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STATEMENT OF PURPOSE:

Improving parametrizations of clouds used in global climate models has been identified as a key to decreasing uncertainty in climate change predictions. Parametrizations of cloud composition in particular are key contributors to differences in equilibrium climate sensitivity studies. Improving parametrizations of cloud water phase requires 3D cloud data including amount and vertical distribution of liquid water and ice crystals in clouds. This data story provides multiple visualizations of this 3D cloud data and explores global trends in cloud amount and composition. Radiation data is also visualized in order to explain the importance of clouds on Earth's climate, including how composition and amount of cloud affect radiation to and from Earth. Finally, a parameterization is proposed that represents vertical cloud profiles using Gaussian curve-fits. This collapses 387 pieces of information into 18 parameters that allow for trends to be more readily seen as well as enabling stochastic and deterministic modeling.

DESCRIPTION OF DATA SETS:

The CERES-CALIPSO-CloudSat-MODIS (C3M) dataset used in this work was obtained from NASA Langley Research Center's Atmospheric Science Data Center. This dataset contains merged data from four sensors: CERES (Aqua FM3), a broadband radiometer; CALIOP, a lidar sensor; CPR, a radar sensor; and MODIS, a spectroradiometer. Each reading is collocated on a single CERES footprint that overlaps with the CALIPSO and CloudSat ground track. In this dataset, the imager radiances from MODIS are averaged over the entire CERES footprint for each reading. Additionally, the retrieved vertical cloud properties from CALIOP/CPR are averaged over the 20 km length of the CERES footprint. The CERES top-of-atmosphere radiative flux for each footprint is provided as well.