STREAM summary

The Space-Time Rainfall Error and Autocorrelation Model (STREAM) combines space-time correlation structures of satellite precipitation fields with a pixel scale precipitation error model to generate precipitation ensembles that can “bracket” the magnitude and replicate the correlation structure of ground reference (i.e. true) rainfall. STREAM was developed and evaluated for a study area in the central U.S. using the NASA satellite precipitation product, IMERG-Early, at an hourly 0.1º scale. For more information about STREAM methodology, see Hartke et al. (in review).

<insert Hartke et al. reference here>

Retrieving data for STREAM

[IMERG Early data downloaded from GESDISC](https://disc.gsfc.nasa.gov/datasets/GPM_3IMERGHHE_06/summary) – variable ‘precipitationCal’

[MERRA2 data downloaded from GESDISC](https://disc.gsfc.nasa.gov/datasets/M2T1NXSLV_5.12.4/summary?keywords=merra2) – variables ‘U850’ and ‘V850’ in m/s

Required python packages for STREAM

Required packages: pysteps, netCDF4, tqdm

Installing pysteps python library

* + For anaconda users: <https://anaconda.org/conda-forge/pysteps>
  + Otherwise: <https://pysteps.readthedocs.io/en/v1.0.0/user_guide/install_pysteps.html>

Input parameters and filenames for STREAM

nEns – number of ensemble members to generate

dt – date to begin STREAM simulation at

ts – timesteps to run STREAM simulation for

wd – directory containing input data for STREAM

obsInFname – name of netcdf file containing satellite precipitation data

windInFname – name of netcdf file containing wind speed data in u- and v- directions

paramsInFname – name of netcdf file containing CSGD error model parameters

noiseOutFname – name of netcdf file to save noise ensemble to

precipOutFname – name of netcdf file to save STREAM precipitation ensemble to

Running STREAM

Fill in all parameters and filenames in the Input Parameters Section of STREAM\_main.py

Run STREAM\_main.py

Formatting input data for STREAM

obsInFname should be a netcdf file with variable ‘prcp’ with dimensions (time,y,x)

windInFname should be a netcdf file with variables ‘uWind’ and ‘vWind’ with dimensions (time,y,x) at the same resolution as obsInFname

paramsInFname should be a netcdf file with dimensions (y,x) at the same resolution as obsInFname and variables 'clim1','clim2','clim3', 'par1','par2','par3','par4','par5'

Training CSGD error model for STREAM

Use functions in CSGD\_utilities.py to train CSGD error model.

An example training script is provided in CSGD\_trainErrorModel.py.

For more details on the pixel-scale CSGD error model, see:

Wright, D. B., Kirschbaum, D. B., & Yatheendradas, S. (2017). Satellite Precipitation Characterization, Error Modeling, and Error Correction Using Censored Shifted Gamma Distributions. Journal of Hydrometeorology, 18(10), 2801–2815. https://doi.org/10.1175/JHM-D-17-0060.1