# Evaluating AeroCom phase III TOA clear-sky flux using the CERES Energy Balanced and Filled (EBAF) product

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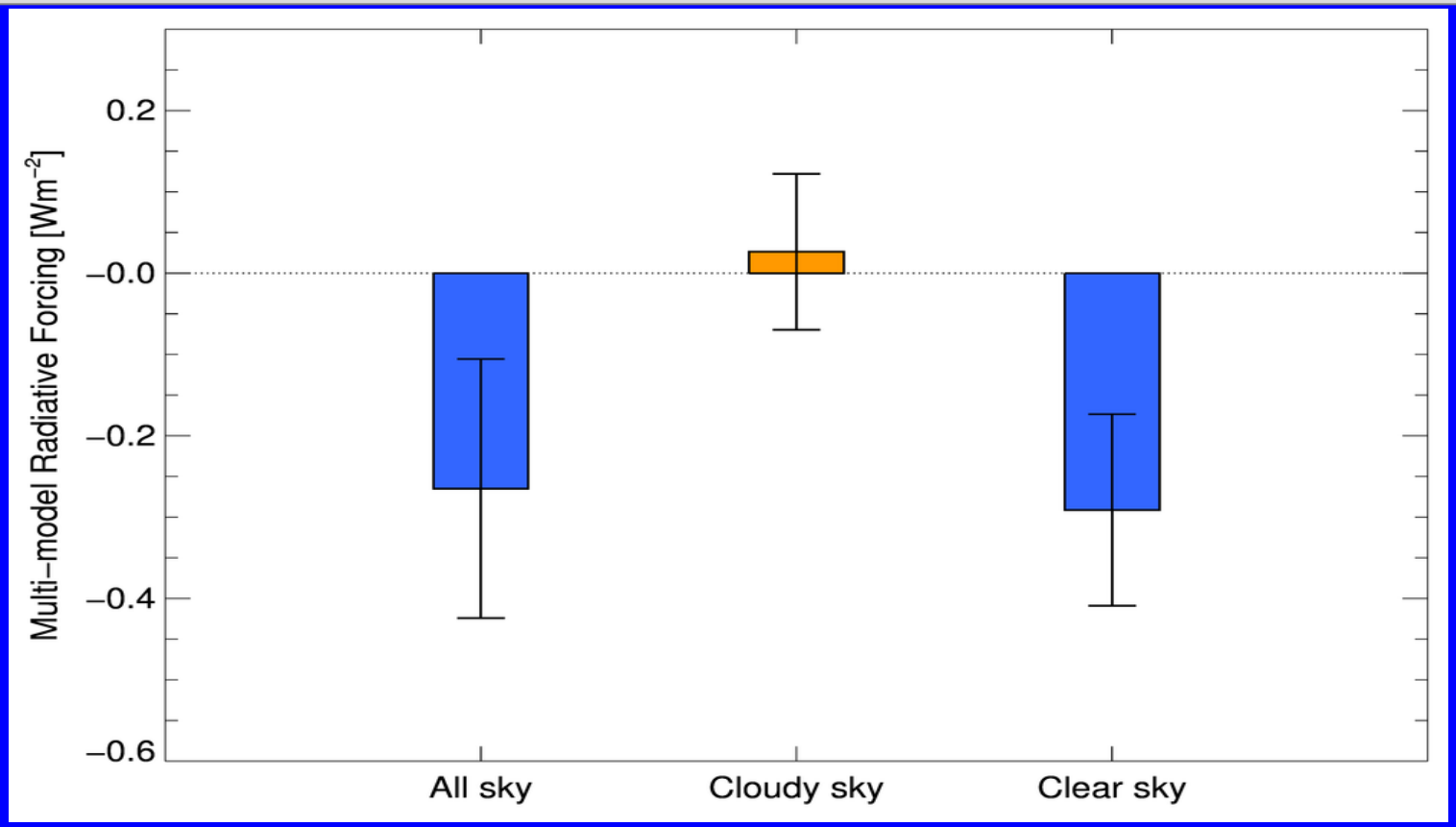
Details on Edition 4 TOA EBAF product are provided in Loeb et al. (2018).

