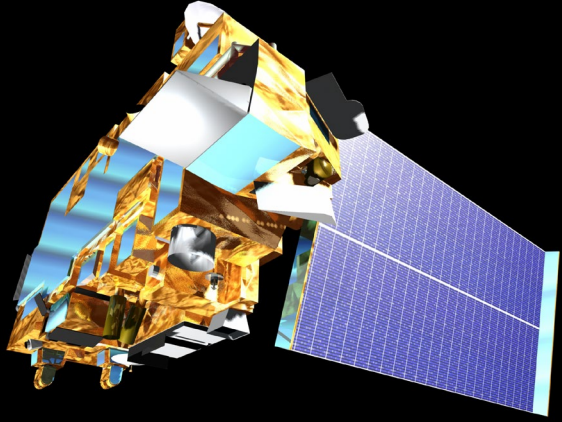


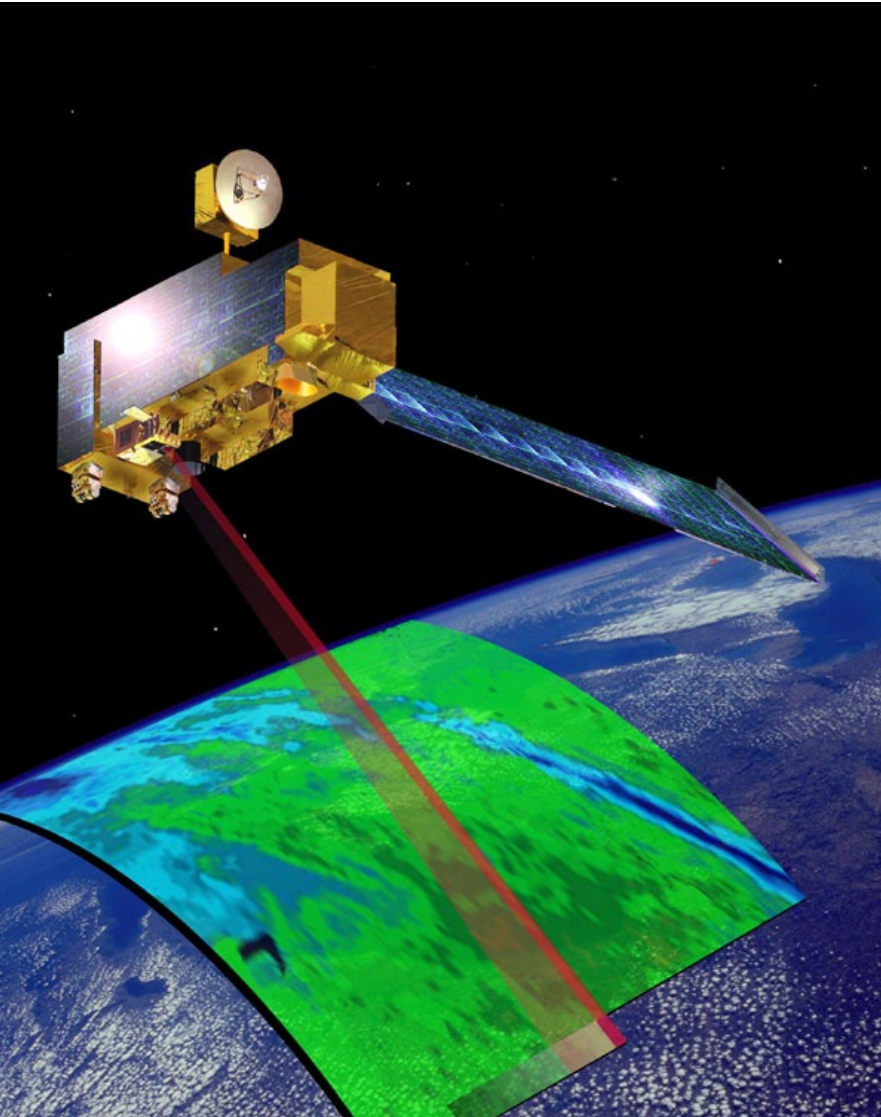


Continuation of the MOPITT record of global carbon monoxide



H. Worden,
NCAR MOPITT Team

MOPITT on EOS/Terra

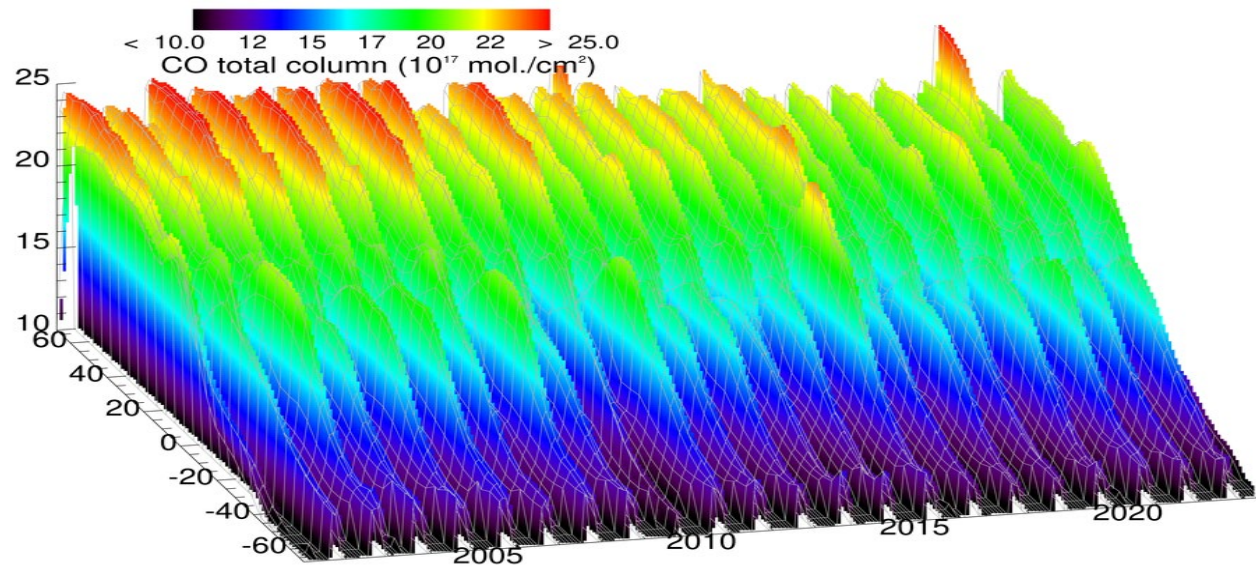


- Launched Dec. 1999 into sun-synchronous 705 km orbit with 10:30 mean-local-time.
- Uses Gas Filter Correlation Radiometry (GFCR) to measure carbon monoxide (CO) in both thermal and SW infrared
- 605 km wide swath gives global coverage in ~3 days with 22 x 22 km² pixels.
- CO plays a key role in atmospheric chemistry:
 - Good tracer of pollution (lifetime of weeks to months)
 - Major sink of OH => emissions of CO increase methane lifetime
 - Precursor to tropospheric ozone
 - Emissions of CO have a net climate radiative forcing of ~0.23 W/m²

