

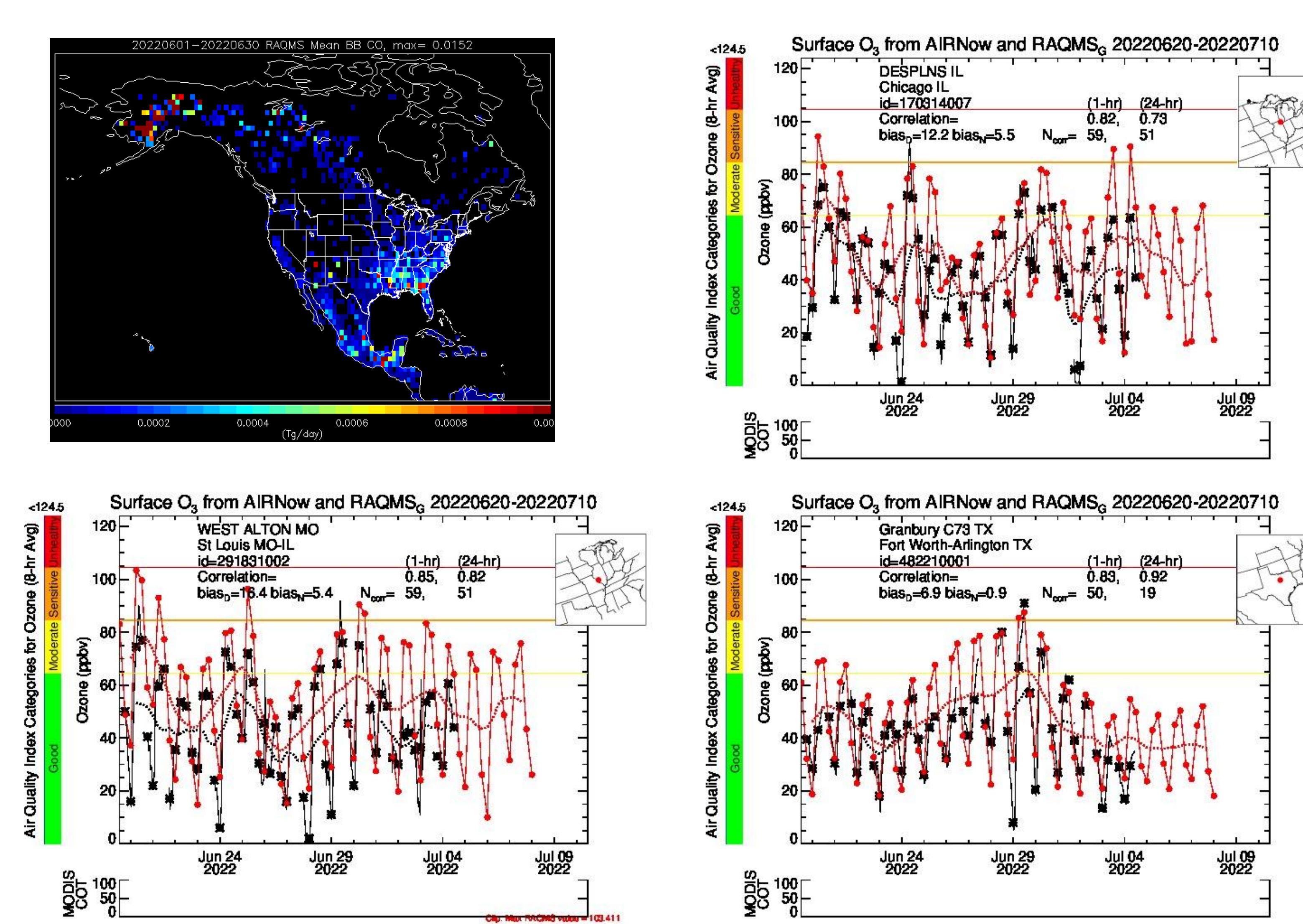


Global Models and Satellite Informed Lateral Boundary Conditions



Case Study

June 2022 had wildfires in Alaska (more fires in July, but not clear surface impact). Elevated ozone seen at monitors



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Tiger Team Motivation and Goals

- Emission controls have reduced local US anthropogenic contributions of ozone.
- Natural and international contributions from “lateral boundaries” increase as a fraction.
- Lateral boundaries from global models with satellite constraints have been shown to improve regional model performance (e.g., Pour-Biazar et al, 10.1029/2010JD015200).
- GOAL:** NASA Health and Air Quality Applied Sciences Team (HAQAST) working to improve access to boundary conditions from multiple global models including satellite data assimilation.

