NUCAPS Trace Gas Recent Updates

Juying Warner and Zigang Wei, AOSC/UMD

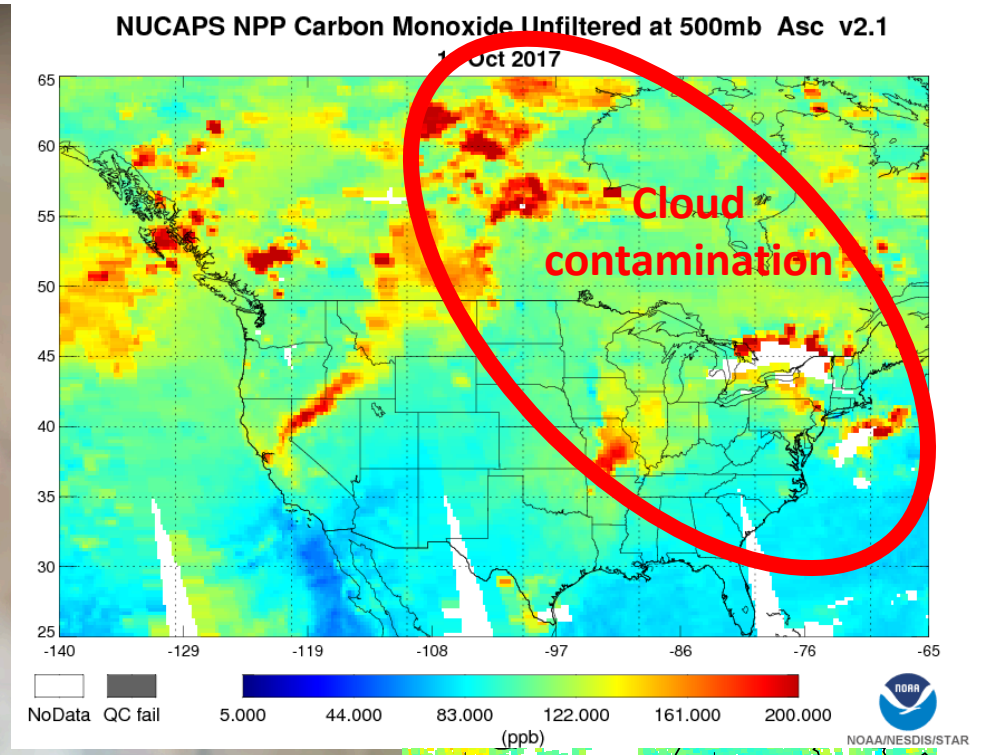
NOAA/STAR NUCAPS: Murty Divakaria, Ken Pryor, Michael Wilson, Nick Nalli, Changyi Tan, Tong Zhu, Tianyuan Wang

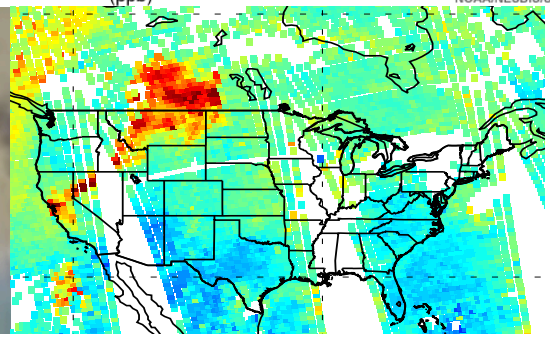
*Supported through CICS-MD and CISESS, University of Maryland

NUCAPS CO

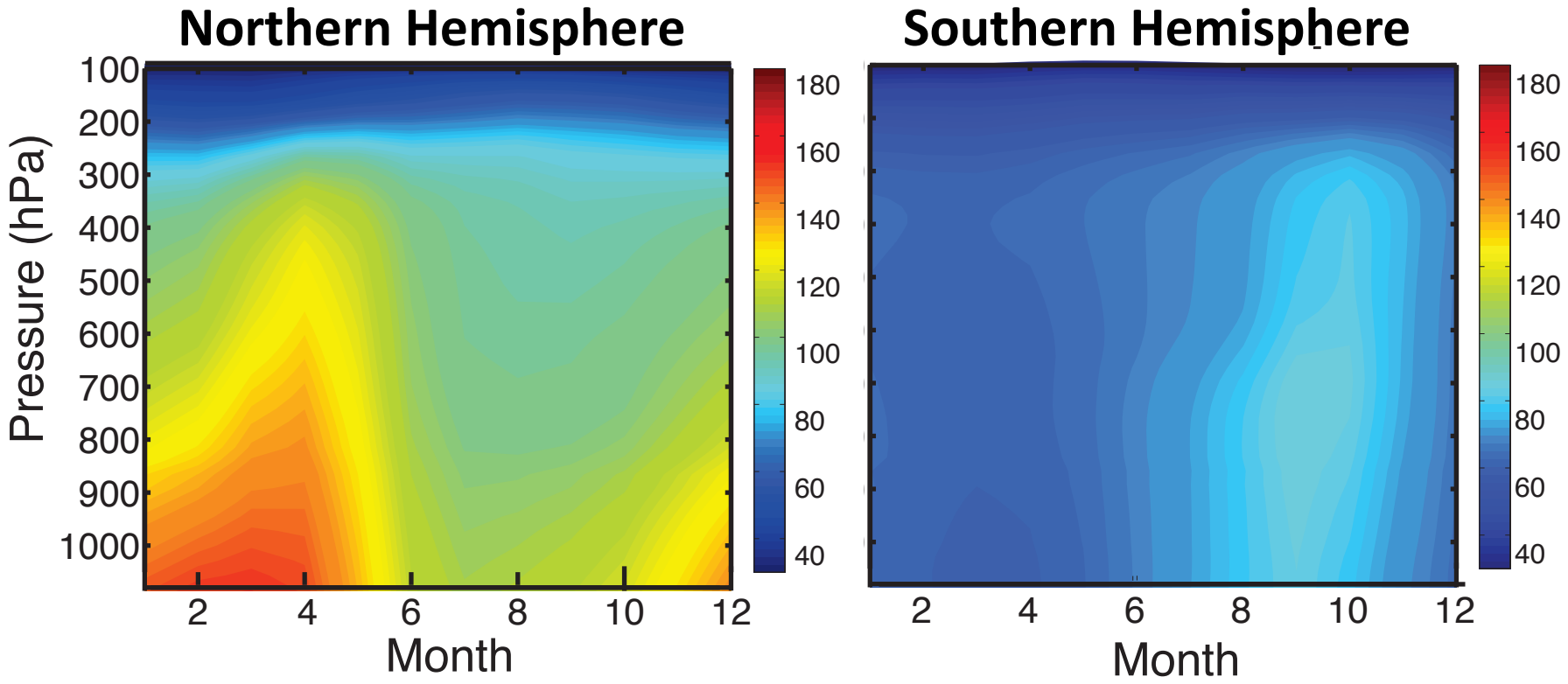
JPSS NUCAPS Carbon Monoxide of Santa Rosa Fire 20171011







