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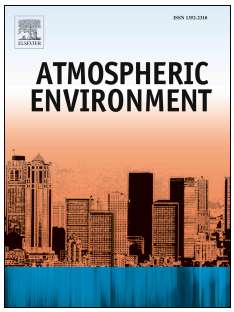

Observed and predicted sensitivities of extreme surface ozone to meteorological drivers in three US cities

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Observed and predicted sensitivities of extreme surface ozone to meteorological drivers in three US cities

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Abstract

We conduct a case study of observed and simulated maximum daily 8-hour average (MDA8) ozone (O_3) in three US cities for summers during 1996-2005. The purpose of this study is to evaluate the ability of a high resolution atmospheric chemistry model to reproduce observed relationships between meteorology and high or extreme O_3. We employ regional coupled chemistry-transport model simulations to make three types of comparisons between simulated and observational data, comparing (1) tails of the O_3 response variable, (2) distributions of meteorological predictor variables, and (3) sensitivities of high and extreme O_3 to meteorological predictors. This last comparison is made using two methods: quantile regression, for the 0.95 quantile of O_3, and tail dependence optimization, which is used to investigate even higher O_3 extremes. Across all three locations, we find substantial differences between simulations and observational data in both meteorology and meteorological sensitivities of high and extreme O_3.

Keywords: surface ozone, meteorological variables, quantile regression, extreme value theory

1. Introduction

Surface ozone (O_3) is one of the major air pollutants associated with adverse health effects. According to the US Environmental Protection Agency (EPA), current scientific evidence supports a causal relationship between short-term exposures to O_3 and respiratory health effects, and a

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