0.1 Description of data

The first data set of Climate Data Record (CDR) of AOT was obtained from by the National Oceanic and Atmospheric Administration (NOAA) [**?**]. This data was collected using the Advanced Very High Resolution Radiometer (AVHRR) that provides an optical measure of aerosol column loading derived form the global ocean pixel-level PATMOS-x AVHRR clear-sky reflectance CDR at 0.63 μm channel [**?**]. This satellite provides global readings of oceanic measurements of AOT on a daily, as well as a monthly scale, for the years 1981-2009 [**?**].

The second data set consisting of the $PM_{2.5}$ measurements, was taken on land sites in California, Oregon, Washington, Alaska, and Hawaii. This was provided by the United States Environmental Protection Agency (EPA). $PM_{2.5}$ is so small that it can get lodged into lungs and make it difficult for people to breath. This creates an increase in respiratory problems. Common contributing factors to $PM_{2.5}$ include emissions for motor vehicles, power plants, wood burning, and dust from paved or unpaved roads, [**?**].

The AVHRR takes approximately 16 days to cover the entire earth. We, thus, have roughly two data values for each month of the year. The frequency of the $PM_{2.5}$ data is variable and ranges from once every day to once every six days. On certain occassions, the measurements from the satellite were found to be erroneous due to light reflection from cloud covers. Additionally, there are times when the $PM_{2.5}$ sensors malfunctioned resulting in no data. These points were appropriately removed from the datasets. Hence, we sometimes have months that have only two or less $PM_{2.5}$ data and/or no AOT data.

0.2 Challenges

Arvind: Here I would list the challenges associated with the data, lack of spatial and temporal coverage, etc. The differences between what we would like to have vs what we have instead.