Routine Evaluation of TEMPO Tropospheric Column NO_2 Product at NOAA

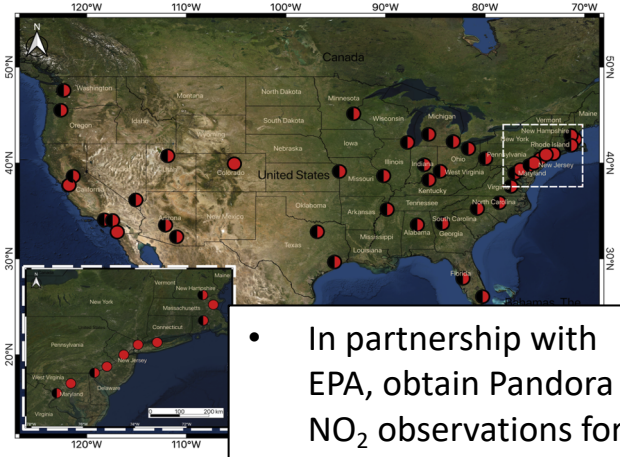
Zigang Wei, IM Systems Group
Shobha Kondragunta (NOAA), James J. Szykman (EPA), Lukas Valin (EPA)

In preparation for GeoXO atmospheric composition capability which includes a planned TEMPO-like instrument, NOAA is preparing to work with TEMPO L1B and L2 products. Prior to the products becoming ready for regular use in air quality models, NESDIS and OAR would like to develop routine cal/val activities of key TEMPO products.

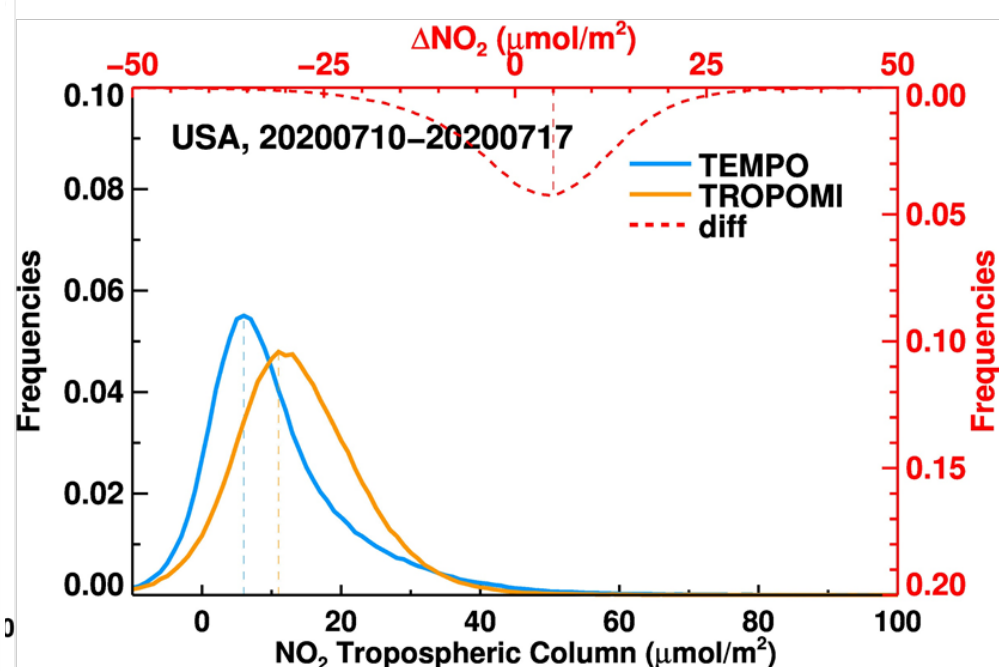
ACX Instrument Team Lead: **Joanna Joiner**