S-NPP & NOAA-20 NUCAPS CO a priori for Operational and V2.5.2.2

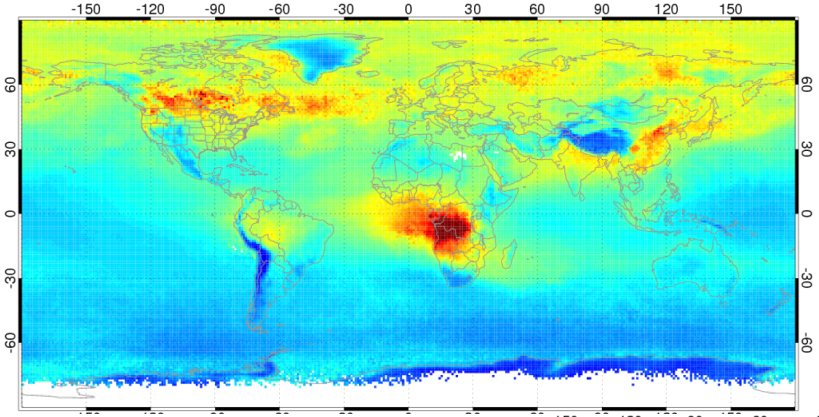


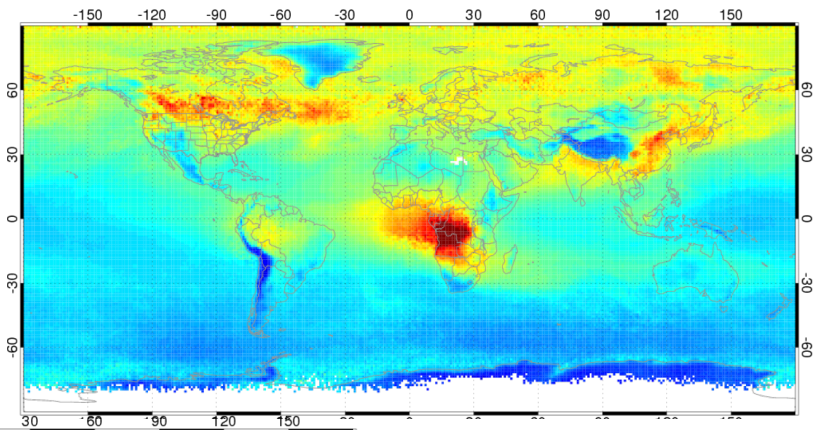
- Two hemispheric CO profiles (ppbv) developed from NCAR MOZART-GEOS5 model;
- Linearly transition between 15N and 15S;
- Monthly varying, but no year-to-year variations;
- Same approach as for AIRS, but updated to current values for NUCAPS.