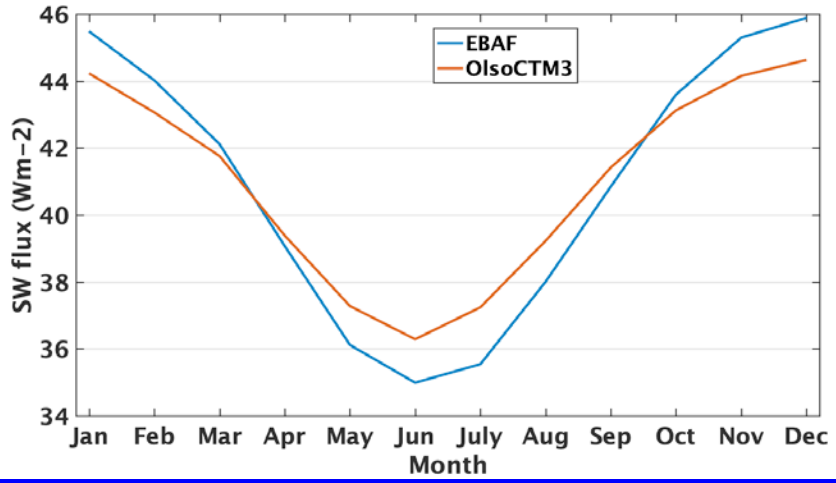
The uncertainty of monthly mean clear-sky TOA SW flux in 1°x1° region is estimated to be 5 $Wm^{-2}$.

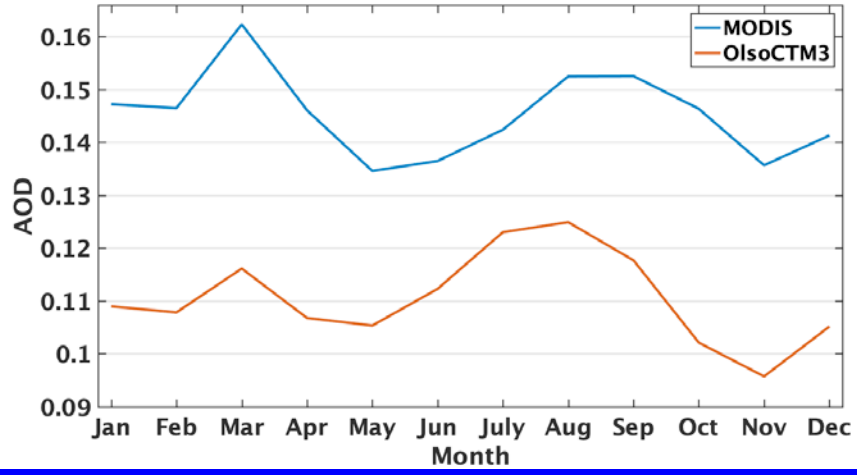
MODIS v6.1 dark target and deep blue combined AOD is also used here.

The sky forcing can be divided into clear sky and cloudy sky contribution.



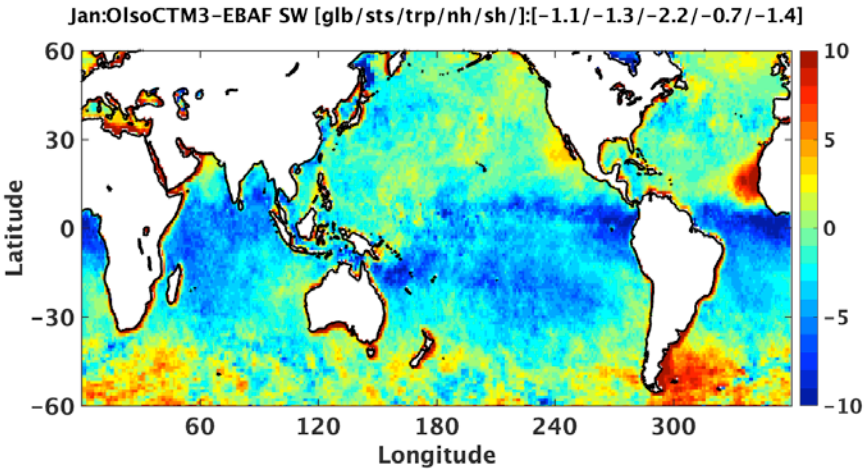
# Monthly mean clear-sky flux and AOD comparison: over ocean

