

Cold winters mean more pollution

February 22 2011



The air quality in Gothenburg is linked to differences in air pressure over the North Atlantic. Credit: University of Gothenburg

Differences in air pressure over the North Atlantic have meant that the last two winters in Gothenburg, Sweden, have been extremely cold. This has led to the air in Gothenburg being more polluted with nitrogen oxides than ever before. A new study from the University of Gothenburg shows that there is a strong link between climate and air pollution.

The [winter weather](#) in Gothenburg and large parts of North-West Europe is partly down to the [North Atlantic Oscillation](#) (NAO), in other words the differences in [air pressure](#) over the North Atlantic. The NAO swings between positive and negative phases depending on the differences in air pressure between Iceland and the Azores. When the NAO is in a negative phase – as has been the case during the last two winters – the city has cold winters because the low pressure sits over southern Europe,

while cold air from the polar region or Siberia sits over northern Europe.

In a study carried out in Gothenburg, a group of researchers from the University of Gothenburg investigated how the concentrations of nitrogen oxides (NO and NO₂) in the air can be linked to the weather. Published in the scientific journal *Atmospheric Environment*, the study shows that the air quality standard has been exceeded more and more frequently during periods of a negative NAO even though emissions have fallen in the city centre since 2000 according to official measurements from the Environmental Administration.

"These extremely cold winters in Gothenburg, with high cold air, bring a clear deterioration in air quality," says Maria Grundström from the University of Gothenburg's Department of Plant and Environmental Sciences, one of the researchers behind the study. "With typical Gothenburg weather – low air pressure with precipitation and strong winds – the air pollution is dispersed more quickly on account of better air mixing."

Air mixing is often poor in Gothenburg during the months when the NAO is negative. This means that [air pollution](#) emitted at ground level accumulates and that the air quality becomes very poor. During the winter months of 1997 to 2006, concentrations of [nitrogen oxides](#) were around 18% higher during months when the NAO was negative than when it was positive.

Air quality standards for nitrogen dioxide (NO₂) were exceeded far more often when the NAO was in a negative phase. The researchers refer, for example, to the fact that the number of exceedances of the hourly limit for nitrogen dioxide (90 µg/m³) increased. This can be linked to the fact that the NAO has tended increasingly to be in a negative phase during the winter months over the last two years.

The study was carried out by Maria Grundström, Jenny Klingberg and Håkan Pleijel from the Department of Plant and Environmental Sciences at the University of Gothenburg, and [climate](#) researcher Hans Linderholm from the Department of Earth Sciences at the University of Gothenburg.

Provided by University of Gothenburg

Citation: Cold winters mean more pollution (2011, February 22) retrieved 11 May 2024 from <https://phys.org/news/2011-02-cold-winters-pollution.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.