Comparisons of CO Column

(x10^{17} mols/cm^2) 201808

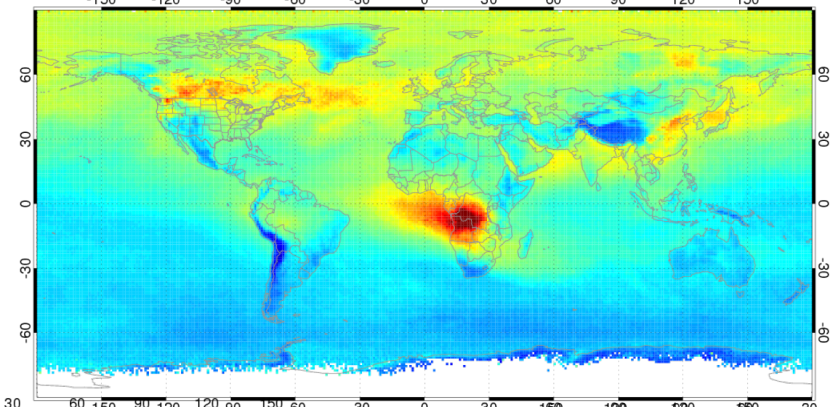
S-NPP CrIS



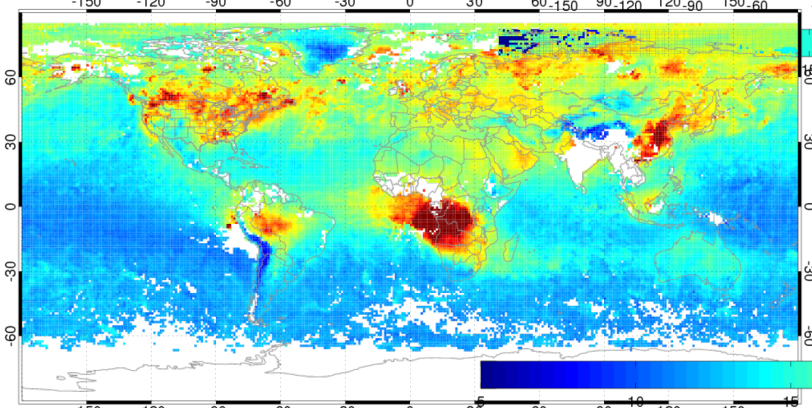


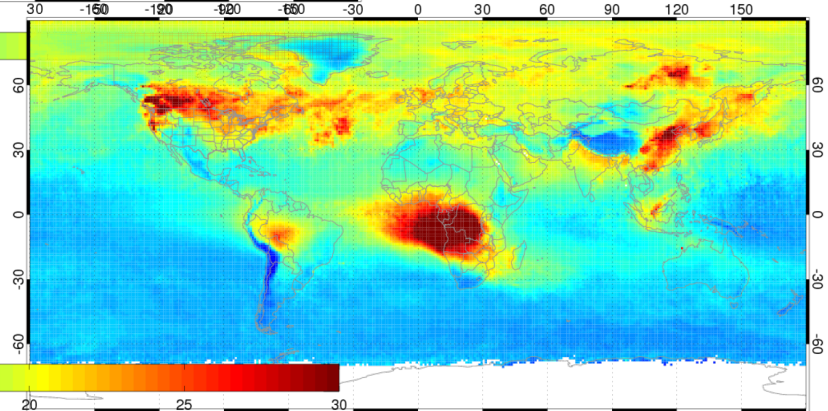
NOAA-20 CrIS

AIRS



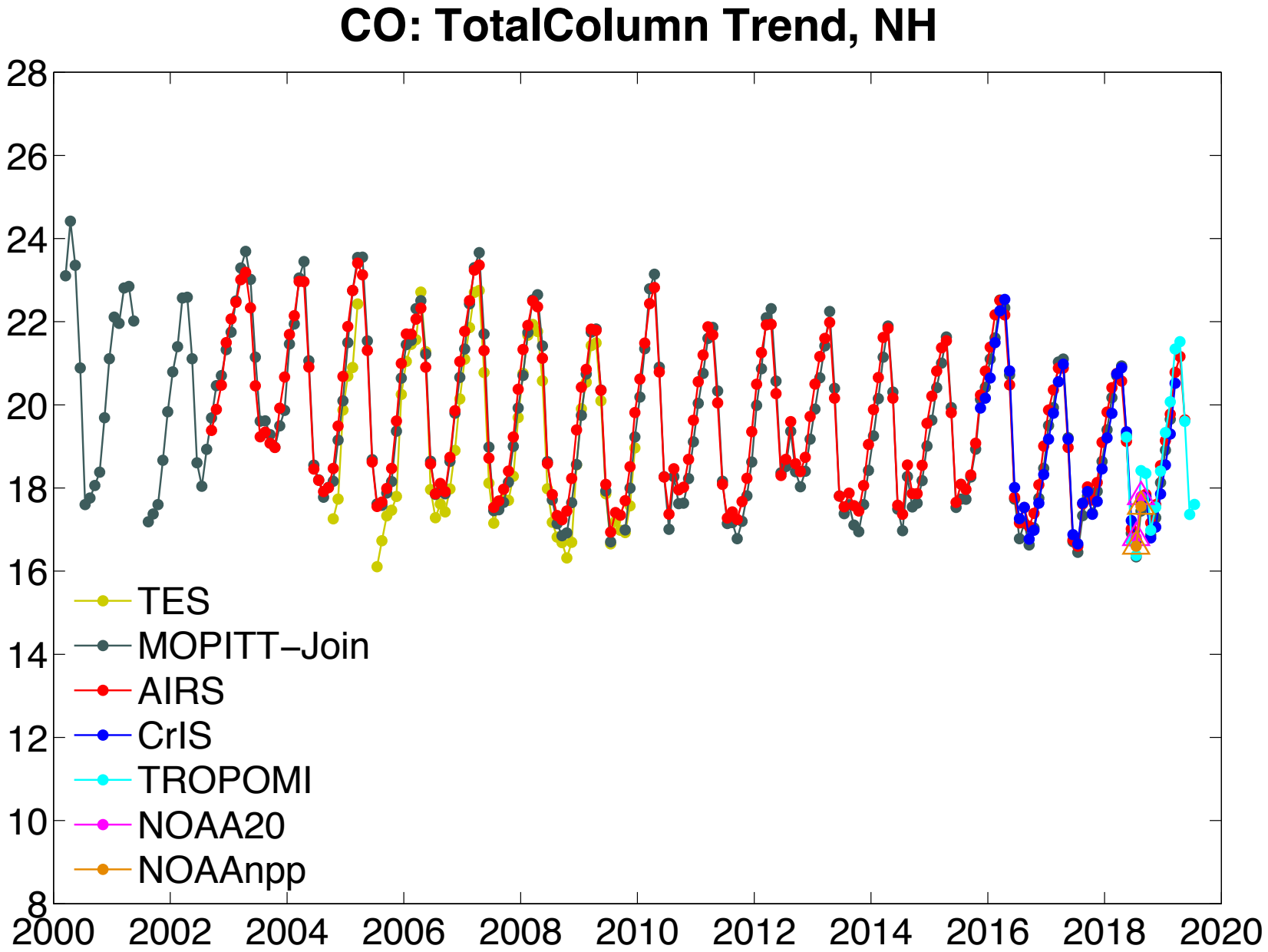
MOPITT





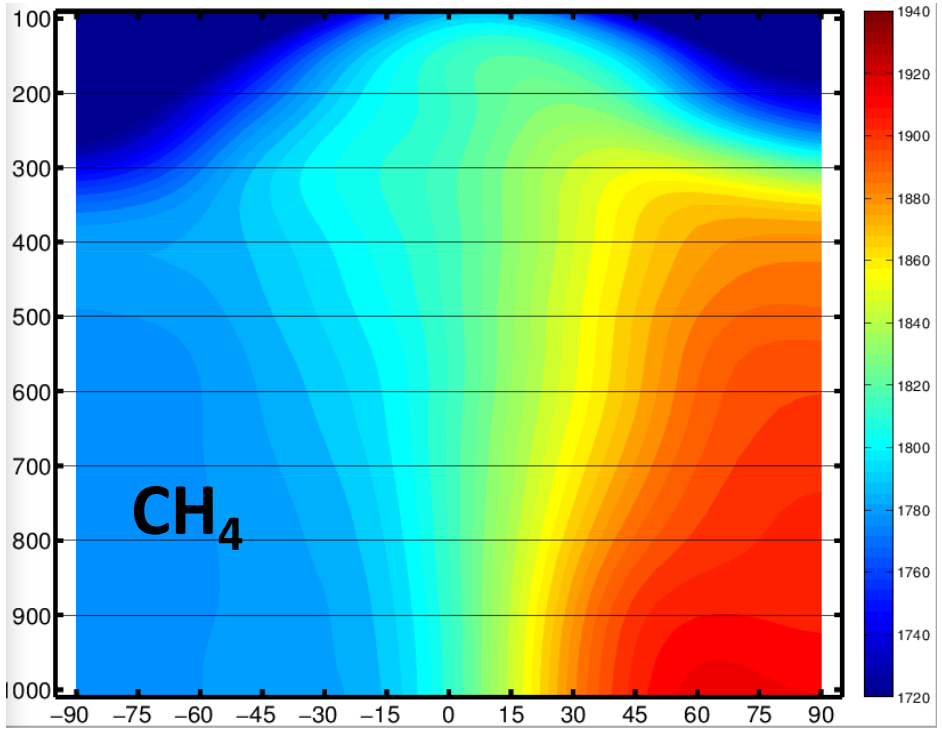
