Trend comparison between AeroCom Historical experiment and satellite observations: TOA clear-sky reflected SW flux and aerosol optical depth

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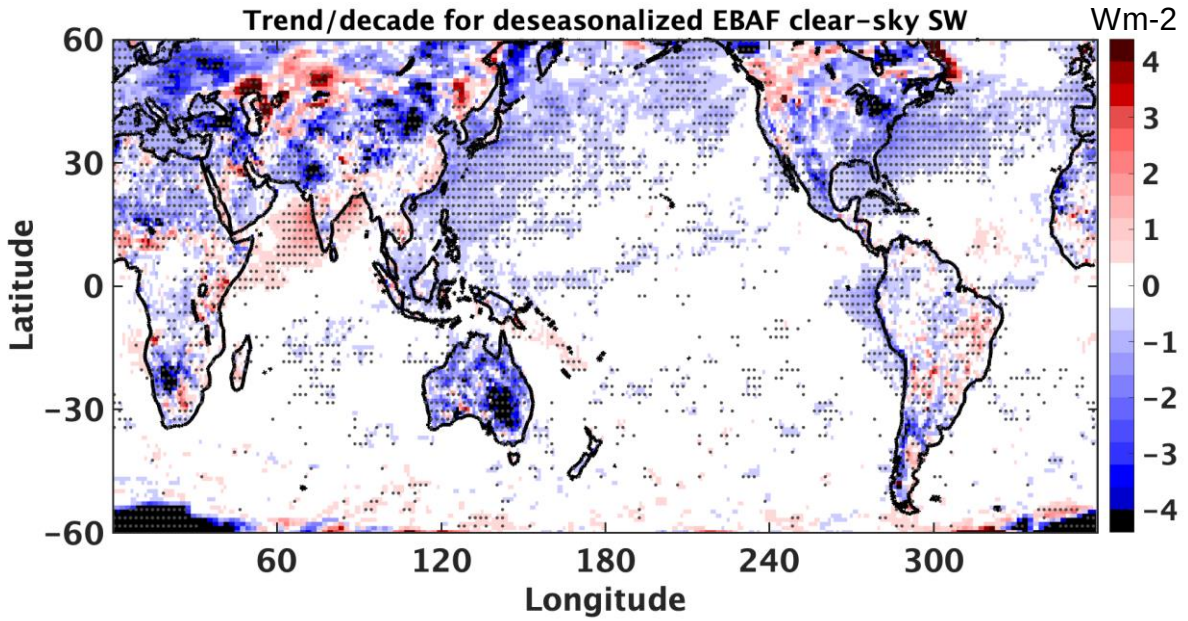
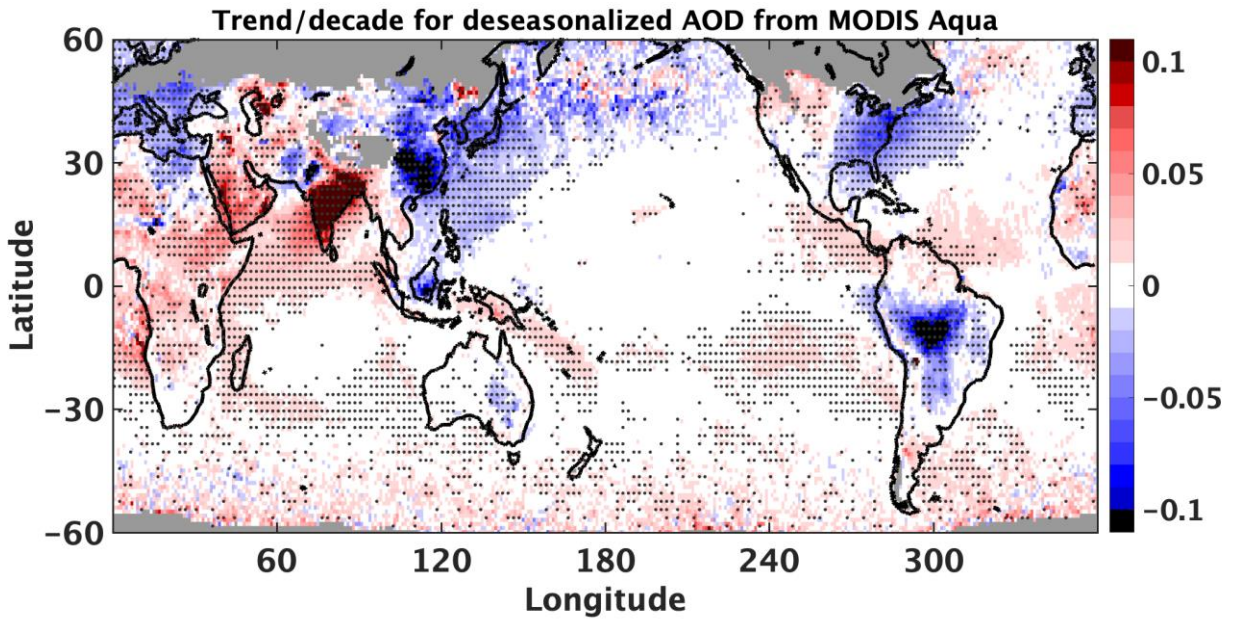
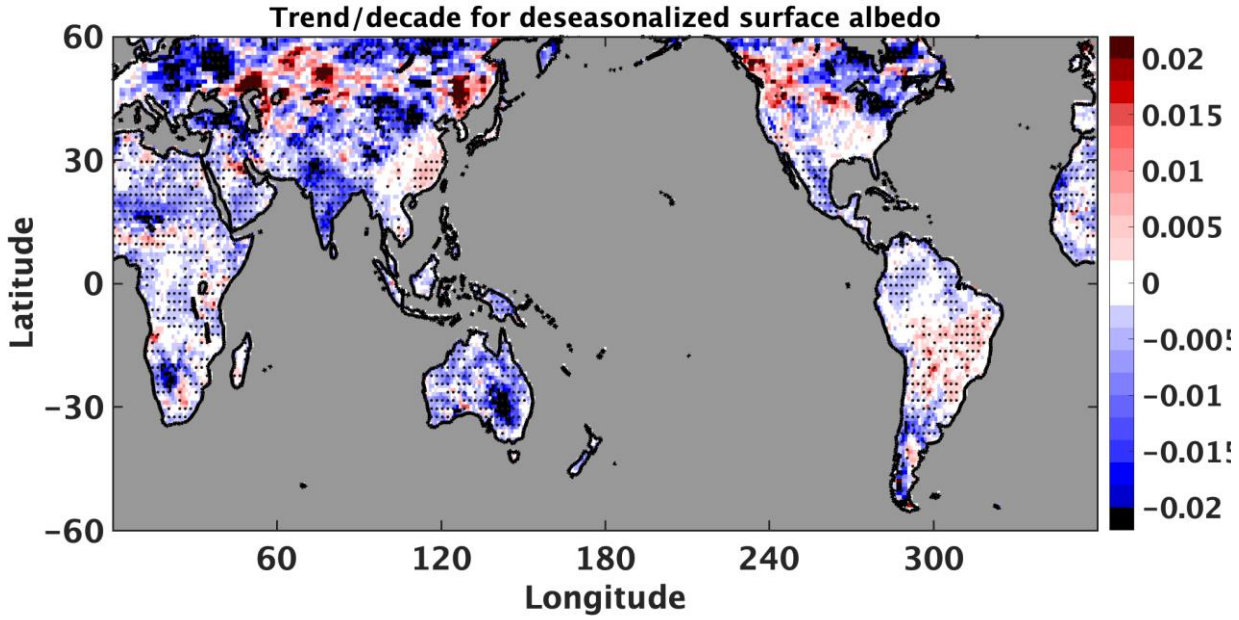
Model simulation and satellite data

