

Measurements of major greenhouse gases at three background sites in the East Asia



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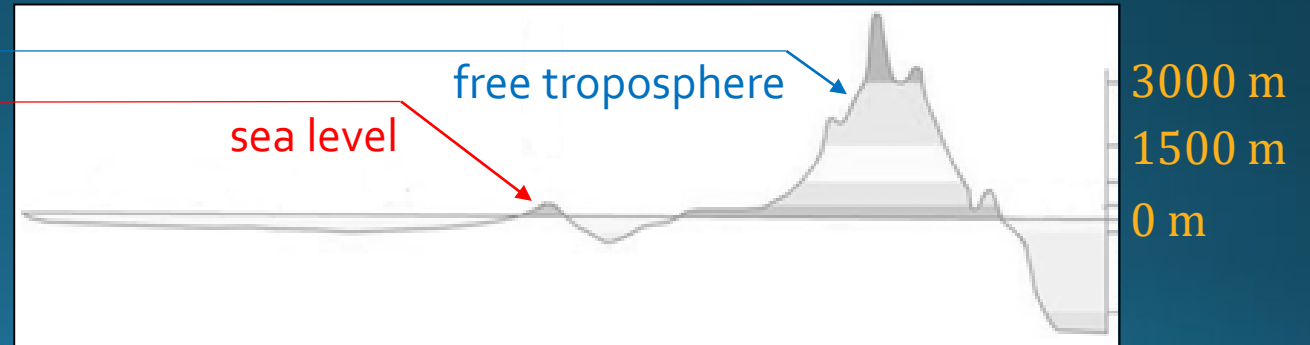


NOAA/CCGG Network

LLN: August, 2006

DSI: March, 2010

TPI: May, 2019



Lulin Atmospheric Background Station (LABS)²



23.47°N,
120.87°E,
2862 m a.s.l.,

ID: LLN



Air pollutants measured:

Continuous:

CO, O₃, CO₂, CH₄, Aerosols,
Hg (GEM, RGM, PHg)

Sample collection:

GHGs (NOAA/GMD), VOCs



Dongsha Island (DSI)

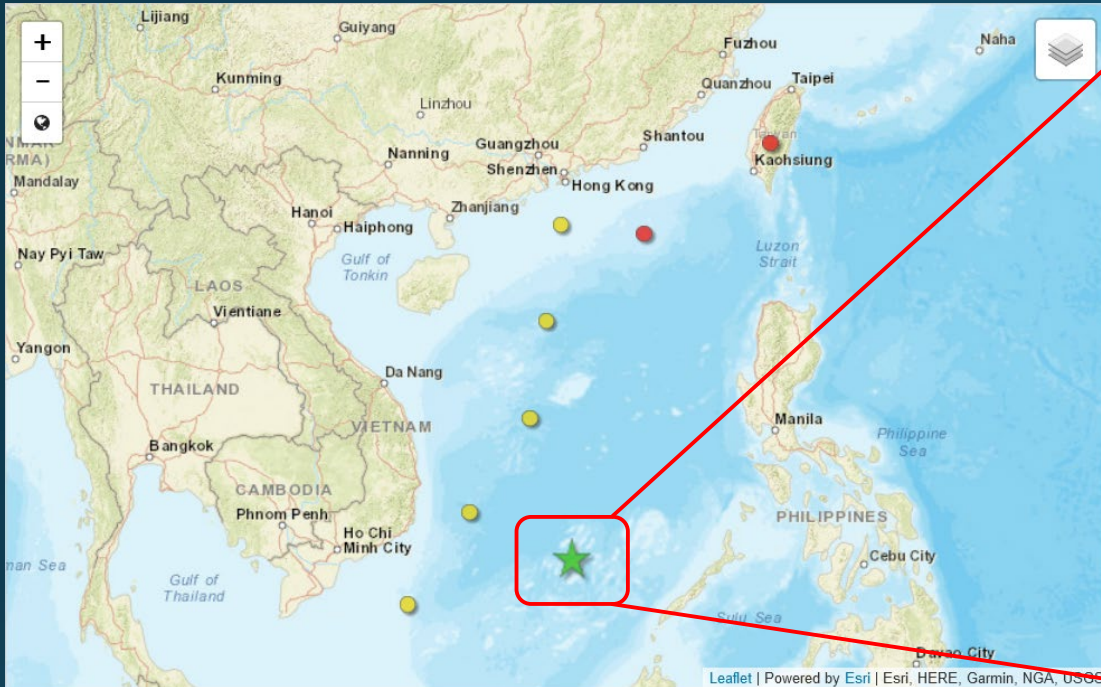


**20.70°N, 116.73°E,
5 m a.s.l.,**

ID: DSI

Air pollutants measured:
Sample collection:
GHGs (NOAA/GMD)

Taiping Island (TPI)

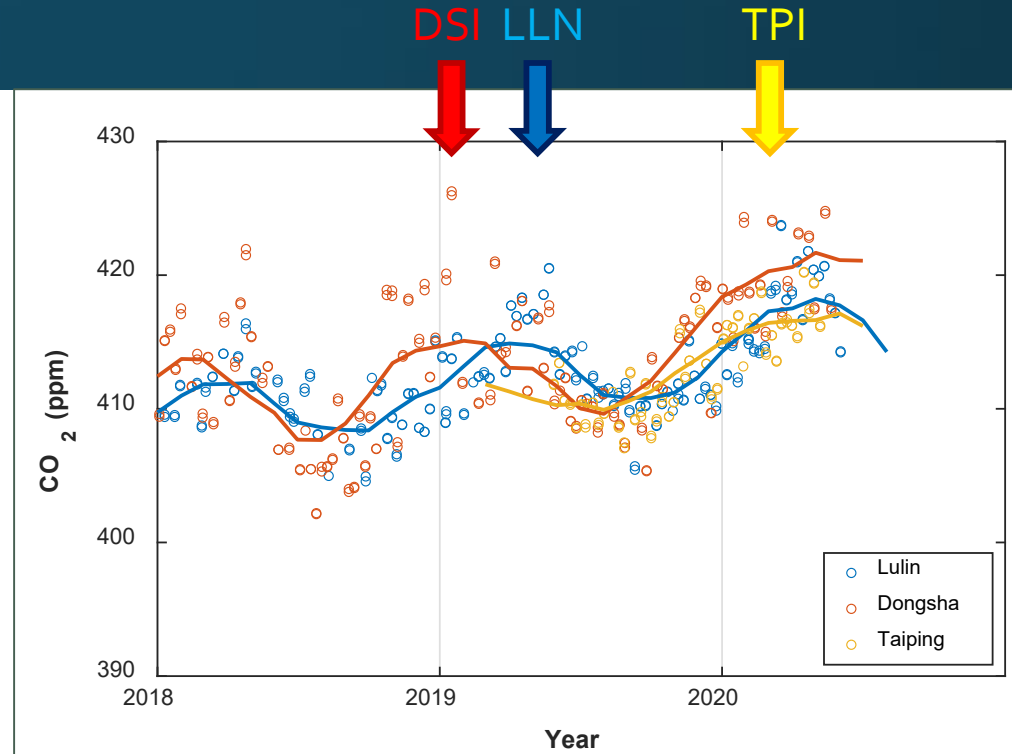
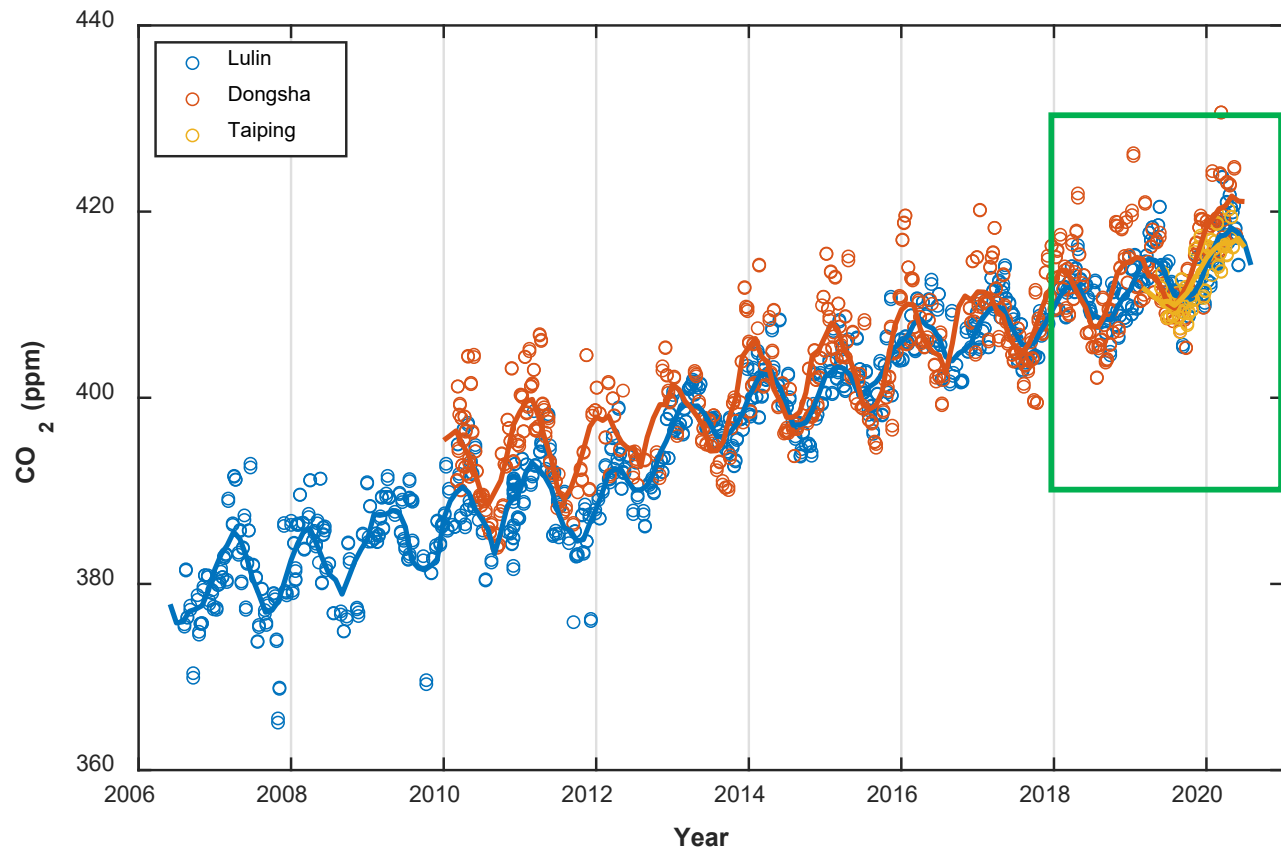