TROPOMI

CO Trend Comparison

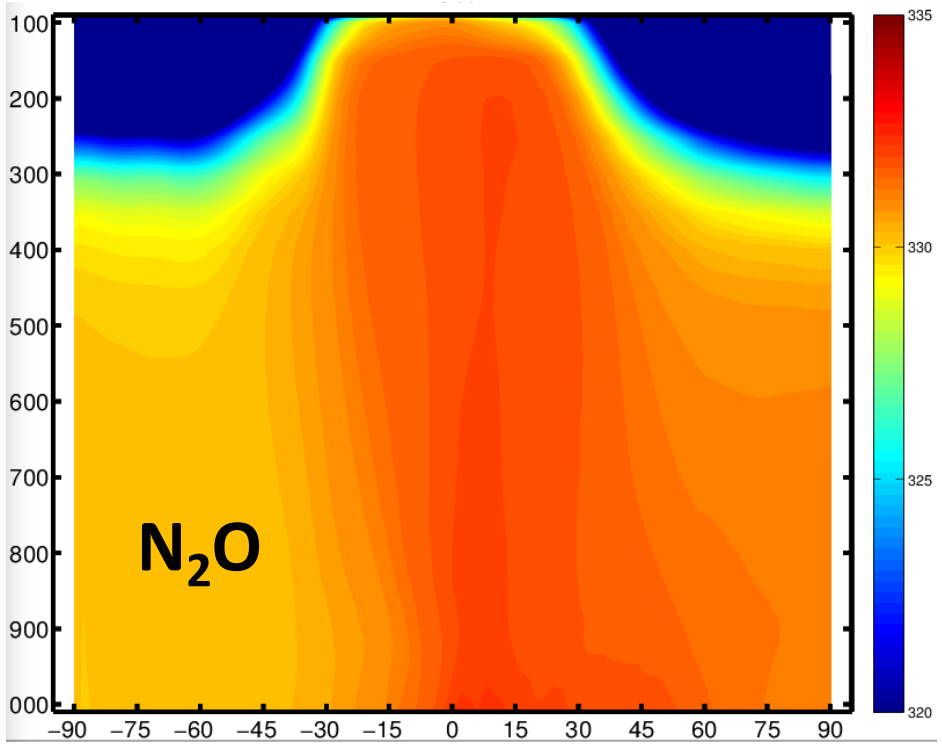


NUCAPS CH4

CH_4 a priori/first guess - CH4fgtype=9

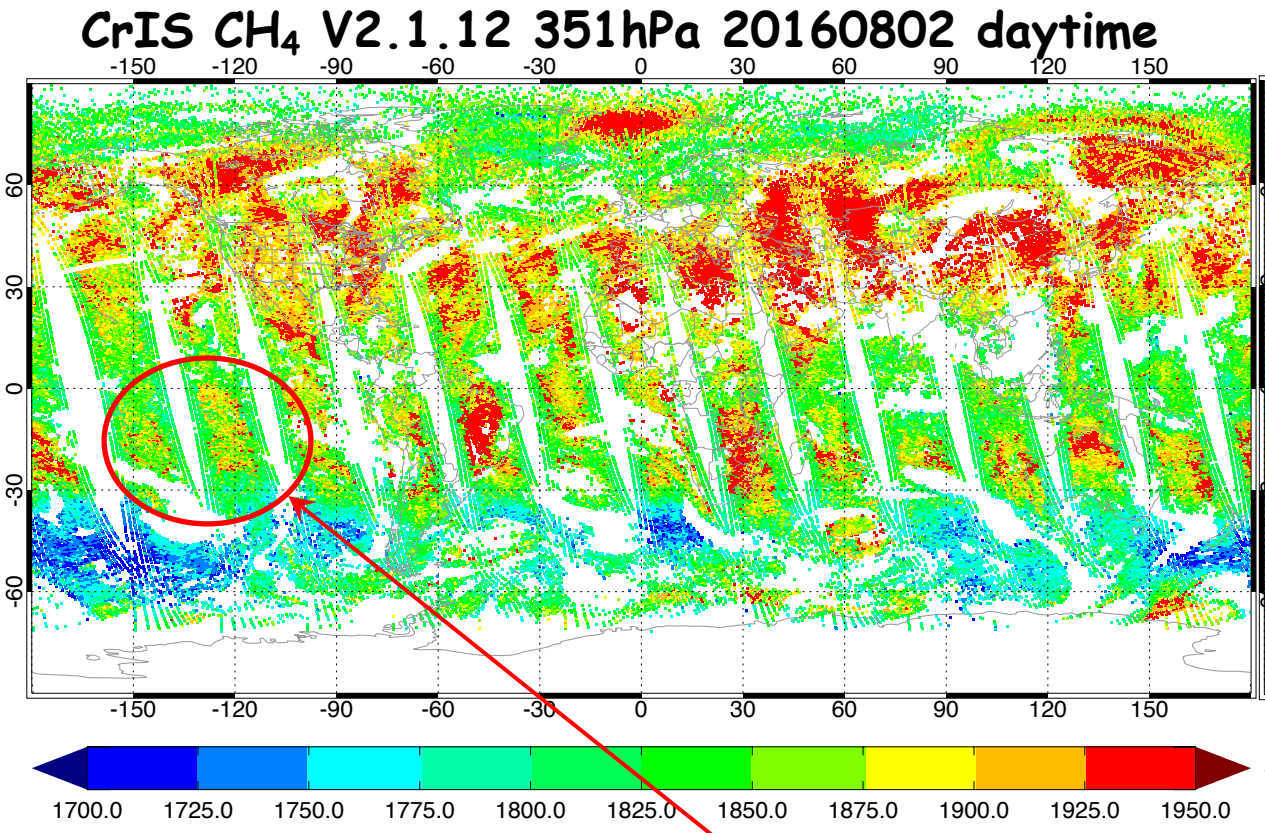


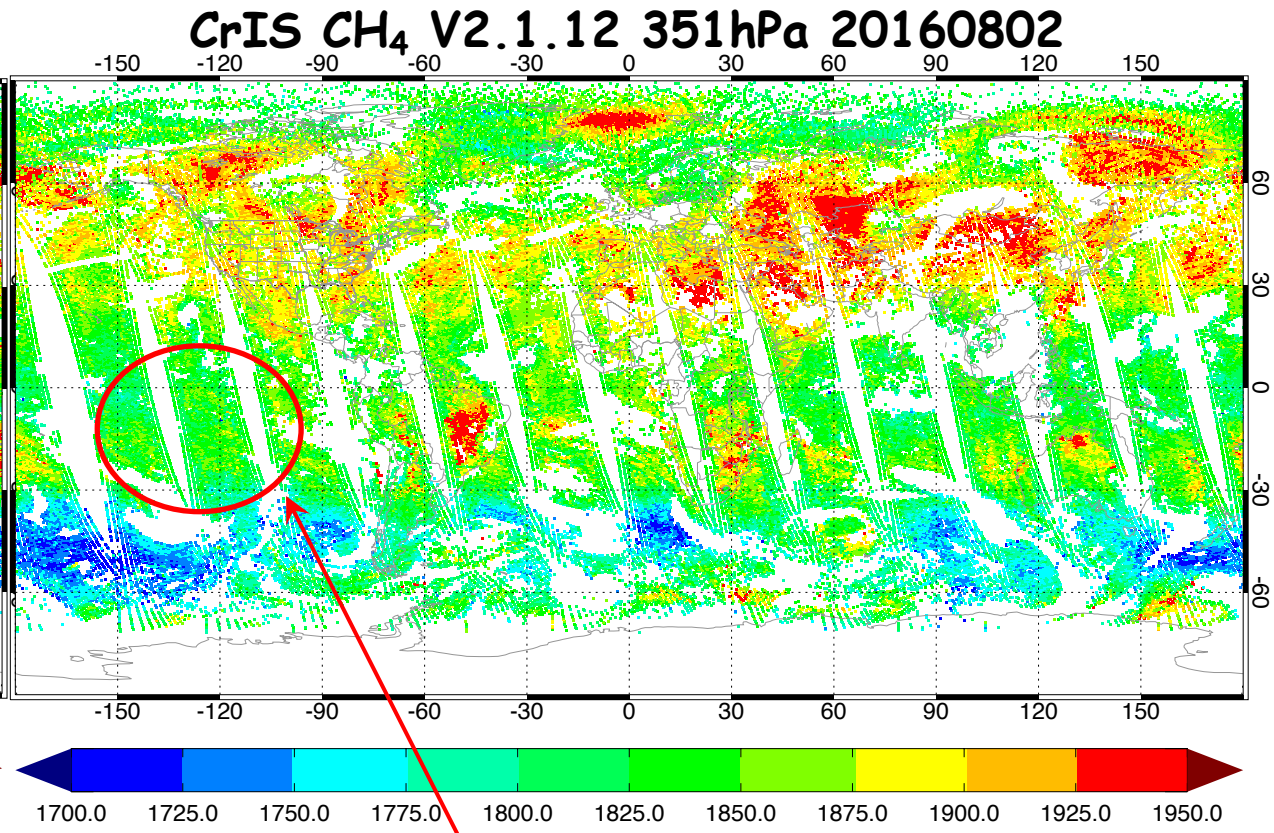
N_2O a priori/first guess - N2Ofgtype=5



