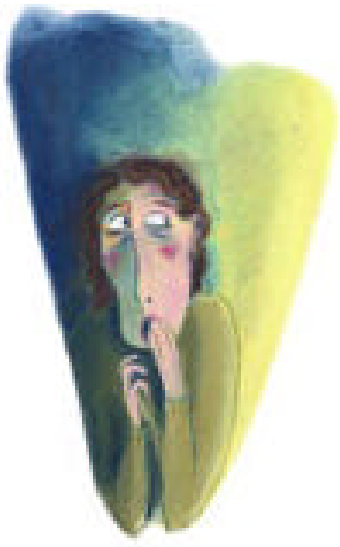
ScareWatch

"Oxygen Scarcity Threatens Humankind"

August 18, 2008



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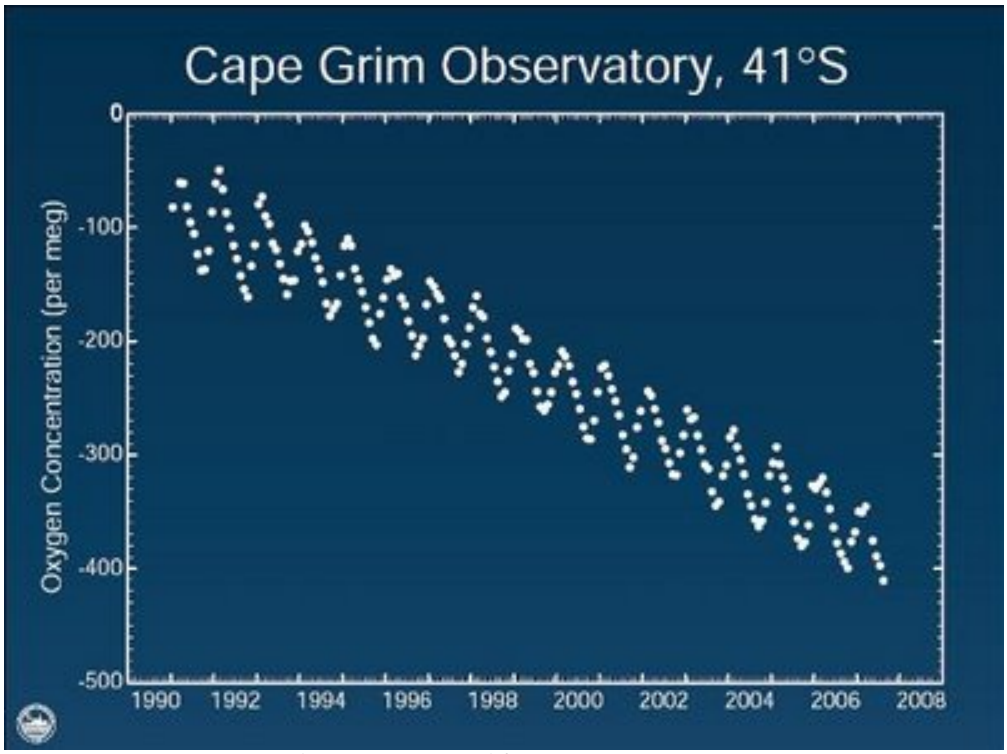
"Oxygen scarcity threatens humankind"

The scare: As the peer-reviewed literature is filled with a growing proportion of learned papers demolishing the imagined "consensus" that anthropogenic "global warming" will prove "catastrophic", the less serious newspapers are looking for new scares to peddle to the feeble-minded. In mid-August 2008, *The Guardian,* Britain's silliest newspaper, printed an article by Peter Tatchell suggesting that the world's oxygen is running out because of humankind's use of fossil fuels.



Atmospheric oxygen trend from Cape Grim, Tasmania.

Tatchell says: "Little or no attention is being paid to the long-term fall in oxygen concentrations and its knock-on effects. Compared to prehistoric times, the level of oxygen in the Earth's atmosphere has declined by over a third and in polluted cities the decline may be more than 50%. … Much of this recent, accelerated change is down to human activity, notably the industrial revolution and the burning of fossil fuels. … This change in the makeup of the air we breathe has potentially serious implications for our health. Indeed, it could ultimately threaten the survival of human life on earth. …"

