Jasper Kok

UCLA

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**Description of code used to generate results in Kok et al., 2018**

This repository contains the data and scripts needed to produce the figures in the main text of Kok et al., Global and regional importance of the direct dust-climate feedback, *Nature Communications*, 2018. Below follows a brief description of each script and data file, which is organized by in ascending order of figures presented in the paper.

Figure 1a:

* Evan\_comp.m
  + this script calculates the comparison against the AVHRR data set of Evan and Mukhopadhyay (2010) and Evan et al. (2014)

Figure 1b:

* main\_longterm.m
  + main script, which calculates the comparison of the CESM AERONET-BASE and AERONET-PHYS simulations against AOD measured at AERONET stations
* AERONET\_calc\_longterm\_trend.m
  + script that calculates the long-term AOD trend at dusty AERONET stations, and compares those against model simulations
* AERONET\_calc\_seasonal\_cycle.m
  + script that calculates the seasonal cycle in AOD at AERONET stations, the result of which is used to calculate the anomaly in AOD for a given measurement in AERONET\_calc\_longterm\_trend.
* AERONET\_station\_dust\_AOD\_fraction.mat
  + loads the fraction of AOD that is due to dust for each station; from the simulations in Kok et al. (ACP, 2014b)
* create\_longterm\_trend\_yearly\_plots.m
  + this plots the long-term records of AOD at the dusty stations, as well as their anomalies after subtracting the seasonal cycle
* create\_seasonal\_cycle\_plots.m
  + plots the seasonal cycle in AOD at each AERONET station
* determine\_end\_day
  + returns the number of days in a given month
* linearfit.m
  + performs a linear-least squares fitting procedure based on Bevington and Robinson (2003)
* load\_station\_filenames\_daily.m
  + read in the filenames of the AERONET data
* read\_obs\_AOT\_daily.m
  + reads in the daily data from a given AERONET station, and returns the daily AOD and angstrom exponent

Figure 2:

* calc\_global\_dust\_emission\_rate\_CLM\_runs.m
  + main script, which reads in the different CLM runs, extracts the global dust flux, and calibrates it using the calibration to AERONET data in Kok et al. (2014)

Figures 3 and 4:

* calc\_kappa\_and\_feedback\_pdf.m
  + main script, which calculates kappa (fractional change in dust loading per degree globally-averaged surface T change) and the resulting global dust climate feedback (using the constraints on the dust direct radiative effect in Kok et al., Nature Geoscience, 2017)

Figure 5:

* regional\_dust\_DRE.m
  + main script, which calculates the regional dust climate feedback using kappa calculated from CMIP5 and CESM/CLM, the global DRE from Kok et al. (Nature Geoscience, 2017), and four global model (CESM, GISS, GEOS-Chem and WRF-Chem) simulations of how that global dust DRE is distributed across the planet.
* Plot\_regional\_DCF\_results.m
  + script that plots up the constraints on the regional dust DRE and dust climate feedback
* map\_plot\_script\_zero\_log.m
  + script designed to plot a variable that straddles zero, with increases in the variable denoted in red and decreases in blue. The axes will be symmetric about zero, and logarithmically spaced.
* cbrewer.m, interpolate\_cbrewer.m, and colorbrewer.mat
  + script that generates color table. Obtained from http://colorbrewer2.org/
* Model\_AOD\_per\_bin.mat
  + Data set that contains the global DAOD for each model bin, as constrained in Kok et al. (Nature Geoscience, 2017). This data is generated by main\_bootstrap\_global\_dust\_cycle, which is a script used by Kok et al. (Nature Geoscience, 2017) and also archived with that paper
* REE.mat
  + The radiative effect efficiency for each bin of each of the four models. This data is generated by write\_REE, which is a script used by Kok et al. (Nature Geoscience, 2017) and also archived with that paper.
* DRE\_data\_climate\_models.mat
  + Loading the climate model simulations of the regionally-resolved DRE for the SW and LW spectra