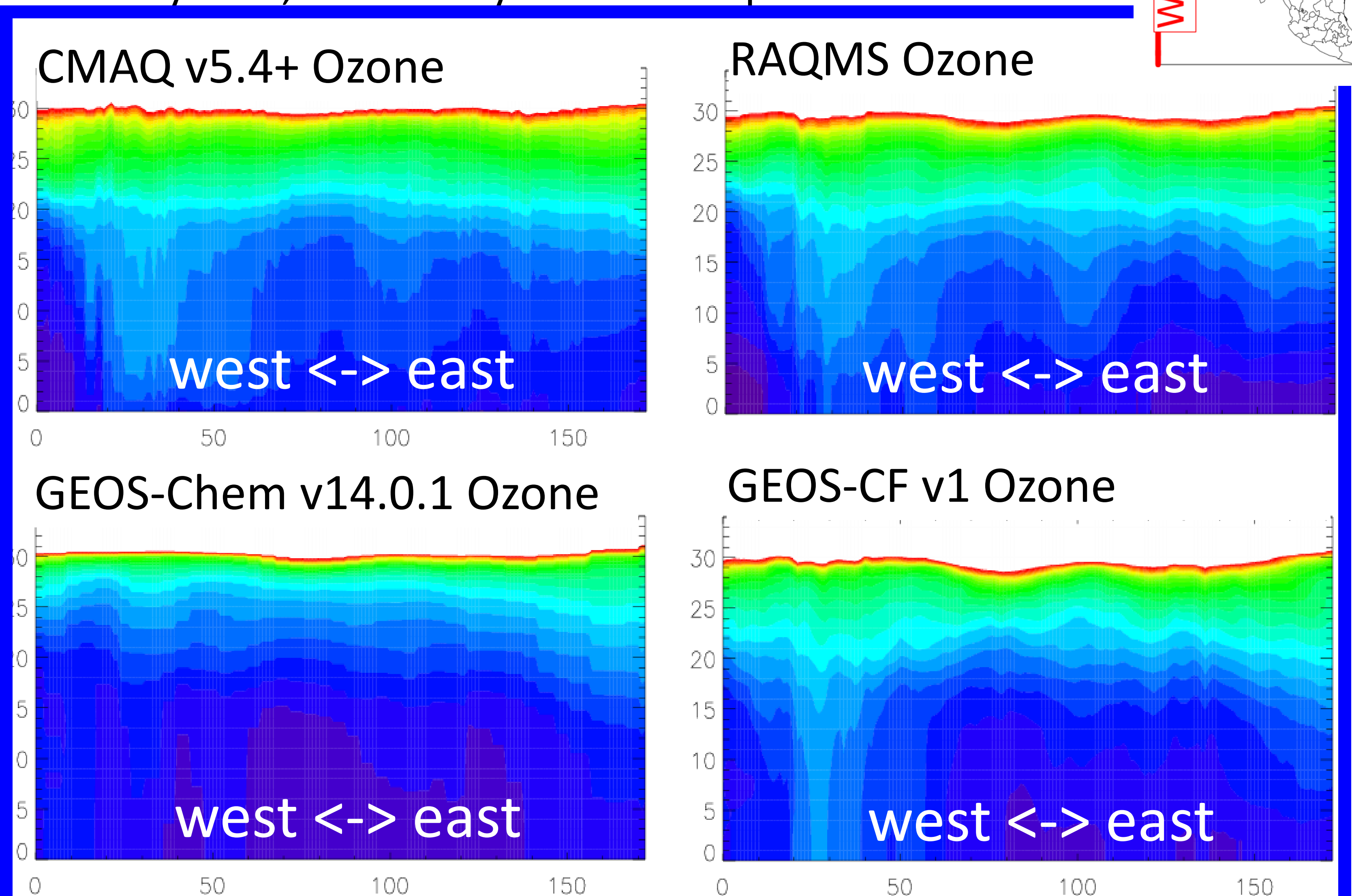
Progress

- Identification of a focus: 2022 year, 36US3 domain, and case study June 20 to July 3rd
- Evaluation of GOES-Chem, GOES-CF, Hemispheric CMAQ, and RAQMS to sondes.
- air quality model boundary condition (aqmbc) processor updated to facilitate multiple models.
- aqmbc updated to automate LBC documentation including summary tables and figures.
- LBC processing with aqmbc and comparison of boundary conditions for the case study.
- Case study CAMx simulations to evaluate the value of LBC are *in progress*
- Availability satellite constraints via assimilation: TCR available, GEOS-CF *soon*

