First run of HTAP emissions in CAM-Chem

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NCAR

CAM-Chem

NCAR Community Earth System Model
With MOZART tropospheric and stratospheric chemistry
Nudged with GEOS-5 meteorology or ECMWF

Simulations will be run by
Louisa Emmons – NCAR
Steve Arnold – U. Leeds
Tim Butler – IASS-Potsdam

Output will be provided for regional model boundary conditions
NCAR – base and perturbations for Owen Cooper's WP
Between 3 groups all cases will be run

HTAP Emissions

CO, NO, SO2, NH3, BC, OC – directly provided (NO is 50% higher than MACCity)
VOCs – EPA speciation used for globe

Species	HTAP	POLMIP	CCMI
CO	551	592	585
NO	111	70	70
C2H6	6.3	6.3	3.3
C3H8	4.6	5.6	4.0
BIGALK	80	51	32
BIGENE	22	6.5	4.7
AROMATICS	38	25	35
Acetone	9.2	0.5	1.3
Acetaldehyde	11.2	2.0	1.3
Methanol	17	0.9	2.2

POLMIP: Streets ARCTAS-v1.2

Model	Resolution	Meteorology	Chemistry
TOMCAT	2.8°x2.8°, 31 levels	ECMWF ERA-oper.	trop: 82 species
MOZART-4	1.9°x2.5°, 56 levels	GEOS-5	trop: 103 species, bulk aerosols; photolysis options: FTUV: online; LUT: lookup table
CAM4-chem	1.9°x2.5°, 56 levels	GEOS-5	MOZART-4, bulk aerosols
CAM5-chem	1.9°x2.5°, 56 levels	GEOS-5	MOZART-4, modal aerosols
LMDZ-INCA	1.9°x3.75°, 19 levels	ECMWF	trop: 89 species
C-IFS	T159 (~1°), 60 levels	ECMWF	trop: CB05, strat: linear. O3 (Cariolle)
TM5	2°x3°, 60 levels	ECMWF	trop: CB05
NASA GMI	2°x2.5°, 72 levels	GEOS-5	strat&trop (154 species), GOCART aer.
GEOS-Chem	2°x2.5°, 47 levels	GEOS-5	trop: ~100 species
WRF-Chem	100, 50, 25 km	NCEP GFS	MOZART-GOCART

Emissions – Same for all models:

Anthropogenic: Streets' ARCTAS-v1.2

Fires: FINN-v1

Biogenic, Ocean, etc: MACCity

*GEOS-chem used slightly different anthro emissions and includes increased HO_2 aerosol uptake [Mao et al., ACPD, 2012]

Output:

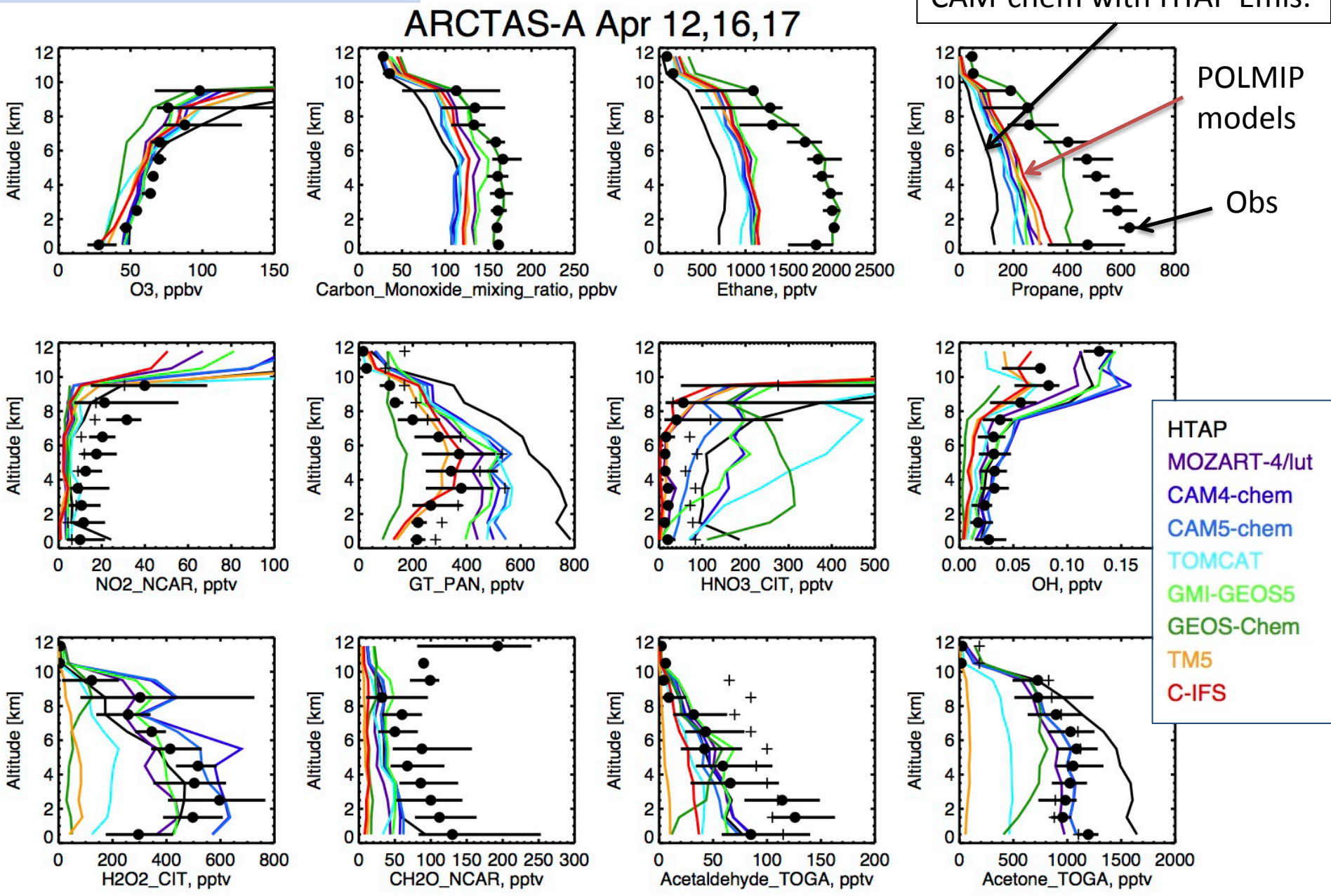
Monthly for all of 2008

Hourly for Spring & Summer for comparison with field campaigns