ACX Product Team Lead: **Shobha Kondragunta**

ACX User Team **Lead: Gregory Frost**



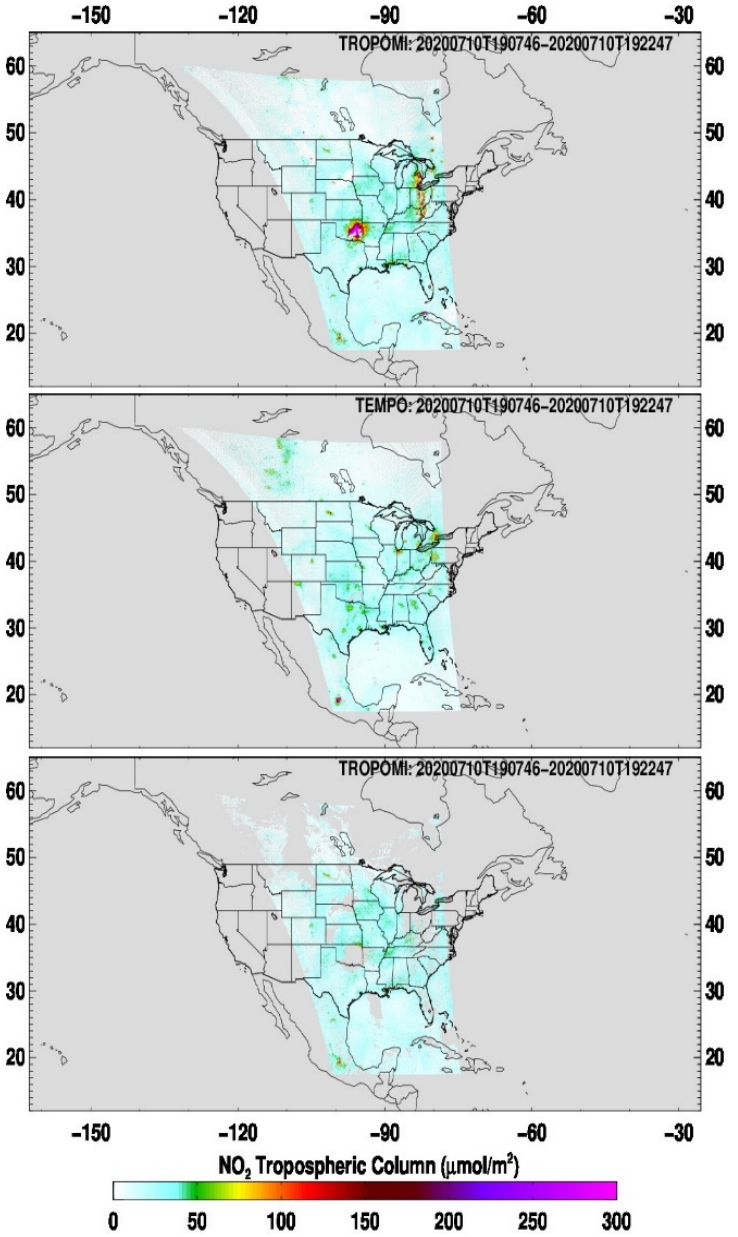
- In partnership with EPA, obtain Pandora NO_2 observations for routine evaluation of TEMPO tropospheric NO_2 column
- Compare TEMPO tropospheric NO_2 column with TROPOMI and OMPS
- Prior to TEMPO launch, work with proxy data to develop cal/val tools and model applications (e.g., NO_x emissions updates)



