Sea salt worsens coastal air pollution: study

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Air pollution in the world's busiest ports and shipping regions may be markedly worse than previously suspected, according to a new study showing that industrial and shipping pollution is exacerbated when it combines with sunshine and salty sea air.

In a paper published in this week's advance online edition of the journal *Nature Geoscience*, a team of researchers that included University of Calgary chemistry professor Hans Osthoff report that the disturbing phenomenon substantially raises the levels of ground-level ozone and other pollutants in coastal areas.

"We found unexpectedly high levels of certain air pollutants where pollution from cities and ships meets salt in the ocean air along the southeast coast of the United States," said Osthoff, who joined the U of C's Department of Chemistry last August. "It only makes sense that this is a problem everywhere industrial pollution meets the ocean, as is the case in many of the largest cities around the world. It also changes our view of the chemical transformations that occur in ship engine exhaust plumes, and tells us that emissions from marine vessels may be polluting the globe to a greater extent than currently estimated."

Dr. Osthoff was part of a National Oceanic and Atmospheric Administration (NOAA) team that spent six weeks monitoring air quality in busy shipping areas off the southeastern coast of the United States between Charleston, South Carolina and Houston, Texas, in the summer of 2006. The researchers found unexpectedly high levels of nitryl chloride ($ClNO_2$), a chemical long suspected to be involved in

ground-level ozone production along the coast.

They then determined that the compound is efficiently produced at night by the reaction of the nitrogen oxide N_2O_5 in polluted air with chloride from sea salt. With the help of sunlight, the chemical then splits into radicals that accelerate production of ozone and, potentially, fine particulate matter, which are the main components of air pollution. Their findings also show that up to 30 per cent of the ground-level ozone present in seaside cities such as Houston may be the result of pollution mixing with salt from ocean mist.

Dr. Osthoff intends to continue to work on halogen compounds at the University of Calgary.

"The Texas study covered only a very limited geographic area. We would like to find out to what extent this chemistry affects air quality in other regions, for example, the the Greater Vancouver area, or the Arctic," he said. "Our study indicates that halide salts such as chloride or bromide, which have been thought of as being relatively inert, may be playing a much greater role overall in the lower atmosphere."

The paper "High levels of nitryl chloride in the polluted subtropical marine boundary layer" is available in the April 6, 2008 advance online edition of the journal *Nature Geoscience* at: www.nature.com/ngeo/journal/va … /ncurrent/index.html . The print version is scheduled to appear on May 1st, 2008.

Source: University of Calgary