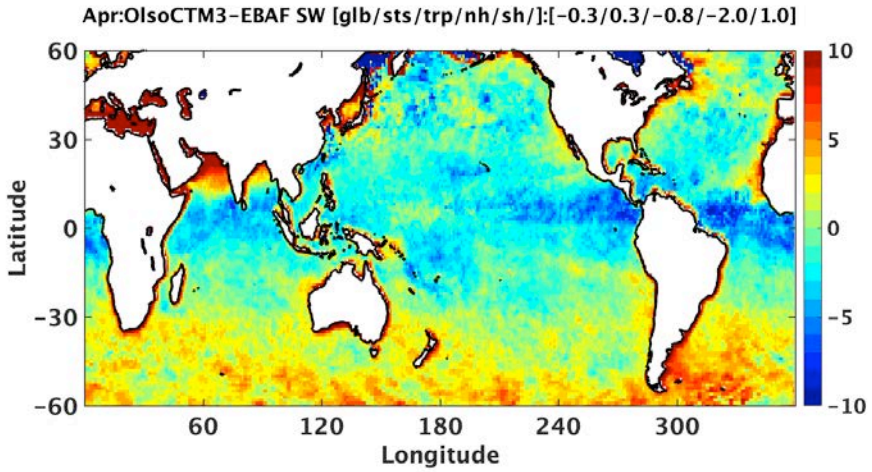


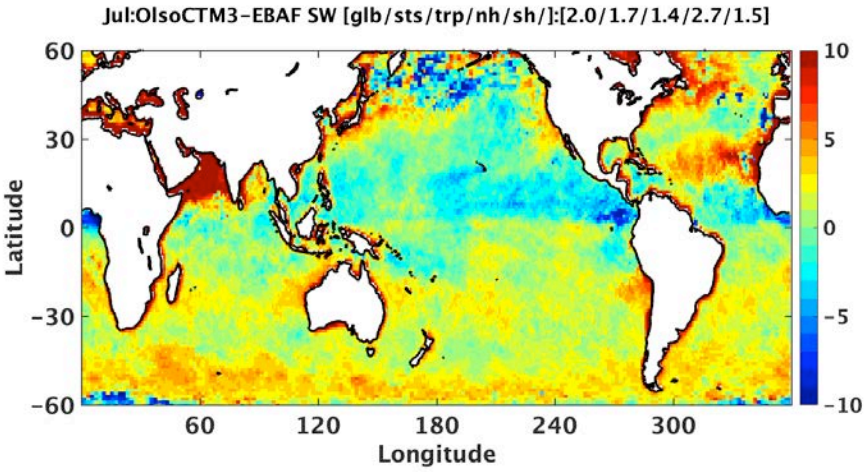



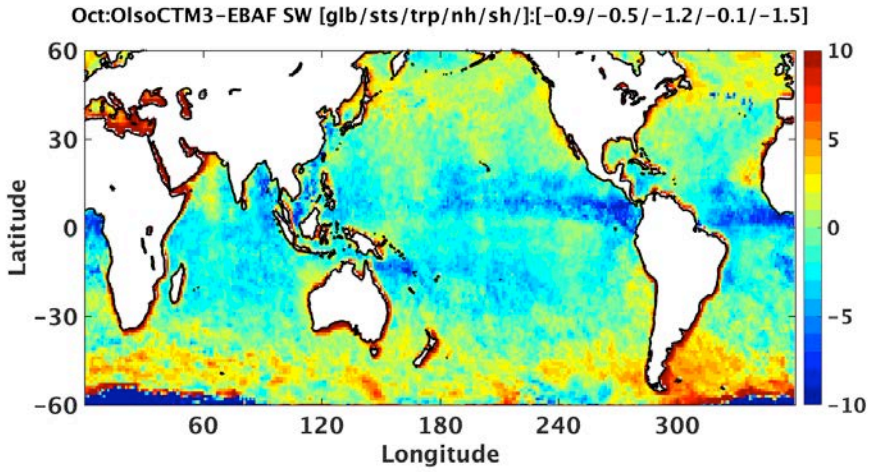

- Monthly mean difference of TOA upwelling SW flux between OlsoCTM3 and EBAF is within 2 Wm-2.
- Monthly mean AODs from OlsoCTM3 are smaller than MODIS AOD by about 0.04.