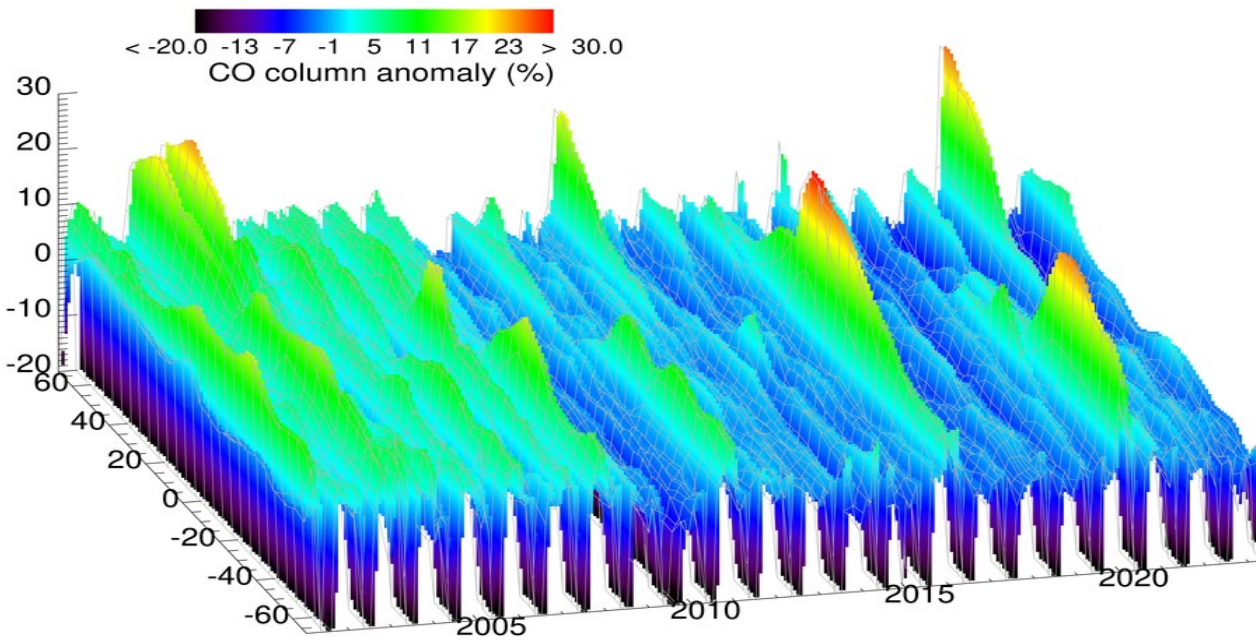


MOPITT record of global carbon monoxide

Except for recent extreme fire events, carbon monoxide (CO) has been decreasing over the last 2 decades. In the Northern Hemisphere, this is mostly due to improvements in combustion efficiency

