



China and Taiwan: A Tale of Two COVID-19 Lockdown Measures and Air Quality Impacts

Satellite sensors



TROPOMI



OMPS



VIIRS

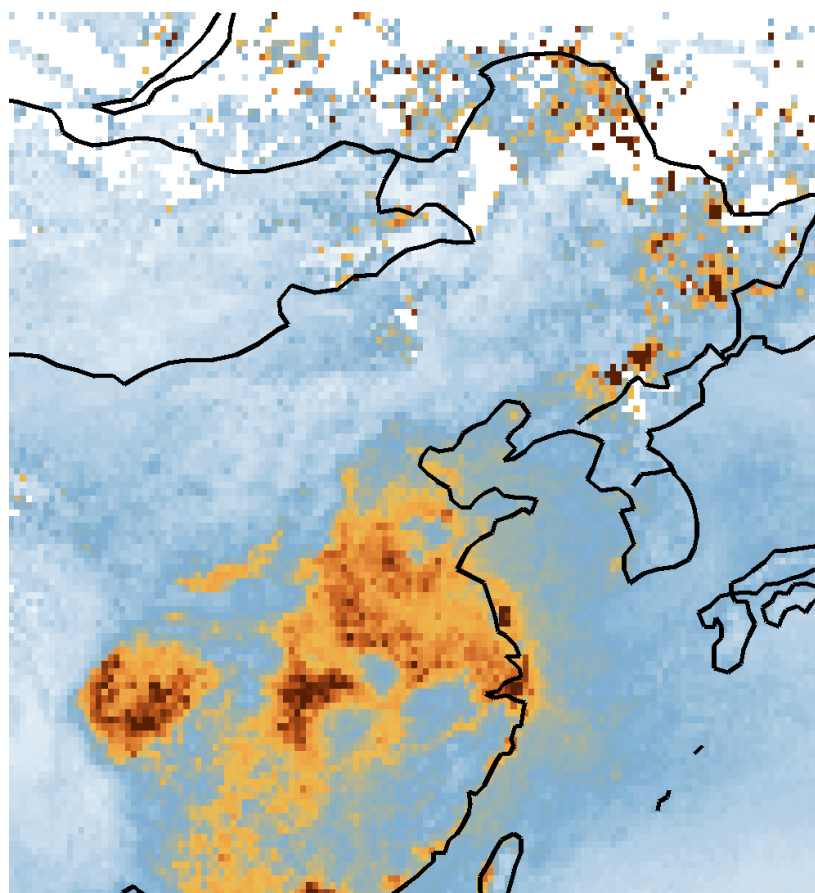
Shobha Kondragunta,
NOAA/NESDIS/STAR

Hai Zhang and Zigang Wei (IMSG)

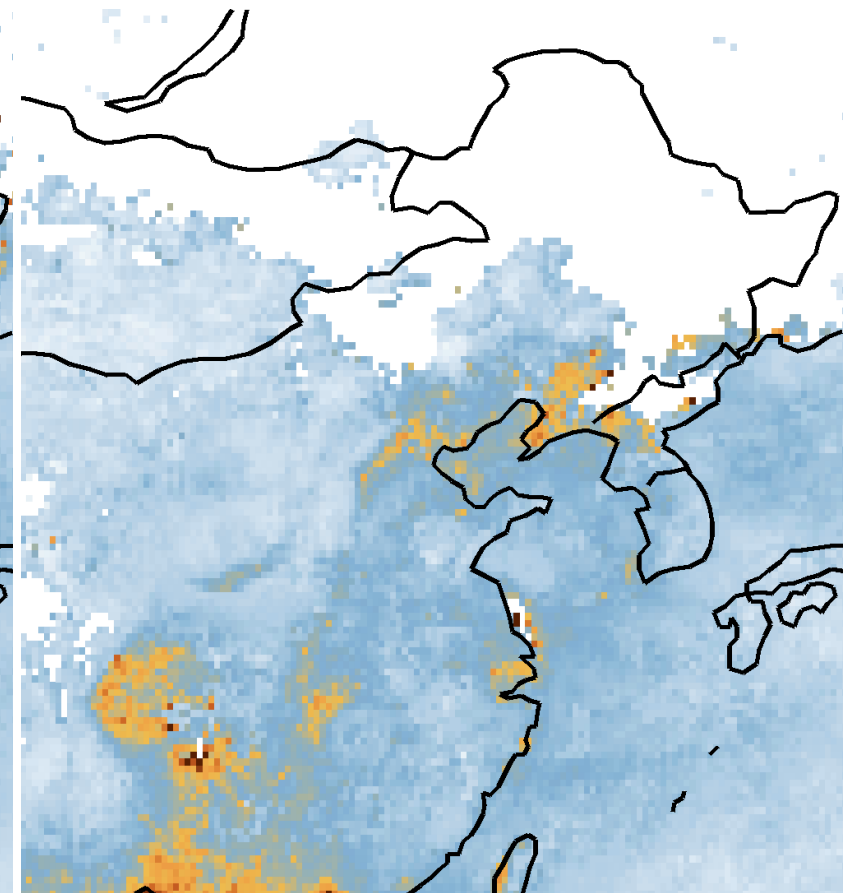
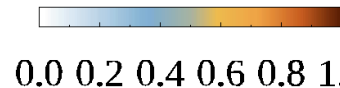


