# Interesting data sets for model evaluation

Louisa Emmons

# MOZART-4 published and released

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**Description and evaluation of the Model for Ozone and Related chemical Tracers, version 4 (MOZART-4)**

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**Abstract.** The Model for Ozone and Related chemical Tracers, version 4 (MOZART-4) is an offline global chemical transport model particularly suited for studies of the troposphere. The updates of the model from its previous version MOZART-2 are described, including an expansion of the chemical mechanism to include more detailed hydrocarbon chemistry and bulk aerosols. Online calculations of a number of processes, such as dry deposition, emissions of isoprene and monoterpenes and photolysis frequencies, are now included. Results from an eight-year simulation (2000–2007) are presented and evaluated. The MOZART-4 source code and standard input files are available for download from the NCAR Community Data Portal (http://cdp.ucar.edu).

Emmons, L. K., et al.: Description and evaluation of the Model for Ozone and Related chemical Tracers, version 4 (MOZART-4), *Geosci. Model Dev., 3*, 43-67, 2010.

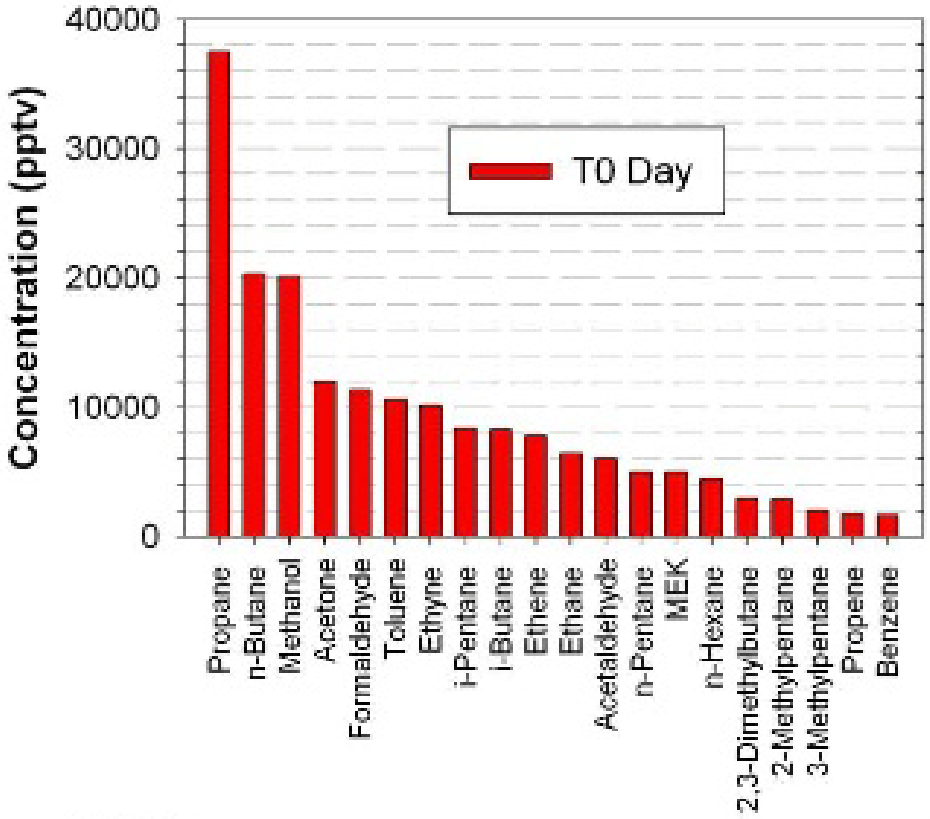
# Recent MOZART-4 updates/corrections

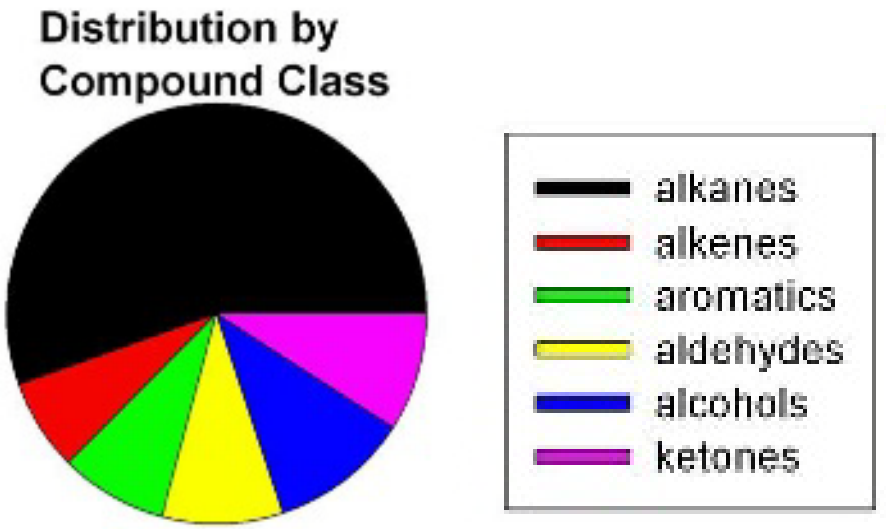
- FTUV found to be negative on occasion (near terminator, generally), probably result of $5^{th}$ order polynomial fit to ozone column
- Sea salt deposition velocities could exceed machine limitations (found on NOAA computers, didn't happen on bluefire)

# Observations in Megacities

- Mexico City – MILAGRO/MIRAGE-Mex
- Shanghai – ACD ground measurements
- Mumbai, Dubai – E.Apel & D.Riemer

