

# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

## Is pollution affecting precipitation?

By Darin Langerud

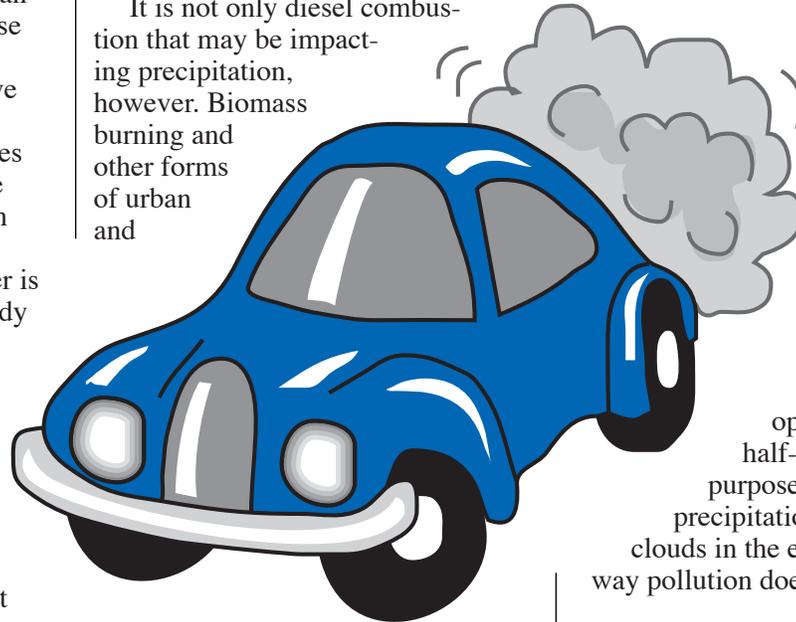
For years scientists have contemplated the potential impacts of man on his environment. Some of these concerns, such as global warming and the polar ozone hole, have recently come to the forefront of public consciousness. These issues are being attributed largely to the introduction of man-made carbon dioxide and chlorofluorocarbons into the atmosphere. Now another is gaining attention and could already be having profound, adverse impacts on precipitation around the world.

Recently published research has strongly indicated that pollution, primarily very fine particulates, is producing a negative impact on natural precipitation. It is hypothesized that this pollution is reducing precipitation efficiencies as these particles distribute a clouds' water over too many small, uniformly-sized droplets (or ice crystals) making them either slower, or unable to coalesce and grow to sufficient size to fall to the ground as precipitation.

Recent work published in the *Journal of Applied Meteorology* has suggested that large-scale pollution is having a negative effect on precipitation on the upwind side of mountain barriers in California and Israel. The scientists surmise that the primary culprit is the combustion of diesel fuel, which produces tremendous numbers of very small particulates, leading to precipitation inefficiencies when ingested into clouds and cloud systems. Their estimate of

annual precipitation loss due to pollution is 15 to 25 percent!

It is not only diesel combustion that may be impacting precipitation, however. Biomass burning and other forms of urban and



industrial pollution have also been shown to cause similar effects on clouds, reducing their ability to produce precipitation efficiently.

Evaluations of satellite data suggest pollution can completely shut off precipitation from clouds with relatively warm cloud-top temperatures. The research here suggests that not only are areas downwind of urban centers susceptible to these effects, but areas where persistent biomass burning occurs are susceptible as well.

With so many regions around the globe becoming more vulnerable to water shortages and drought, these preliminary findings are ominous. Additional research would improve our understanding and quantification

of this problem and perhaps elucidate technologies to mitigate, or even reverse their effects.

An obvious tie exists here with the field of planned weather modification, where technologies have been developed over the last half-century for the purpose of enhancing precipitation, by acting on clouds in the exact opposite way pollution does.

The North American Interstate Weather Modification Council and Weather Modification Association are pursuing federal funds for research in these areas. Further research in both planned and inadvertent weather modification would be mutually beneficial and serve as a catalyst for addressing a significant and growing water-resource problem worldwide.

Atmospheric Resource Board  
North Dakota State Water Commission  
900 East Boulevard, Bismarck, ND 58505  
(701) 328-2788  
[www.swc.state.nd.us/ARB/](http://www.swc.state.nd.us/ARB/)  
ND Weather Modification Association  
PO Box 2599, Bismarck, ND 58502  
(701) 223-4232