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PUBLIC COMMENTS TO CASAC

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To: **CASAC**

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Subject: **Background Ozone in the Integrated Science Assessment**

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Today, I will focus my comments on two important elements regarding background ozone in the EPA's second draft of the Integrated Science Assessment (ISA). First, I will discuss the uncertainties relating to modeling background ozone, and second, I will examine the underlying assumptions of background ozone, and how these relate to public health.

1) Considerable uncertainties remain in modeling background ozone, particularly with respect to modeling peak concentrations. EPA has historically relied on the GEOS-Chem chemical transport model to calculate background ozone concentrations, and for this review, they are focusing their analysis on the 0.5 x 0.67 degree model run conducted by Zhang et al. 2011. Over the past year, several groups have modeled background ozone with several different CTM's. Today, I will focus my comments on two of these studies, both of which I was an author on. First, in Zhang et al. 2011, which used a high-resolution nested version of GEOS-Chem, we found significant variability in background ozone concentrations across the U.S.. In contrast to earlier work, we did not find that background ozone decreased at high ambient ozone concentrations. Instead, we found that background ozone generally increased with increasing ozone concentrations in some regions, and in others, there was no significant correlation.

Peak background ozone concentrations in the Zhang et al. 2011 work never exceeded 60 ppb . Regions with peak 4^{th} highest background ozone values were generally located in regions near wildfire or lightning sources. Recent work by Jaffe and Downey (in prep) using satellite based CO as a tracer for wildfire impacts, shows that this version of GEOS-Chem does a poor job at capturing the variability associated with wildfire emissions.

Comparisons with in-situ observations at CASTNET sites suggest that peak lightning emissions are overestimated in this model. The second study I participated in used two regional models, CAMx and EPA's CMAQ model, with GEOS-Chem boundary conditions to model background ozone (Emery et al. 2011). These results were largely consistent with those of Zhang et al. 2011, but there were several important differences. Mean background ozone values were slightly higher in the regional models, and performance (particularly at peak ozone concentrations) was better. We analyzed a specific Stratosphere-Troposphere Exchange (STE) event on April 20, 2011 and found that both the global and regional models failed to predict the magnitude of the impact of this STE event on surface ozone concentrations. Peak 4^{th} highest background ozone reached over 100 ppb in regions impacted by wildfires, and over 60 ppb in regions impacted by STE. There was a significant difference in the magnitude and extent of wildfire impacts between the regional models (CAMx and CMAQ) and GEOS-Chem. With a 40 ppb difference in peak background ozone concentrations, it is clear that the processes driving background ozone in models are not well constrained. There remains significant work to be done to fully characterize the spatial and temporal impacts of wildfires, STE, lightning, soil NOx, biogenic VOC emissions, and long range transport of international emissions.

2) My second point relates to the fundamental assumptions behind EPA's definition of background ozone. EPA has defined background ozone as the concentrations of ozone that would exist when all anthropogenic emissions are eliminated from various regions.

The underlying assumption is that by eliminating emissions of ozone precursors, you will maximize the benefit to public health. This is a fundamental flaw in the definition of background ozone because there is a significant public health benefit derived from processes which emit ozone precursors. Life expectancy in the United States has increased from a median age of 38.3 in 1850, to 76.7 in 1998 (Haines 2002), presumably due to increased stability in the food supply, better housing and interior climate control, and advances in medicine and public health. EPA does not allow for the production of food (agriculture), for constructing and maintaining shelter, for climate control within that shelter, or for the maintenance of the public health infrastructure including doctors, hospitals or medication. All of these activities significantly benefit public health, but also are associated with some level of emissions of ozone precursors. The clean air act gives EPA the authority to regulate emissions to 'protect public health with an adequate margin of safety'. By assuming that eliminating emissions protects public health, they are, in fact, developing a scenario that if enacted today, would lead to significant negative public health impacts.

EPA should develop and utilize a new background scenario that protects public health by including emissions that are necessary to maintain public health. EPA should base this scenario on proven levels of control technology (i.e. Best Available Control Technology (BACT) or Reasonable Available Control Technology (RACT)), and the scenario should be based on broad implementation of proven control technology over the review cycle of the ozone NAAQS (i.e. 5-year cycles). The cost of compliance associated with achieving this scenario should be included in the final cost estimates of the proposed NAAQS. The public health benefit scenario would need to be developed with input from broad stakeholders.