# Observed Mexico City VOCs




Propane is most abundant VOC – from large LPG use

High OVOC MRs (CH3OH, CH3COCH3, CH2O)

➢ This is very different speciation from US cities

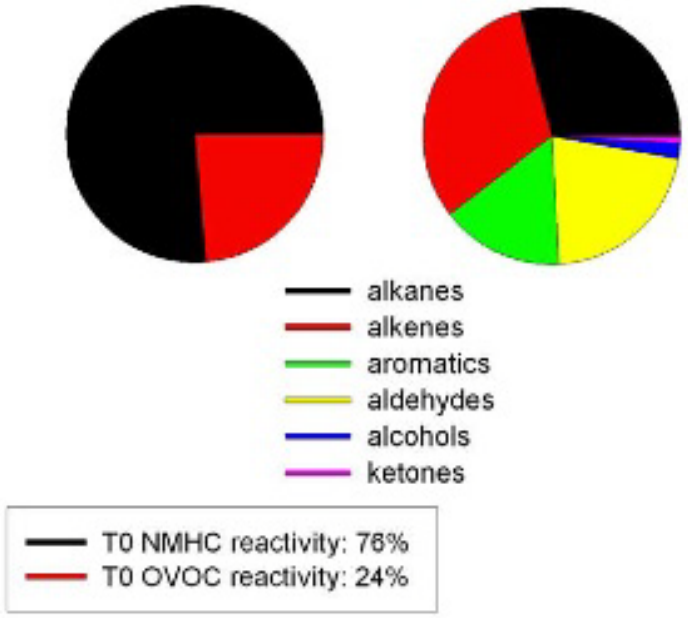
*Apel et al., ACPD, 2009*

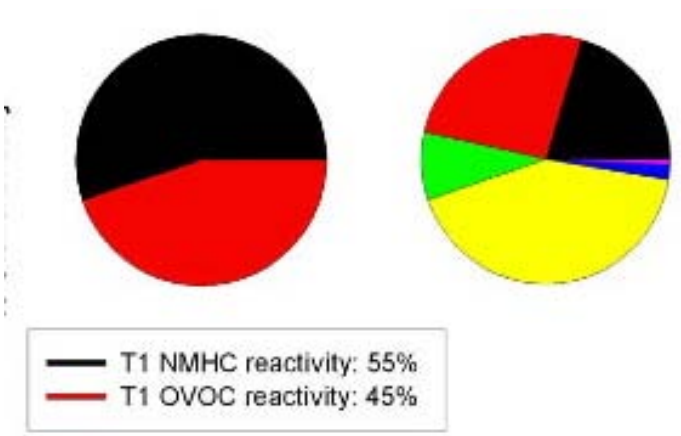
# OH reactivity

OH reactivity calculated from VOC concentrations and their reaction rate with OH

Formaldehyde and acetaldehyde are 2 most important for OH reactivity

OVOCs become more important at downwind site

