2.039 Assessing the role of dry deposition in observed ozone-meteorology correlations.

Early Career Scientist

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Abstract:

Strong seasonally and spatially dependent correlations between surface ozone (O3) and meteorological variables have been reported by many authors and implemented in phenomenological air quality forecast models. While the meteorological dependence on O3 production (PO3) is well known, the strength of site specific O3-meteorology correlations is not always well captured by mechanistic models. Chemical transport models (CTMs) are unable to accurately predict the strength and location of the ozone-relative humidity negative correlation seen widely in summer time observations with differing explanations given for this failing. Using 20 years of hourly O3 and meteorological data from the Environmental Protection Agency's Clean Air Status and Trends Network (CASTNET) and a coupled atmosphere-biosphere box model, we look at the role of individual ozone production and loss processes in regulating O3 concentrations as a function of

meteorology. We find that it is only with the inclusion of an ozone deposition scheme with a fully meteorologically dependent stomatal uptake parametrization that we can explain the strength, seasonality, and spatial dependence of the ozone-relative humidity correlation seen in CASTNET observations. Deposition to vegetation is responsible for a significant portion of ozone loss in the continental surface layer during the growing season and as such needs to be treated accurately. This poses a challenge to CTMs run at coarse resolutions with limited land-use data and simplified treatment of stomatal uptake, and as such we should not expect these models to predict the ozone-relative humidity correlation seen in real data.