

6.214 Subseasonal variability of surface ozone in the Mexico City basin.

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Abstract:

Concentrations of winter and summer ozone in the Mexico City basin were investigated for variability by phase of the Madden-Julian Oscillation (MJO). The MJO is the leading mode of atmospheric variability on the subseasonal (30-60 day) time scale, and changes in large-scale tropospheric circulation occur in both the tropics and extratropics in response to the convective heating anomalies of the MJO. The primary hypothesis tested in this study was whether large-scale changes in tropospheric circulation would affect surface ozone concentrations in Mexico City. Mexico City's ozone, with nearly 30 years of hourly measurements at stations around the metropolitan area, offer a unique chance to investigate both local and teleconnected influence of the MJO because, at 19 degrees north latitude, Mexico City experiences both tropical (in summer) and extratropical (in winter) synoptic-scale circulation patterns. The primary findings of the study were: (1) surface ozone concentrations did exhibit statistically significant ($p < 0.05$) variability by phase of the MJO in both summer and winter. In summer, highest ozone concentrations occurred on days when the MJO was active and in phase 6, while lowest concentrations occurred on days when the MJO was active and in phase 1. In winter, highest ozone concentrations were occurred on days when the MJO was active and in phase 2, while lowest concentrations occurred on days when the MJO was active and in phase 8. (2) Anomalies in both total cloud cover and surface UV-B radiation were found that strongly supported this variability. (3) Finally, in both summer and winter, days with above-normal ozone featured anomalies in upper-tropospheric circulation supporting reduced cloud cover, and days with below-normal ozone featured anomalies in upper-tropospheric circulation supporting enhanced cloud cover.