

# Global dimming

## – the new global warming?

**The world has woken up to the reality of a new global danger to our climate caused by human activity. The realisation follows a number of research publications and, in the UK, a BBC Horizon programme.**

Global dimming is a gradual reduction in the amount of sunlight reaching the earth's surface since the 1950s. The effect varies across the world but on average is around 10% over the last 40 years. It affects the growth of crops and its cooling effect may have led scientists to underestimate the effect of greenhouse gases on global warming. The true effect, without dimming, could be twice as much as previously thought.

### What causes it?

It is probably due to the increased presence of aerosols and other particulates - from burning coal, oil and wood, transportation - in the atmosphere. There are also natural causes: volcanoes, wind-blown dust and natural fires. Water droplets in clouds coalesce around the particles, increasing their size and making them reflect more sunlight back into space. Clouds intercept both heat from the sun and heat radiated from the earth. During the day they will cool the earth's surface but at night they keep it warmer. The overall 24-hour effect will depend on the location and type of cloud.

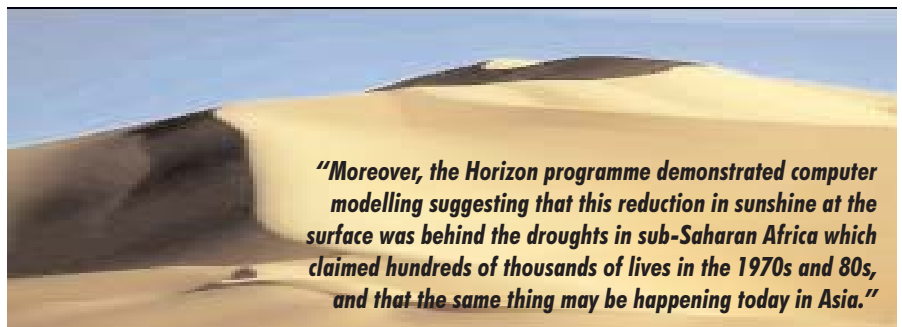
### What's the evidence?

Independent research in Israel and Netherlands in the late 1980s showed an apparent reduction in the amount of sunlight despite the temperatures rising. The rate of dimming varies around the world but on average is estimated at around 2-3% per decade. Evidence of the effect of contrails from aircraft was confirmed by research post-9/11 when US aircraft were grounded for three days. An increase in diurnal

temperature variation of over one degree C was observed.

Experiments in the Maldives (comparing the atmosphere over the northern and southern islands) in the 1990s showed that the effect of macroscopic pollutants in the atmosphere at that time (blown south from India) caused about a 10% reduction in sunlight reaching the surface in the area under the pollution cloud - much greater than expected from the presence of the particles themselves.

Reduced sunlight affects the quality and quantity of light received by plants, and therefore the size and quality of crops.



***“Moreover, the Horizon programme demonstrated computer modelling suggesting that this reduction in sunshine at the surface was behind the droughts in sub-Saharan Africa which claimed hundreds of thousands of lives in the 1970s and 80s, and that the same thing may be happening today in Asia.”***

A 10% reduction of sunlight globally could therefore imply a severe impact on our ability to feed our growing population.

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"My main concern is that global dimming is also having a detrimental impact on the Asian monsoon," says Professor Veerhabhadran Ramanathan, professor of climate and atmospheric sciences at the University of California, San Diego.

### How does it affect global warming?

Initial work to build the effects of global dimming into models projecting global warming suggest that world temperatures may rise by 2°C by 2030, and as much as 10°C by 2100, double the current widely accepted figure. European data from 1990 onwards shows that chemical scrubbing of exhaust gases from power plants and catalytic converters has improved air quality, but it's presumed this inadvertently caused the rise in average temperatures in Europe in the early 2000s that resulted in forest fires in Portugal, nearly 15,000 heat-related deaths in France, and increased the melting of alpine glaciers during the summer of 2003.

According to the producer of the Horizon programme, David Sington, "there is still a very large range in the estimates of the cooling effect of dimming - by up to a factor of four. What seems to have been established already, however, is that the cooling effect of dimming is far larger than previously thought. This may explain why the world has not already warmed more strongly - the cooling effect of particle pollution has been offsetting the warming from carbon dioxide. If this is true, then we are in for far faster warming in the future as particle emissions are brought under control while greenhouse gas emissions continue to rise."

Link: [www.bbc.co.uk/sn/tvradio/programmes/horizon/dimming\\_prog\\_summary.shtml](http://www.bbc.co.uk/sn/tvradio/programmes/horizon/dimming_prog_summary.shtml)

## Dimming and climate models

**UK Climate Impacts Programme's Director Chris West says that "most of the processes thought to be responsible for global dimming were already included in the modelling for the UKCIP02 scenarios. Soot, which is important for global dimming, is not included in the UKCIP02 model, but is not thought to be important for climate change".**

**He says the Hadley Centre model used for the UKCIP02 scenarios does show global dimming over the past few decades, but this is not as great as the observed dimming. "This is one of a number of uncertainties the climate modelling community is working hard to address. The underestimation and effect of global dimming might be minor when**

**compared to other uncertainties in the modelling - note that this is currently unknown. It is possible that all climate models (Hadley Centre and others) underestimate the effect of dimming to some extent."**

**For a technical note on uncertainty and UKCIP02, go to [www.metoffice.com/research/hadleycentre/pubs/HCTN/HCTN\\_44.pdf](http://www.metoffice.com/research/hadleycentre/pubs/HCTN/HCTN_44.pdf).**