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The Effect of Lightning on Tropospheric Ozone Concentrations over Valparaiso, Indiana in 2006 and 2007

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Ozone (O_3) is a well-known greenhouse gas that plays an important role in our atmosphere. The highest concentrations of O_3 occur in the stratosphere, but O_3 can also be found in smaller concentrations in the troposphere. Tropospheric O_3 can result from multiple processes, such as subsidence from the stratosphere or photochemical production resulting from emissions of precursors at or near the surface. O_3 can also be produced throughout the troposphere in conjunction with or as a direct result of lightning. In the years 2006 and 2007, 30 weather balloons were launched from Valparaiso, Indiana to measure O_3 concentrations in the troposphere. Using archived radar, satellite, and surface observation data, we identified several of these dates on which convective weather capable of producing lightning passed over Valparaiso. We connect the lightning strikes from the World Wide Lightning Location Network (WWLLN) with observed enhancements in O_3 as detected by instruments on the Valparaiso weather balloons using modeled air mass trajectories and estimate the fraction of observed O_3 resulting from lightning production.

Information about the Authors:

Abby Kenyon, Molly Becker, and Kevin Wagner are meteorology students who conducted this project under the advising of Professor Gary Morris of the Physics and Astronomy Department. Junior Abby Kenyon plans to continue her education in atmospheric sciences through graduate school. She hopes to conduct further lightning-based research. Senior Molly Becker hopes to continue her research after school and work with fellow meteorologists on lightning studies. Senior Kevin Wagner wanted to broaden his research experience in the atmospheric sciences and will continue his studies after graduation.

Faculty Sponsor: Dr. Gary Morris

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