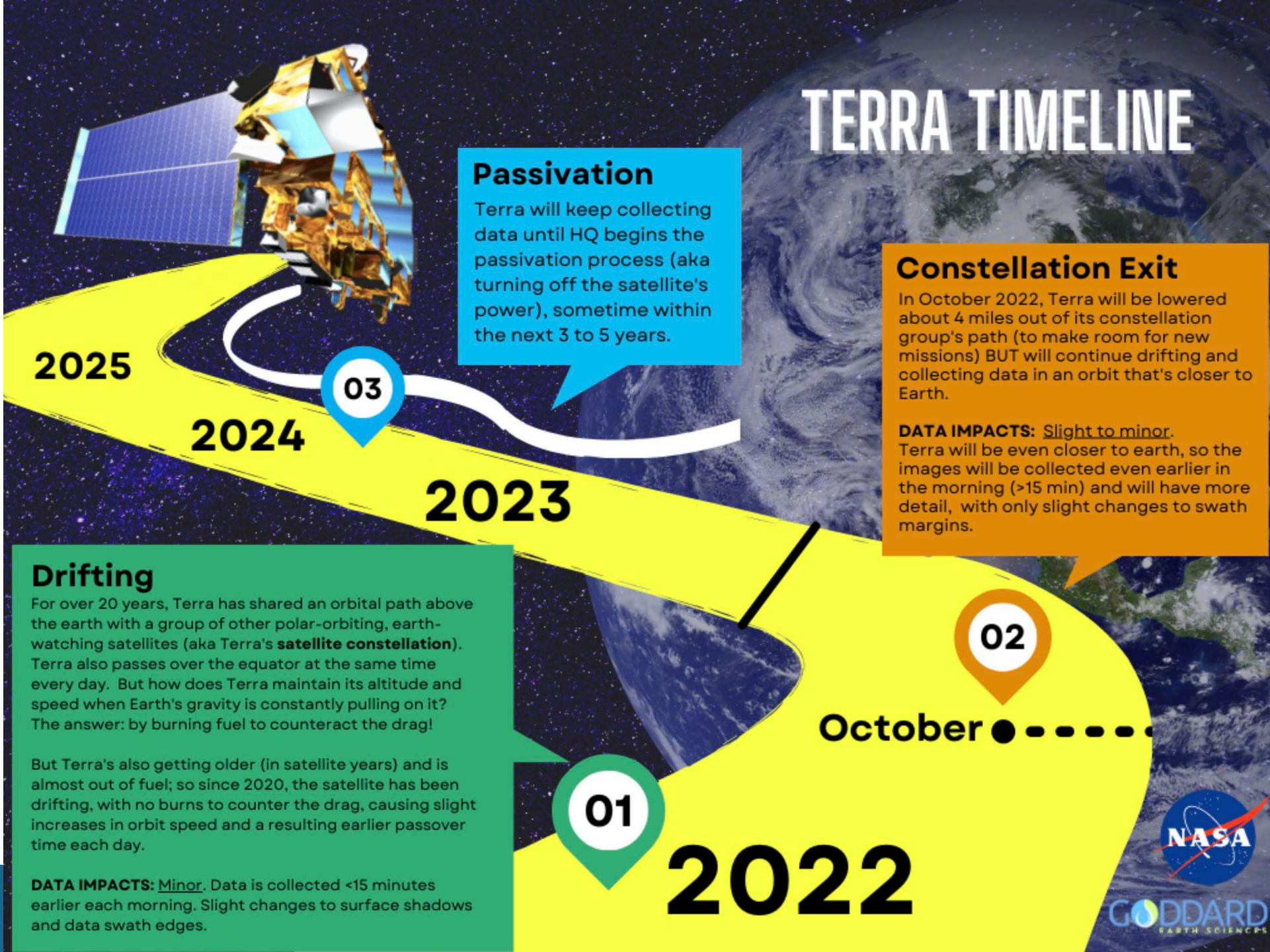


Zonal Average



% Anomaly (monthly means removed)

TERRA TIMELINE



Passivation
 Terra will keep collecting data until HQ begins the passivation process (aka turning off the satellite's power), sometime within the next 3 to 5 years.

Constellation Exit
 In October 2022, Terra will be lowered about 4 miles out of its constellation group's path (to make room for new missions) BUT will continue drifting and collecting data in an orbit that's closer to Earth.

DATA IMPACTS: Slight to minor. Terra will be even closer to earth, so the images will be collected even earlier in the morning (>15 min) and will have more detail, with only slight changes to swath margins.

Drifting
 For over 20 years, Terra has shared an orbital path above the earth with a group of other polar-orbiting, earth-watching satellites (aka Terra's **satellite constellation**). Terra also passes over the equator at the same time every day. But how does Terra maintain its altitude and speed when Earth's gravity is constantly pulling on it? The answer: by burning fuel to counteract the drag!

But Terra's also getting older (in satellite years) and is almost out of fuel; so since 2020, the satellite has been drifting, with no burns to counter the drag, causing slight increases in orbit speed and a resulting earlier passover time each day.

DATA IMPACTS: Minor. Data is collected <15 minutes earlier each morning. Slight changes to surface shadows and data swath edges.



