Wet deposition is a major removal process for many air pollutants including aerosols and other soluble species. Global climate change can significantly affect the precipitation amount and other characteristics which have important implications for the wet deposition process.

We examine the sensitivity of atmospheric aerosols to precipitation characteristics using GEOS-Chem. In addition, we analyze multiple meteorological datasets for the long-term changes in global precipitation patterns, including total precipitation amount, intensity and frequency. Finally, we evaluate the possible change of atmospheric lifetimes of aerosols due to the change of precipitation patterns in the past decades.

**Introduction**

**Data and method**

**Region definition**

**Model setup**

**Potential change of aerosols**

The potential change of atmospheric aerosol lifetime driven by the change of precipitation characteristics within 1981-2010 based on three meteorological datasets.

**Sensitivity of the lifetime to precipitation change**

With the contour plot, we are able to summary how the lifetime of black carbon changes with all three precipitation characteristics.

The comparison between star (original level) and cross reveals that even both the total amount and intensity increase, the lifetime of black carbon might still decrease.

**Conclusion**

Our preliminary results show that the atmospheric lifetimes of aerosols are more sensitive to precipitation frequency than precipitation intensity. It implies that the increase of total precipitation amount may not lead to more efficient wet scavenging of atmospheric aerosols.

Based on three meteorology datasets (NCEP, NCEP2, and MERRA) for the past decades, we find that precipitation intensity increases over most continental regions, but precipitation frequency significant decreases over some regions.

The changes of precipitation characteristics affect the wet deposition of aerosols, and further impact the total burden of aerosols and their atmospheric lifetimes. For some regions, these change in the past 30 years can go up to 30% or more.

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