**10.38°N, 114.37°E,
4 m a.s.l.,**

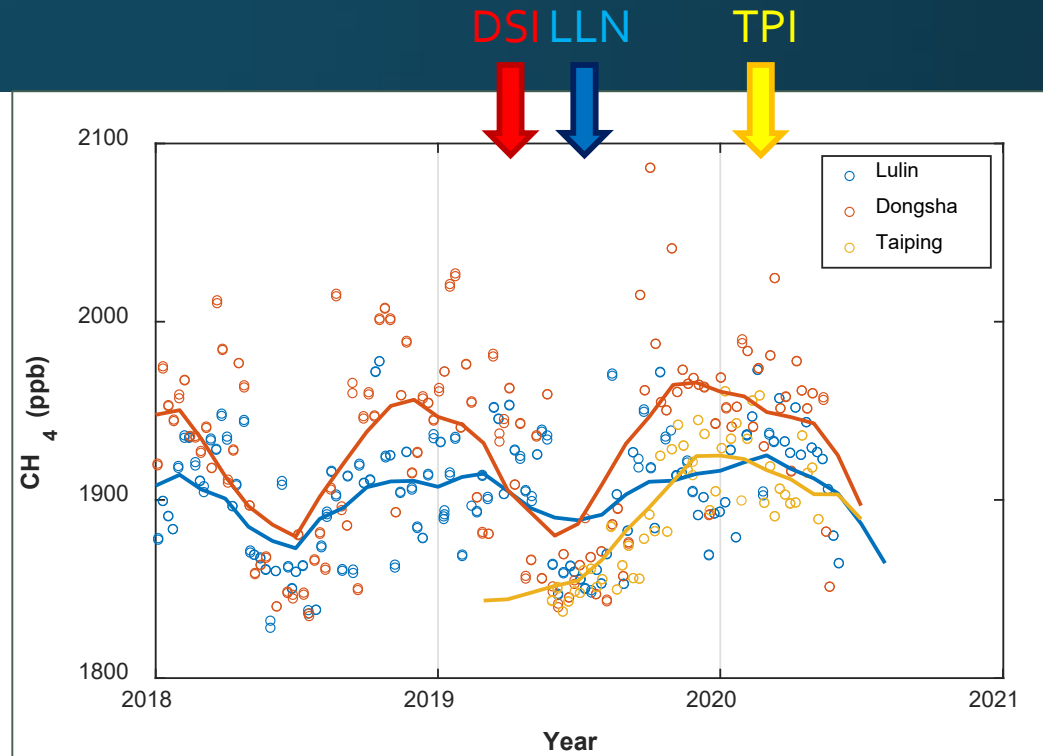
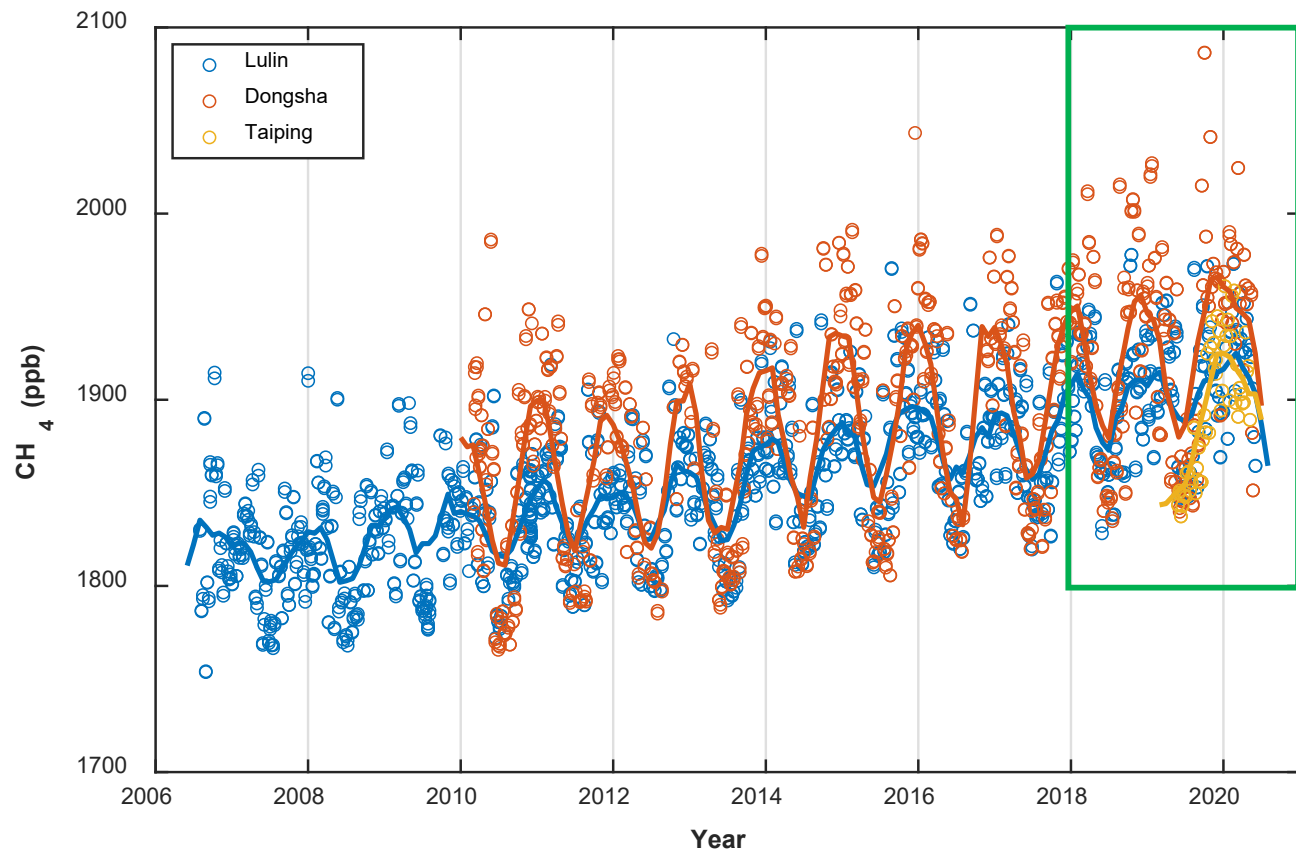
ID: TPI

