In what scientists are calling a success story for air-quality controls, levels of ozone pollution, which have been increasing since the beginning of the 19th century, appear to now be flattening out worldwide, according to a new study led by a researcher at the Cooperative Institute for Research in Environmental Sciences (CIRES).

“In the lower atmosphere, ozone concentrations have doubled since the Industrial Revolution in the Northern Hemisphere’s mid-latitudes,” said CIRES atmospheric scientist and lead author Samuel Oltmans, working at the Global Monitoring Division at NOAA’s Earth System Research Laboratory. “But over the last couple decades, those increases have essentially stopped, and in some places, such as North America and Western Europe, we’re even seeing declines.”

Ozone pollution occurs in the lower atmosphere and is the main component of smog. Exposure to ozone can worsen asthma and lung function; damage infrastructure (cracking tire rubber, for example); and harm plant tissue, decreasing crop productivity and browning forests. It’s also a greenhouse gas, trapping in heat at Earth’s surface.

To obtain a global perspective on current trends, Oltmans and the international team that coauthored the paper analyzed ozone measurements taken from the ground surface up to 18 miles in the air at key locations around the world, spanning the last 40 years. The results appear in the journal Atmospheric Environment.

“The data show reductions over a large part of North America and Western Europe, lowering the hemispheric burden of ozone,” Oltmans said. “It has an impact on a large scale, not just a local one.”

That’s important since ozone doesn’t follow state lines or country borders: Winds can carry ozone pollution around the world.

The main reason for ozone levels stabilizing is likely pollution control regulations, which first started being implemented in the 1970s, Oltmans said. Automobiles and coal and gas power plants release, through combustion, nitrogen oxides and volatile organic chemicals (VOCs); these compounds react in the air to form ozone pollution. But requirements for catalytic converters on cars, more stringent standards for power plants, and other initiatives have lowered these emissions.

Despite the overall lowering trend, some regions, such as Denver, Texas, and parts of California, still violate EPA ozone standards, Oltmans said. Those standards might get tighter as well. “The EPA is evaluating the current standards and determining whether they need to be tightened to be more protective of human health and vegetation,” he said.

Scientists also don’t know whether “the downward trajectory of ozone in the lower atmosphere is a permanent change,” Oltmans said.

A few of the factors that could increase ozone levels include changes in weather patterns (warm stagnant air promotes ozone formation) and the rapidly developing Asian economies. The limited data from China indicate that ozone pollution there has increased in the last few decades. Nevertheless, the same data seem to show a flattening trend in China as well—though scientists don’t know if this is a short-term reduction in ozone pollution due to Asia’s recent economic recession or a long-term change because of China’s aggressive pollution-reduction goals, Oltmans said.

 “There’s been a lot of discussion in recent years over the impacts of Chinese emissions and how they are going to impact ozone on a hemispheric scale,” he said. “Right now, it’s not clear.”

Continued monitoring of ozone levels, especially in eastern Asia, will help answer these questions. In the meantime, the research findings sound a hopeful note for air quality, Oltmans said, and will also improve computer modeling of the atmosphere.

“There have been important changes, and those changes should be recognized,” Oltmans said. “It is a success that pollution controls have an impact.”