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NESL's Atmospheric Chemistry Division Seminar

The X Files: Oxidation via Criegee radicals – From reactions to global impacts

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Monday, February 11th, 3:30 p.m.

3:00 p.m. – Refreshments & Socializing

Foothills Lab 2, Room 1001

Abstract

Oxidation processes in Earth's atmosphere are tightly connected to many environmental and human health issues and are essential drivers for biogeochemistry. Oxidation processes remove natural and anthropogenic trace gases and air pollutants from the atmosphere, and produce low-volatility vapors that control secondary aerosol formation and atmospheric production of cloud condensation nuclei. These atmospheric oxidation processes are typically thought to be dominated by three main oxidants: ozone, hydroxyl radical (OH) and nitrate radical. Field measurements however have shown discrepancies between measurements and models indicating the presence of other mechanisms. Our group has recently shown that products formed from the ozonolysis of biogenic alkenes (most likely stabilized Criegee radicals) have a substantial oxidizing capacity, with the ability to oxidized compounds such as SO_2 or dimethyl sulphide. This new "X-chemistry" can have significant, or even dominant, contribution to formation of low-volatility inorganic (sulfuric acid) and, most strikingly, very highly oxidized condensable organic vapors. This new route to the formation of sulfuric acid and extremely low-volatility organic compounds can have a considerable impact to global budgets of cloud condensation nuclei. Our observations point toward a highly important, yet unexplored area of atmospheric chemistry and indicate the discovery of a new natural negative feedback mechanism that could partially counteract climate warming.