- N_2O AP are based on CTM from NASA/GSFC, with yearly change, so not for N_2O retrievals;
- CH_4 AP are based on in situ measurement;
- N_2O AP are used to improve CH_4 retrievals;
- V2.5.2.2 validation include these upgrades

Significant Improvements Lowered Biases!



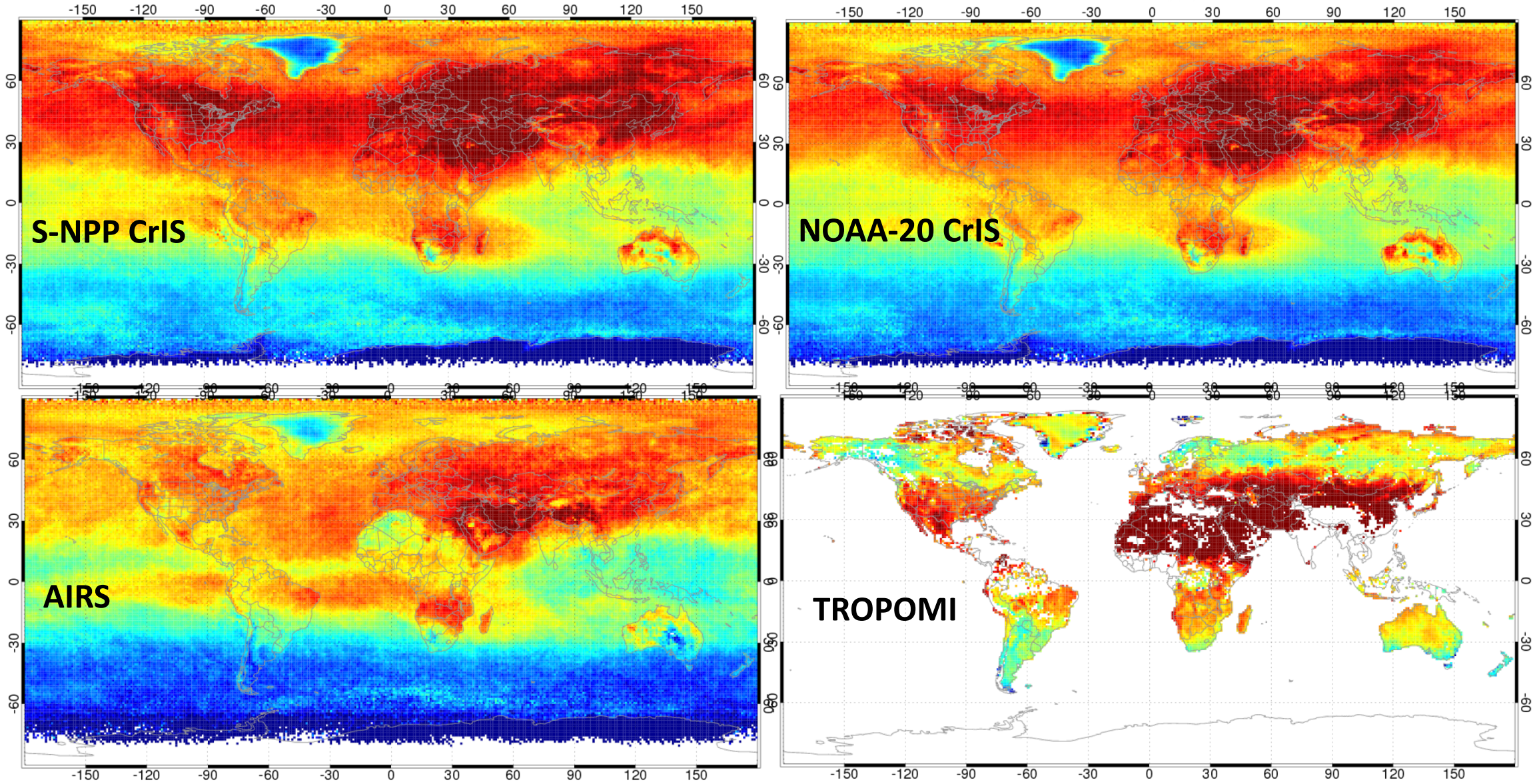


Edges lower!