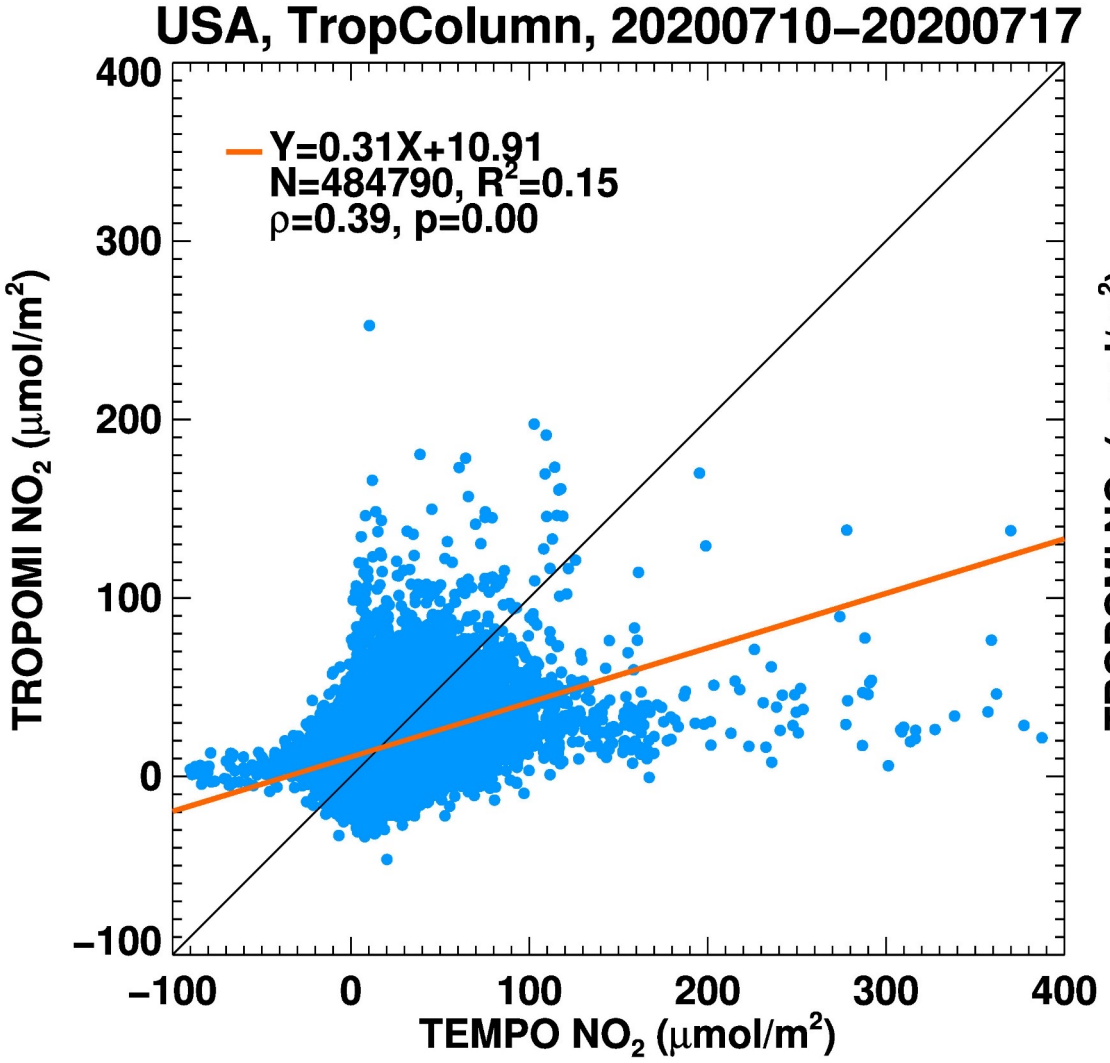
- TEMPO proxy NO_2 retrievals for July 10-17, 2020 obtained from science team (*POC: Aaron Nager*)
- Comparisons with TROPOMI show a mean bias of 5 μmoles/m^2

