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For immediate release:
March 17, 2009

Carnegie Mellon Researchers Apply Statistical Tests To Find Sources of Particulate Matter Reaching the Heart of Pittsburgh

PITTSBURGH—Carnegie Mellon University’s Cliff I. Davidson, Joseph B. Kadane and Nanjun Chu have found that polluted air in the highly populated East End areas of Pittsburgh are more affected by major sources to the city’s southeast than previously thought.

Because more than three-quarters of particulate matter found in the city originates from outside the Pittsburgh urban area — mainly to the west — the importance of certain air quality sources had not been quantified in the past.

However, the new study shows that the most polluted days often occur when the winds are from the southeast, when emissions from the U.S. Steel plants add to the regional background to raise PM (particulate matter) levels over the National Air Quality Standard.

“Those southeast winds are helping pollutants from the Clairton and Edgar Thompson works hitch a ride right into our backyards,” said Davidson, a professor of civil and environmental engineering and engineering and public policy at Carnegie Mellon.

Pittsburgh’s history and buildings are stained with soot from steel and coal-burning home furnaces and locomotives, but pollution controls over the past decade have helped remove much of the visible dust and soot from the air. Still, interest in tiny, almost invisible PM2.5 particles ballooned in the early 1990s, when studies showed a correlation between these particles and dangerous health effects, including respiratory problems.

In last month’s prestigious Environmental, Science & Technology magazine, Davidson’s research team said that by using statistical methods incorporating wind speed and wind direction at 10-minute intervals for a full year, they can help track the source of PM2.5. Their research also found that the number of days when concentration exceeds 35 micrograms of PM2.5 per cubic meter of air in the city’s

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Kadane, the Leonard J. Savage University Professor of Statistics and Social Science at Carnegie Mellon, said the data was collected between July 2001 and September 2002 using a device that measured 10-minute average PM2.5 concentrations for a full year. The monitoring station was located on a hill in Schenley Park, adjacent to Carnegie Mellon and about six miles east of downtown Pittsburgh.

“The winds measured at this location were representative of regional winds without being affected by local topography,” said Chu, a graduate student in Carnegie Mellon’s Department of Statistics.

The research team is studying the impacts of these and other sources on Pittsburgh’s air quality.

“The low elevations of emissions from the U.S. Steel plants could contribute to the concentrations we see in the East End, but we need to do further studies,” Davidson said. “The demise of the steel industry contributed to great improvements in Pittsburgh’s air quality, but there are still hot spots where emissions can contribute to levels of PM2.5 over the federal standard.”

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