

# A decline in fog and haze clears the air and fuels warming in Europe

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## CLEARING SOME AIR OVER WARMING IN EUROPE

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A decline in fog and haze clears the air but also fuels 20 percent of the warming in Europe, a new study concludes

By Sid Perkins

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A substantial part of the long–term warming seen in Europe during recent decades is the result of a decline in the region's pollution and fog, a new study suggests.

Aerosols—tiny particles or droplets suspended in the atmosphere, such as fog, smoke and various pollutants scatter light and cut down on visibility. But aerosols also scatter incoming radiation from the sun back into space, thereby cooling the atmosphere just above the ground level, says Pascal Yiou, an atmospheric scientist at the Laboratory of Climate Sciences and the Environment in Gif–sur–Yvette, France. Yiou and his colleagues recently studied the link between aerosols and cooling by analyzing temperature and daytime visibility data gathered at 342 weather stations throughout Europe from the late 1970s through 2006.

During those three decades, visibility has improved substantially, the researchers report online January 18 in *Nature Geoscience*. In part, the air is clear because of pollution control measures.

For example, today Europe experiences, on average, about nine fewer days with visibility of two kilometers or less during fall and winter months than it did three decades ago. In spring and summer, the continent's weather stations see, on average, three fewer days with visibility two kilometers or less. Each decline is about 50 percent over the three–decade interval, Yiou notes.

Similarly large declines have been measured in the number of days with visibility five kilometers or less and days with visibility eight kilometers or less visibility, the researchers note.

Comparing data taken at weather stations located within 100 kilometers of each other, the researchers found that the temperature at a locale where the visibility was less than two kilometers was also typically about 2 degrees Celsius lower than the temperature where visibility extended more than 15 kilometers.

This long–term decline in aerosol concentration over Europe has therefore led to an increase in warming on the continent, the researchers say. Altogether, data suggest that average temperatures have warmed about 0.08 degrees Celsius per decade since the 1970s—between 10 and 20 percent of the total warming observed during

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that period, Yiou and his colleagues report. The rest of the warming stemmed from other factors, such as changes in weather patterns and the increased concentration of greenhouse gases such as carbon dioxide.

In eastern Europe, where air pollution was particularly bad before the fall of the Soviet Union in 1991 devastated economies there, the long-term decrease in aerosols accounts for about 50 percent of the warming seen in the last three decades, the researchers estimate.

The new findings quantifying the cooling effect of aerosols could improve climate models, which now typically don't include such effects, says Yiou.

This is an interesting paper, and the results are reasonable, says Jeffrey Gaffney, an atmospheric scientist at the University of Arkansas in Little Rock. But, is this [study] the complete answer? he continues. Probably not, he notes, because the analyses didn't distinguish between the light-colored sulfate aerosols commonly associated with emissions from coal-fired power plants, which have an overall cooling effect, and the darker, smoky aerosols generated by burning wood and other biomass, which can have a warming effect.

Nevertheless, he adds, the team's analyses set the stage for further studies that will help scientists assess the overall effect of various aerosols on Earth's climate.