Seminar Series 2022 - 2023

Southern Ontario Centre for Atmospheric Aerosol Research

University of Toronto

Ozone source apportionment over Europe

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It is well established that in Europe, high O_3 concentrations are most pronounced in southern/Mediterranean countries due to the more favorable climatological conditions for its formation. However, the contribution of the different sources of precursors to O_3 formation within each country relative to the imported (regional and hemispheric) O_3 is poorly quantified. This lack of quantitative knowledge prevents local authorities from effectively designing plans that reduce the exceedances of the O_3 target value set by the European Air Quality Directive. O_3 source attribution is a challenge because the concentration at each location and time results not only from local biogenic and anthropogenic precursors, but also from the transport of O_3 and precursors from neighboring regions, O_3 regional and hemispheric transport and stratospheric O_3 injections.

This seminar presents the results of applying a source-oriented source apportionment method to provide an estimation of the contribution of the largest NO_x national sectors to peak O_3 events in southwestern Europe (targeting Spain) relative to the contribution of imported (regional and hemispheric) O_3. We show, for the first time, that imported O_3 is the largest input to the ground-level O_3 concentration in Spain, accounting for 46 %–68 % of the daily mean O_3 concentration during exceedances of the European target value. However, during stagnant conditions, the local anthropogenic precursors control the O_3 peaks in areas downwind of the main urban and industrial regions (up to 40 % in hourly peaks). We also show that ground-level O_3 concentrations are strongly affected by vertical mixing of O_3-rich layers present in the free troposphere. Our results show O_3 source apportionment to be an essential analysis prior to the design of O_3 mitigation plans in any non-attainment area. Achieving the European O_3 objectives in southern Europe requires not only ad hoc local actions but also decided national and European-wide strategies.

Wednesday, February 1, 2023 3:00PM - 4:00PM EDT

In Person: Wallberg Building, 200 College Street, Room 407

OR

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Passcode: weFv4C

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