POPCORN Field campaign

Overview

ABSTRACT:

POPCORN: A Field Study of Photochemistry in North-Eastern Germany

The intensive field study POPCORN (Photo-Oxidant Formation by Plant Emitted Compounds and OH Radicals in North-Eastern Germany) was carried out in a rural area in North-Eastern Germany in August 1994. An overview of the objectives, measurements and results of the campaign is presented. Measurements of a set of relevant atmospheric trace compounds and meteorological data focused on a better understanding of OH radical chemistry and photo-oxidant formation. Additionally, plant emissions and the exchange of trace gases between a maize field and the atmosphere was investigated. The measurements were made in the center of a maize field. The situation was characterized by relatively low concentrations of most trace gases, e.g. CO: 85-200 ppb, ethane: 0.6-2 ppb, and noontime NOx: 0.5-5 ppb. Concentrations of individual biogenic volatile organic compounds (VOC) were mostly well below 100 ppt. However, formaldehyde and acetaldehyde which partly originate from biological sources were observed at mixing ratios of some ppb. Additionally, a large variety of compounds of different origin were observed at fairly low concentrations. Nevertheless, they substantially contribute to the atmospheric turnover of VOC due to their large number (more than 100) and their high reactivity. OH radical concentrations were measured simultaneously by LIF (Laser Induced Fluorescence) and DOAS (Differential Optical Absorption Spectroscopy). Both methods showed good agreement. Maximum values were around 10^7 cm^{-3}. The diurnal cycle of the OH radical concentration closely follows the rate of primary production via ozone photolysis, the main primary production mechanisms for HOx radicals. Episodically, other mechanisms, e. g. the photolysis of formaldehyde, substantially contributed to OH radical formation.

Pictures from the field site

Instrumental setup

Science in free nature

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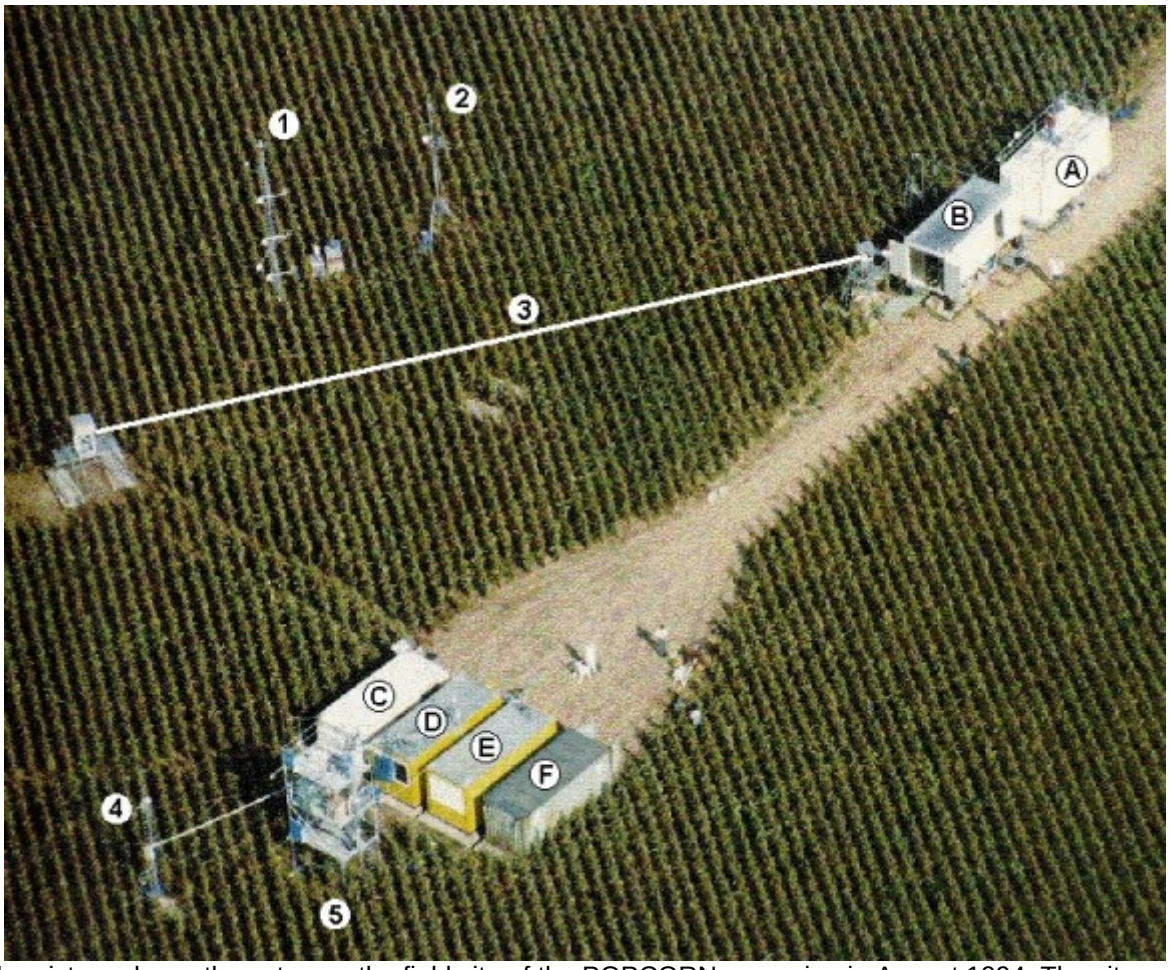
Instrumental Setup



The picture shows the setup on the field site of the POPCORN campaign in August 1994. The site was located in the center of a 600m x 600m corn field. The 20ft-containers housed the instruments:

A. **LIF**
   - OH measurement using Laser Induced Fluorescence / Air sampling on the top of the container.
   - Photolysis frequencies measured by a spectro radiometer

B. **DOAS**
   - OH measurement using Differential Optical Absorption Spectroscopy. The light path of 1848m was realized in the open White cell of 38.5m base length (white line #3).
   - Data aquisition for ozone concentration and meteorological data measured on the masts (#1 and #2).

C. **GC:**
   - Gaschromatographic detection of CO, Non-methane hydrocarbons, and PAN / Sampling on top of mast #4.

D. **Lab1:**
   - Chemiluminescence instrument for NO and NOx / Sampling on top of mast #4.
   - Fluorescence instrument for H2O2
   - Air CO2 measurements / Sampling on top of mast #4.

E. **Lab2:**
   - preparation of filters and cartridges for the measurement of Aldehydes and nitric acid / Sampling on the scaffold (#5).
   - intrumentation for the determination of Rd and Pb activity / Sampling on the scaffold (#5)

F. **Storage:**
   - Supplies