North Boundary Comparison

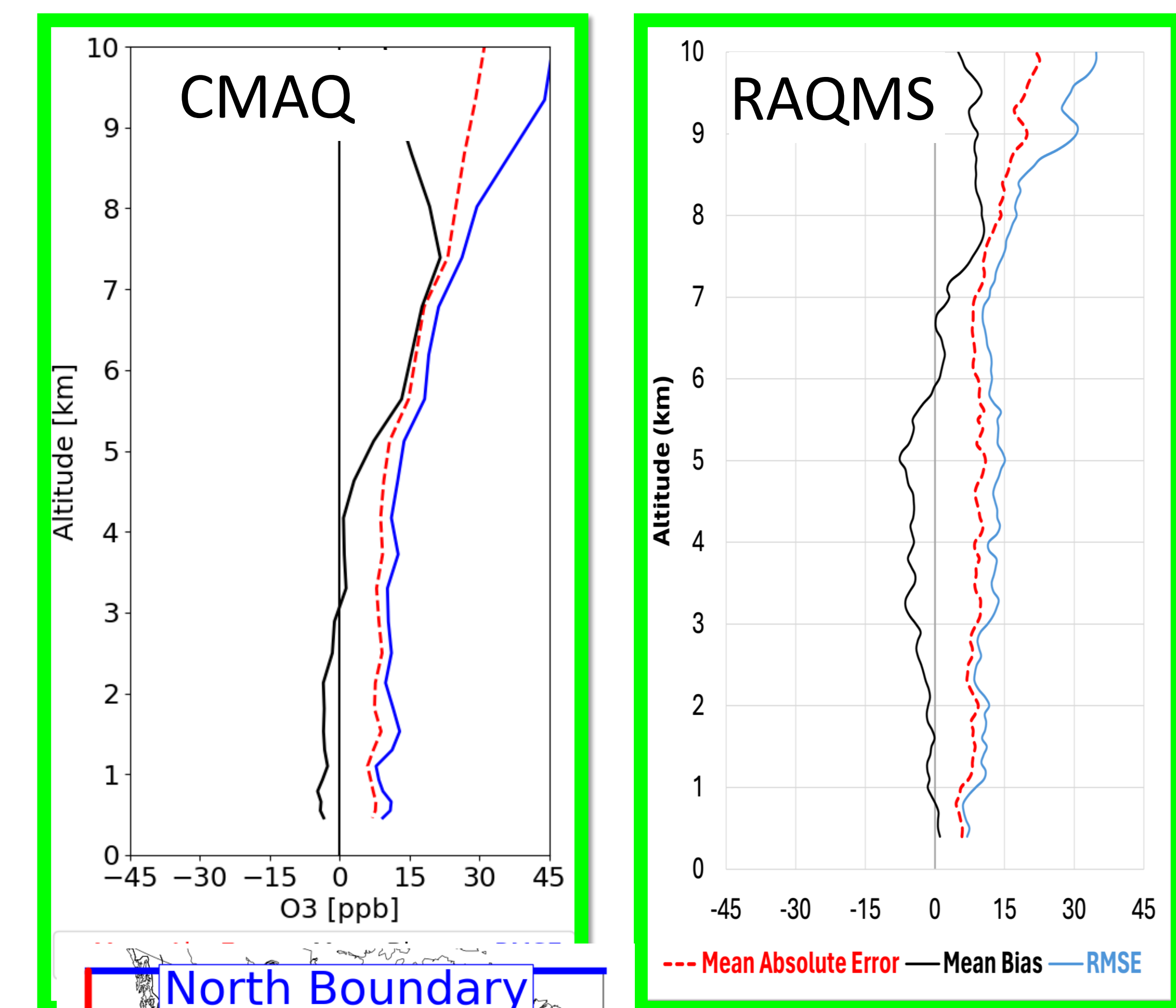
General consistency, but this GEOS-Chem simulation used monthly fires, which may not have captured the fire well.