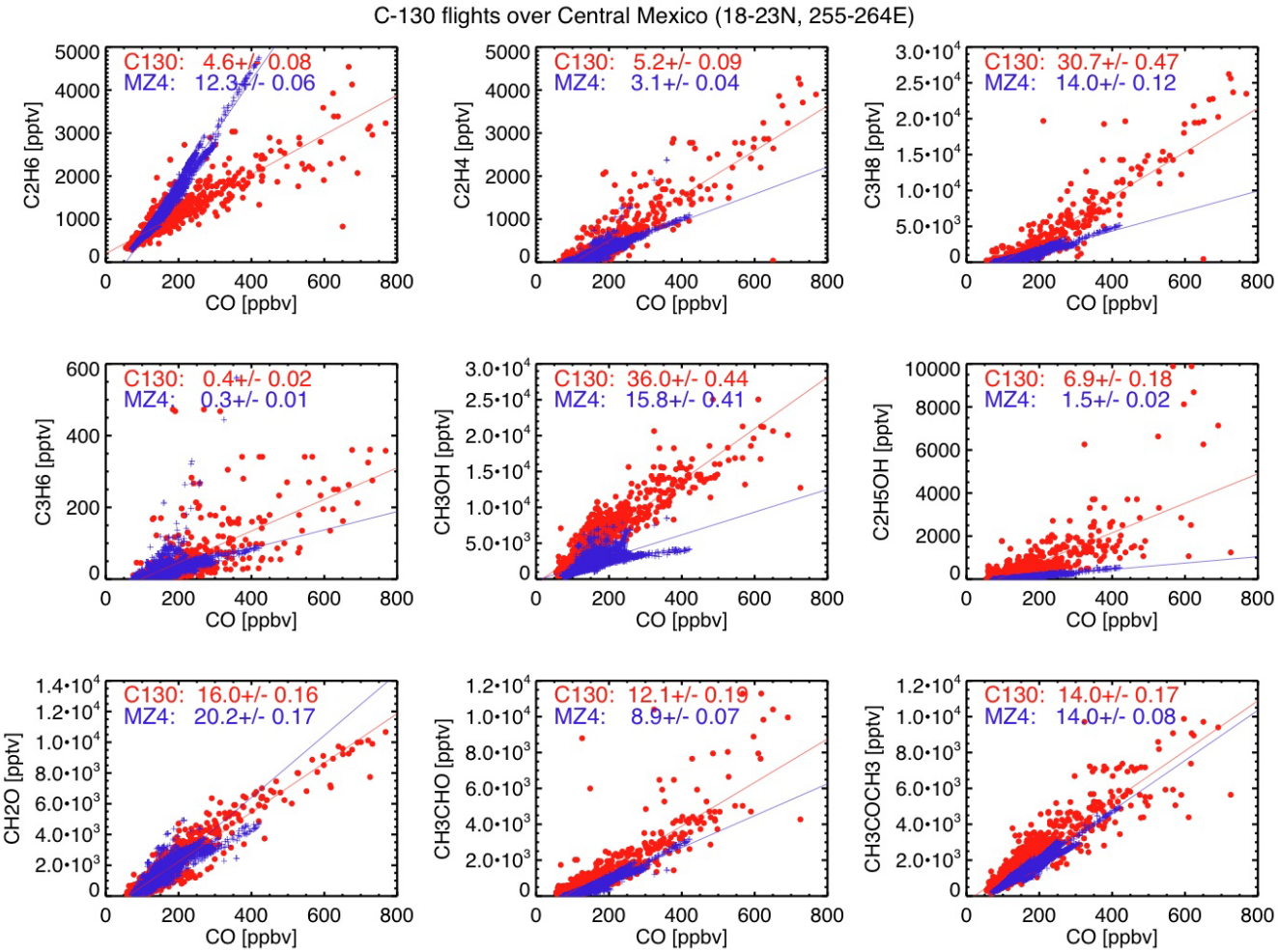



*Apel et al., ACPD, 2009*

# Mexico City VOC emissions

MZ4 simulations for MIRAGE-Mex used VOC speciation based on POET/EDGAR-2 – not correct in some cases

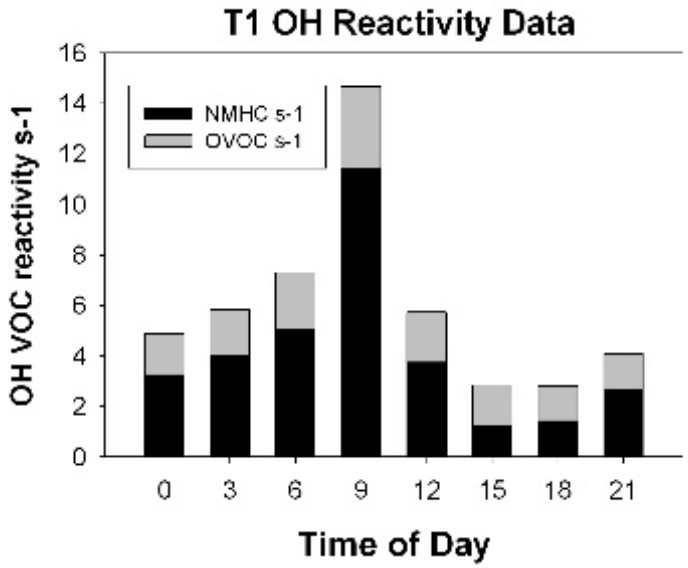


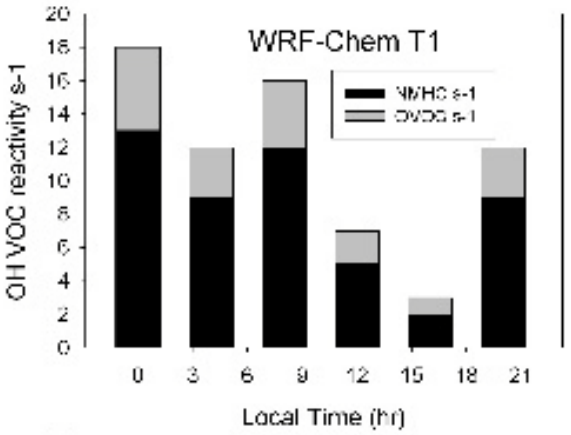

*Emmons et al., ACPD, 2010*

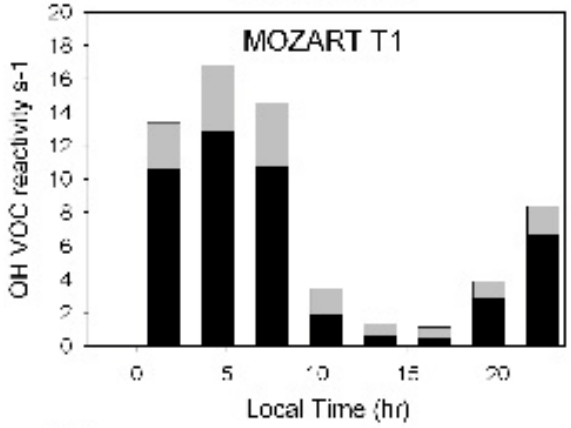
# Modeled OH reactivity

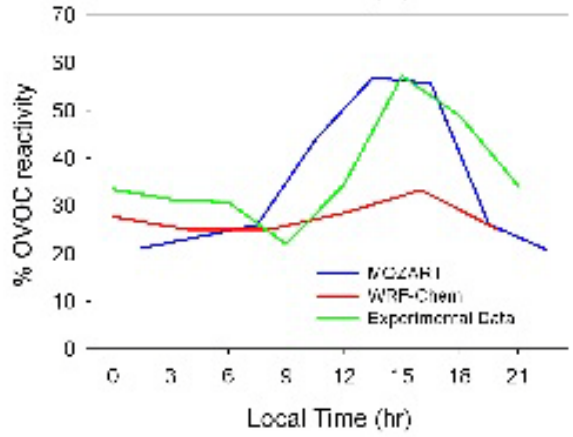
Both MZ4 and WRF-chem over-estimate nighttime reactivity probably due to BL being too shallow