# Regional clear-sky SW flux differences between OlsoCTM3 and EBAF

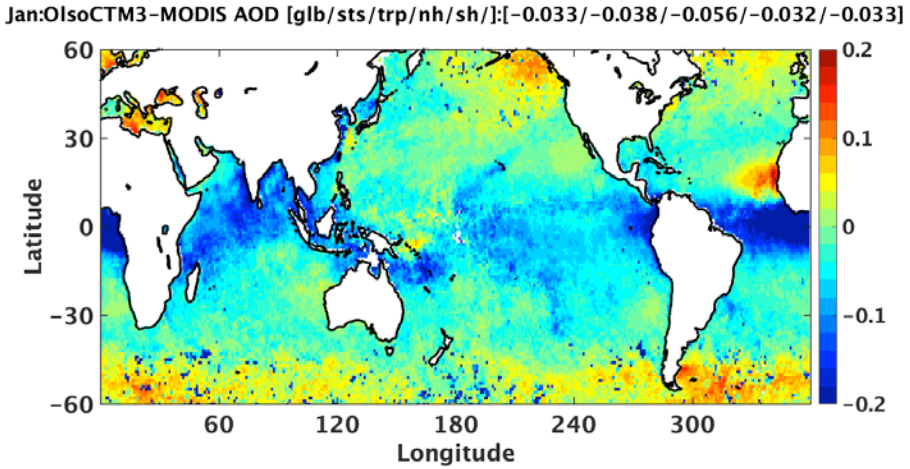


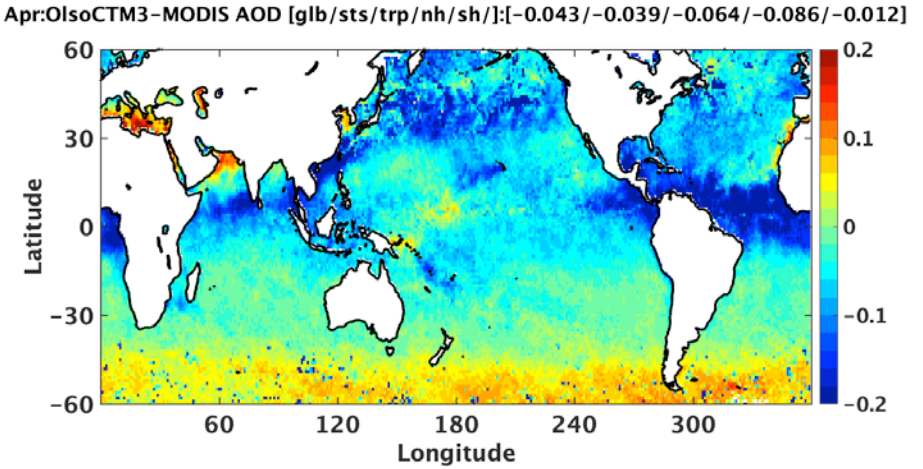



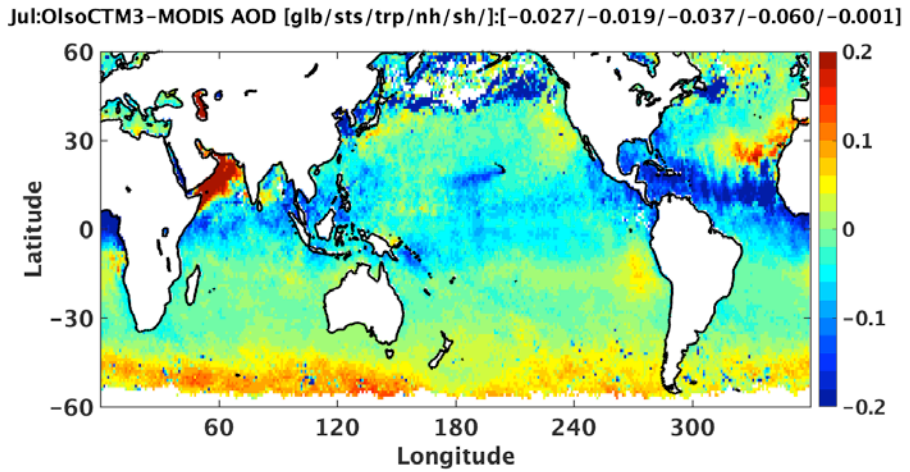



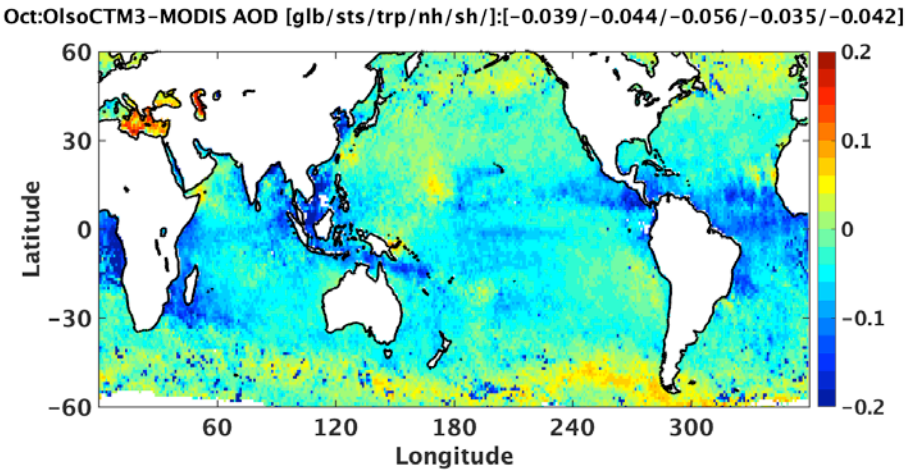