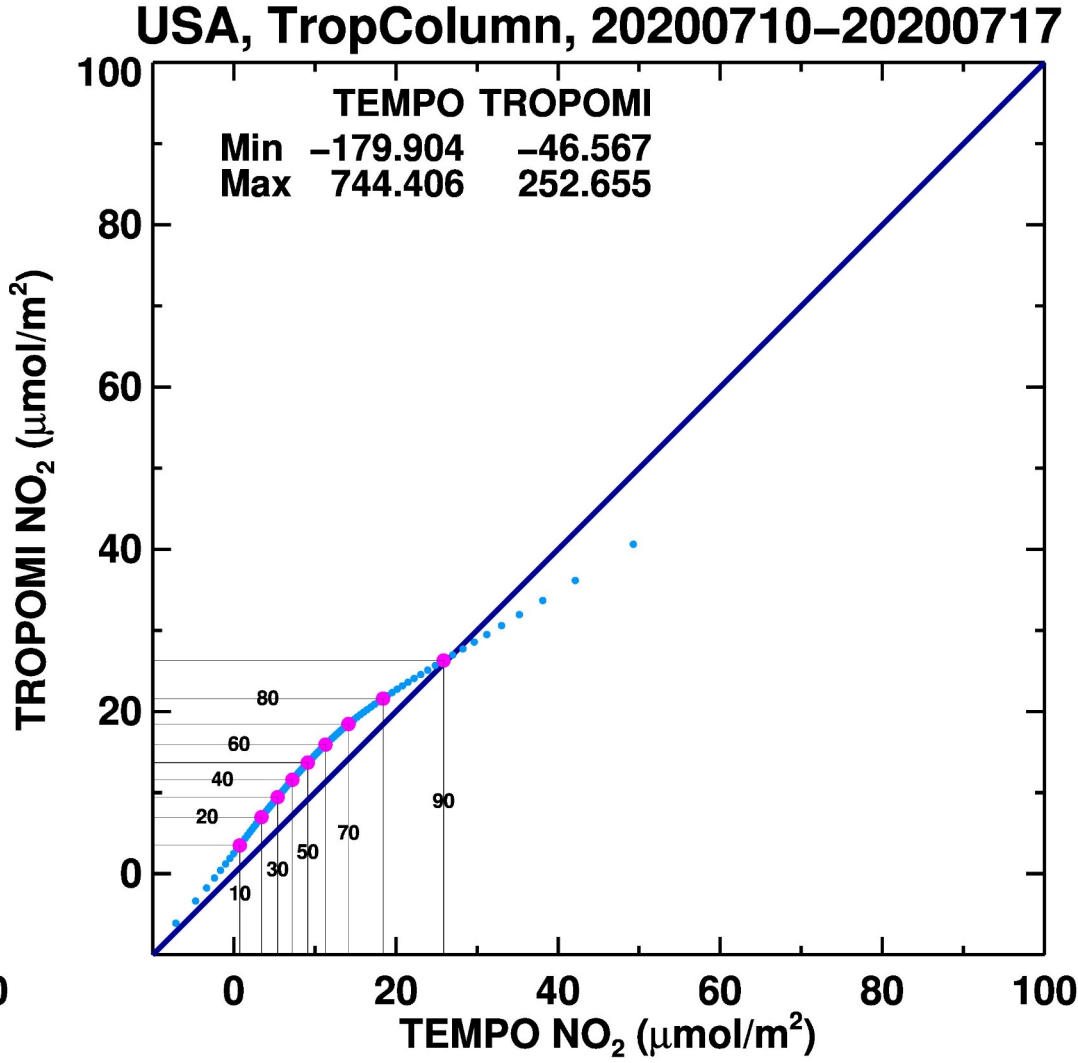
Preparing for GeoXO ACX NO_2 product

- Work with NASA proxy TEMPO NO_2 retrievals (*obtained from Aaron Nager*)
  - July 2020 and additional proxy data prior to launch
  - After launch, work with near real time TEMPO data
- Matchups of TROPOMI and TEMPO are generated after remapping both data to a gridded with 0.05°x0.05° resolution
- Temporal matchup window ±18 minutes.
  - ➢ The matchup process uses the TROPOMI swath and TEMPO field of regard to constrain each other. The top panel shows a TROPOMI swath underpass the TEMPO at 19:07:46, July 10, 2020. The middle panel shows the TEMPO field of view at the same time period (within ±18minutes). The Bottom panel shows the final collocated valid TROPOMI pixels (Quality Flag >0.75)