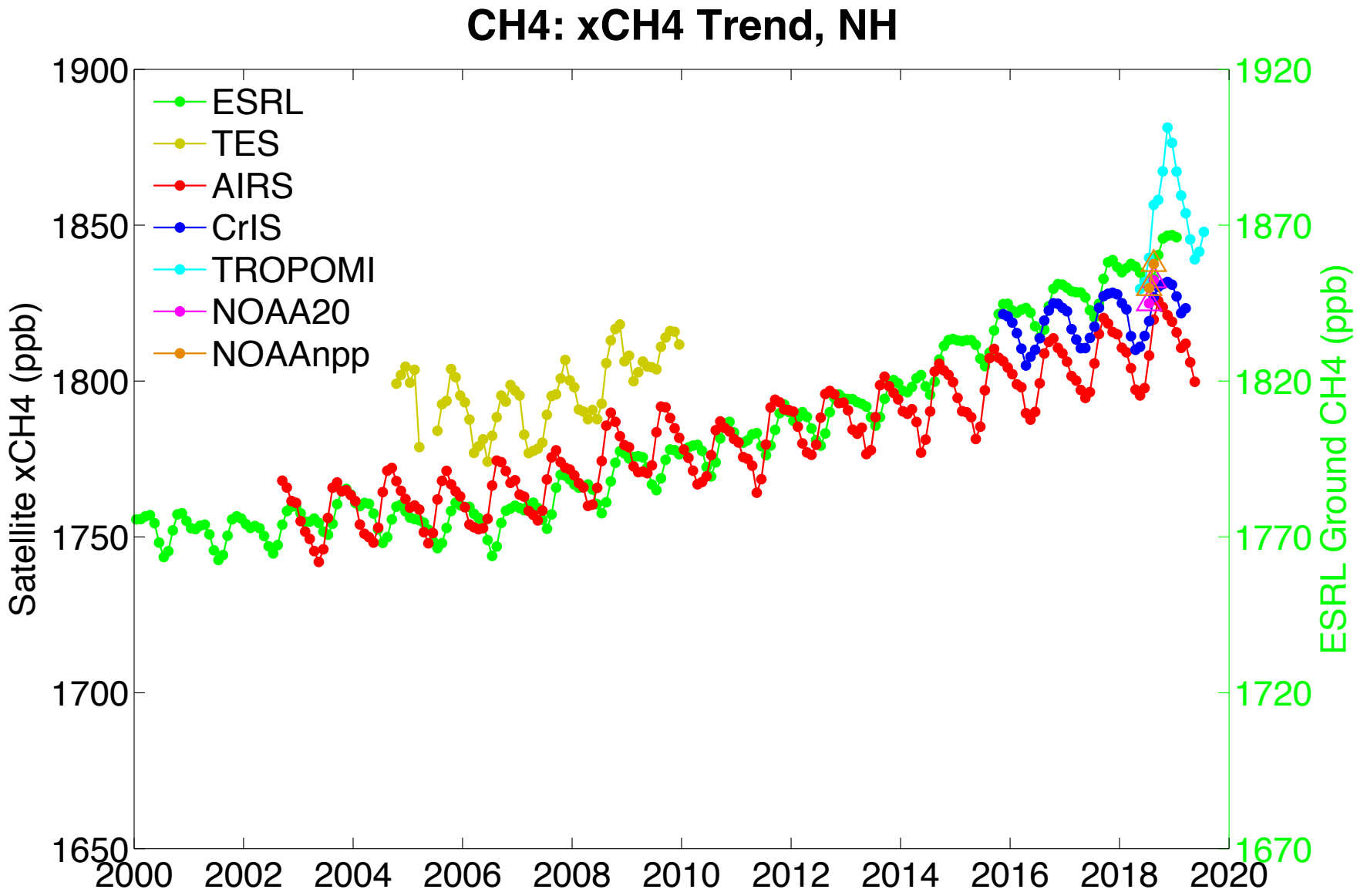
NO Edges!

- Removed cross-track biases and provided realistic values based on validations
- Delivered CH4 and N2O a priori; channel selection, and quality control.