**Air pollutants measured:
Sample collection:
GHGs (NOAA/GMD)**

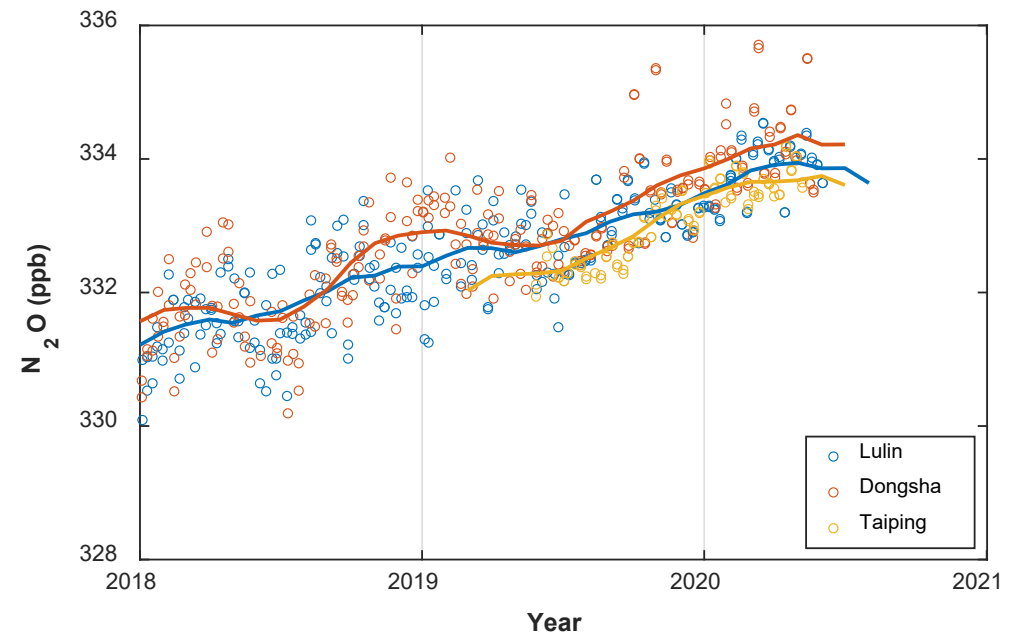
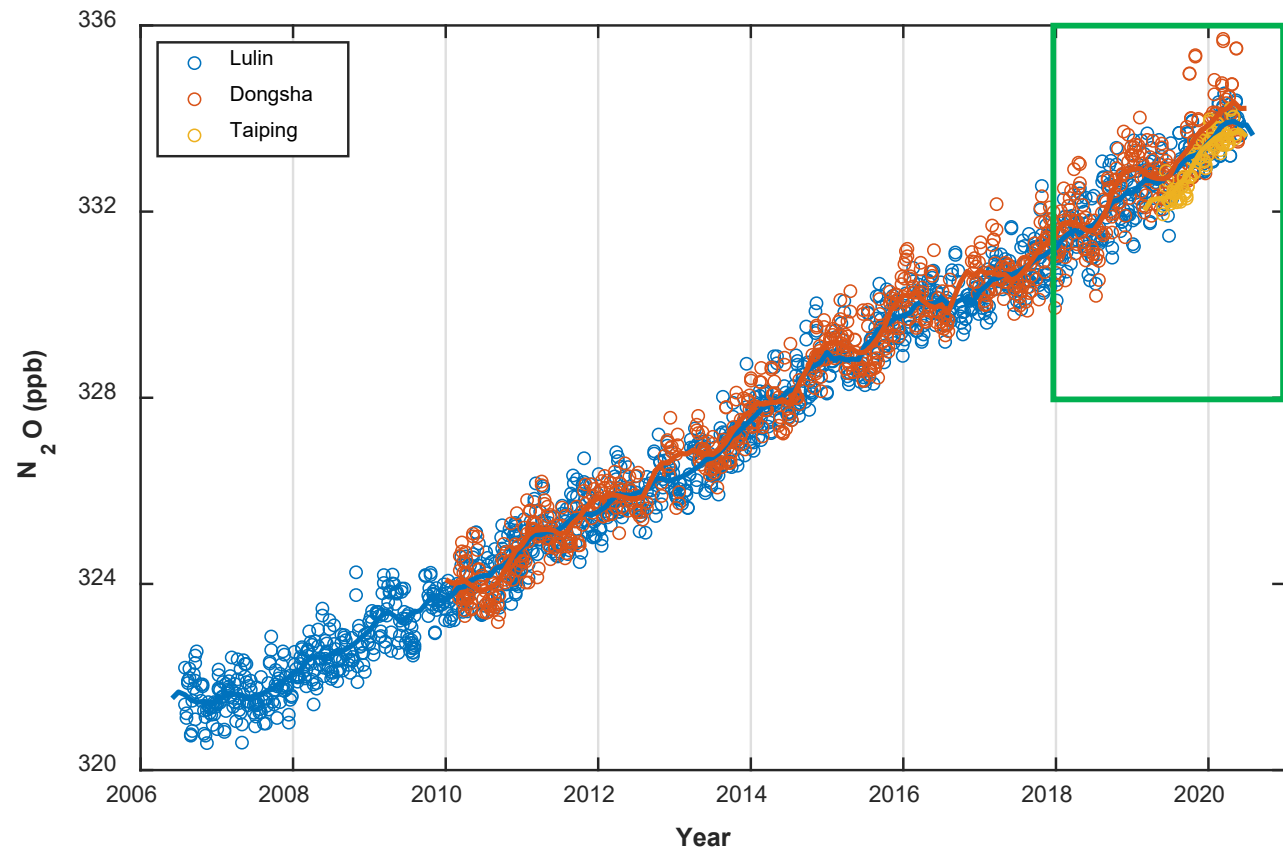
CO₂



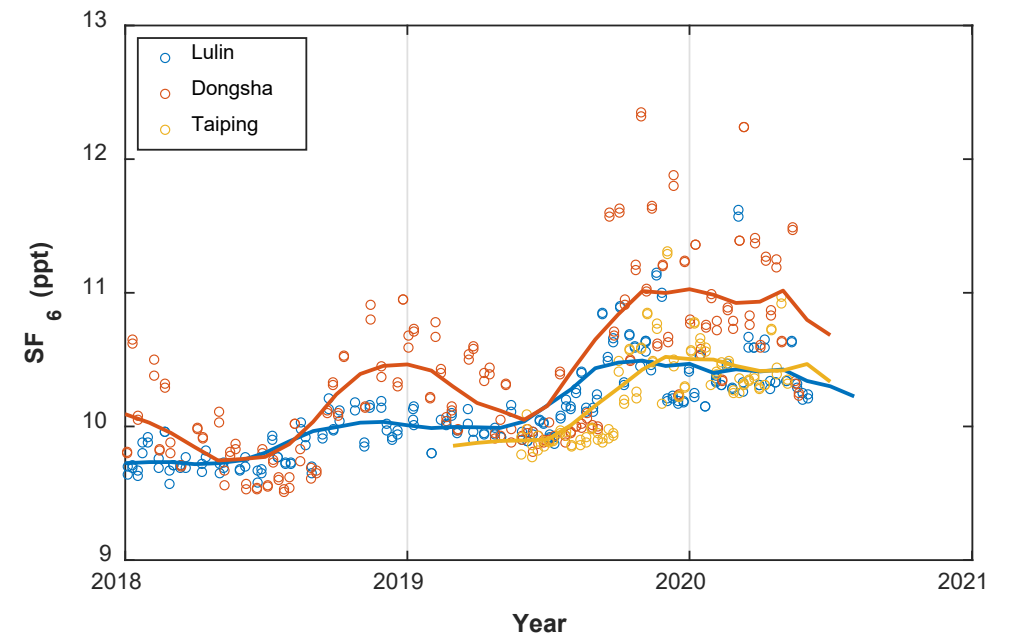
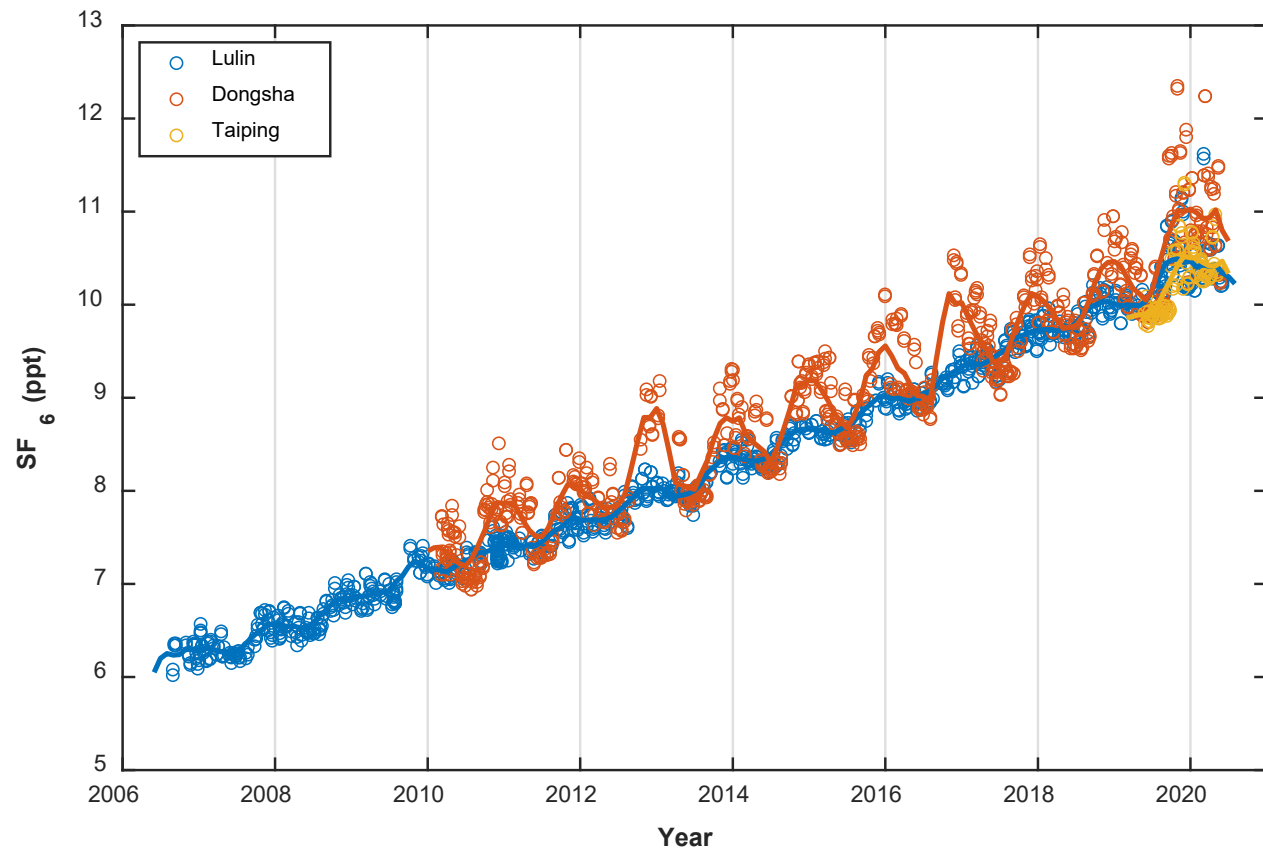
CH₄



