Topic: Analyzing the accuracy of satellite precipitation measurements with Rain Gauges across different geographic and topographic regions in US.

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Description:

The satellite precipitation estimation suffers from inconsistency of product accuracy in areas with different geographic, and topographic characteristics. This study aims to quantify the errors of satellite measurements with traditional precipitation measurement in regions with different geographic, and topographic characteristics. The quantification of errors is crucial for the further processing of analysis for recognizing the error pattern of satellite data with respect to geography, topography, and climatology.

The satellite measurements we access for this project is the international satellite mission: Global Precipitation Measurement (GPM) by NASA and Japanese Aerospace Exploration Agency (JAXA). The GPM dataset can be obtained from the FTP in NASA precipitation measurement missions website (https://pmm.nasa.gov/data-access/downloads/gpm). GPM rainfall raster is recorded as .HDF5 file in a 30 minutes time frame. The spatial resolution of GPM is 0.1 degree to 30 min. There are some ways to download GPM files from FTP. Either writing a python script with ftplib, or running our own batch file from Command Prompt could successfully download the files. The .HDF5 files can be read in Python.

Traditionally, precipitation is measured through rain gauges. In the United States, rainfall data is collected by National Oceanic and Atmospheric Administration's (NOAA's) and is available for download from the National Climate Data Center (NCDC). With cdo-api-py module, the precipitation datasets from NCDC can be downloaded automatically. The precipitation would be stored in dataframe directly.

We would extract the satellite measurements for different gauge locations across three different states in US, Indiana, Texas, California and quantify the errors. The states have been chosen in a manner to cover different geographic and topographic characteristics. The pattern of errors with respect to time would allow us to build regression coefficients for correcting satellite measurements to get predicted ground measurements.