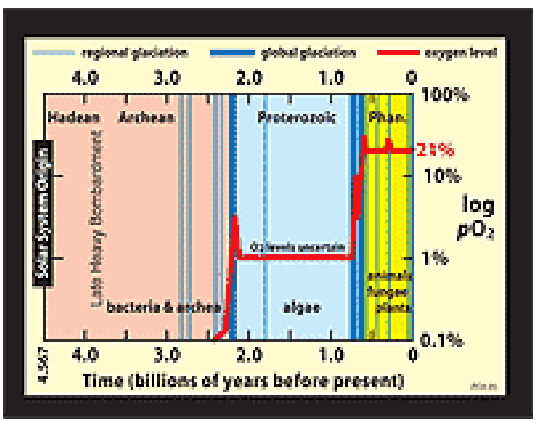

Figure 1. "13.2: Postulated rise in atmospheric oxygen over geologic time, and its relationship to ice ages (blue bars) and biospheric evolution. If the step-like rises in oxygen were rapid, consequent destruction of atmospheric methane (a powerful and potentially major greenhouse gas in the early atmosphere) could account for the Makganyene and Sturtian snowball earths. If the oxygen rises were slow (millions of years), methane destruction might be offset by CO2 rise modulated by silicate weathering feedback. The Marinoan snowball earth, coming <75 Myr after the Sturtian, is more difficult to attribute to methane destruction, requiring a methane-oxygen see-saw." [7]

Figure 1 shows the peer reviewed data on a chart for the geochemistry of oxygen as it ties to glaciation in the fossil records. Ice/snow albedo is considered the most important solar radiation reflection surface[8], thus, a lead measure for an oxygen and oxygen ion restoration to the Northern and Southern Ozone layers, Troposphere, and air sheds, would be the oxygen dosages at these points, and a lag measure would be the returning of ice cover as measured by satellites. The required infrastructure for the measurement of global and regional climate and weather is in place. The oxygen generation infrastructure development is early and ongoing. Fossil fuels generate CO2 that can be converted to oxygen for this purpose and is abundant from a conservation technology developed by a private firm[9].

A single oxygen ions has a -100 CO2 equivalent GWP (global Warming Potential) value and can drive down greenhouse gases by oxidizing them as they always have in the history of the Earth's system[10]. It is accurately described as a natural anti-aerosol agent.

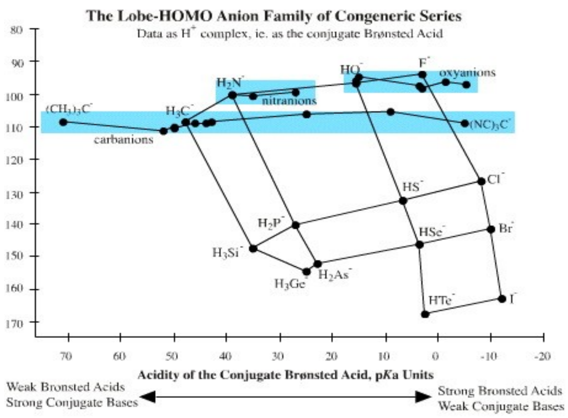

Figure 2. Standard reference diagram for anions.

Figure 2 indicates why CFC damage Ozone and Oxygen populations-F^- (Fluoride)is the most electronegative ion so the natural OH^- oxidants are overpowered. When an Oxygen ion contacts water, it forms $2OH^-$ and all associated oxyanions/hydro oxygen is infinitely soluble in water even at very low temperatures and high altitudes[1].

Oxygen Earth Protocol Road Map

Solar Radiation Correction

Accepting that an emergency oxygen based remediation will not remove Fluoride ions nor metallic oxide toxicity in the soils and the biome, the dosage is arrived at for two altitudes:
Firstly the polar stratospheres at a target altitude of 49-82,000 ft. and suited to the height of the Stratosphere at that time averaged mass of 5.1 x 10^{18}Kg, oxygen is 20% based on the mean molecular weight, giving 1 x 10^{18}Kg (10^{12} Megatonnes), and 0.000005% oxygen is applied, which is 1/100th of the mass needed if it is ions, 0.0005 of the mass likely missing due to combustion, multiplied by 19.9% of total mass of atmosphere, finally 1/3rd of the total mass (which is found missing in the holes), and comes to 16,666 Metric Tonnes. If additional factors such as Methane, CO, other high GWP gases, etc, oxidation are desired, then a stoichiometric calculation for those reactions can be applied[12],

Table 1 - Key Equations[2]