xCH_4 Comparisons

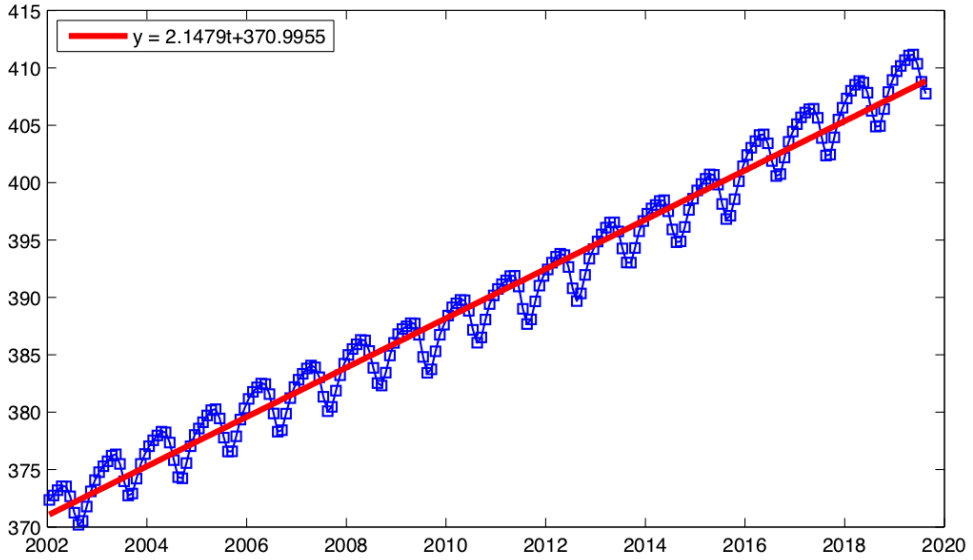


xCH_4 Trend Comparison



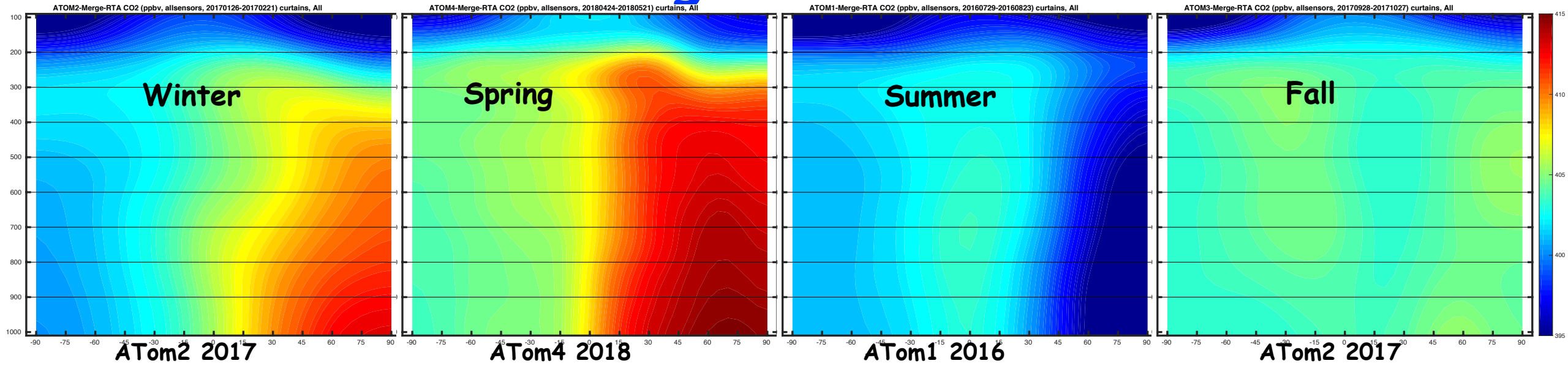
NUCAPS CO2

A priori Using Carbon Tracker and ESRL Trends



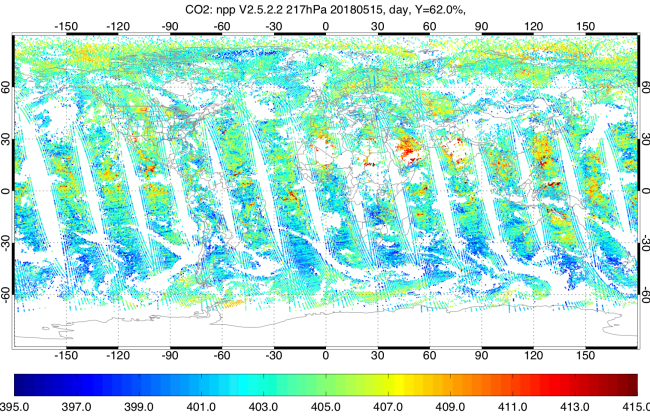
1. Latitudinal variation from curtains;
2. Seasonality from Carbon Tracker;
3. Linear trend from ESRL surface measurements;
4. Climatology uses anomaly from ESRL data.