# Regional aerosol optical depth differences between OlsoCTM3 and MODIS

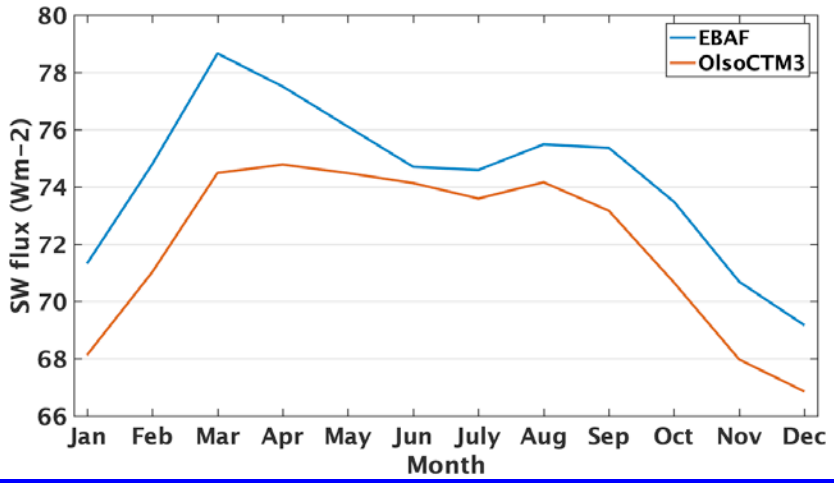


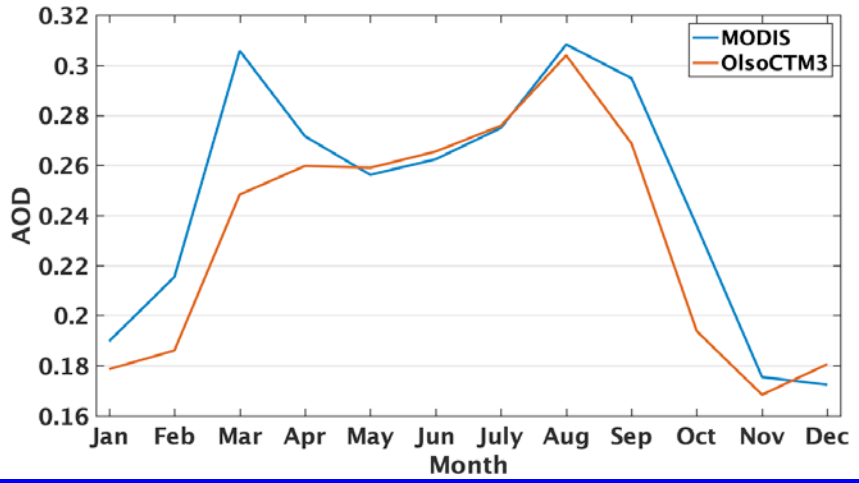



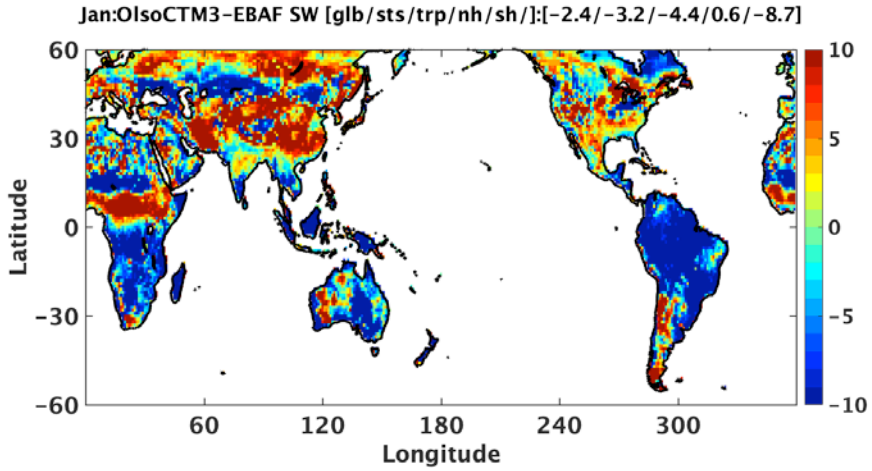
# Monthly mean clear-sky flux and AOD comparison: over land