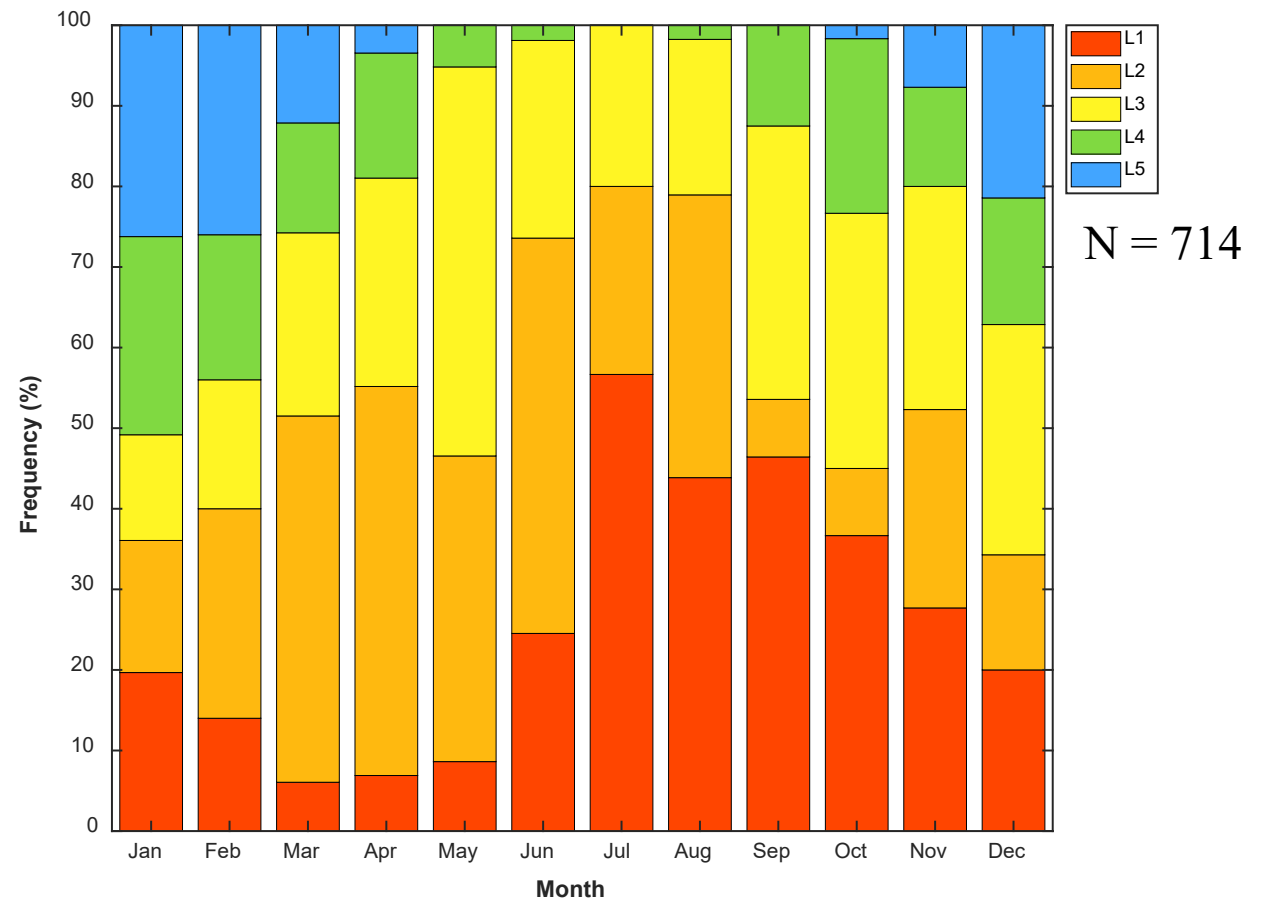
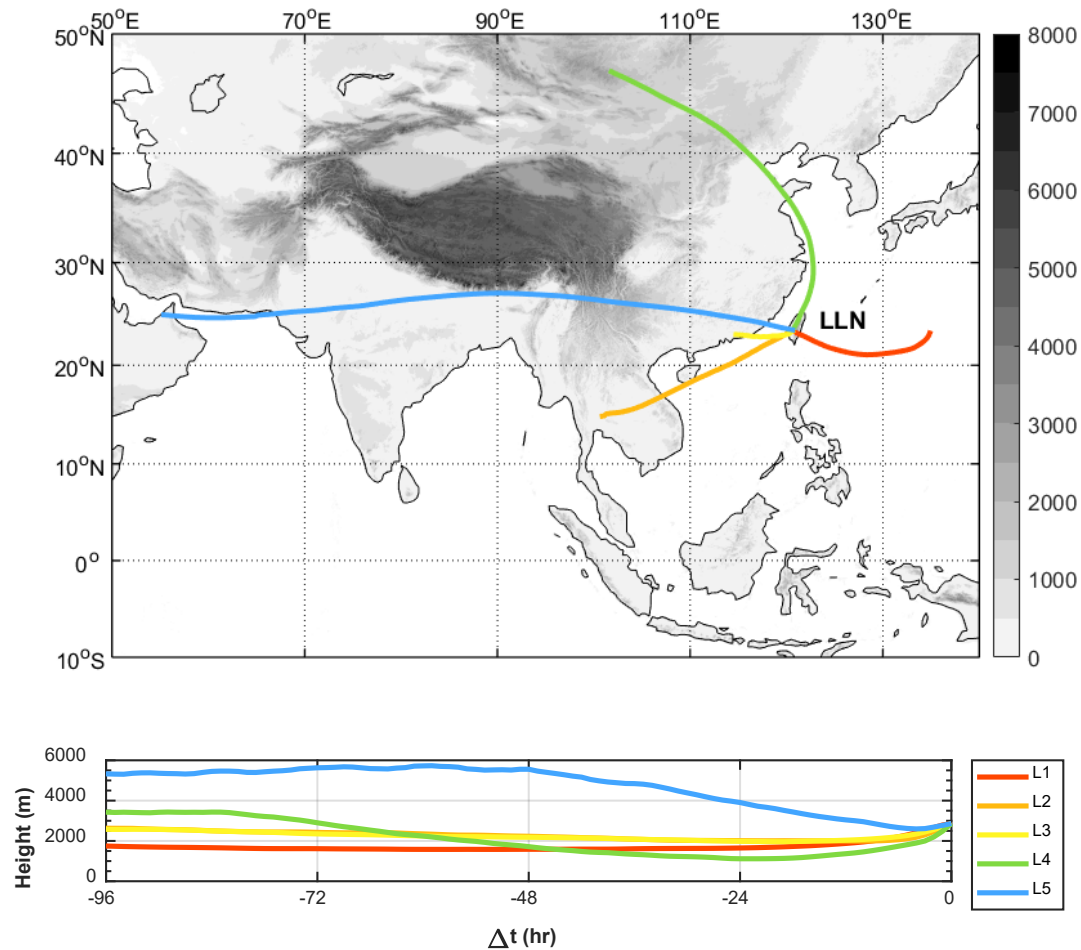
N₂O