The truth: Dr. Roy Spencer, of the University of Alabama at Huntsville, says: "The O_2 concentration of the atmosphere has been measured off and on for about 100 years now, and the concentration, at 20.95%, has not varied within the accuracy of the measurements. Only in recent years have more precise measurement techniques been developed, and the tiny decrease in O_2 with increasing CO_2 has

been actually measured. But I believe the O_2 concentration is still close to 20.95%. There is so much O_2 in the atmosphere, it is believed not to be substantially affected by vegetation, but it is the result of geochemistry in deep-ocean sediments. No one really knows for sure. Since too much O_2 is not good for humans, the human body keeps O_2 concentrations down to around 5% in our major organs. Extra O_2 can give you a burst of energy, but it will harm you (or kill you) if the exposure is too long. It has been estimated that global wildfire risk would increase greatly if O_2 concentrations were much more than they are now. To say that there is an impending 'oxygen crisis' on Earth is the epitome of fear-mongering."

Professor Roy Watts, of www.wattsupwiththat.com, adds: "This is the sort of story I would expect in the supermarket tabloids next to a picture of Bat Boy. For the UK Guardian to say there is a 'oxygen crisis', is not only ignorant of the facts, but simple fear-mongering riding on the coat-tails of the 'CO_2 crisis'. … I really wish the media would do a better job of researching and reporting science stories. This example from the Guardian shows how bad science and bad reporting combine to create fear-mongering."

Dr. Lubos Motl, a physicist, has posted a detailed comment on the Tatchell article on his blog. He says:

"The reality is, of course, that the oxygen percentage in the atmosphere has been 20.94 or 20.95 percent for thousands of years and probably much longer than that. The amount of oxygen in the atmosphere is so huge that the biosphere (and fossil fuels which used to belong to the biosphere as well) is completely unable to change this amount significantly.

"It may be useful to mention that the oxygen is only 1/5 of the atmosphere and the atmosphere is just 1/1,200,000 of the mass of the Earth. However, the Earth is very heavy, 6×10^{24} kg, so the mass of the oxygen in the atmosphere is something like 10^{18} kilograms – about 150,000 tons per capita. We could not burn that much oxygen even if everyone in the world were using a private jet on a daily basis.

"There is a simpler way to see that man-made changes to the oxygen levels are trivial and we will look at it now. For a schoolboy who is not skipping his science classes at elementary school, it shouldn't be difficult to see why we can't significantly influence the amount of oxygen in the atmosphere. How can he do it? Well, he must realize that virtually all processes related to life and human activity – breathing (by animals and plants) and burning (combustion) – exchange the atmospheric O_2 molecules for CO_2 molecules or vice versa. Sometimes one needs two O2 molecules and only produces one CO_2 molecule, but this subtlety won't change our final result significantly.

"Virtually all other compounds participating in the relevant chemical reactions are either liquids or solids, which is why they don't influence the composition of the atmosphere and we can ignore them.

"When you realize what the words above mean, you will see that the man-made decrease of O_2 is controlled by the increase of carbon dioxide: they're inseparably linked to one another. The human activity has increased the CO_2 concentration from 280 ppm two centuries ago to 385 ppm today (the schoolboy should have seen these elementary numbers during his 'CO_2 crisis' classes). Because many people don't know what the acronym ppm (parts per million) really means, even if they like to use it, let me tell you that it is the same thing as 0.0001%.

"So the carbon dioxide went from 0.028% to 0.038%: the difference is 0.01%, or one-ten-thousandth, of the volume of the atmosphere. Because O_2 and CO_2 molecules occupy the same volume at a given pressure and a given temperature (since $pV = NkT$), the decrease of O_2 should be equal to the increase

of CO_2 if the molecules were exchanged for one another: the oxygen should drop by 0.01% of the volume of the atmosphere.

“As we have already mentioned, two oxygen molecules are replaced in typical "combustion" chemical reactions for one carbon dioxide molecule, so the oxygen drop might be 0.02% instead of 0.01%. However, in the long run, there exist other processes besides the combustion-like processes involving CO_2 that we have considered – for example, processes involving deep ocean sediments – and these processes tend to restore the oxygen levels (as well as the CO_2 levels).

“At any rate, you see that the oxygen level couldn’t have decreased by more than 0.01% or so, from 20.95% to 20.94%, which is pretty much exactly what was observed. We needed centuries or millenia to achieve this modest effect. It is very clear that even if we burned all forests, plants, animals, and fossil fuels in the world, we couldn't get the oxygen levels below 20% (and maybe not even 20.9%).