COVID-19 Impact on Aerosols in China

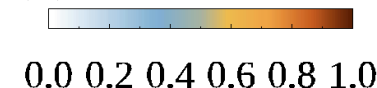
- Transportation sector one of the main sources of particulate pollution in China
- Lockdown measures in Hubei and other provinces resulted in reduced NOx and primary particulate emissions
- Lower AODs in 2020 due to lower emissions but what about the role of transported smoke, dust, and local/regional sulfate aerosols?



Feb Climatology



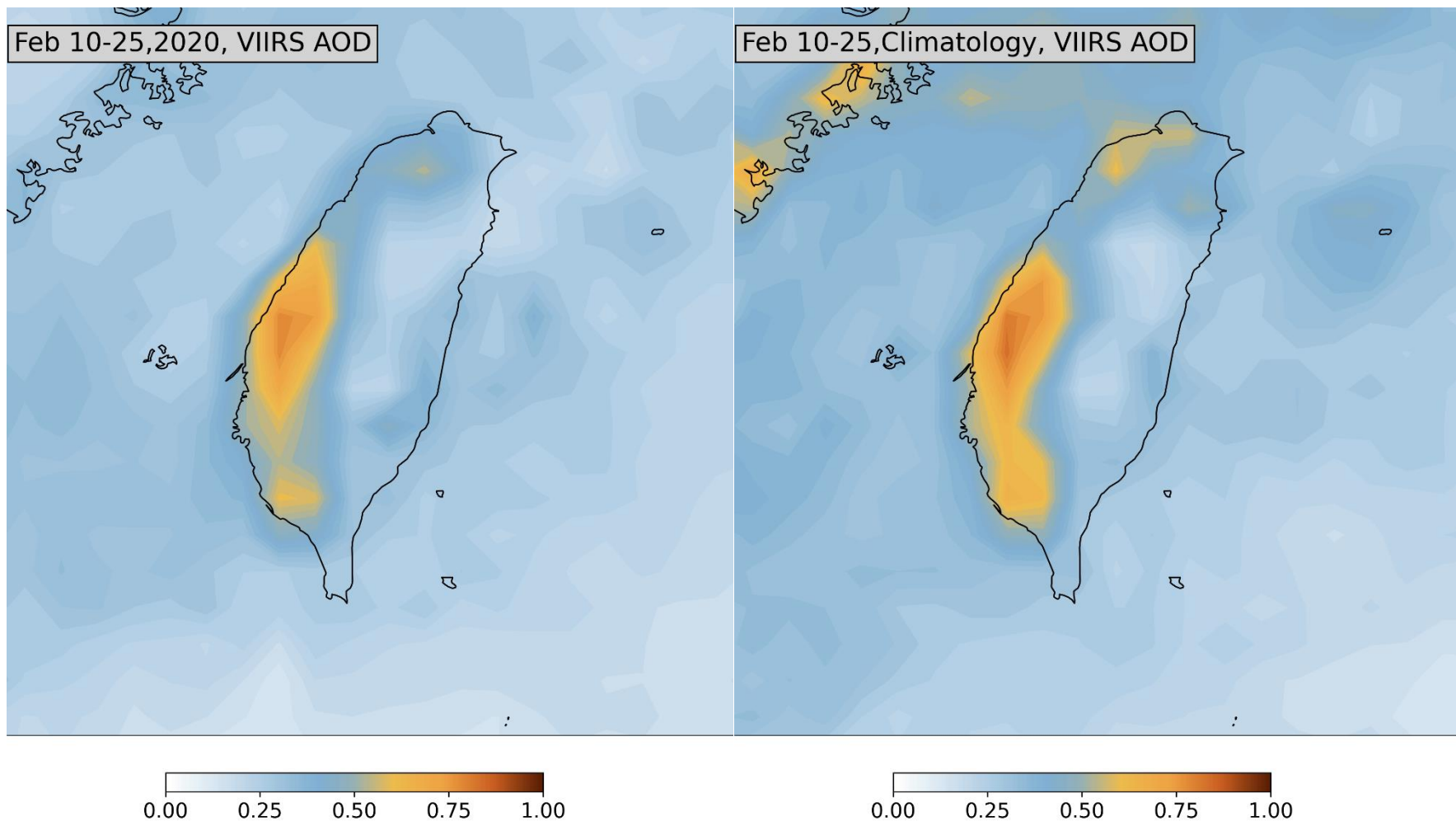
Feb 10-25,2020





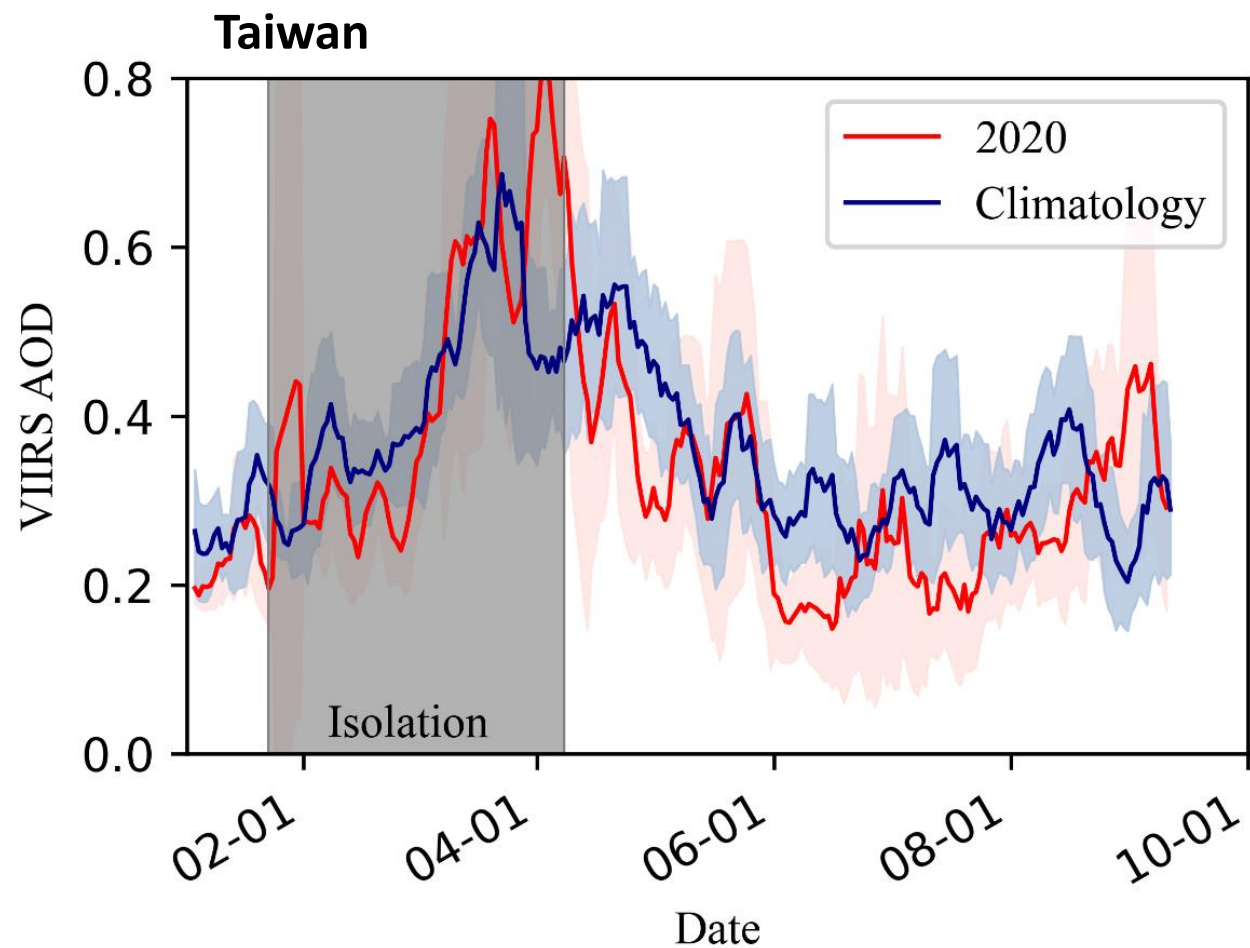
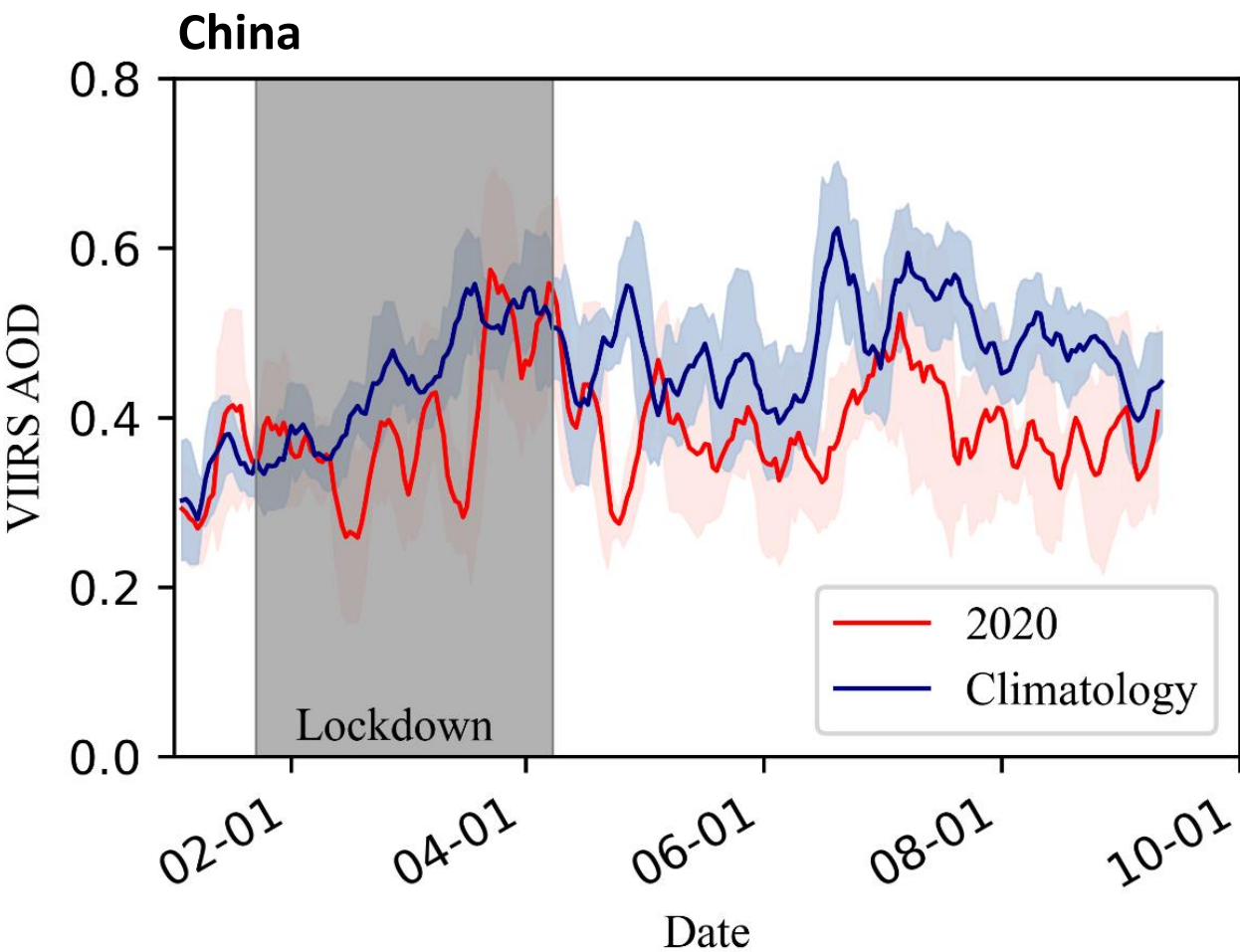
COVID-19 Impact on Aerosols in Taiwan

