README

Greenland Ice Sheet precipitation and surface temperature from CloudSat and ECMWF
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This dataset contains code, data, and instructions for recreating the figures and analysis in Thompson-Munson et al. (submitted), "An Observational Constraint for Future Greenland Rainfall in a Warmer Atmosphere".

Datasets

IMBIE Greenland drainage basins

- Download from http://imbie.org/imbie-2016/drainage-basins/ and click on “Rignot Greenland Drainage Basins”
- Associated publication: https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2012GL051634
- These data have been uploaded to the current repository and are available in the file, “`GRE_Basins_IMBIE2_v1.3`”

ERA-5 geopotential

- Download this form: https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels?tab=form
- Fill out the form with the following information:
    - Product type: Reanalysis
    - Variable: Geopotential
    - Year: pick one
    - Month: pick one
    - Day: pick one
    - Time: pick one
    - Geographical area:
        - North: 85
        - South: 58
        - West: -70
        - East: -10
    - Format: NetCDF (experimental)
- These data have been uploaded to the current repository and are available in the file,, “`ERA5_geopotential.nc`”

CloudSat 2B-GEOPROF

- Instructions for SFTP: https://www.cloudsat.cira.colostate.edu/order/sftp-access
- Product information: https://www.cloudsat.cira.colostate.edu/data-products/2b-geoprof
- These files are not included in the current repository given the large size

CloudSat ECMWF-AUX

- Instructions for SFTP: https://www.cloudsat.cira.colostate.edu/order/sftp-access
- Product information: https://www.cloudsat.cira.colostate.edu/data-products/ecmwf-aux
- These files are not included in the current repository given the large size

Code

1_convert-hdf-to-netcdf.ipynb
This script converts the downloaded CloudSat HDF files into NetCDFs and subsets for locations over the country of Greenland.

- Input:
  - `*.hdf` files (not in current repository)
- Output:
  - `*.nc` files (not in current repository)

2_export-data-as-csv.ipynb
This script converts reflectivity to precipitation, extracts surface temperature, and buffers out ground clutter. Data are subset for the Greenland Ice Sheet only and saved in .csv files.

- Input:
  - `*.nc` files (not in current repository)
  - `GRE_Basins_IMBIE2_v1.3.shp`
- Output:
  - `*.csv` files by year (not in current repository)

3_combine-files.ipynb
This script combines all .csv files into a single file. The output from this is the primary file used for creating the figures.

- Input:
  - `*.csv` files by year (not in current repository)
- Output:
  - `precip_profiles_all_years.csv`

4_export-metadata.ipynb
This script produces a .csv file with metadata, which is used to generate Figure S1.

- Input:
  - `*.nc` files (not in current repository)
  - `GRE_Basins_IMBIE2_v1.3.shp`
- Output:
  - `*.csv` metadata by year (not in current repository)
  - `dataset_description.csv`

plot_figures_1-4.ipynb
plot_figures_S1.ipynb
plot_figures_S2-S3.ipynb
These scripts use the output from the processing steps and produce the figures for the paper.

- Input:
  - `precip_profiles_all_years.csv`
  - `dataset_description.csv`
  - `ERA5_geopotential.nc`
- Output:
  - Figures 1-4, S1-S3