MZ4 reproduces ratio of OVOC/NMHC reactivity



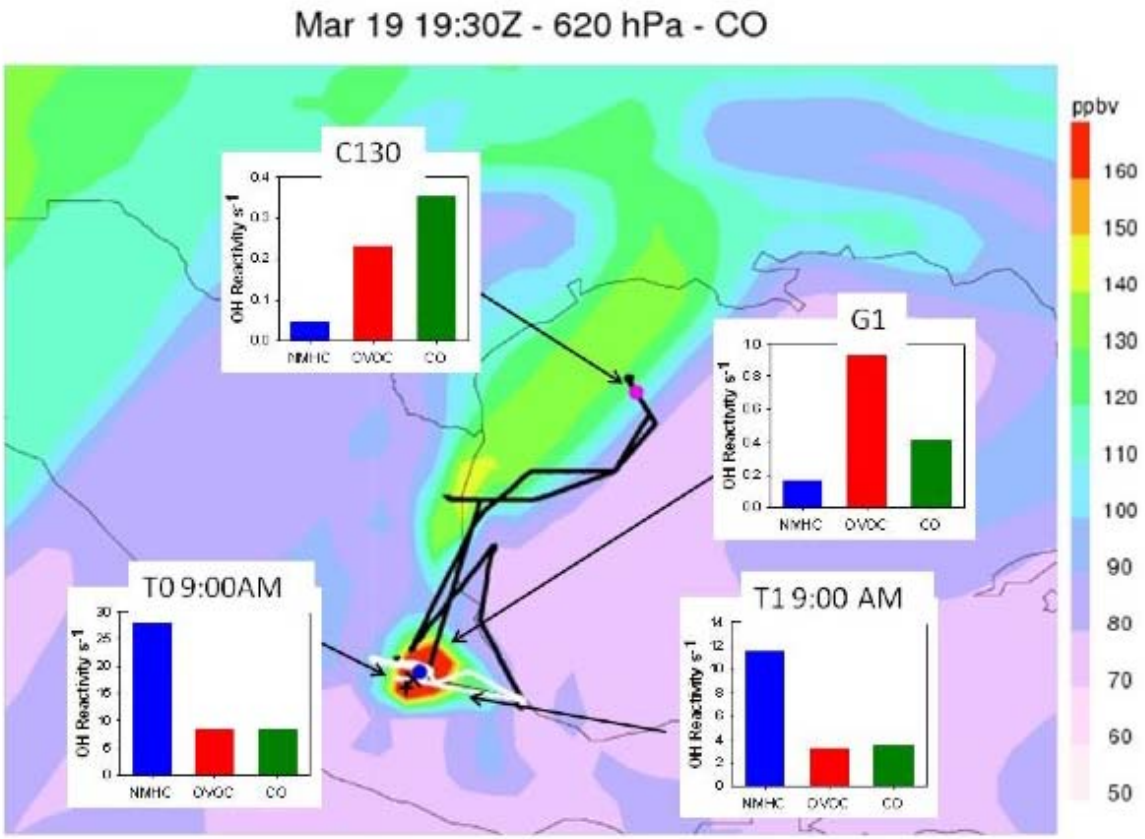



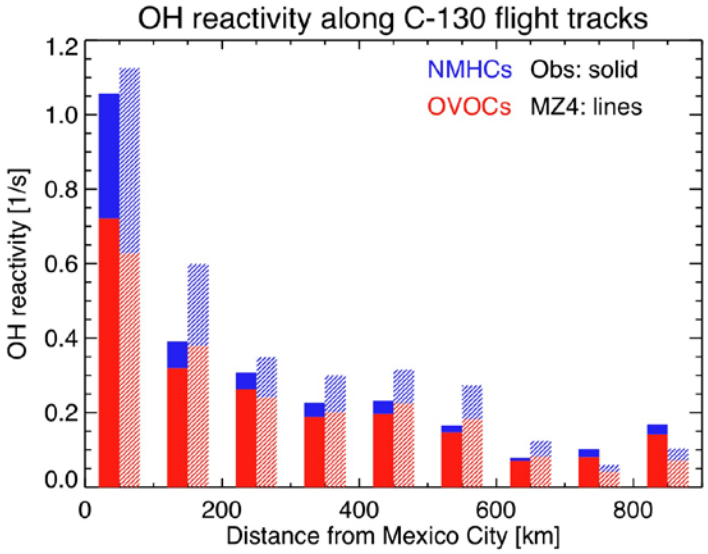




March average

*Apel et al., ACPD, 2009*

# Evolution of Mexico City plume




OVOCs become increasingly important downwind