- Taiwan did not introduce any lockdown measures for COVID-19 pandemic but went into isolation with international travel ban
- No significant changes in AOD. Particle pollution in Taiwan local at this time of the year. Pollution from China impacts Taiwan air quality in the Spring season due to transport patterns





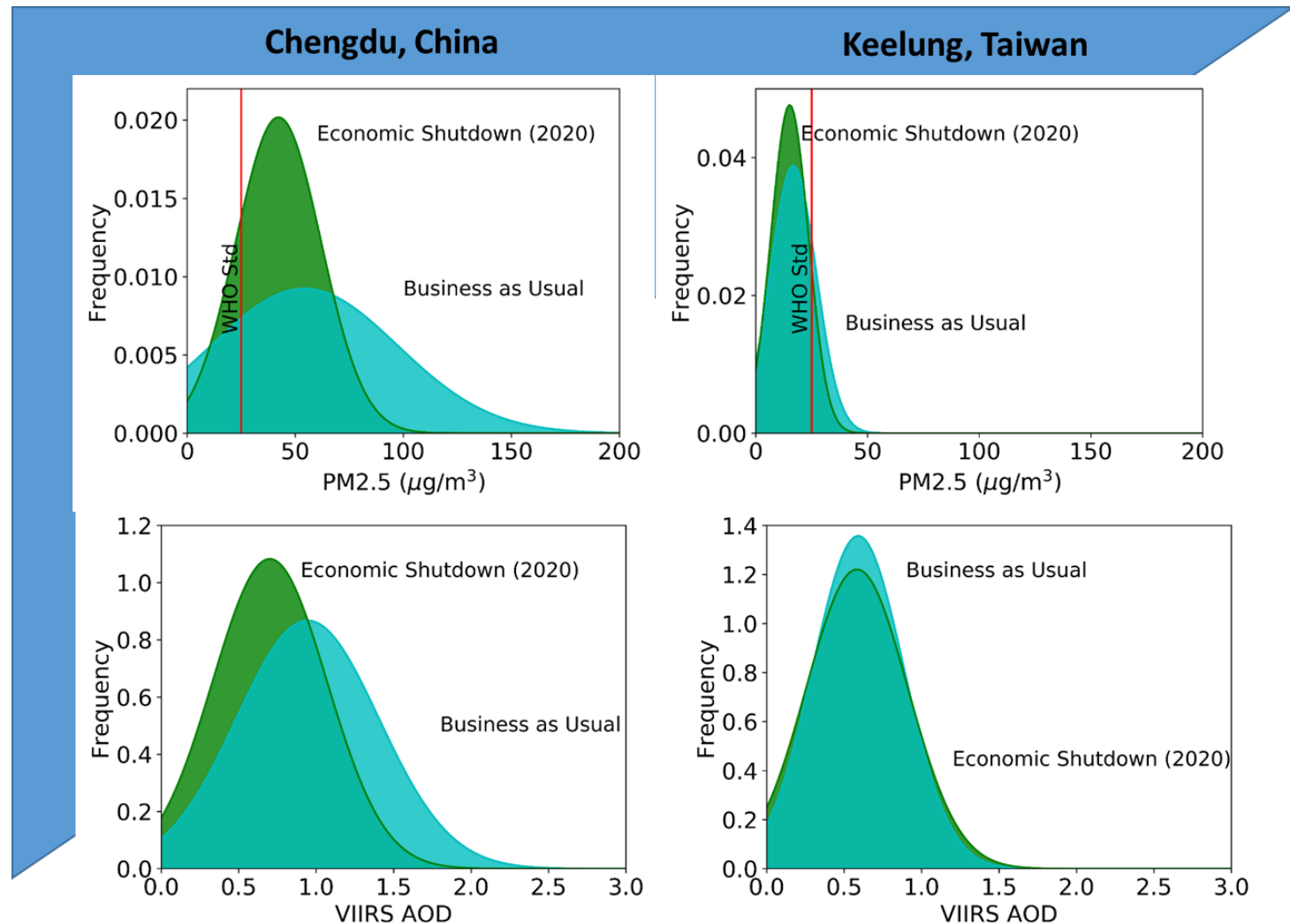
COVID-19 Impact on Aerosols: China vs. Taiwan