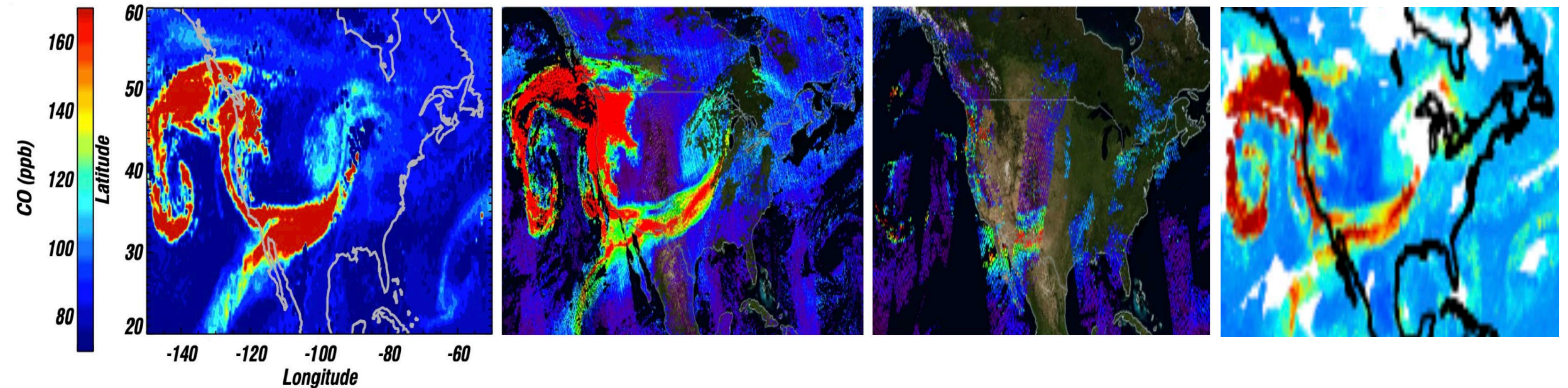
4 views of CO plume on 2020.09.12

SNPP/CrIS

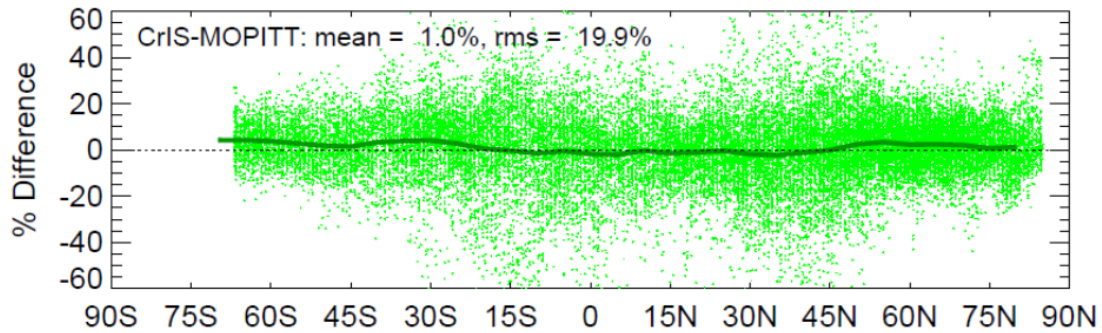
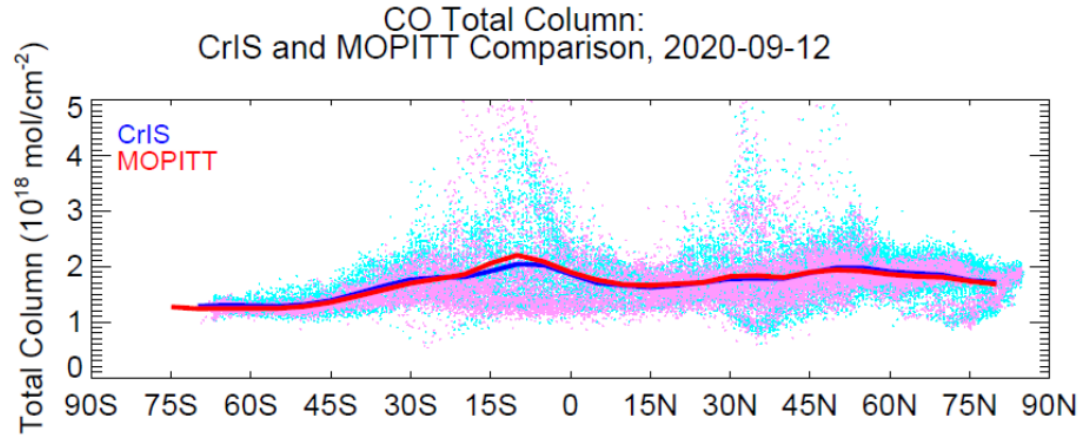
S5P/TROPOMI