Focus on gas-phase chemistry

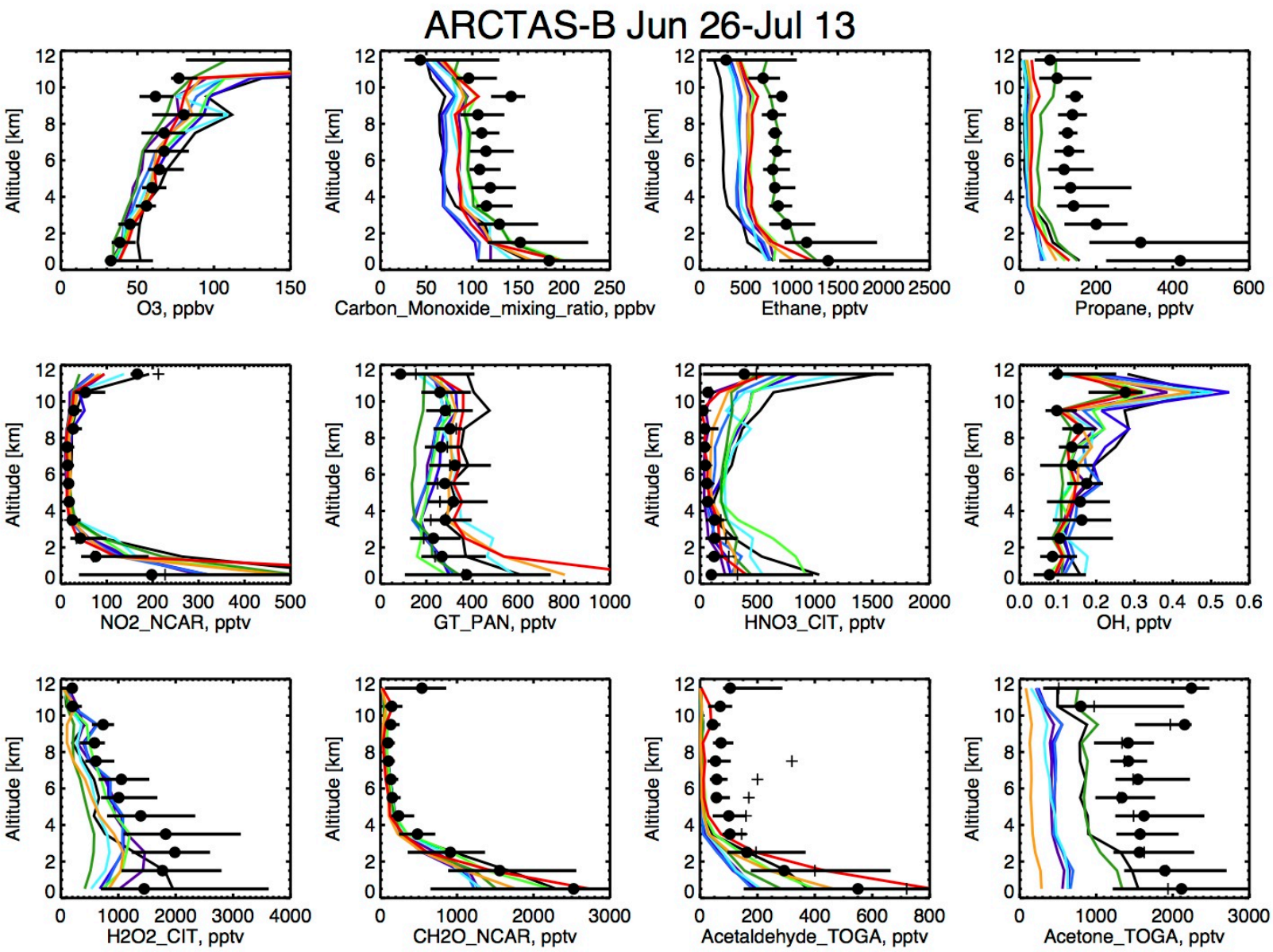
Artificial tracers – 25-day lifetime, based on CO anthro and fire emissions