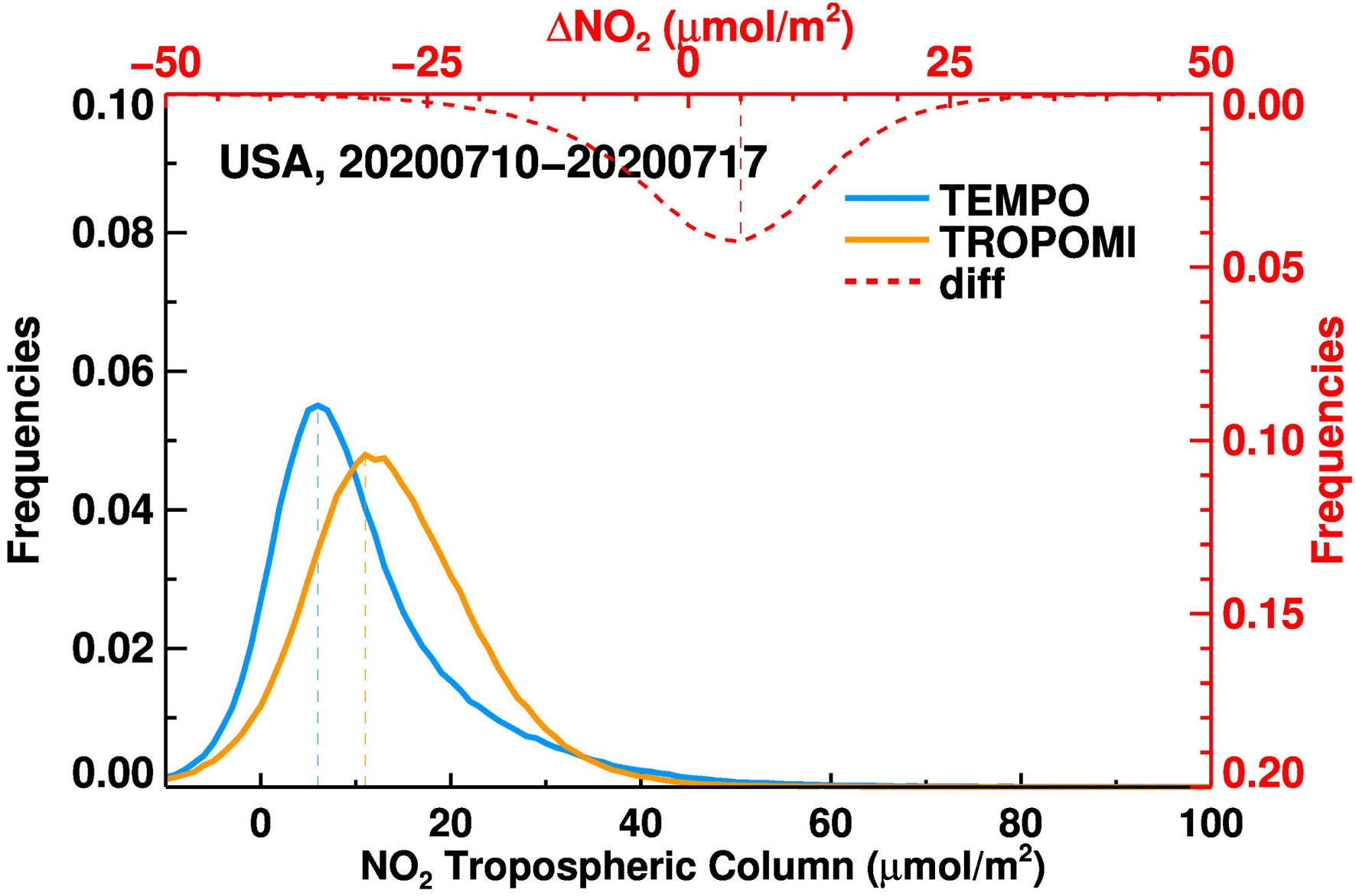
Preparing for GeoXO ACX NO_2 product



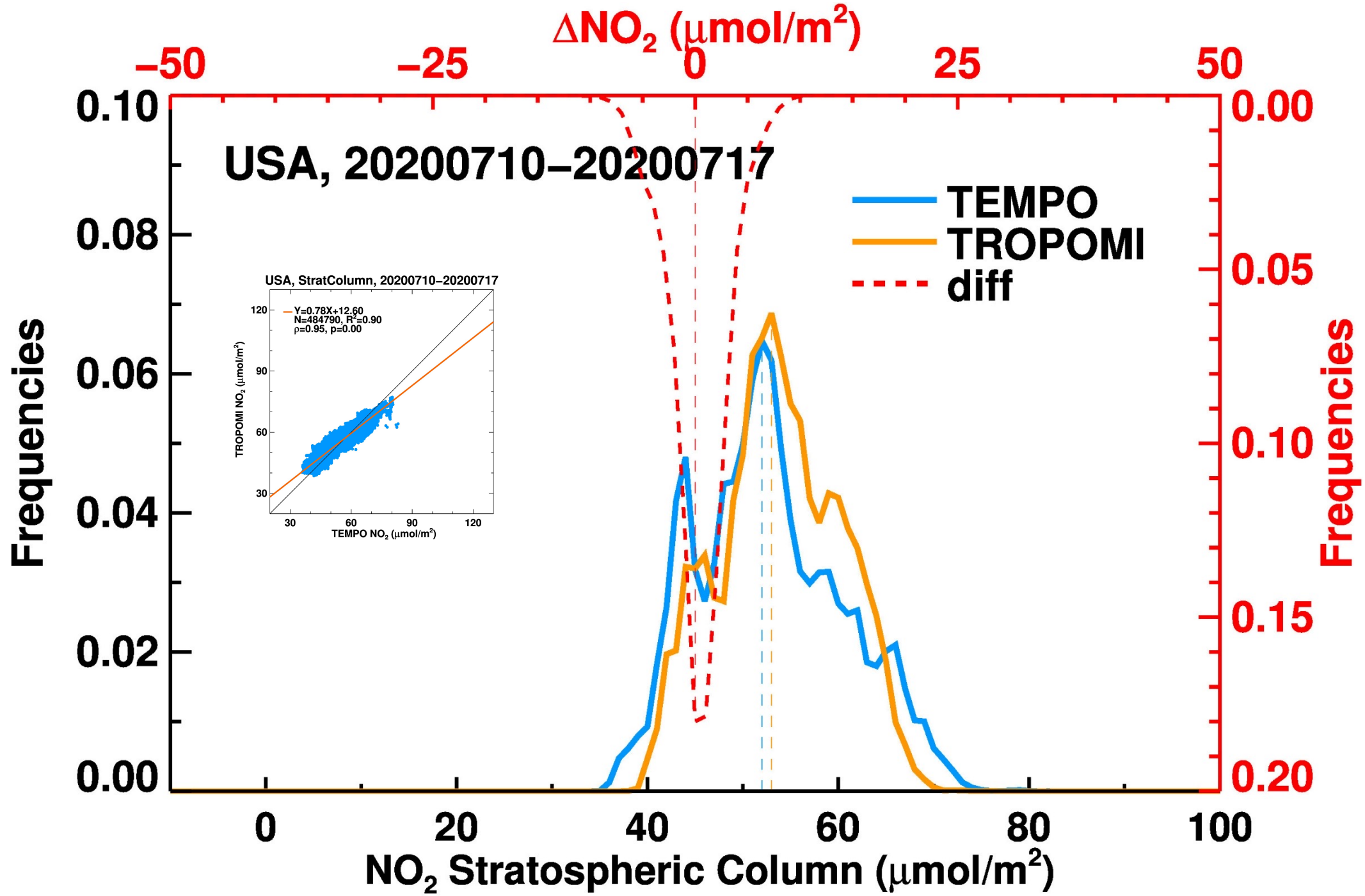


- Work with NASA proxy TEMPO NO_2 retrievals (*obtained from Aaron Nager*)
- Matchups of TROPOMI and TEMPO are generated after remapping both data to a gridded with 0.05^ox0.05^o resolution
- Quantile-quantile plot shows TROPOMI tropospheric column NO_2 is biased high but some extremely high NO2 values in TEMPO proxy data

Preparing for GeoXO ACX NO_2 product



Preparing for GeoXO
ACX NO_2 product



Field Campaigns

- NOAA will work with NASA in conducting periodic field campaigns to validate TEMPO data
  - AEROMMA field campaign is planned for 2023
- NOAA will partner with EPA to develop routine calibration and validation tools for NO_2 and aerosols.
- NOAA is planning for 10+ years of work with TEMPO L2 products until GeoXO ACX launches as a follow-on to TEMPO