MOZART also shows this

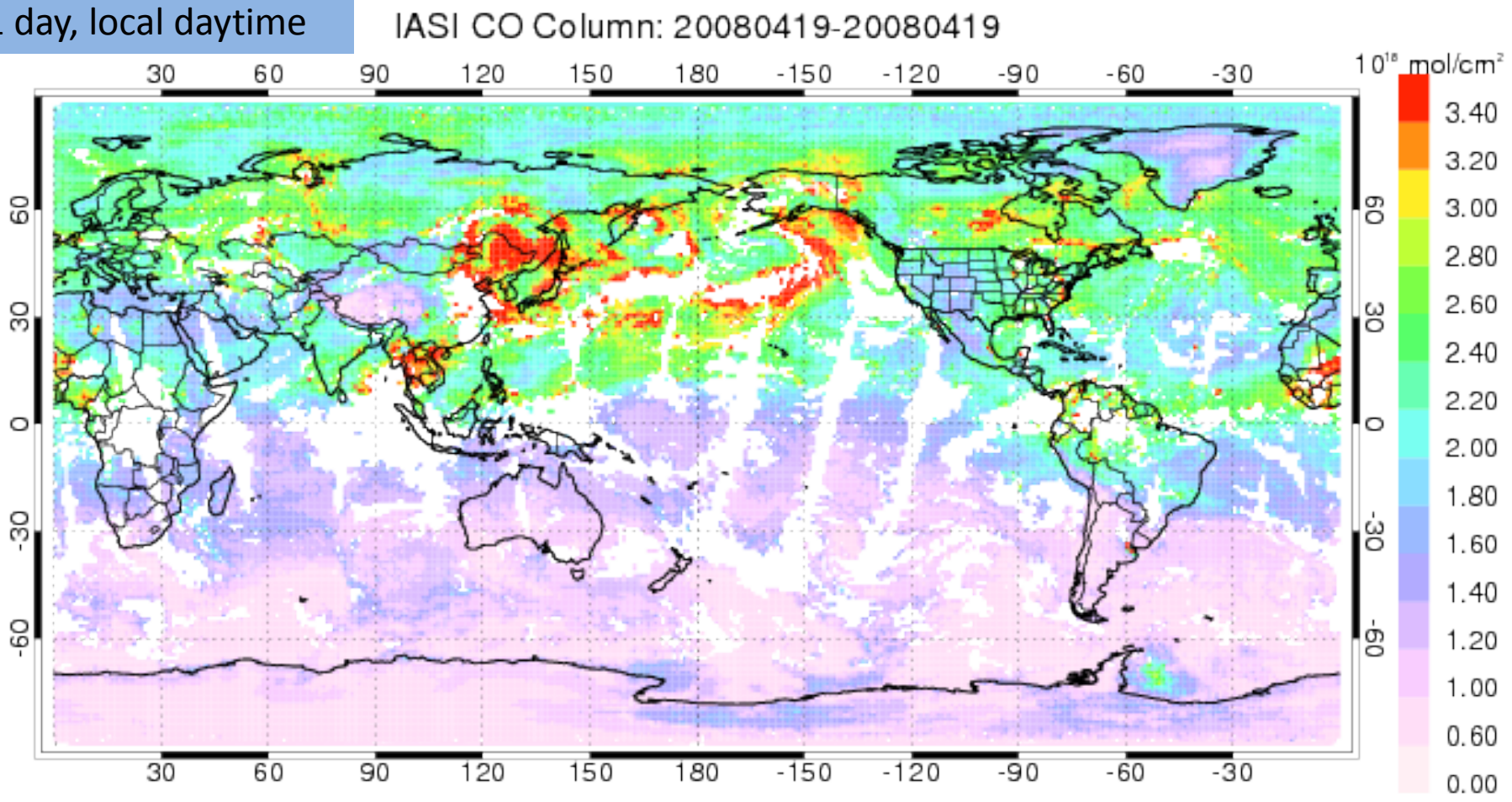
*Apel et al., ACPD, 2009*

*Emmons et al., ACPD, 2010*

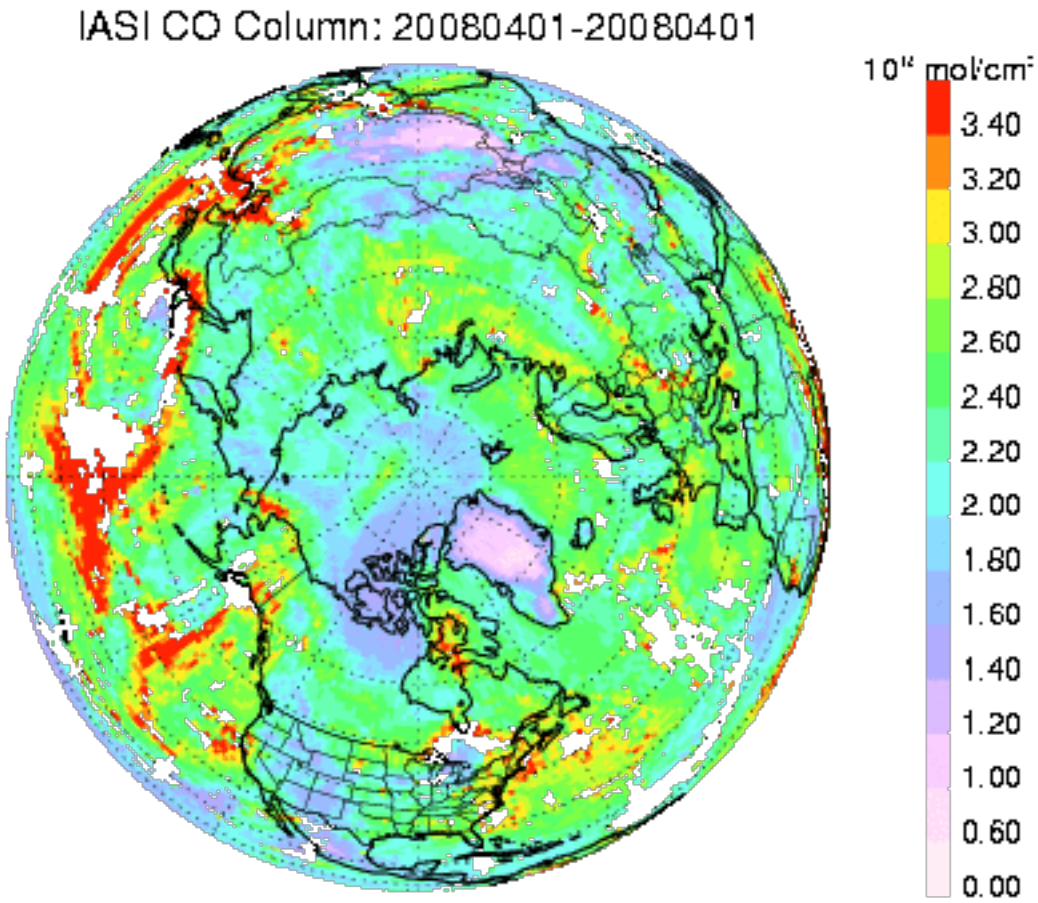
# IASI – Infrared Atmospheric Sounding Interferometer

