This package includes the dataset in *Nie and Fan (2019)*, which applied the Quasi-geostrophic omega (QGω) analyses to study the summer extreme precipitation in East China and the southeastern United States. The date is open for research use. Please cite:

Nie, J. and B. Fan, 2019: Roles of dynamic forcings and diabatic heating in summer extreme precipitation in East China and the southeastern United States, Journal of Climate, in press.

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**Folder 1: PrimData**

The “PrimData” folder contains primary data about 39 summer extreme rainfall events in East China and Southeast US, separately.

* 1. Main data

PrimECN/SUS\_year.mat includes main primary data prepared for QG diagnostics. The resolution of time is 6 hours, and the day of max precipitation corresponds to time = [62:65].

Name of variables / Meaning:

Geopot / geopotential (not geopotential height!!!)

Q / Absolute humidity

Sigma / Averaged dry static stability for each level

UGeostr / Zonal geostrophic wind

VGeostr / Meridional geostrophic wind

W / Vertical velocity

Tcwv / Precipitable water

Temp / temperature

Vort / Absolute vorticity

F0 / Coriolis parameter for this region

* 1. Precipitation

Summer\_precip\_events.mat includes the horizontal distribution of precipitation from the day before events to the day after events. The unit is m/12hr. The coordinates for x and y are identical to HorCN/US.mat at “HoriData” folder. I can tell you the region around East China (85<lon<145 && 10<lat<55) corresponds to (122:207,51:114); while the region around Southeast US (240<lon<300 && 10<lat<55) corresponds to (343:427,51:114).

Name of variables / Meaning:

MprecipCbf / Precipitation at day -1 for extreme rainfall events at East China

MprecipC / Precipitation at day 0 for extreme rainfall events at East China

MprecipCaf / Precipitation at day 1 for extreme rainfall events at East China

MprecipUbf / Precipitation at day -1 for extreme rainfall events at Southeast US

MprecipU / Precipitation at day 0 for extreme rainfall events at Southeast US

MprecipUaf / Precipitation at day 1 for extreme rainfall events at Southeast US

1.3 Extreme precipitation events

EventsChina/US.mat includes some basic information about the events we selected.

Name of variables / Meaning:

Date / Date of summer max precipitation for each year from 1979 to 2017

Length / Beginning and ending of 25 days around the event

List / Number of day relative June 1st for each “date”

Size / Precipitation amount (unit in m/12hr)

**Folder 2: DiagData**

The “DiagData” folder contains diagnostic data about these events.

2.1 Result of QG inversion

Diag\_ECN/SUS\_year/avg.mat contains the result of QG inversion (mainly about vertical winds).

Name of variables / Meaning:

P: Pressure coordinates

Levs / Levels in p where we performed the calculation

QgOmega / Pressure velocity averaged at the day when events happened

Those 4 dimensions refer to lon, lat, level, and type, separately.

Type 1: W\_vorticity

Type 2: W\_temperature

Type 3: W\_heating

Type 4: W\_total minus w\_vorticity minus w\_temperature

Type 5: W\_total

Omega / Horizontally averaged pressure velocity

Vertical\_v / Horizontally averaged vertical velocity

Vertical\_q / Horizontally averaged absolute humidity

Vertical\_s / Horizontally averaged dry static stability

2.2 Precipitation

PrecipXCN/US.mat contains the amount of rainfall (unit in mm/day) diagnosed from pressure velocity in qgw\_summer\_X\_Y.mat. The day of max precipitation corresponds to time = [62:65].

Name of variables / Meaning:

Precip / Total precipitation

PrecipD / Precipitation from adiabatic forings

PrecipQ / Precipitation from adiabatic heatings

**Usage Example:**

In the folder "matlab", Eg1.m is a script for average-state-analysis, using data from previous folders.

If you are interested one or two specific events (like the event for ECN & SUS in 2015), you should modify the file path by replacing line 21 and line 127 in Eg.m with

load('M:\DiagData\DiagECN\_2015.mat');

load('M:\DiagData\DiagSUS\_2015.mat');