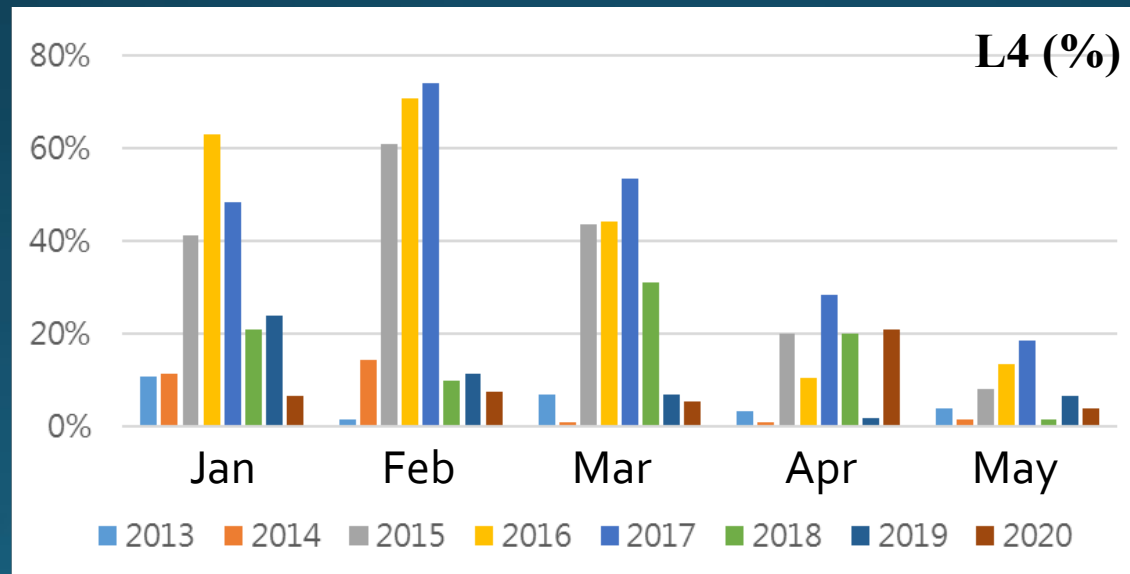
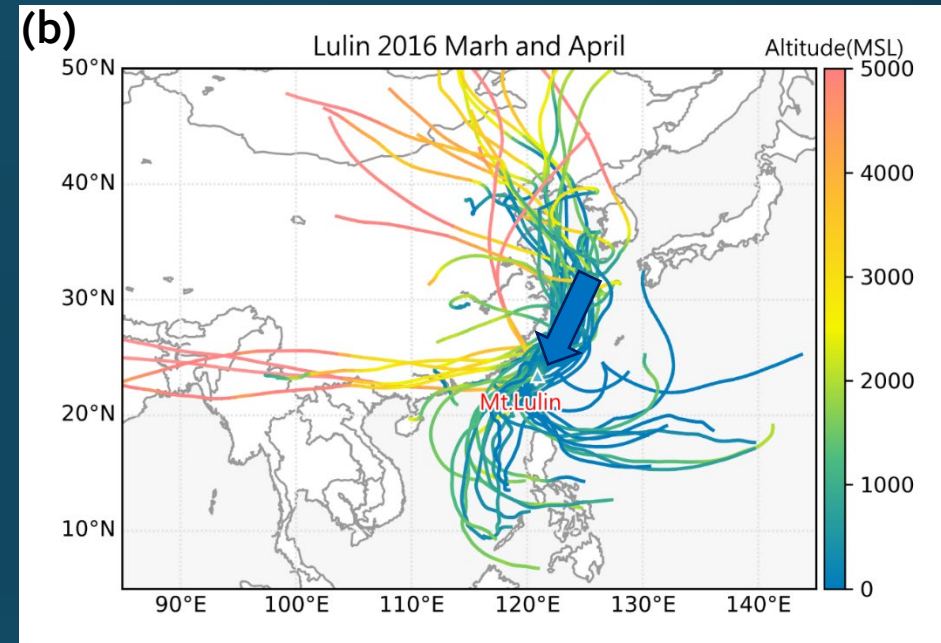
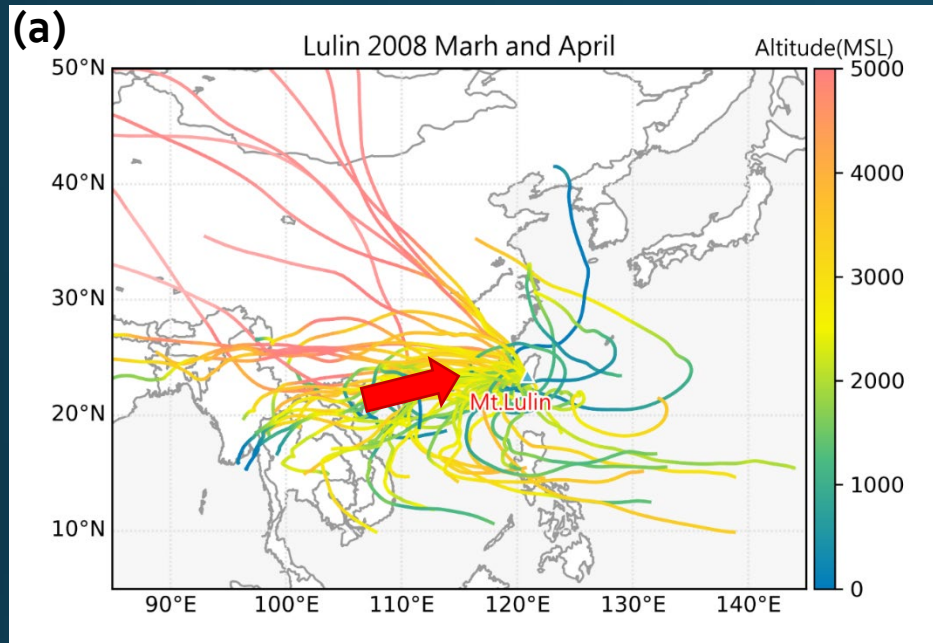


