Working Group on Organics

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Working Group Meeting- 4:30pm Tuesday, M-D 119 (joint with Chemistry WG)
geos-chem-organics-join@seas.harvard.edu

igcvii
History of gas-phase organic tracers in standard version of GEOS-Chem

- Organic tracers
- Inorganic tracers

- Caltech isoprene, speciated NOx-Ox (5/14)
- Br chem (9/12)
- New S, N tracers (2/03)
- V1-01 (9/98)
History of gas-phase organic tracers in standard version of GEOS-Chem

# of organic peaks detected by PTR-TOF (Park et al., 2013)
Broad Scope of Research Topics Related to Organics

Biogenic fluxes and impacts

- Isoprene emissions (summer 2011) from US Upper Midwest (Lu Hu, UMN)
- ...to Borneo (Shani Garraway, York)

Anthropogenic emissions

- Impact of oil and gas (Zitely Tzompa, CSU)
- AVOC emissions from space (Lei Zhu, Harvard)

Implications of isoprene chem today...

- These figures show the percent change in average annual NO, O₃, and OH mixing ratios in the lowest 1 km of the atmosphere when rapid hydrolysis of one isoprene nitrate isomer is included in the oxidation mechanism.

... and in the past

- New mechanistic constraints and effects on oxidants (Kelvin Bates, CalTech)

- OH [10⁷ molec cm⁻³]

  - Present Preind. warm LGM cold LGM
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  (Ploy Achakulwisut, Harvard)
Broad Scope of Research Topics Related to Organics

**Coupling to N-cycle...**

- Significant Isoprene Oxidation Occurs in the ‘Low-NOx’ Pathway

**... and to regional-to-global ozone**

- drivers of $O_3$ over SE US (May Fu, PKU)
- global ozone budget (Lu Hu, Harvard)

**OVOC budgets and surface interactions**

- missing acetone source? (Jared Brewer, CSU)
- air-sea exchange (Xin Chen, UMN)
- new space-based constraints on PAN (Juliet Zhu, CSU)

**Role of organic nitrates in N-budget and NOx fate** (Jenny Fisher, Wollongong; Katie Travis, Harvard)

**... aerosols...**

- role of organic nitrates in N-budget and NOx fate (Jenny Fisher, Wollongong; Katie Travis, Harvard)

**Broad Scope of Research Topics Related to Organics**

- new space-based constraints on PAN (Juliet Zhu, CSU)
- missing acetone source? (Jared Brewer, CSU)
- air-sea exchange (Xin Chen, UMN)
Broad Scope of Research Topics Related to Organics

**Space-based emission constraints**

![Map showing space-based emission constraints](image)

- fire emissions of HCOOH (Sree Chaliyakunnel, UMN)

**Land-atmosphere coupling**

![Diagram showing land-atmosphere coupling](image)

- new land-use module for self-consistent, coupled simulation of emissions, deposition (Jeff Geddes, Dalhousie/MIT)

**Global VOC source inversion** (Hansen Cao, PKU)
Recent updates & ongoing developments relevant to organics in GEOS-Chem

Included in 10-01:
- Several emission updates that affect organics: EMEP (van Donkelaar); NEI 2011 (Travis); MIX Asia (Zhang); GFED4 (Kasibhatla); FINN (Fisher)
- Update MEGAN to Guenther 2012; use 15 CLM PFTs to compute emissions (Millet)

In the pipeline for possible inclusion in standard model:
- Ongoing updates to isoprene chemistry (Bates, Fisher)
- Aerosol uptake of organic nitrates (Fisher)
- Updated treatment of terpenes (Fisher)
- Updated Criegee chemistry (Millet, Kim)
- New land-use module for self-consistent treatment of biogenic emissions, deposition, LAI (Geddes, Heald)
Organics & Chemistry Joint Working Group Breakout: Tuesday, 4:30pm (MD G115)

Topics for discussion – laying out the future for organics in GC

- Monoterpenes in the GEOS-Chem standard model: is zero enough?
- How should we treat bidirectional fluxes?
- Do we need year-specific LAI?
- How best to keep pace with firehose of organic chemistry updates in the field, and the increasing number of observed species (CIMS, etc.)? Comprehensiveness vs. efficiency, state-of-science vs continuity/stability
- How well does our current subset of organic tracers capture the chemical tendencies of the full atmospheric suite of compounds?
- Is our legacy lumping scheme still appropriate?
- Other questions, challenges and issues raised by the community (you!) and in this meeting