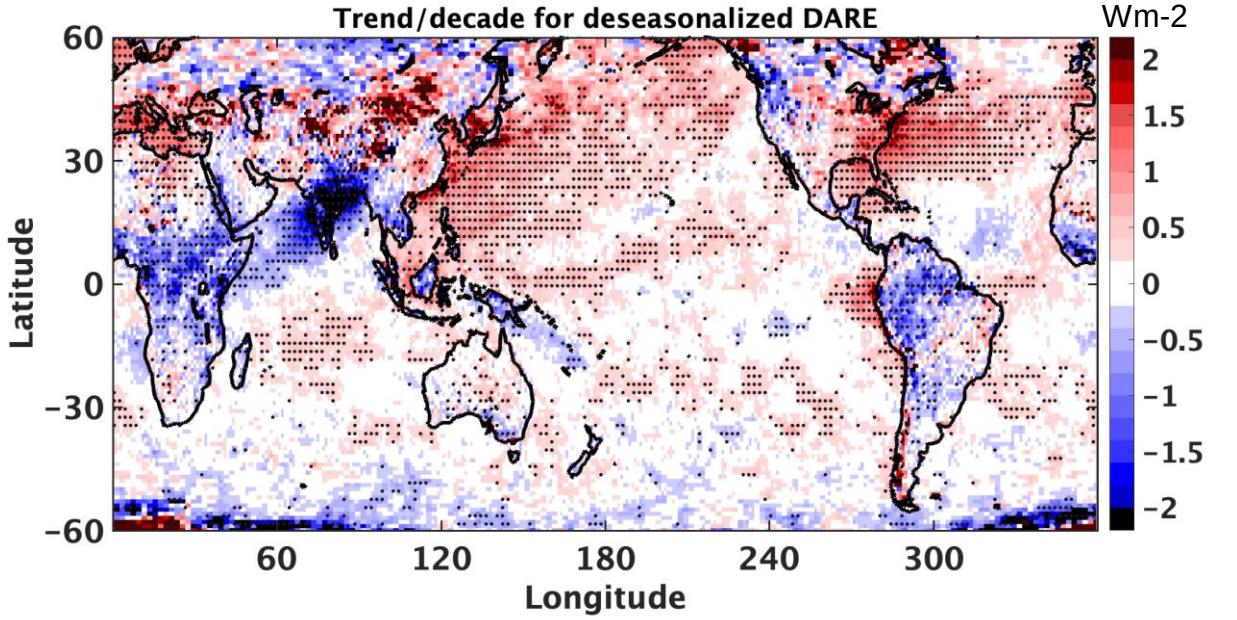
- AeroCom historical experiment:
  - One of the main goals of the historical experiment is to understand regional trends in aerosol distribution from 1850 to present
- Satellite data used:
  - CERES Ed4.1 TOA Energy Balanced and Filled (EBAF) data: clear-sky reflected TOA SW flux
  - MODIS Aqua collection 6.1 dark target and deep blue combined AOD
- Use the time period (200207-201712) that is common for both Oslo model simulations and satellite observations for regional trend analysis

