'Planetary sunshade' could strip ozone layer by 76% 19:00 24 April 2008

NewScientist.com news service

Catherine Brahic

Planetary engineering projects to cool the planet could backfire quite spectacularly: a new model shows that a "sulphate sunshade" would punch huge holes through the ozone layer above the Arctic.

To make matters worse, it would also delay the full recovery of the Antarctic ozone hole by up to 70 years.

Pumping tiny sulphate particles into the atmosphere to create a sunshield that would keep the planet cool was first suggested as a solution to global warming by Edward Teller, a physicist best known for his involvement in the development of the hydrogen bomb.

Simone Tilmes of the National Center for Atmospheric Research in Colorado, US, used computer models to see how a sulphate sunshade would affect the ozone layer, which protects us from harmful UV rays. She says it could have "a drastic impact".

Tilmes modelled two different scenarios: one in which "large" particles measuring 0.43 microns in diameter are used, and one where the particles are two-and-a-half times...
Cooling effect

Sulphate particles catalyse the breakdown of ozone molecules by chlorine atoms. Western economies have almost entirely stopped using chlorine-based coolants called CFCs, thanks to the Montreal Protocol. However, such substances are increasingly being used in Asia and the atmosphere is still full of CFCs emitted during the 20th century.

In January 2008, researchers described how much of each type of sulphate particle would need to be injected into the stratosphere in order to compensate for a doubling in atmospheric carbon dioxide concentration (Geophysical Research Letters, DOI: 10.1029/2007GL032179). Tilmes used these volumes in her computer models.

She found that injections of small particles over the next 20 years could wintertime ozone layer over the Arctic by between 22 and 76%. Large particles, which would have less of a cooling effect, according to previous research, would still reduce Arctic ozone by 15 to 50% during the winter.

In the Antarctic, the injections would delay the recovery of the existing ozone hole by 30 to 70 years.

Cancer increase

A thinner ozone layer – popularly known as an ozone "hole" – lets more through, which can cause an increase in the incidence of various cancer. According to NASA, a 1% decrease in the ozone layer can cause an estimated 2% increase in UV-B irradiation, leading to a 4% increase in basal carcinoma, the most common form of skin cancer.

In 2007, Ken Caldeira of the Carnegie Institution of Washington in the US found that if a sulphate sunshield were deployed and then removed – for instance, because of a change in governments – the effects of global warming after removal would be far worse than before the sunshield.

Caldeira has also found that a sunshade could cause severe drought.

Journal reference: Science (DOI: 10.1126/science.1153966)

Climate Change – Want to know more about global warming – the science, impacts and political debate? Visit our continually updated special report.
Ozone Layer
By Paul Emeny
Thu Apr 24 20:24:49 BST 2008
Has anyone thought that the seeding of atmosphere by russians for m parades has had an effect on ozone layer. Is there any way to extrap data to see if this has had an effect.
REPORT | REPLY

Question About Atmospheric Co2
By Rob
Thu Apr 24 21:18:15 BST 2008
It has always seemed intuitive to me that there could be a way to seq CO2 from the atmosphere. Is it feasable to send up molecules into the atmohsere that would either bind to or react to CO2, creating either a l molecule that would fall to the earth or perhaps 2 less harmful molecu Can anyone speak to this idea/set me straight?
REPORT | REPLY

Question About Atmospheric Co2
By Gapthemind
Thu Apr 24 22:28:28 BST 2008
The idea is that CO2 is a stable molecule, so it takes energy to separate it out into one carbon and 2 oxygen atoms. To summon this kind of energy, we'd need to burn fuel, which would inherently be less than 100% efficient, and therefore would release more CO2 into the atmosphere than it uses up.

An alternative is to use a non-fossil source of energy, like the sun, that nature already does that. Research into the energy efficiencies of various organisms makes me suppose that plants are about as efficient at turning the environment into plants as anything could ever get. Of course a plant's goals aren't our goals, so CO2 sequestration gains might be genetically engineered. That's in the future, though.

So the simple for-now answer is.. Plant some plants.
Question About Atmospheric CO2
By Soylent
Tue Apr 29 08:40:46 BST 2008

6 billion tonnes of coal per year is ~20 billion tonnes of CO2. That's around 4 000 cubic miles of CO2 at standard temperature and pressure that you need to capture and shove into an hole somewhere and hope it doesn't come back up. And you need to do so at a handful of dollars per tonne and without using a whole lot of energy.

Leaving the coal in the ground and using nuclear fission for electricity might be a saner approach.

REPORT | REPLY

Acid Rain
By Ugly American
Thu Apr 24 21:44:11 BST 2008

Sulphates precipitate out as acid rain.

REPORT | REPLY

Acid Rain
By Ecoeng
Thu Apr 24 22:16:40 BST 2008

Most sulfates precipitate out as ammonium sulfate and are not acid.

REPORT | REPLY

Acid Rain
By Toxophilomaniac
Fri Apr 25 13:21:09 BST 2008

Sorry, but you are slightly incorrect. Ammonium sulphate is the product of a weak base (ammonium hydroxide) and a strong acid (sulphuric acid), and as such will return a slightly acidic solution.

REPORT | REPLY

Acid Rain
By Ugly American
Mon Apr 28 09:01:39 BST 2008

That's misleading. Ammonium sulfate decomposes to sulfuric acid.
in both soil and water. It's even used commercially to acidify alkaline soil.

The problem is lowering the pH of lakes and even coastal waterways has already caused severe disruption in the ecosystem. It's not that adult fish dissolve - it's that the things they eat never hatch.

PS - worldwide fish yield peaked in 1987 and we can see the dead zones from space

REPORT | REPLY

There are 19 comments on 3 pages

There are 19 comments on 3 pages

Report | Reply

All comments should respect the New Scientist House Rules. If you think a particular comment breaks these rules then please use the "Report" link in that comment to report us.

If you are having a technical problem posting a comment, please contact technical support.

Related Articles

'Sunshade' for global warming could cause drought
Solar shield could be quick fix for global warming

Web Links

Simone Tilmes, NCAR
Ken Caldeira, Carnegie Institution of Washington

≥ For exclusive news and expert analysis every week subscribe to New Scientist Print Edition
≥ For what's in New Scientist magazine this week see contents
≥ Search all stories
≥ Contact us about this story
≥ Sign up for our free newsletter
'Planetary sunshade' could strip ozone layer by 76% - earth - 24 April 2008 - New Scientist Enviro...