SF₆

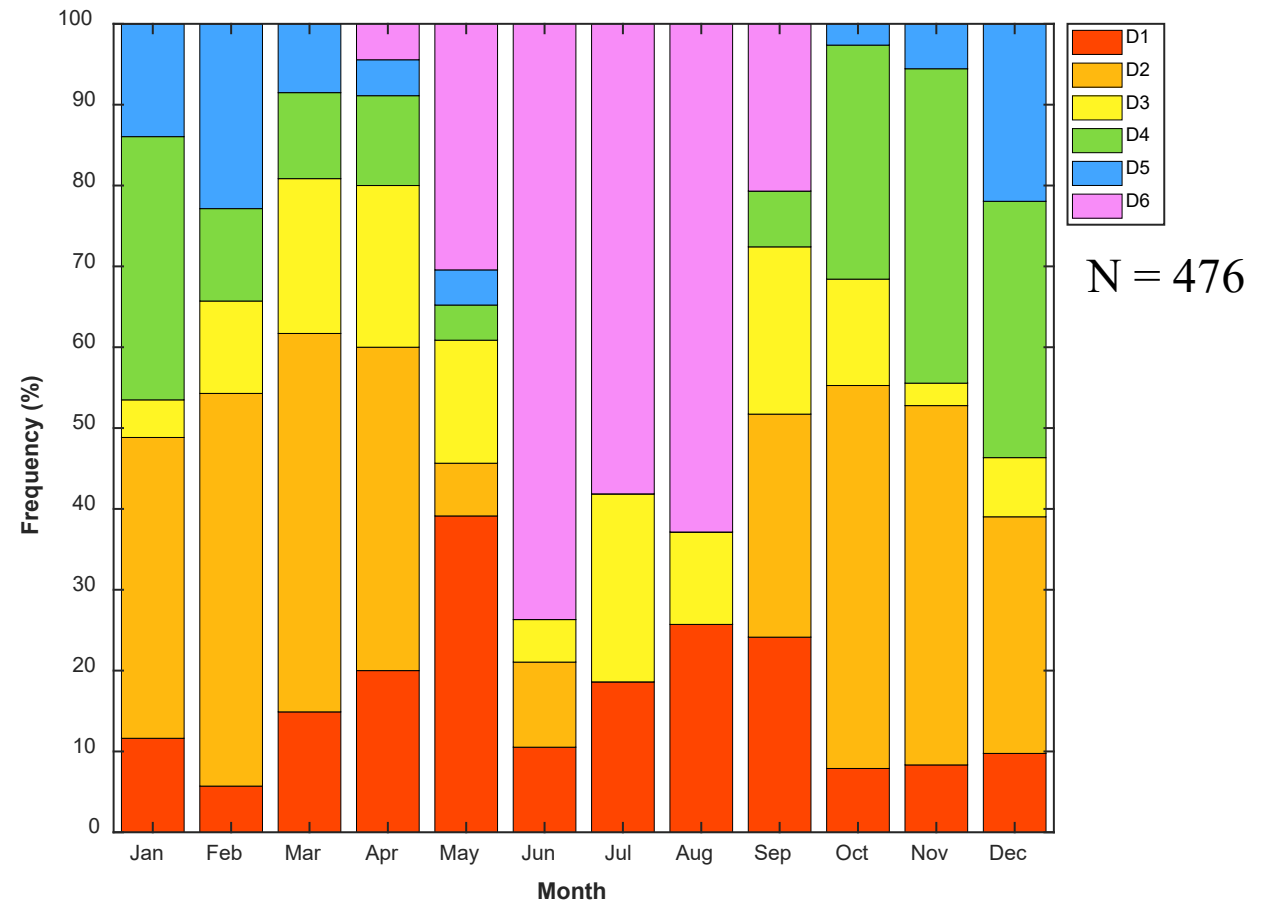
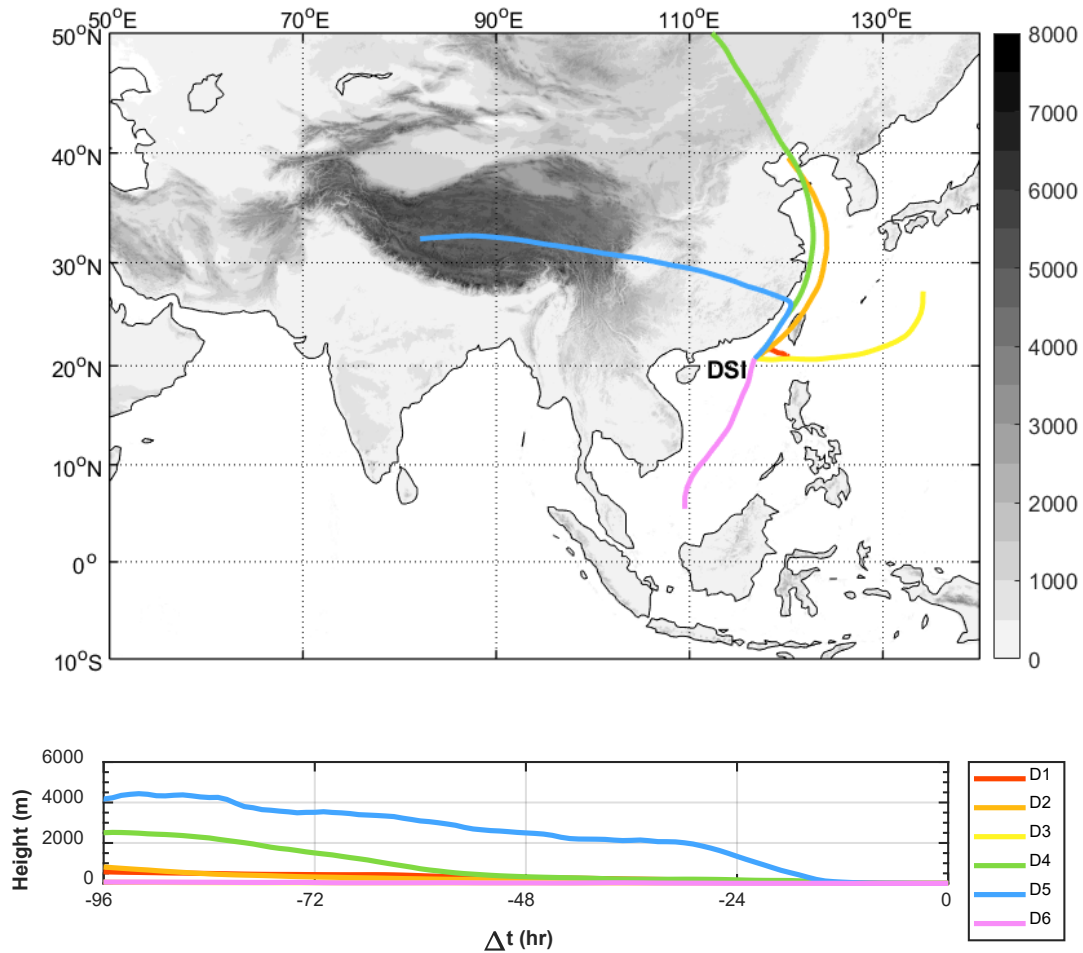


LLN (free troposphere/East Asia)





DSI (sea-level/northern SCS)

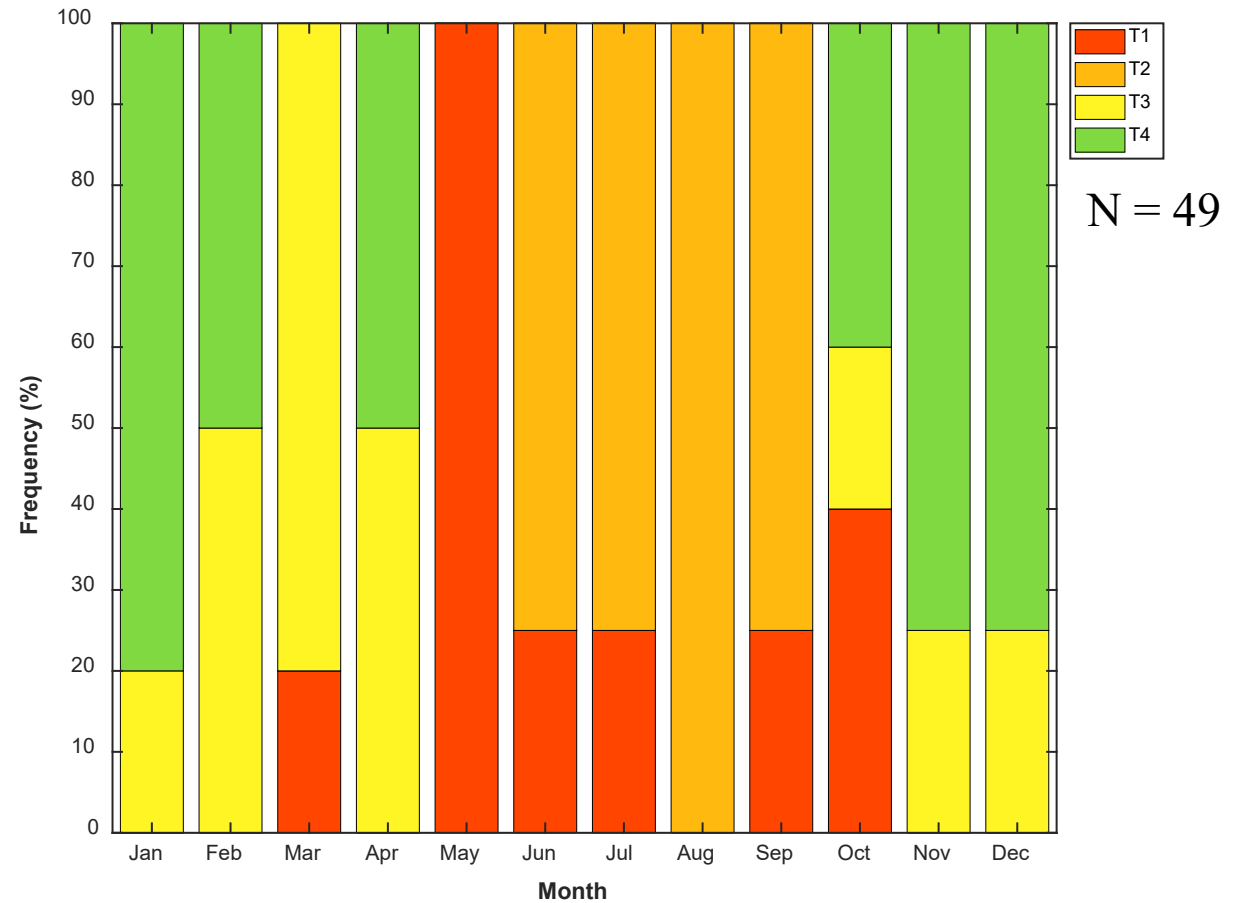
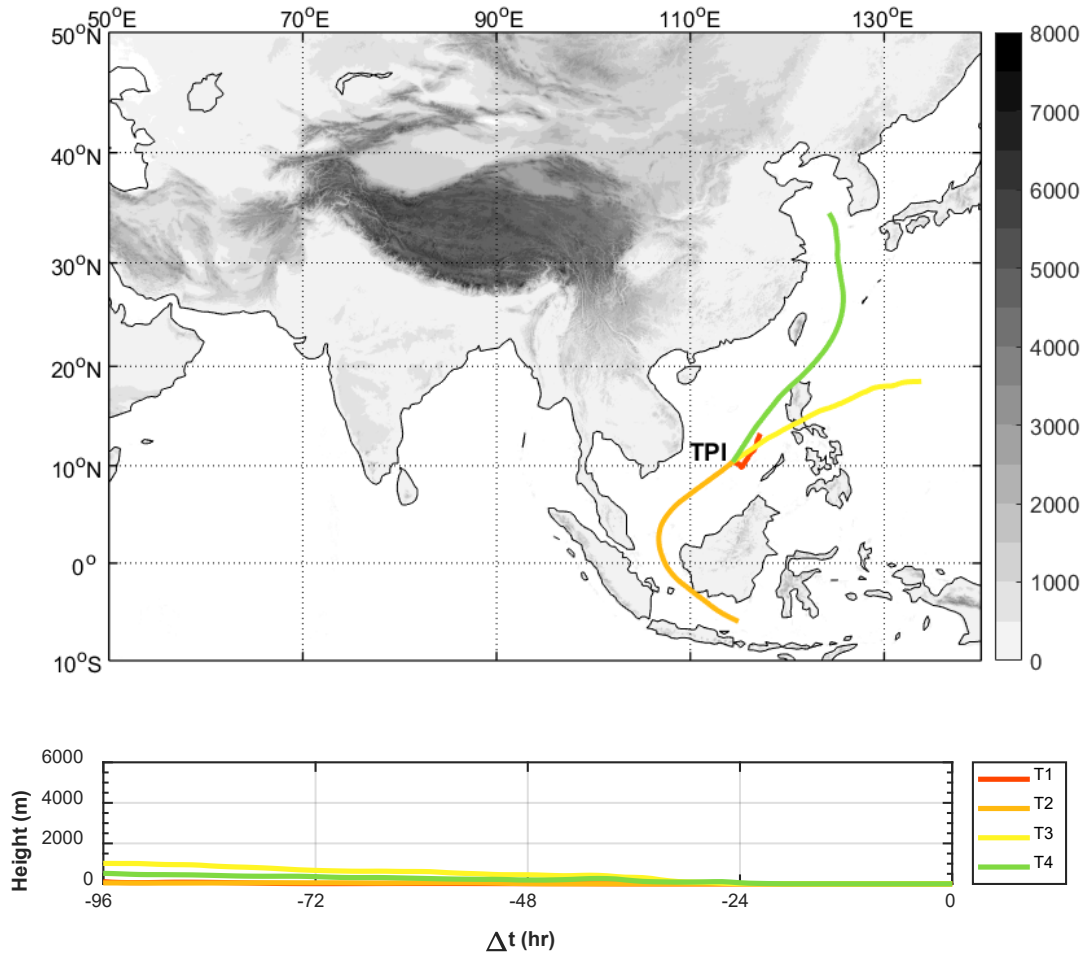