Terra/MOPITT

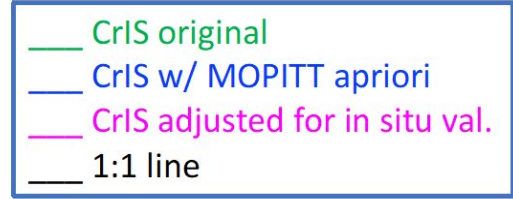
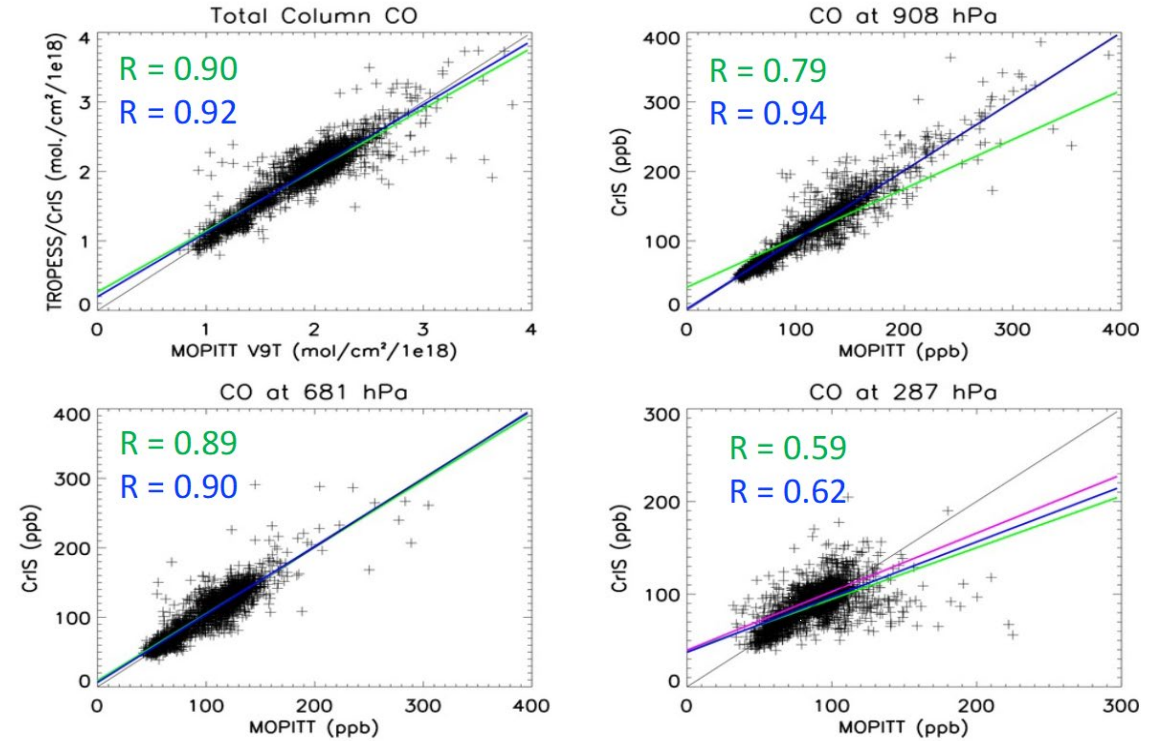
METOP/IASI (B+C)



