



On the causal link between carbon dioxide and air pollution mortality

M.Z. Jacobson

Stanford University, California, USA (jacobson@stanford.edu / Phone: 1-650-723-6836)

Greenhouse gases and particle soot have been linked to enhanced sea-level, snowmelt, disease, heat stress, severe weather, and ocean acidification, but the effect of carbon dioxide (CO₂) alone on air pollution mortality has not been examined or quantified. Here, it is shown that increased water vapor and temperatures from higher CO₂ separately increase ozone more with higher ozone; thus, global warming may exacerbate ozone the most in already-polluted areas. A high-resolution global-regional model then found that CO₂ may increase U.S. annual air pollution deaths by about 1000 (350-1800) and cancers by 20-30 per 1K rise in CO₂-induced temperature. About 40% of the additional deaths may be due to ozone and the rest, to particles, which increase due to CO₂-enhanced stability, humidity, and biogenic particle mass. An extrapolation by population could render 21,600 (7400-39,000) excess CO₂-caused annual pollution deaths worldwide, more than those from CO₂-enhanced storminess. Although it has only 12% of the U.S. population, more than 30% of the increased deaths in the U.S. occur in California, which has 6 of the top 10 polluted U.S. cities. The results here provide a basis for regulators to control carbon dioxide based on health grounds.