Statistics

LLN Cluster	ΔCO_2 (ppm)	ΔCH_4 (ppb)	$\Delta\text{N}_2\text{O}$ (ppb)	ΔSF_6 (ppt)
L1 (Pacific)	-0.83 ± 12.16	-15.0 ± 40.9	-0.04 ± 3.77	$+0.10 \pm 1.35$
L2 (SEA)	-0.06 ± 11.66	-6.0 ± 44.8	-0.35 ± 3.79	-0.29 ± 1.26
L3 (Local)	-0.48 ± 12.30	$+4.0 \pm 44.9$	-0.04 ± 3.88	$+0.04 \pm 1.38$
L4 (Coastal China)	$+2.54 \pm 11.91$	$+26.9 \pm 37.0$	$+1.24 \pm 3.40$	$+0.56 \pm 1.16$
L5 (Westerlies)	-0.03 ± 10.04	$+14.3 \pm 33.4$	-0.46 ± 3.40	-0.22 ± 1.19

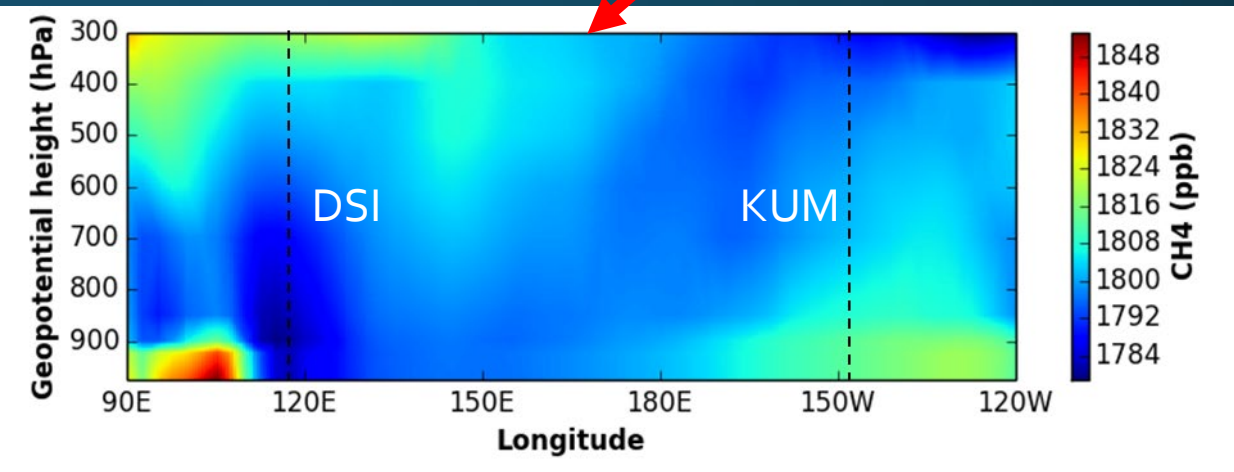
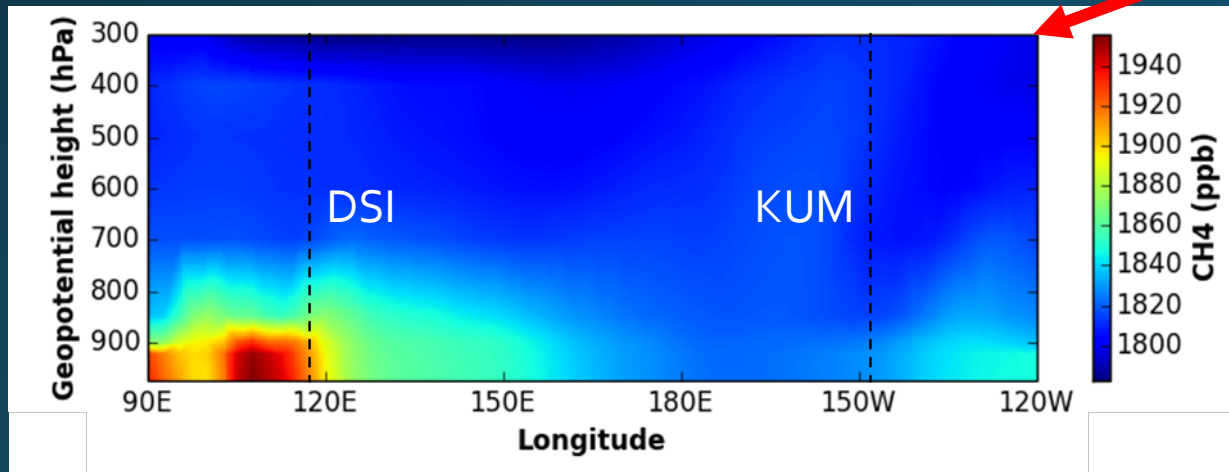
DSI Cluster	ΔCO_2 (ppm)	ΔCH_4 (ppb)	$\Delta\text{N}_2\text{O}$ (ppb)	ΔSF_6 (ppt)
D1 (Local)	-0.81 ± 8.77	-20.7 ± 61.0	-0.39 ± 3.14	$+0.21 \pm 1.35$
D2 (Coastal China ↓)	$+2.71 \pm 9.45$	$+35.4 \pm 40.8$	$+0.74 \pm 3.46$	$+0.47 \pm 1.26$
D3 (Pacific)	-3.07 ± 8.36	-30.5 ± 41.8	-0.51 ± 2.94	-0.34 ± 1.38
D4 (Coastal China ↑)	$+2.18 \pm 8.17$	$+38.5 \pm 35.1$	$+0.01 \pm 3.23$	$+0.26 \pm 1.16$
D5 (Westerlies)	$+3.47 \pm 6.77$	$+44.5 \pm 32.2$	$+0.06 \pm 2.05$	$+0.44 \pm 1.19$
D6 (SCS)	-4.57 ± 7.62	-56.4 ± 38.5	-0.42 ± 2.93	-0.43 ± 0.95

TPI (sea-level/southern SCS)