IASI will be on 3 Eumetsat METOP satellites (2006, 2012, 2016)
Can detect many species: CO, O3, HNO3, NH3, CH4, etc
Global coverage twice a day

1 day, local daytime

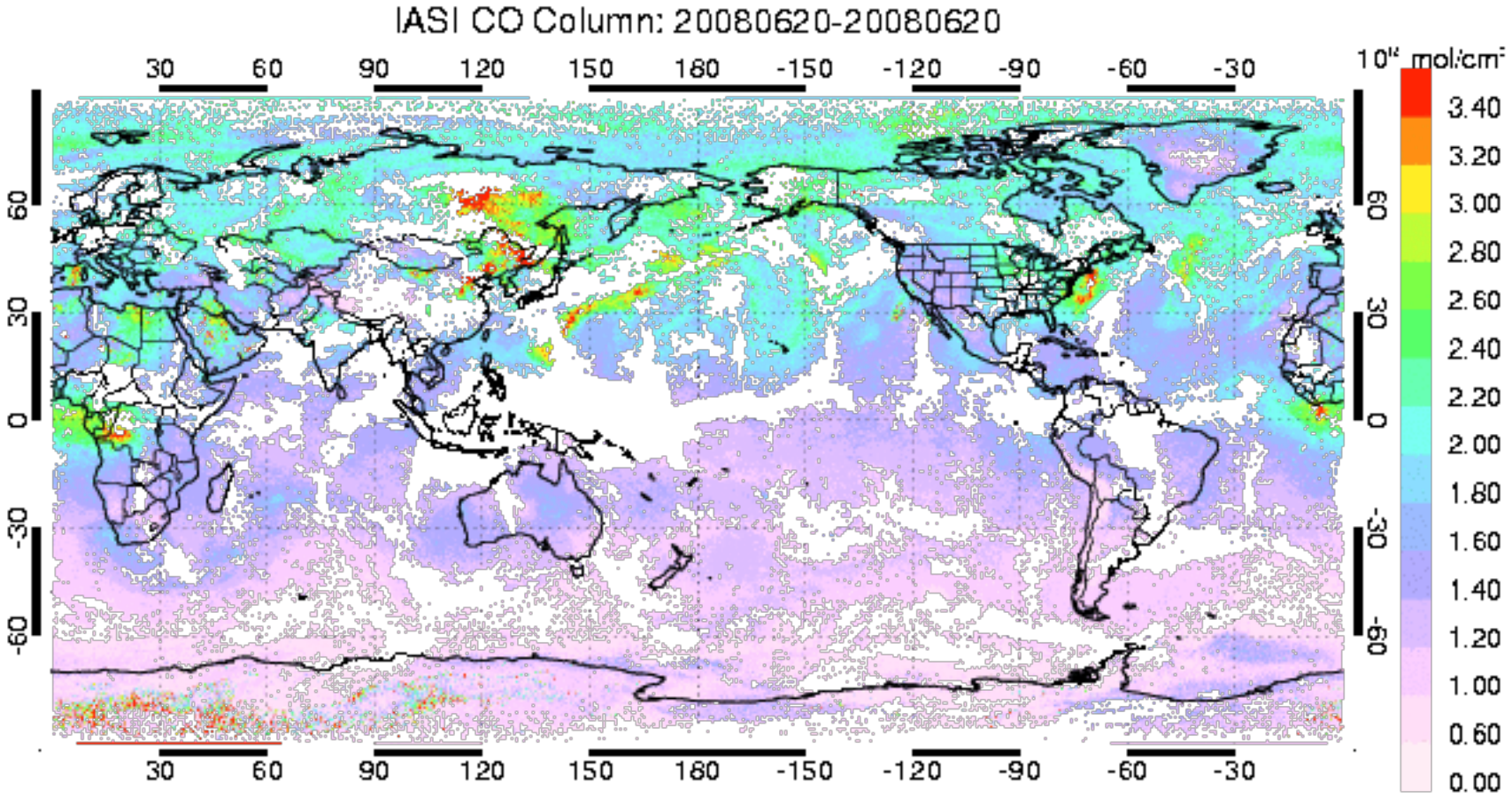


# IASI - CO Column – April 2008

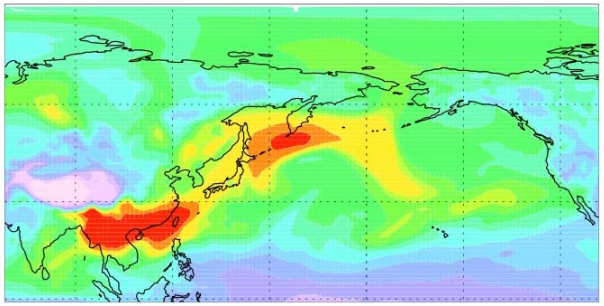


# IASI

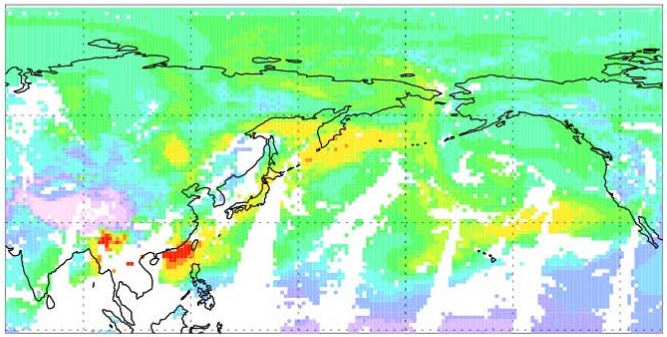
CO column – Jun 20-Jul 15, 2008



MOZART-4 CO Column 20080423



MOZART * IASI-AvgKer 20080423



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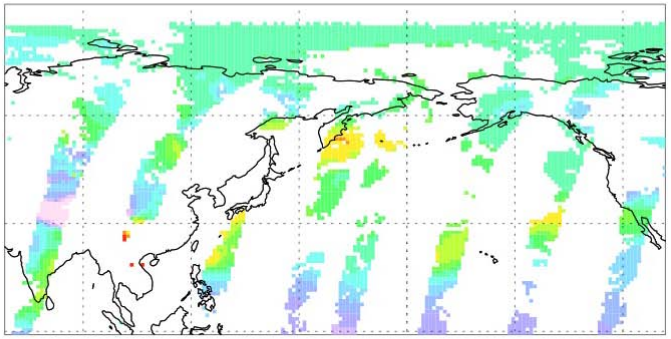