“Does the tiny decrease of oxygen levels change some important things? It doesn’t. The most ‘spectacular’ change is that the wildfire risk decreases by something like 0.01%, too (and maybe slightly more), as the oxygen levels drop. Because wildfires are somewhat unpopular and their decrease would be good news, you won’t read about it.

“At any rate, all these changes are negligible given the tiny change in O_2 levels.

”Tatchell writes: ‘I am not a scientist, but this seems a reasonable concern.’ Reasonable to whom? To me, worries about the ‘oxygen crisis’ seems to be a ticket for someone to be sent to a mental asylum. The point here is not whether Tatchell is a scientist: he's clearly not. The question is whether he is a dangerous enough weirdo to be isolated from society.

“We can’t change the oxygen level in any significant way. Incidentally, while the overall amount of oxygen in the atmosphere is essentially constant, the amount of oxygen in various organisms varies dramatically. For example, the human body must keep the concentration of this harmful-if-too-abundant gas around 5% in most organs. This optimal percentage depends on the life forms, which is why the varying percentage of oxygen in amber – a point mentioned by Tatchell – says absolutely nothing about the overall O_2 volume.

“Men have been able to change the overall carbon dioxide concentrations measurably because it is a trace gas: there was almost none to start with, so it is easy to change its volume by relatively large amounts, proportionally speaking. But oxygen is one of the gases that the Earth's atmosphere has been made out of for 0.5 or even 2.5 billion years. You can’t change that. …

“Tatchell writes a lot of other incredible nonsense, for example that the oxygen in cities is much (by 15%) lower than it is in the countryside. He probably believes that the pressure drops from 1000 to 900 millibars in cities. …

”Is there someone at *The Guardian* who has some common sense left? Could you please stop printing insane people like Peter Tatchell who help to transform your daily into an expensive and dirty piece of toilet paper?”

Professor Wallace Broecker of Columbia University has written:

"An oft-heard warning with regard to our planet's future is that by cutting back tropical forests we put our supply of oxygen gas at risk. Many good reasons exist for placing deforestation near the top of our list of environmental sins, but fortunately the fate of the Earth's O_2 supply does not hang in the balance. Simply put, our atmosphere is endowed with such an enormous reserve of this gas that even if we were to burn all our fossil fuel reserves, all our trees, and all the organic matter stored in soils, we would use up only a few percent of the available O_2. No matter how foolishly we treat our environmental heritage, we simply don't have the capacity to put more than a small dent in our O_2 supply. Furthermore, the Earth's forests do not play a dominant role in maintaining O_2 reserves, because they consume just as much of this gas as they produce. In the tropics, ants, termites, bacteria, and fungi eat nearly the entire photosynthetic O_2 product. Only a tiny fraction of the organic matter they produce accumulates in swamps and soils or is carried down the rivers for burial on the sea floor.

"While no danger exists that our O_2 reserve will be depleted, nevertheless the O_2 content of our atmosphere is slowly declining–so slowly that a sufficiently accurate technique to measure this change wasn't developed until the late 1980s. Ralph Keeling, its developer, showed that between 1989 and 1994 the O_2 content of the atmosphere decreased at an average annual rate of 2 parts per million. Considering that the atmosphere contains 210,000 parts per million, one can see why this measurement proved so difficult.

"This drop was not unexpected, for the combustion of fossil fuels destroys O_2. For each 100 atoms of fossil-fuel carbon burned, about 140 molecules of O_2 are consumed. The surprise came when Keeling's measurements showed that the rate of decline of O_2 was only about two-thirds of that attributable to fossil-fuel combustion during this period. Only one explanation can be given for this observation: Losses of biomass through deforestation must have been outweighed by a fattening of biomass elsewhere, termed global "greening" by geochemists. Although the details as to just how and where remain obscure, the buildup of extra CO_2 in our atmosphere and of extra fixed nitrogen in our soils probably allows plants to grow a bit faster than before, leading to a greater storage of carbon in tree wood and soil humus. For each atom of extra carbon stored in this way, roughly one molecule of extra oxygen accumulates in the atmosphere."

Finally, here is what Dr. Ray Langenfelds from CSIRO Atmospheric Research, Australia, has to say about the graph of the decline in atmospheric O_2 at Cape Grim: "The changes we are measuring represent just a tiny fraction of the total amount of oxygen in our air - 20.95 percent by volume. The oxygen reduction is just 0.03 percent in the past 20 years and has no impact on our breathing. Typical oxygen fluctuations indoors or in city air would be far greater than this." **End of scare.**