Vertical Layer (surface to 50hPa)



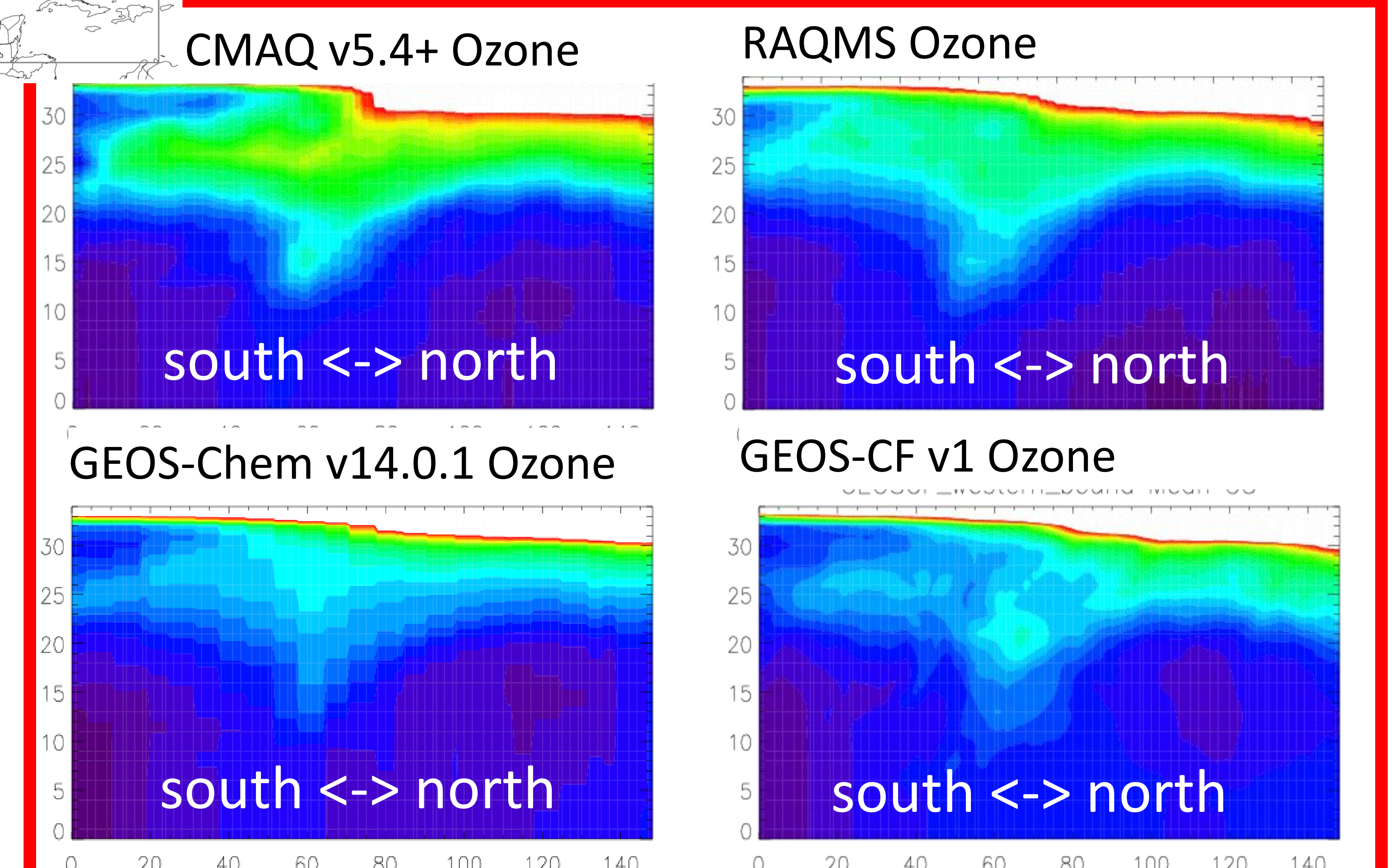
Sonde Evaluation

Examples below for May-Oct at Trinidad Head. More models/sondes/dates available.



West Boundary Comparison

Structure of stratosphere mixing is similar, but the structure and coherence of the downward mixing is quite different.



aqmbc

Documentation with examples

aqmbc Examples

GEOS-Chem Benchmark LBC for CMAQ

Hemispheric CMAQ LBC for CMAQ

GEOS-CF LBC for CMAQ

RAQMS LBC for CMAQ

TCR LBC for CMAQ

WACCM LBC for CMAQ

aqmbc Modify Examples

aqmbc Config File

aqmbc package

```
metaf = aqmbc.options.getmetaf(bctype='bcon', gdnam=gdn
inpath = sorted(glob.glob(
    'TCR-2/tropess.gesdisc.eosdis.nas.gov/data/TCR2_MO
))
suffix = f'_{gdnam}_BCON.r
dims = aqmbc.options.dims[
    'r']
outpath = f'TROPESS_reanalysis_mon_2021_{gdnam}_BCON.nc
history = f'From {inpath}'
outf = aqmbc.bc(
    inpath, outpath, metaf, vmethod='linear', exprpaths
    dimkeys=dims, format_kw={'format': 'tcr'}, history=
    clobber=True, verbose=0
)
```

barronh.github.io/aqmbc

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