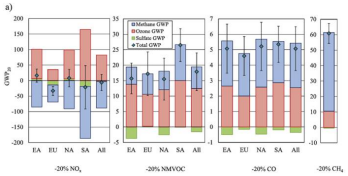
Regional Controls on Ozone Precursors Will Have Different Impacts on Future Climate

Research Highlight

Ozone precursor emissions influence regional and global climate and air quality through changes in tropospheric ozone and oxidants, which also influence methane (CH4) and sulfate aerosols.

Changes in the tropospheric composition of O3, CH4, SO4, and global net radiative forcing (RF) for 20% reductions in global CH4 burden and in 20% reductions of anthropogenic O3 precursor emissions (NOx, NMVOC, and CO) from four regions (East Asia, Europe and Northern Africa, North America, and South Asia) using the Task Force on Hemispheric Transport of Air Pollution Source-Receptor global chemical transport model (CTM) simulations were analyzed. These simulations included the LLNL IMPACT model that was funded by DOE's Atmospheric Science Program (ASP), now Atmospheric System Research (ASR).

This study describes model estimates of contributions of different ozone precursor emissions from different geographical regions towards global net radiative forcing (RF). It quantifies the magnitude and distribution of global net RF due to changes in ozone, methane, and sulfate aerosols for 20% reductions in global methane and regional NOx, NMVOC, and CO emissions. A 20% NOx reduction produces a net positive RF. On the other hand, methane, NMVOC, and CO reductions result in a net negative RF and most effectively reduce RF. Variability in global warming potential among regions for NOx and NMVOC reductions suggest that regionally specific estimates would be important. This information will be essential for policy makers as they try to control future air quality and climate change.



GWPs for time horizon of 20 years for -20% regional emissions (EA east Asia, EU Europe, NA North America, SA south Asia) of NOx, NMVOC, CO, and -20% global CH4 emissions. Controls on CO appear to be insensitive to geographical regions of emission while NOx is more sensitive.

Reference(s)

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Aerosol Life Cycle