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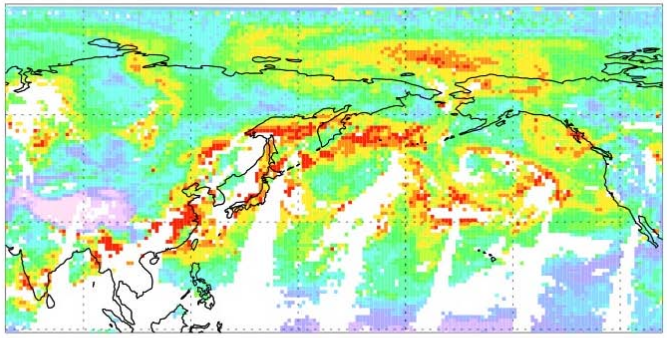
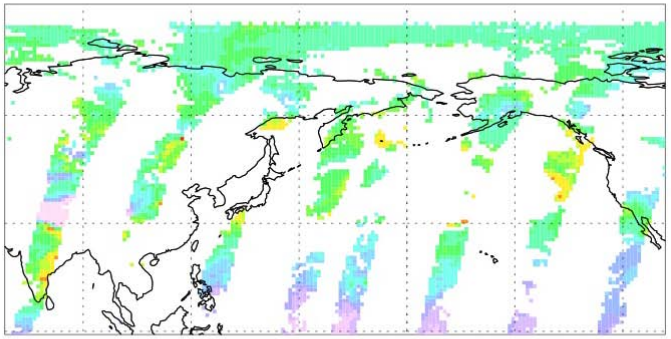


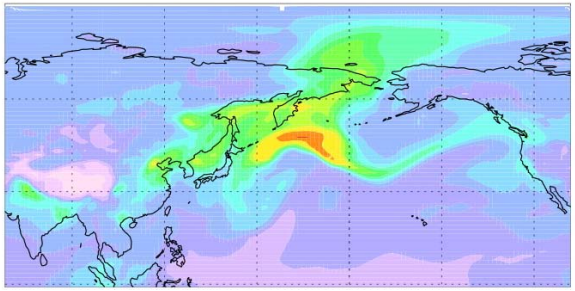
MOPITT Column CO 20080423



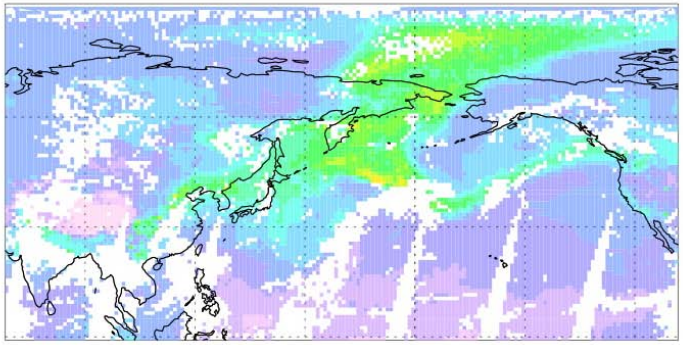

MZ4/arctas-v3vert-t85


MZ4/arctas-v3vert-t85

MOZART-4 CO Column 20080707



MOZART * IASI-AvgKer 20080707



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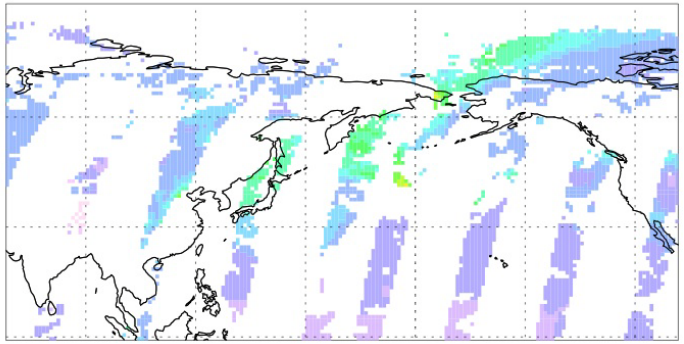