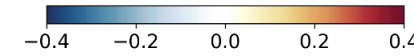
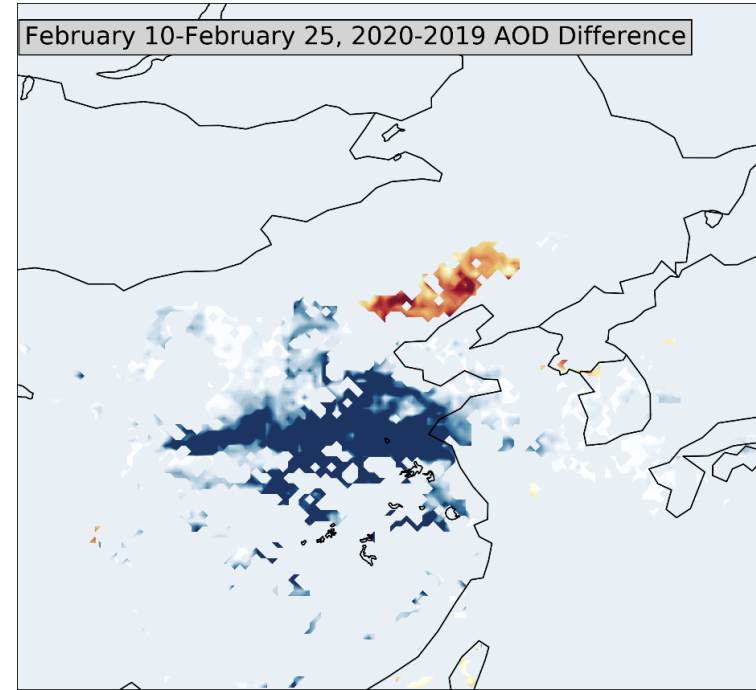
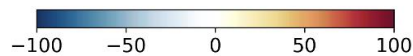
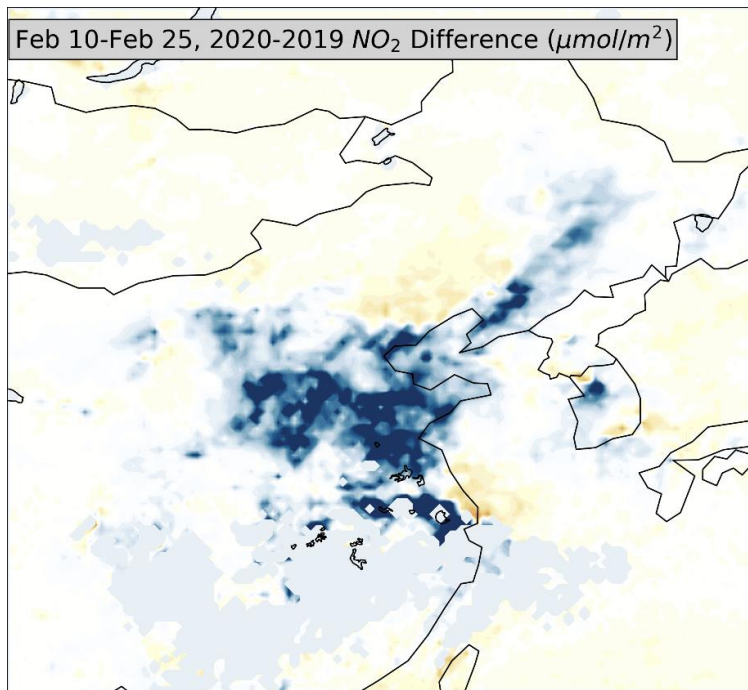
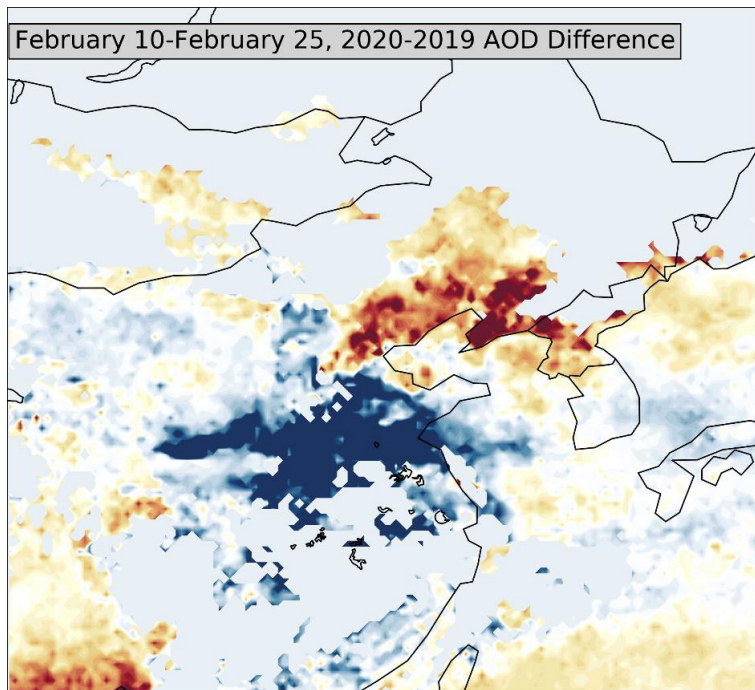