NASA DC-8 flights over Alaska

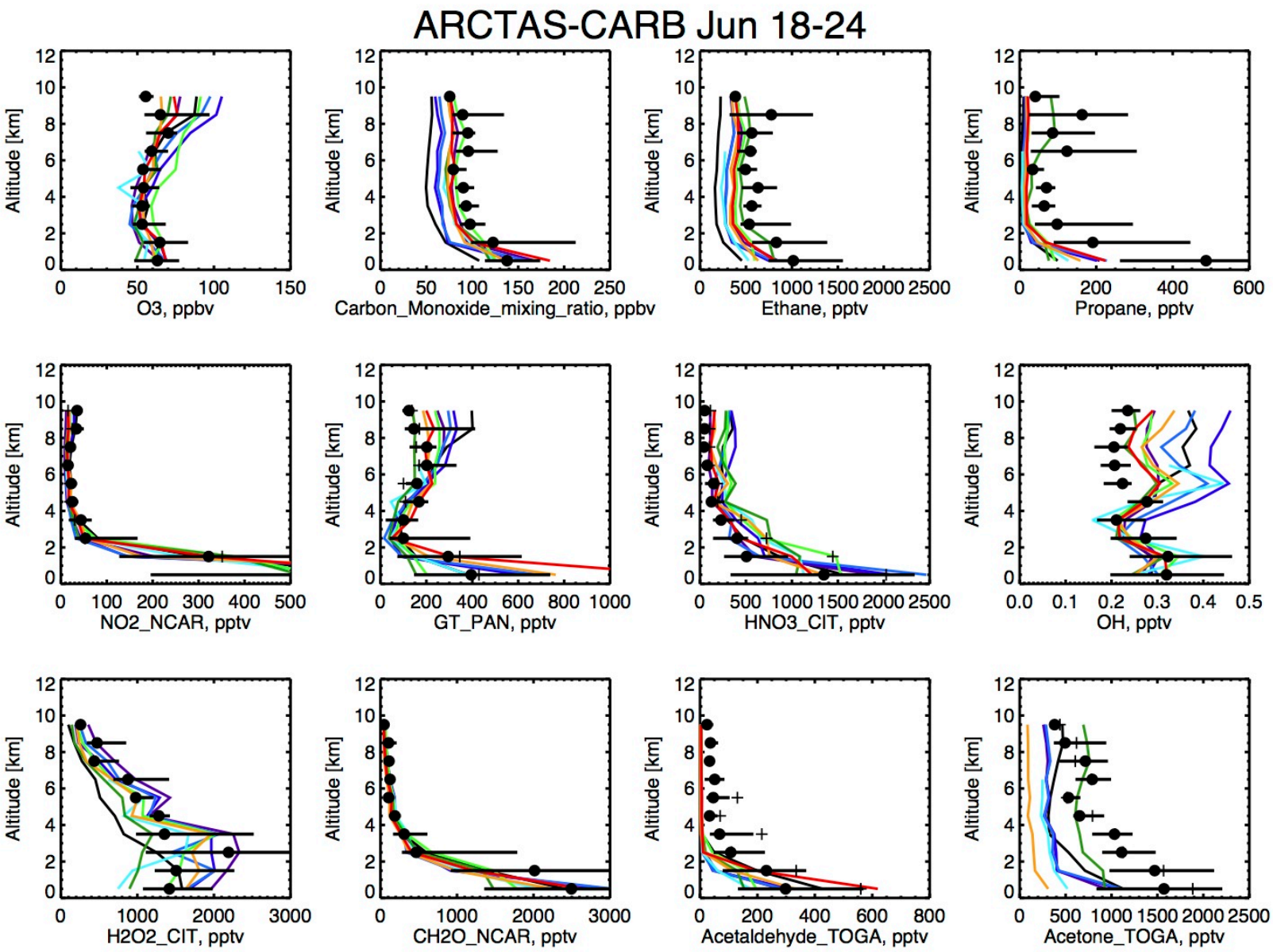


→ EPA speciation is really not a good choice for global speciation

NASA DC-8 flights over Canada



NASA DC-8 flights over California

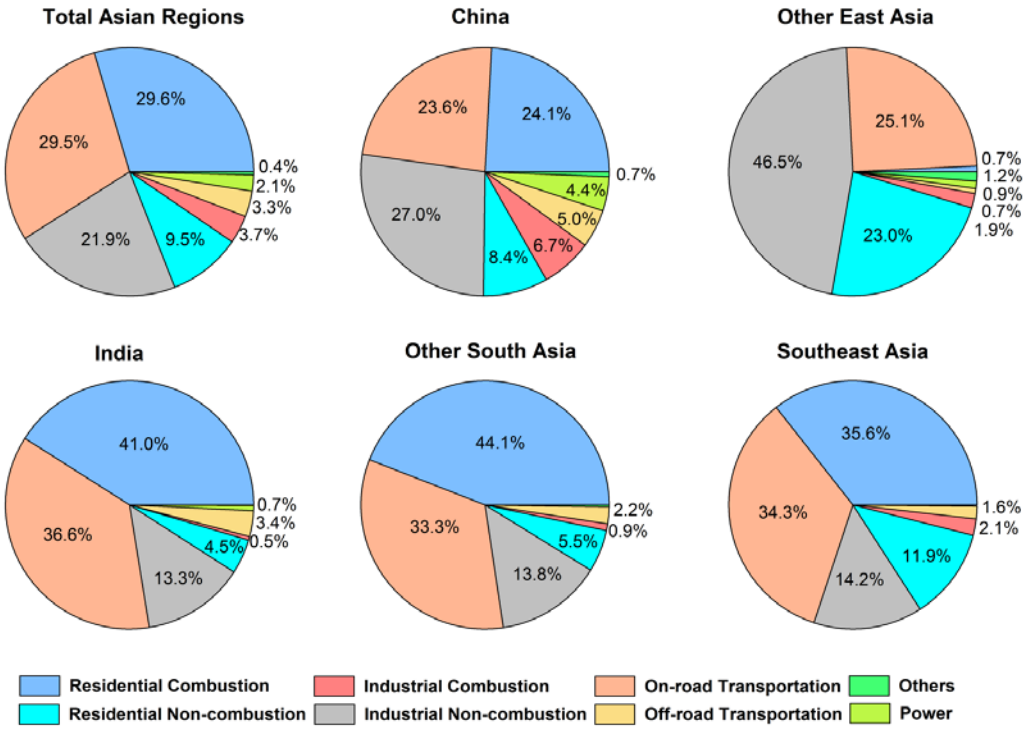


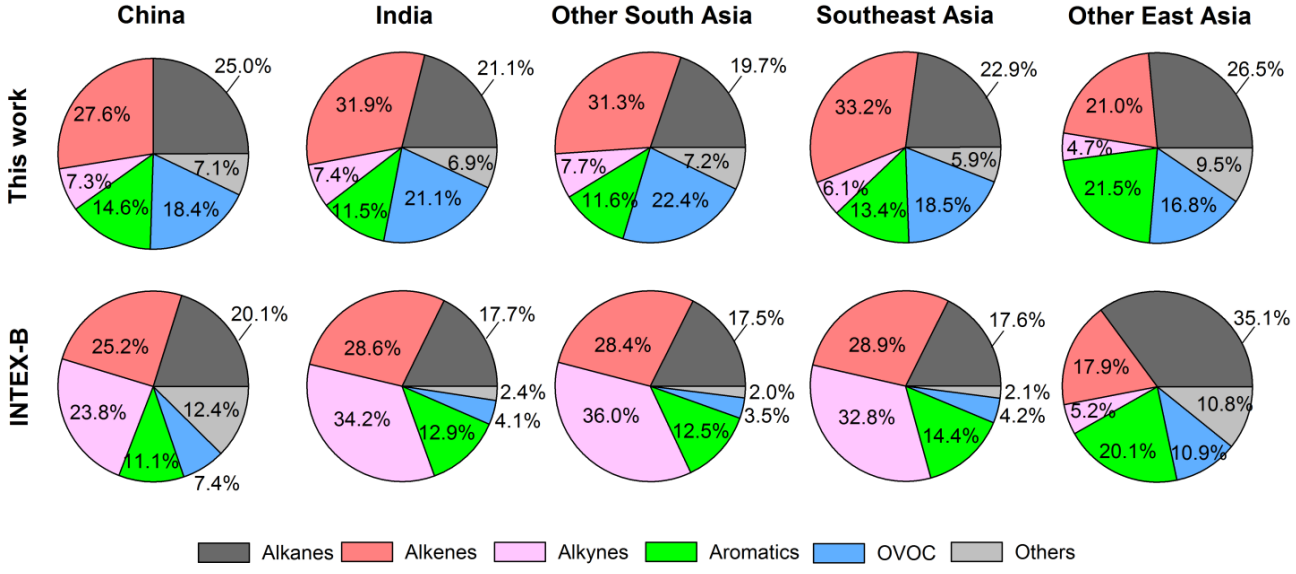
VOC speciation for Asian emissions

Each region of Asia has different contributions of sources

Leading to differences in relative amounts of families of VOCs

New inventory has greater contribution of oxygenated VOCs and reduced alkynes





M. Li, Q. Zhang et al., Mapping Asian anthropogenic NMVOC emissions to multiple model chemical mechanisms, submitted to ACP and poster at AGU Wed PM