Regional trends from satellite observations: 200207-201712

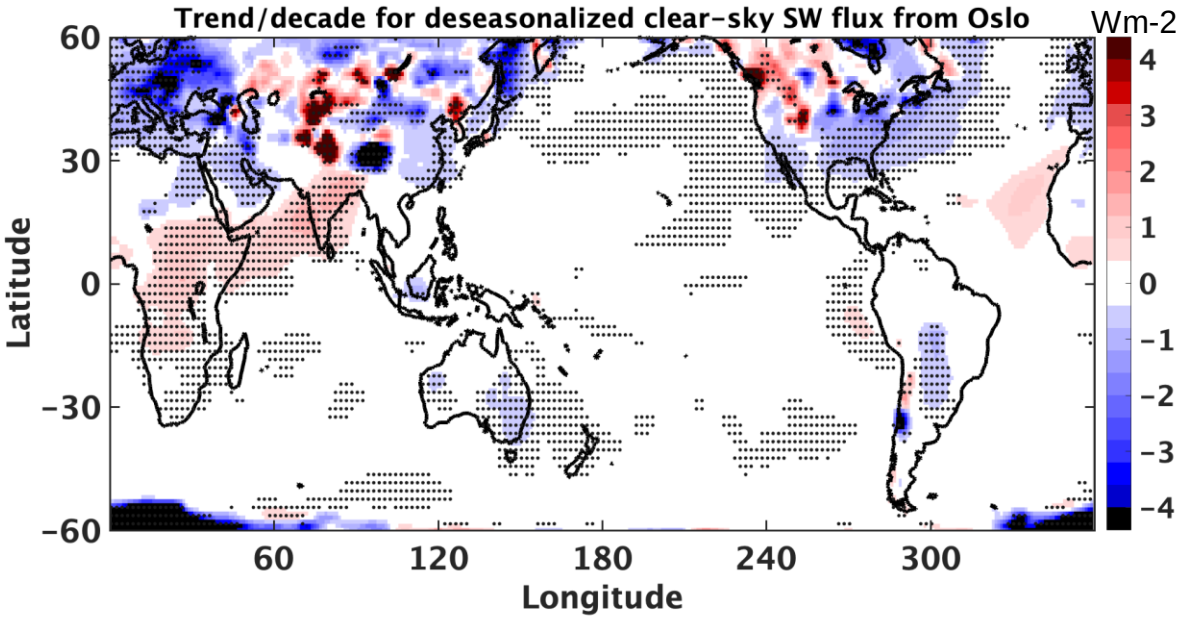


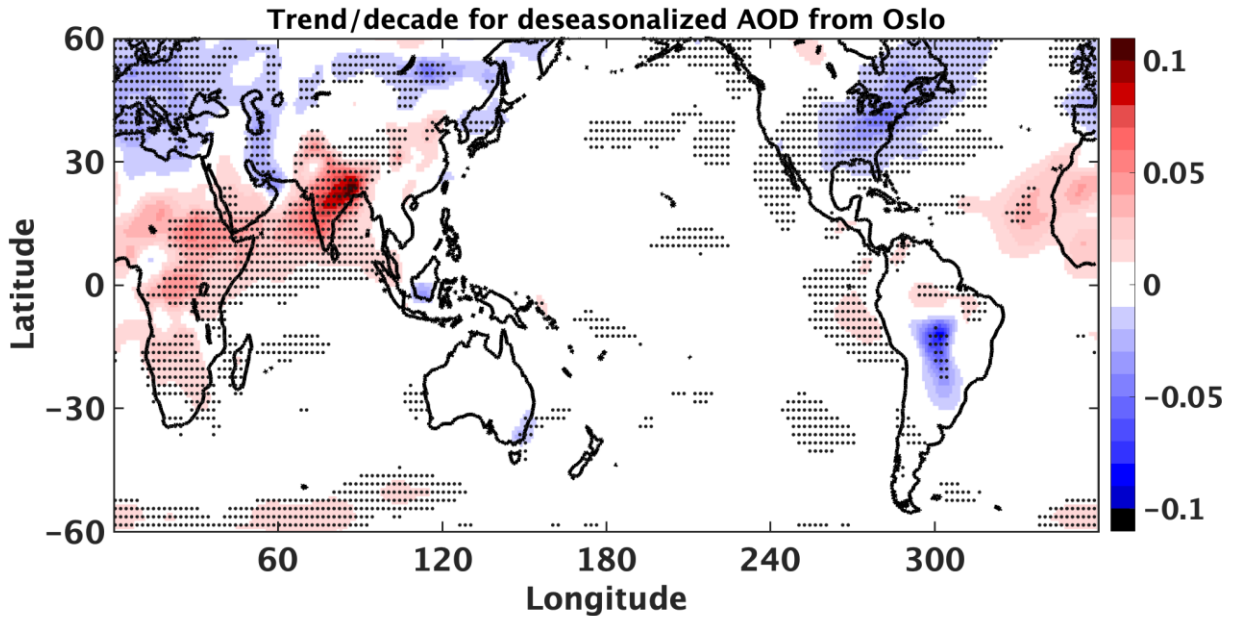


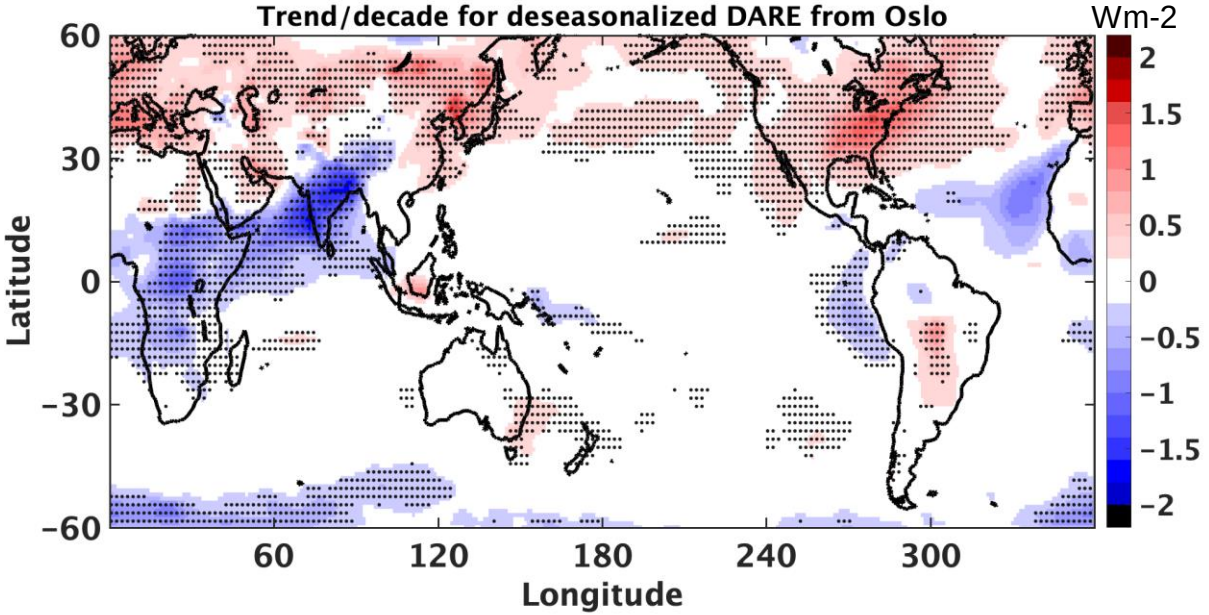


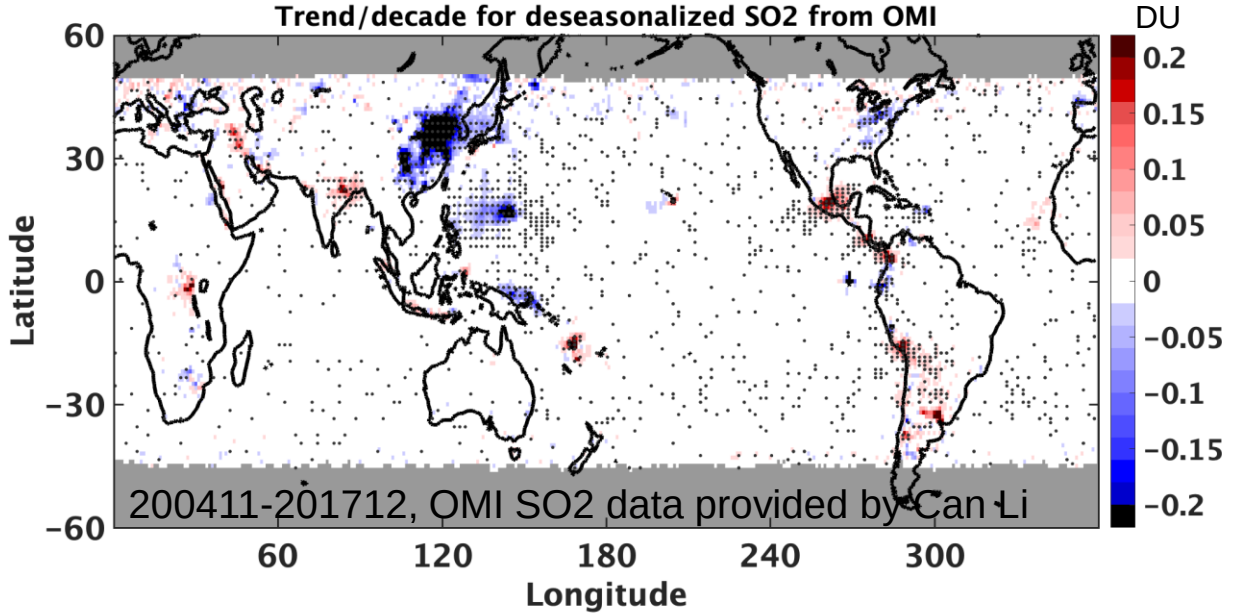


Regional trends from OsloCTM: 200207-201712







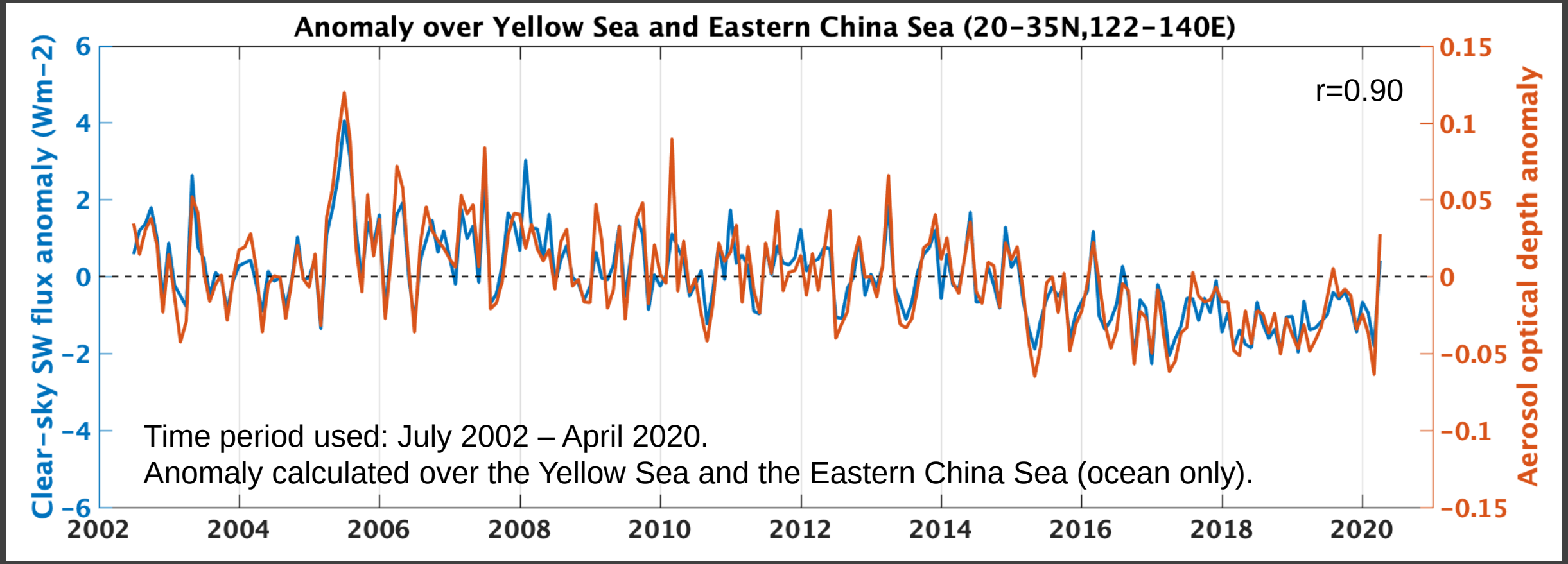


Summary

- Consistency in observed clear-sky flux/DARE and AOD trends is very encouraging.
- Model simulation captured many notable aerosol changes derived from satellite observations, though at smaller magnitudes:
  - decreasing trends over eastern US, Brazil, and Europe.
  - increasing trends over India & central Africa.
- The sharp decrease in aerosol loading over eastern China and the adjacent ocean is missing in Oslo model simulation because it wasn't captured in the emission data used. Paulot et al. (2018) noted that GFDL AM3 model also missed the changes over eastern China.

Moving forward

- Examine more models that provide continuous outputs.
- Extend the analysis to the present.



- For February/March 2020, both the EBAF clear-sky reflected SW flux and the MODIS AOD decreased over the oceans adjacent to China, but both increased in April 2020 after the lockdown was lifted.