Validate Against ATom1-4

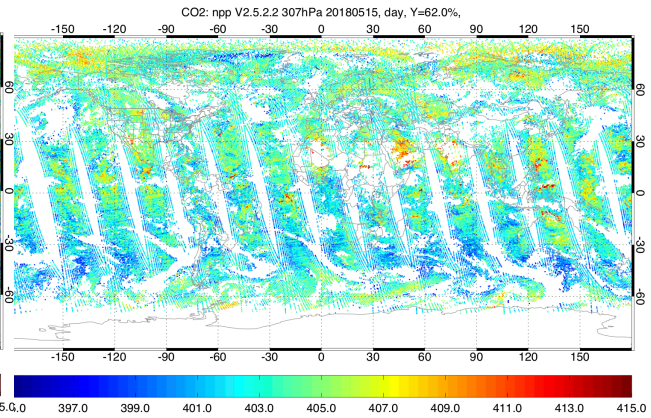


V2.5.2.2 CO2 VMR 2018/5/15

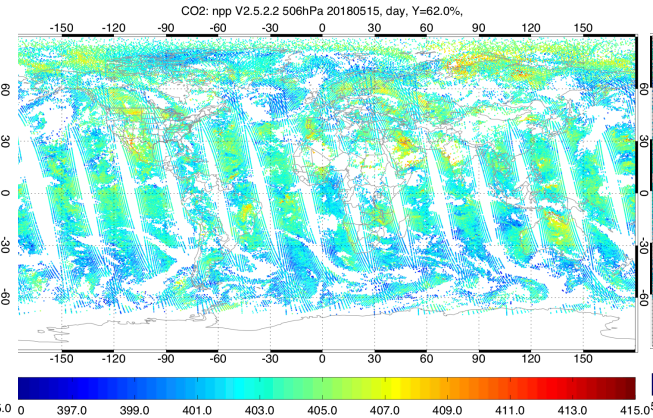
217hPa



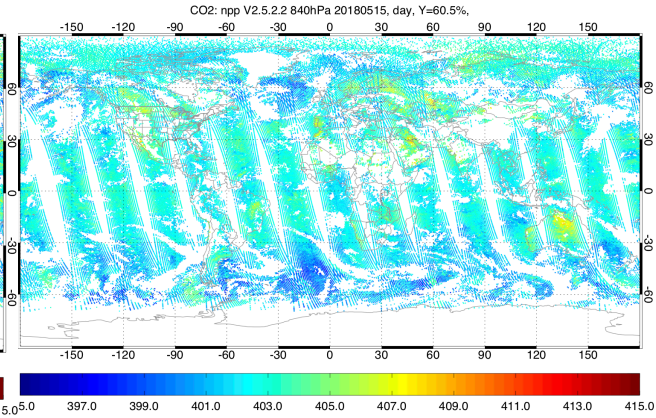
307hPa



506hPa

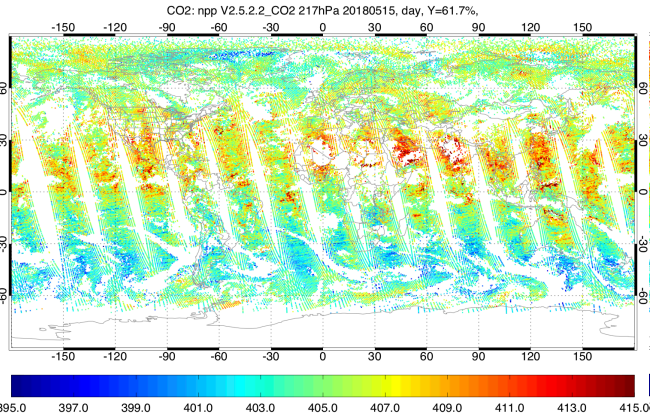


841hPa

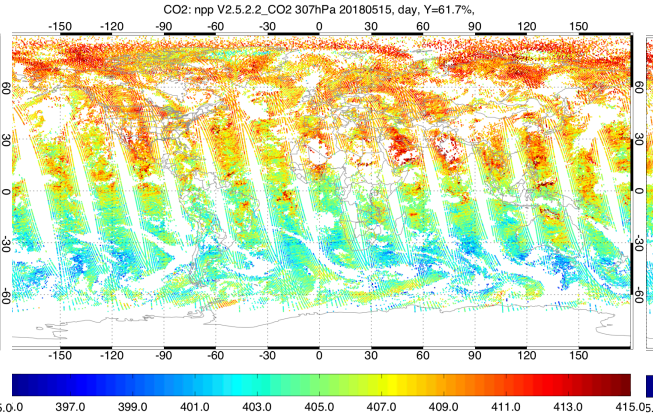


V2.5.2.2 CO2 VMR Updated 2018/5/15

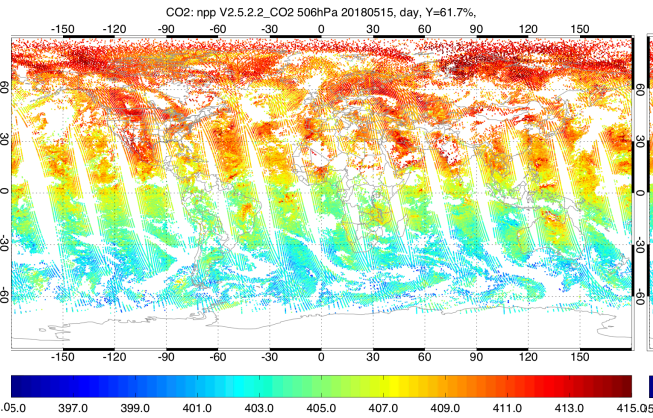
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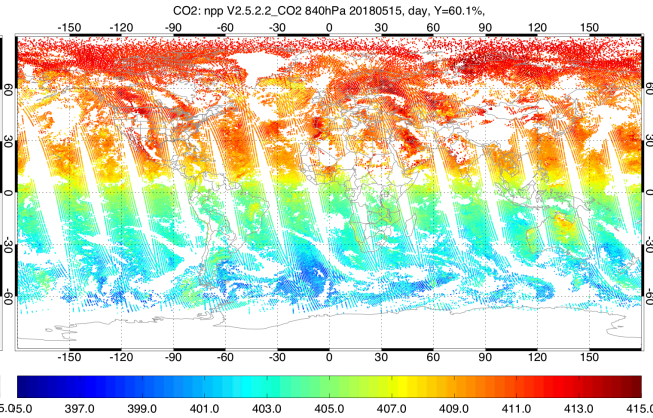
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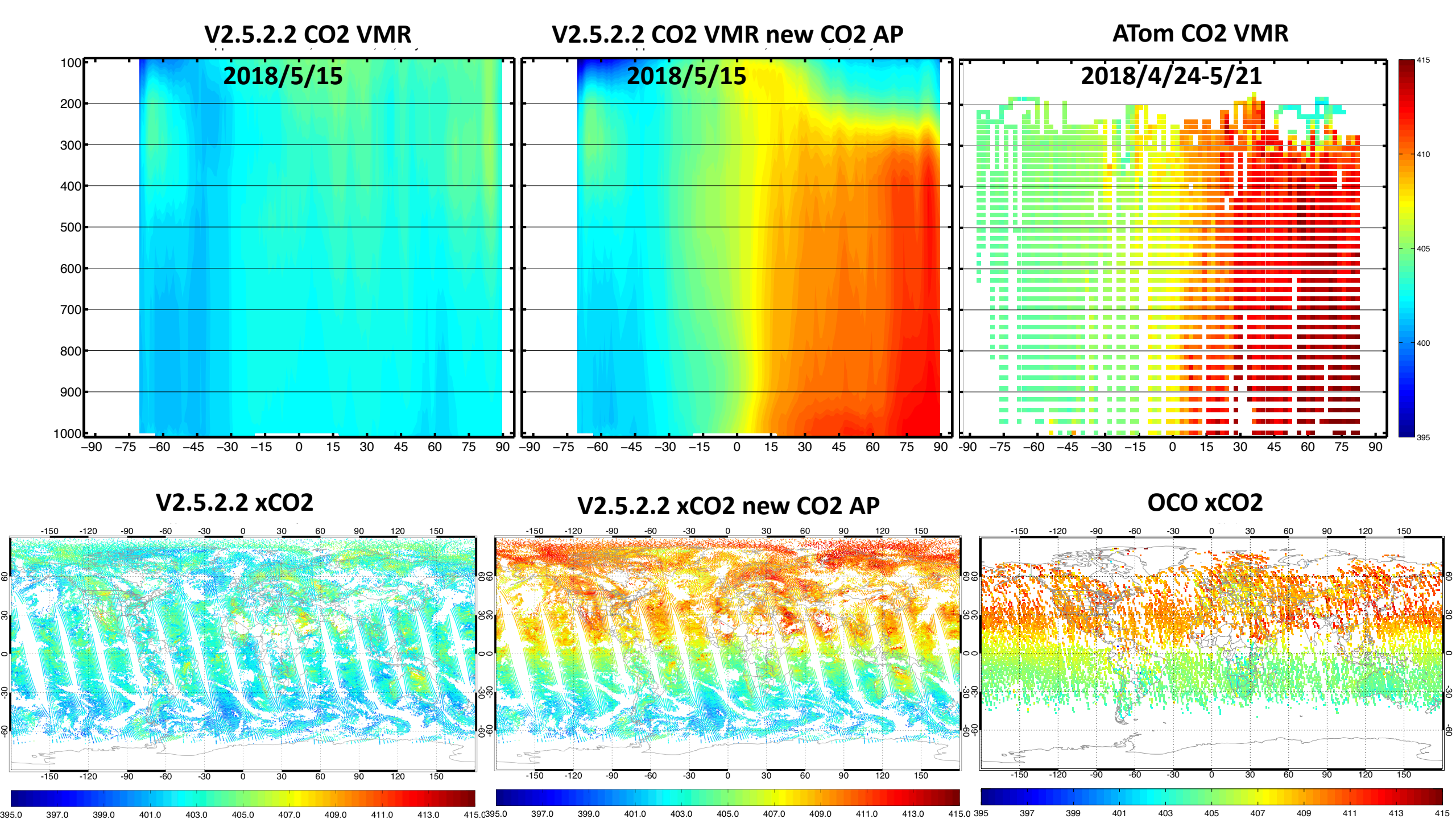


506hPa



841hPa




V2.5.2.2 CO2 VMR
2018/5/15
V2.5.2.2 CO2 VMR new CO2 AP
2018/5/15
ATom CO2 VMR
2018/4/24-5/21
V2.5.2.2 xCO2
V2.5.2.2 xCO2 new CO2 AP
OCO xCO2

Summary and Thoughts

- NUCAPS trace gas products have been significantly improved;
- Continued refinements are needed;
- More in situ measurements for validation are needed;
- Capability to reprocess for the duration of records are needed.

- Better coordination from other NOAA resources to fund algorithms that can be directly delivered to operational products and/or to directly evaluate NOAA operational trace gas products.