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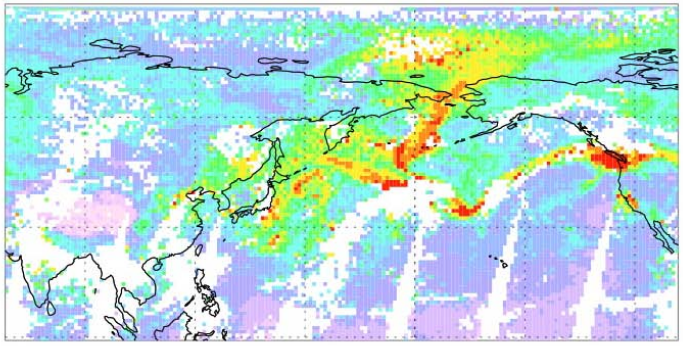
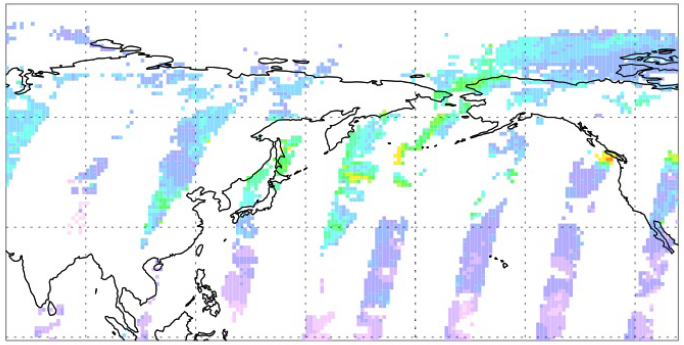
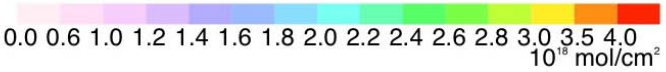


MOPITT Column CO 20080707

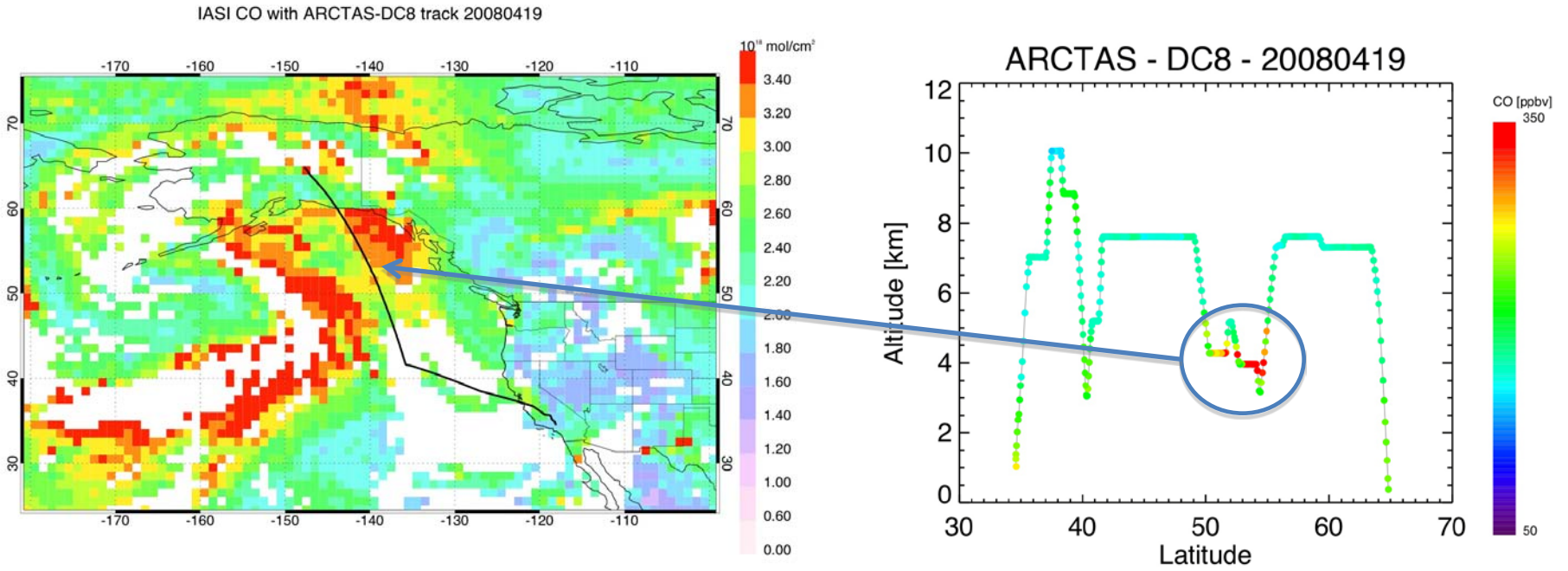





MZ4/arctas-v3vert-t85


MZ4/arctas-v3vert-t85

# Strong Asian plume in IASI was sampled by DC-8




A plume can be seen in MOZART-4 (1.4x1.4), but much weaker

12 hrs later, still has not arrived