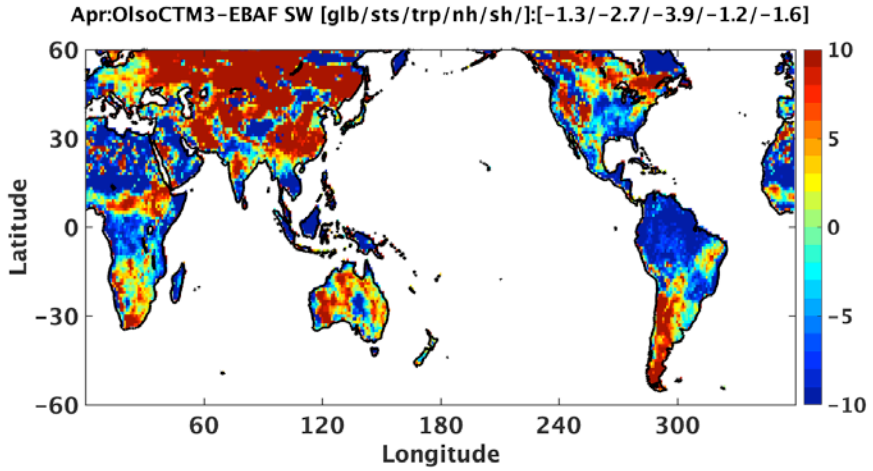


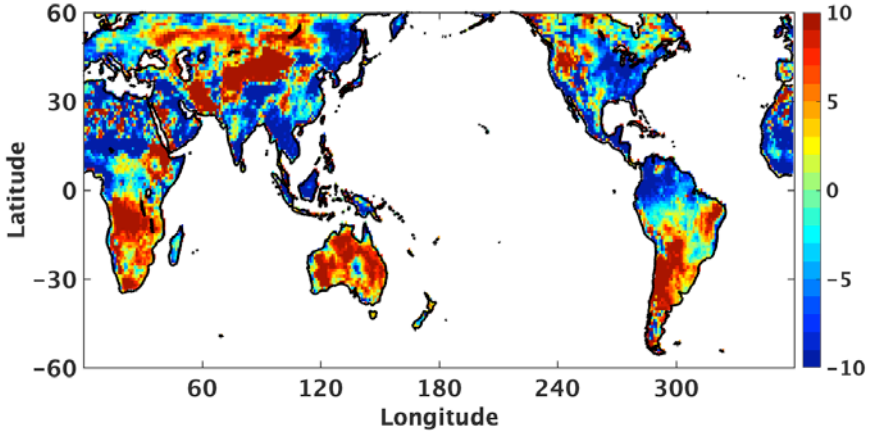



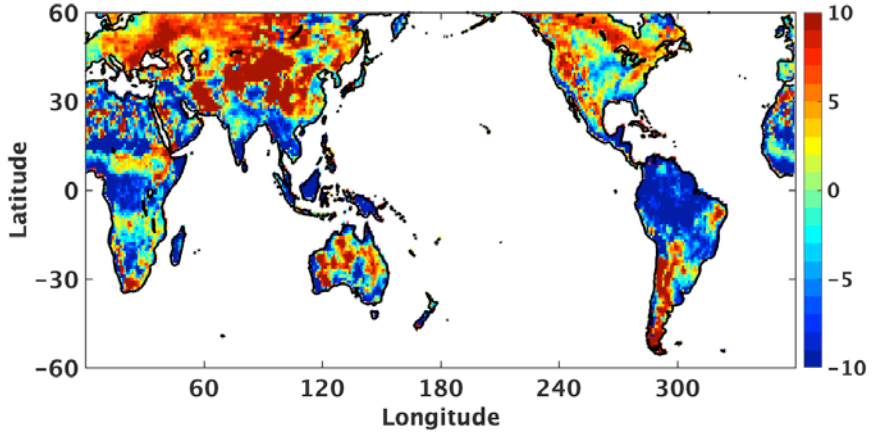

- OlsoCTM3 underestimates the clear-sky TOA SW fluxes, with the largest difference of 4 $Wm^{-2}$ occurs in March;
- Comparing to the MODIS AOD, OlsoCTM3 underestimates the AOD over land during the boreal winter months, and agrees well during the boreal summer months.