Continuity of CO measurements – CrIS/MOPITT comparisons



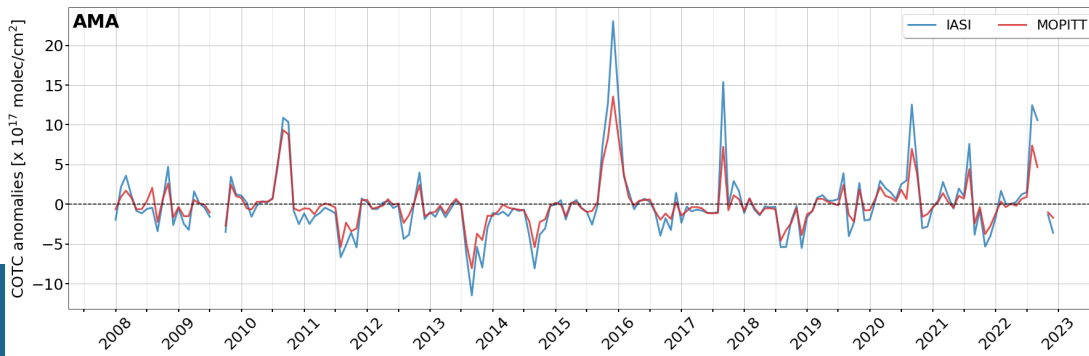
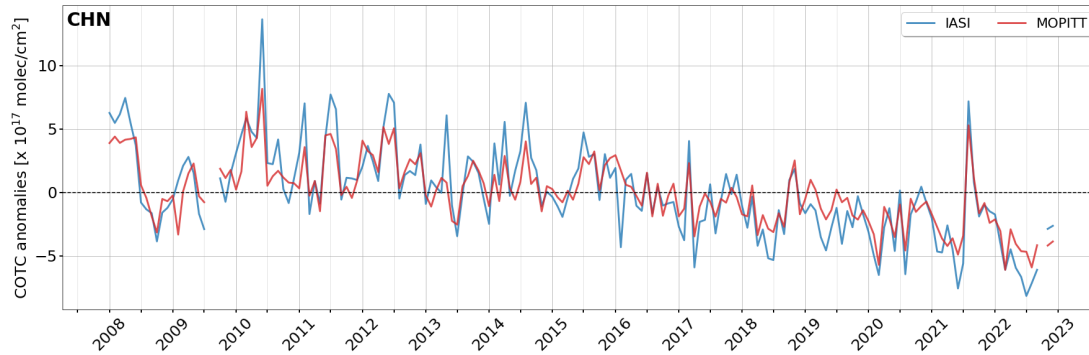
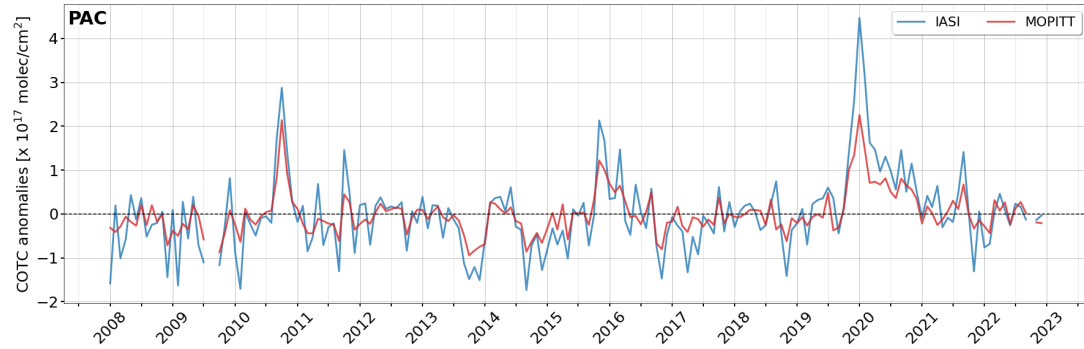
CrIS - MOPITT comparison for 20210502



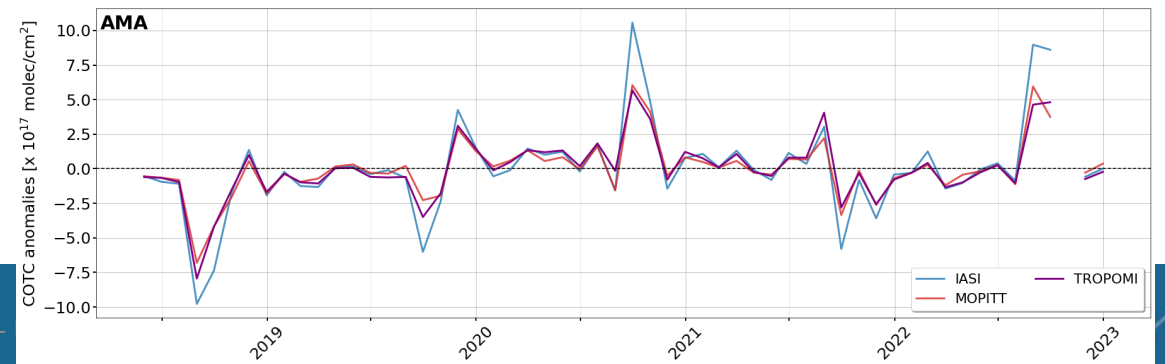
Regional Comparisons: IASI-MOPITT-TROPOMI



Anomalies for [2008-2022] :



Anomalies for [05/2018-2022] :



Summary

- EOS/Terra operations have been extended – MOPITT data expected through 2026
- NOAA/CrIS, Eumetsat/IASI and ESA/TROPOMI have been compared to MOPITT and will provide observations to continue the MOPITT IR and SWIR CO record
- Reanalysis product that could merge CO observations needs to be investigated – could use GOSAT-2 for comparisons