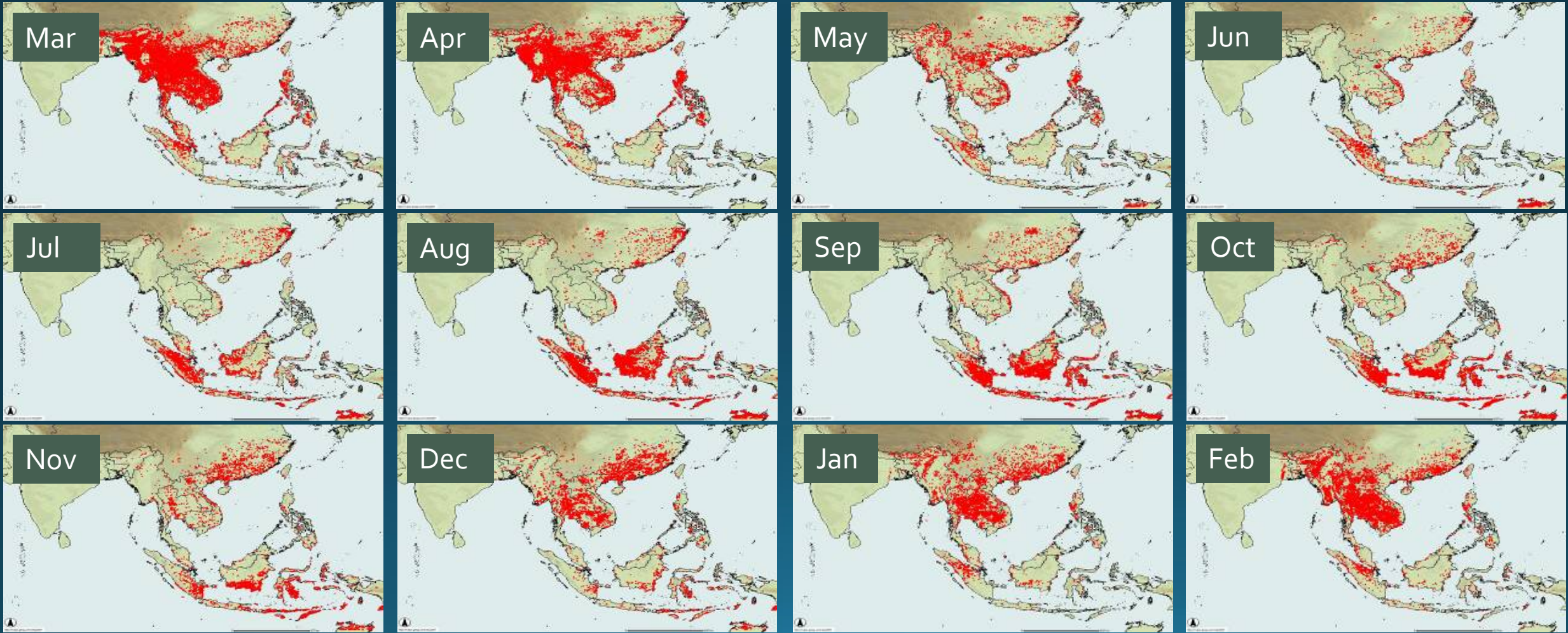
Monsoon

Ref: <https://scied.ucar.edu/docs/why-monsoons-happen>

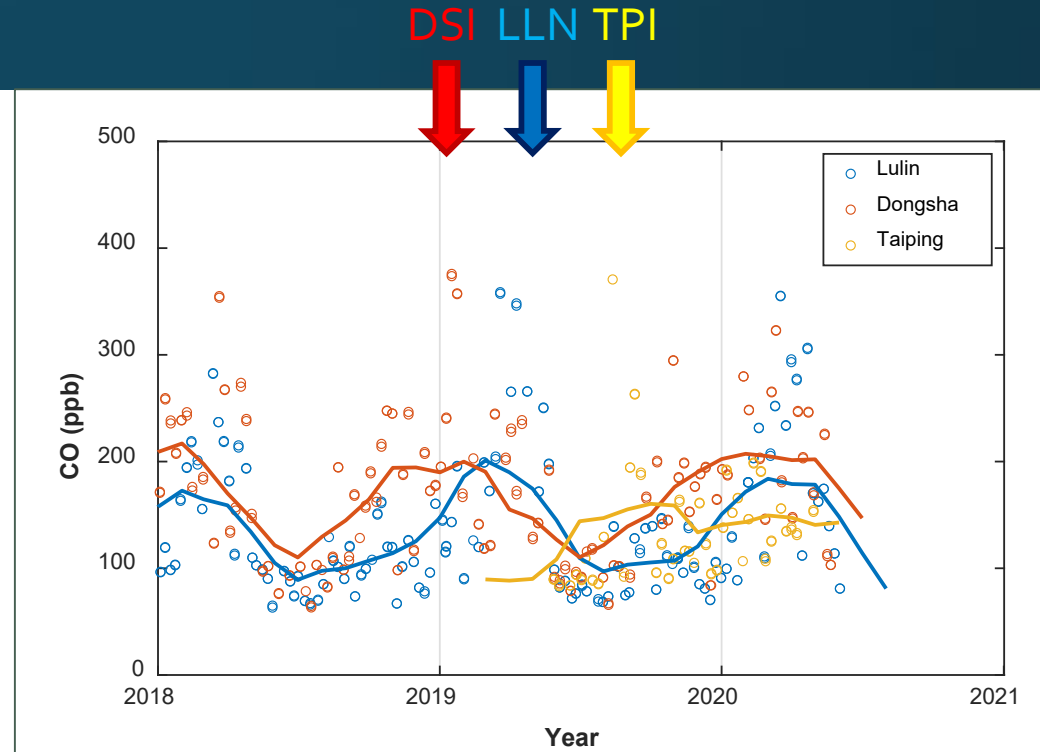
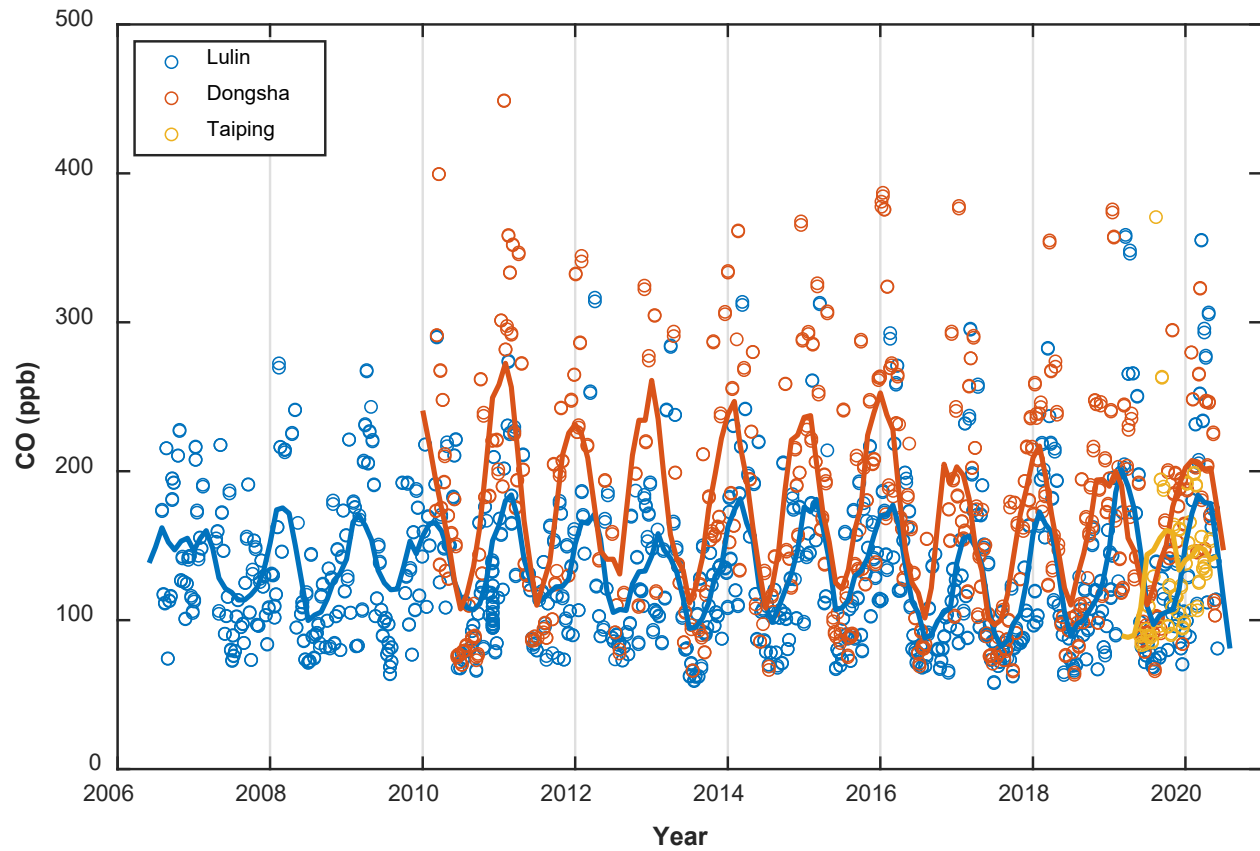


Ref: Ou-Yang et al., ERL, 2015.

and Biomass burning



CO



Summary

- Measurements of major greenhouse gases were carried out at three background sites (Mt. Lulin, Dongsha Island, and Taiping Island) in East Asia.
- Distinct seasonal variations were observed at all sites, but the patterns are not quite the same due to different influences.
- Monsoon with polluted air masses were likely responsible for the seasonal maxima of these compounds.