COVID-19 Impact on Aerosols: China vs. Taiwan

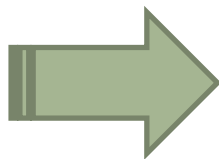
- China instituted strict (100%) lockdown in Hubei and Sichuan provinces leading to reduced emissions whereas Taiwan enforced strict screening of international travelers and went into isolation but no lockdown
- Air quality (PM2.5 and AOD) in China showed improvement in March 2020 compared to Business as Usual. Taiwan had no such air quality impacts. No difference between 2020 and BAU.



Filtering AOD using NO₂ to Examine Changes (1)

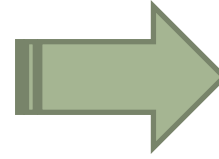


SNPP VIIRS AOD difference between 2020 and 2019 showing decrease in AOD in Hubei province where COVID-19 related shutdown was 100%. Increase in AOD due to transported smoke and/or increase in emissions in 2020 compared to 2019



Use NO₂ to filter AOD data

- NO₂ > 12 $\mu\text{moles}/\text{m}^2$
- ΔNO_2 > 5 $\mu\text{moles}/\text{m}^2$ with criteria that both AOD and NO₂ should either co-increase or co-decrease



Capture AOD changes when source sector for aerosols/aerosol precursors and NO₂ are the same



Filtering AOD using NO₂ to Examine Changes (2)

- Using various indicators including NO₂ to identify metropolitan areas where urban/industrial sources are the main source of particle pollution
- Benchmark AOD changes due to emissions changes for potential future applications