	Common Name	Equation	Global Warming Potential (CO_2e)		
			Inputs	Outputs	Net GWP reduction
1	Methane	$CH_4 + H_2O + 3O^{2-} \rightarrow CO_2 + 3H_2O$	1t CH_4 = GWP 21	2.44t CO_2e	18
2	Nitrous Oxide	$N_2O + 3O^{2-} + H_2O \rightarrow N_2O_4 + H_2O \rightarrow 2HNO_3 + O$	1t N_2O = GWP 310	0t CO_2e	310
3	Perflouromethane	$CF_4 + 6O^{2-} \rightarrow CO_2 + 2OF_2$	1t CF_4 = GWP 6,500	0.50t CO_2e	6,499
4	Perflouroethane	$C_2F_6 + 7O^{2-} \rightarrow 2\ CO_2 + 3OF_2$	1t C_2F_6 = GWP 9,200	0.64t CO_2e	9,199
5	Sulphur Hexaflouride	$SF_6 + 5O^{2-} \rightarrow SO_2 + 3OF_2$	1t SF_6 = GWP 23,900	0t CO_2e	23,900
6	HFC-23	$CHF_3 + 6\ O^{-2} \rightarrow CO_2 + H_2O + 2OF_2$	1t HFC -23 = GWP 11,700	0.63t CO2e	11,699
7	HFC-134a	$CHF_3CH_2F + 8\ O^{-2} \rightarrow 2CO_2 + 2OF_2 + 2H_2O$	1t HFC-134a = GWP 1,300	0.85t CO2e	1,299
8	HFC-152a	$CH_3CHF_2 + 8\ O^{-2} \rightarrow 2CO_2 + 2H_2O + OF_2$	1t HFC-152a = GWP 140	0.66t CO2e	139
9	CFC-11	CFCl3 + 9 O^{-2} → CO2+ OF2 +3CLO2	1t CFC-11 = 3,800	0.32t CO2e	3,799
10	Nitrogen Triflouride	$2NF_3 + 6O^{2-} \rightarrow 2NO_2 + 2OF_2$	12t NF_3= GWP 12,300	0t CO_2e	12,300
11	CFC-12	$CCl_2F_2 + 5O^{2-} \rightarrow CO_2 + Cl_2 + 2OF_2$	1t CCl_2F_2 = GWP 8,100	0.36t CO_2e	8,099.64
12	CFC-13	$CF_3Cl + 6\ O^{-2} \rightarrow CO_2 + 2OF_2 + ClO_2$	1t CFC-13 = GWP 10,800	0.42t CO2e	10,799
13	CFC-113	$CF_2ClCFCl_2 + 11\ O^{-2} \rightarrow 2CO_2 + 2OF_2 + 2ClO_2$	1t CFC-113 = GWP 4,800	0.47t CO2e	4,799
14	CFC-114	$CF_2ClCF_2Cl + 10\ O^{-2} \rightarrow 2CO_2 + 2ClO_2 + 2OF_2$	1t CFC-114 = GWP 8,040	0.51t CO2e	8,049
15	CFC-115	$CF_3CF_2Cl + 9\ O^{-2} \rightarrow 2CO_2 + ClO_2, + 2OF_2$	1t CFC-115 = GWP 5,310	0.57t CO2e	5,309
16	Carbon Tetrachloride	$CCl_4 + 9\ O^{-2} \rightarrow CO_2 + 2ClO_2$	1t CCl4 = GWP 1,400	0.28t CO2e	1,399
17	Methyl Chloroform	$CH_3CCl_3 + 12\ O^{-2} \rightarrow 2CO_2 + 2H_2O, + 2ClO_2$	1t CH3CCl3 = GWP 506	0.66t CO2e	505
18	HCFC-22	$CH_3CFCl2 + 11\ O^{-2} \rightarrow 2CO_2 + 2H_2O + OF_2 + 2ClO_2$	1t HCFC – 22 =GWP 1,500	0.75t CO2e	1,499
19	HCFC-141b	$CH_2CF_2Cl + 9\ O^{-2} \rightarrow 2CO_2 + 2H_2O + OF_2 + ClO_2$	1t HCFC-141b = GWP 2,250	0.76t CO2e	2,249
20	HCFC-142b	$2CHClF_2 + 5O^{2-} \rightarrow CO_2 + ClO + OF_2 + H_2O$	1t HCFC-142b = GWP 1,800	0.25t CO2e	1,799
21	Halon-1211	$CF_3Br + 6\ O^{-2} \rightarrow CO_2 + 2OF_2 + BrO_2$	1t Halon-1211 = GWP 4,750	0.29t CO2e	4,749
22	Halon-1301	$CF_2BrCF_2Br + 10\ O^{-2} \rightarrow 2CO_2 + OF_2 + 2BrO_2$	1t Halon-1301 = GWP 5,400	0.16t CO2e	5,399
23	Halon-2402	$CF_2ClBr + 7\ O^{-2} \rightarrow CO_2 + OF_2 + ClO_2 + BrO_2$	1t Halon-2402 = GWP 3,680	0.27t CO2e	3,679

Table 1. Direct excerpt from reference 12. Gives examples of the stoichiometry of high GWP gases which are also ODS (Ozone Depleting Substances generally).

The maximum payload of a Boeing 737 jet is 16,505 Kg.[13], thus approximately 1,010 sorties would be the baseline restoration flight plan for both polar Stratospheric regions, before other chemistry is considered. The $5 per Kilogram cost is estimated based upon the one known point source of oxygen- industrial stacks. The airlift cost has been estimated for these altitudes at $5US per Kilogram[14], giving a total of $10US/Kg. Which is a total direct cost of $165,050,000.00 to remediate the Ozone layer at the poles. The indirect and soft cost to ensure locating, commissioning and international coordination should be factored in once a the start-up plan is setup. Initially the equivalent of 10 sorties should be budgeted for small scale validation. The direct cost for validation is estimated at $10 million US and could be completed in less than 3 years depending mainly on all the prerequisites of all the governments and agencies that would be involved.

General Regional Remediation With Oxygen

These are possible and will be validated, but in order to validate these, the Ozone layer must be functioning optimally for any meaningful or lasting impacts to be realized. Because the Ozone layer is damaged, it is asserted that all synthetic geoengineering and synthetic solar radiation management operations' benefits are temporally short lived. These measures will never solve the root causes of global warming and persistent ozone hole formation but will exacerbate these and other human/biological costs and waste precious resources.[1,3,10,12]

Re-cited References

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