# Regional clear-sky SW flux differences between OlsoCTM3 and EBAF

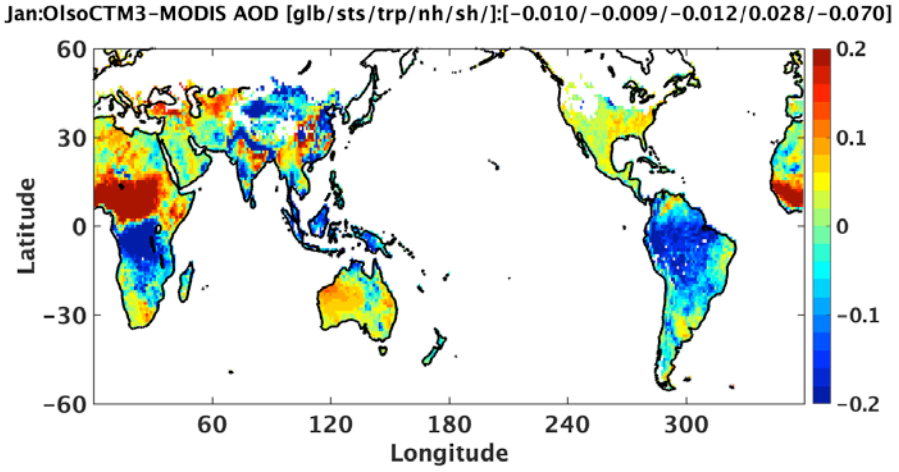


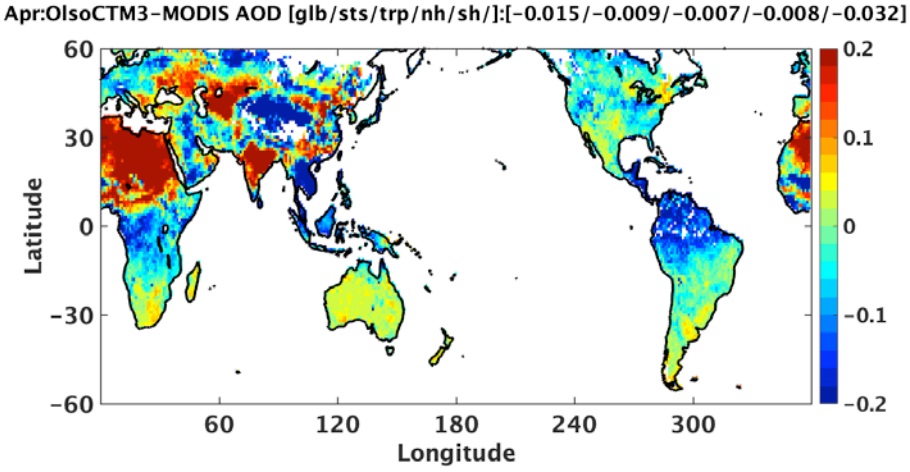



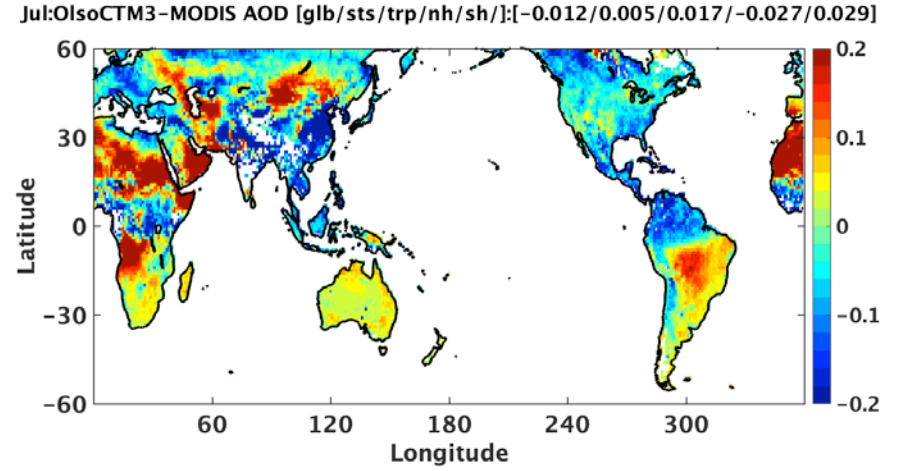



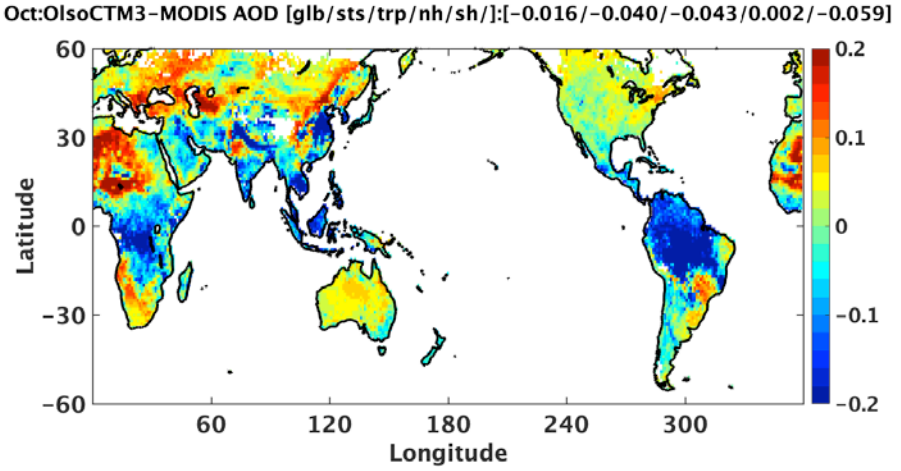



# Regional aerosol optical depth differences between OlsoCTM3 and MODIS



# Some observations

- Over ocean, during boreal summer months, the TOA clear-sky upwelling SW flux from OlsoCTM3 is greater than that from CERES EBAF, even though the AOD from OlsoCTM3 is smaller than that from MODIS.
- Comparing with the MODIS aerosol optical depth, OlsoCTM3
  - Overestimates AOD over Sahara regions
  - Underestimates AOD over the west coast of Africa and over the Amazon
- From the AOD differences and flux differences, it seems
  - Surface albedo for the Sahara specified in OlsoCTM3 might be too small
  - Surface albedo over snow/mountainous regions used in OlsoCTM3 might be too large