An Investigation of Convective Transport Efficiency Using TOGA data and other species observed during DC3

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Trace Organic Gas Analyzer (TOGA)

- **Fast online GC/MS VOC measurement**
- **Up to 53 different VOCs**
- **High sensitivity: detection limits of NMHCs & OVOCs to ppt, many halocarbons to sub-ppt**
- **35-s integrated measurements every 2 min**
- **Altitude independent 0 - 50,000 feet**

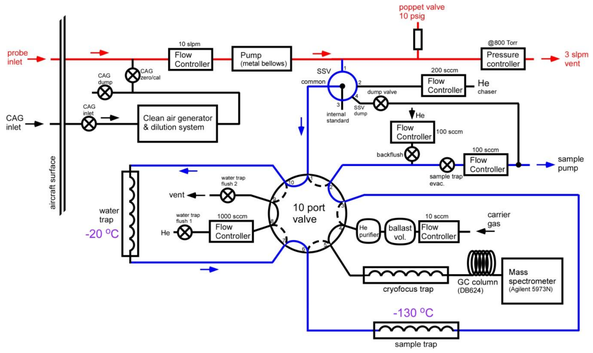
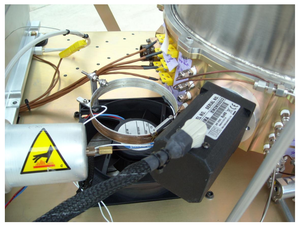


Fig. 1. Simplified schematic of the TOGA.

DC3 Targeted Compounds

NMHC	OVOCs	HVOCs
i-butane	formaldehyde	CH_3Cl
n-butane	acetaldehyde	CH^2Cl_2
i-pentane	propanal	$CHCl_3$
n-pentane	butanal	CCl_4
2-methylpentane	pentanal	CH_3Br
n-hexane	2-pentanone	CH_2Br_2
n-heptane	acrolein	$CHBr_3$
propene	methacrolein	$CHBr_2Cl$
i-butene	methanol	CH_2Cll
1,2-butadiene	ethanol	CH_2I_2
isoprene	acetone	
a-pinene	methyl ethyl ketone (MEK)	
b-pinene	methyl t-butyl ether (MTBE)	
camphene	methyl vinyl kentone (MVK)	
limonene		
benzene		**Other**
toluene		HCN
ethylbenzene+m-/p-xylene		CH_3CN
o-xylene		dimethyl sulfide (DMS)
2-methyl-3-butene-2-ol (MBO)		

Installed on the GV



GC Oven

Case Study 1: 29-May, Oklahoma Convection

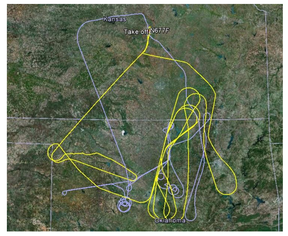
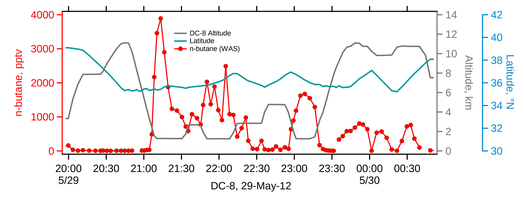


Fig. 2. GV (yellow) and DC-8 (mauve) flight tracks.



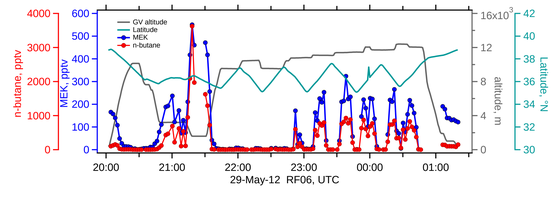
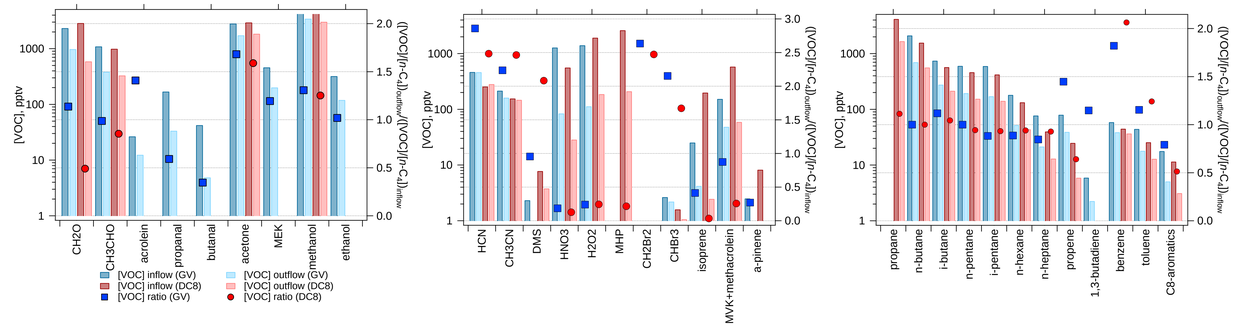
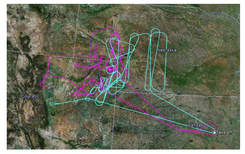


Fig. 3. Time series for n-butane from DC-8 (left) and GV (right) flights. Inflow periods and outflow periods were determined using elevated butane.

Fig. 4. Plots of average inflow and outflow mixing ratios for a number of observed species. (bars), and ratios of species to n-butane in outflow vs. inflow.



Case Study 2: 22-June, Colorado Convection + High Park fire



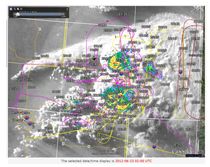
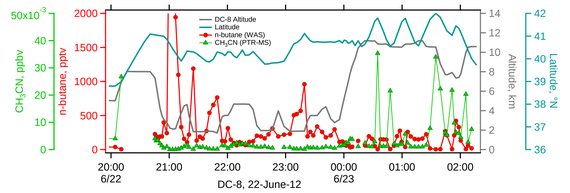


Fig. 5. Above, GV (cyan) and DC-8 (pink) flight tracks, and (right) smoke entrained Into convection from High Park fire.



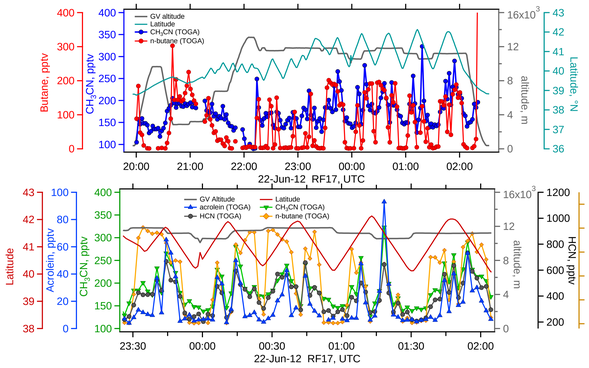


Fig. 6. Time series for n-butane and CH_3CN from DC-8 (above) and GV (right) flights. Inflow periods and outflow periods were determined using elevated butane from two convection events between 22:00 and 23:00 (a), and between 23:30 and 02:00, (b) with and (c) without elevated fire-tracer acrolein.

Fig. 7. Plots of average inflow and outflow mixing ratios for a number of observed species. (bars), and ratios of species to n-butane in outflows vs. inflow.