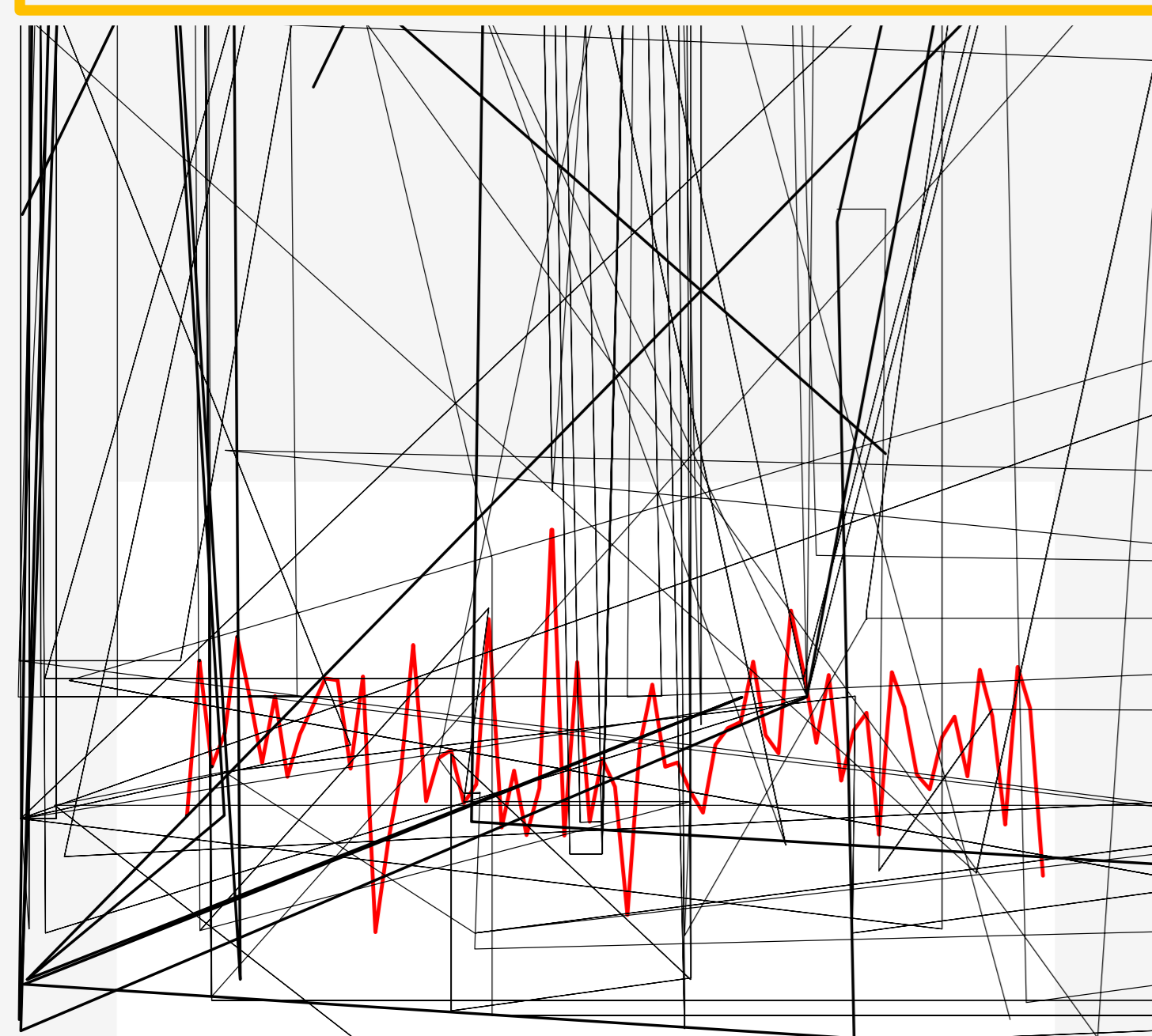


# Southeast China extreme drought event in August 2019: Context of coupling of mid-latitude and tropical systems

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## 1. Introduction



**Fig 1.** (a) Station precipitation anomalies in August 2019; (b) GPCP; (c) Normalized time series of area-averaged precipitation anomalies over the SEC in August.

From late summer to mid-autumn in 2019, Southeast China (SEC) suffered an extreme drought, which devastated more than 3.3 million hectares of crops and caused serious economic losses;

Previous studies highlighted the role of super positive IOD and El Niño Modoki from the August-October-averaged perspective, as well as the Madden-Julian oscillation;

This study aimed to investigate the synergistic influences of the mid- to high-latitude and tropical atmospheric circulation anomalies and analyze the role of the Tibetan Plateau (TP) on the SEC extreme drought in August 2019.

## 2. Datasets, methods, and models

### ➤ Datasets:

**GPCP V2.3** (2.5° × 2.5°) and **839 China stations** (interpolated to a 0.5° × 0.5°; 1951–2019) precipitation; **ERSST V5 SST** (2° × 2°); **ERA-Interim** atmospheric circulation variables (0.75° × 0.75°); 1979–2019

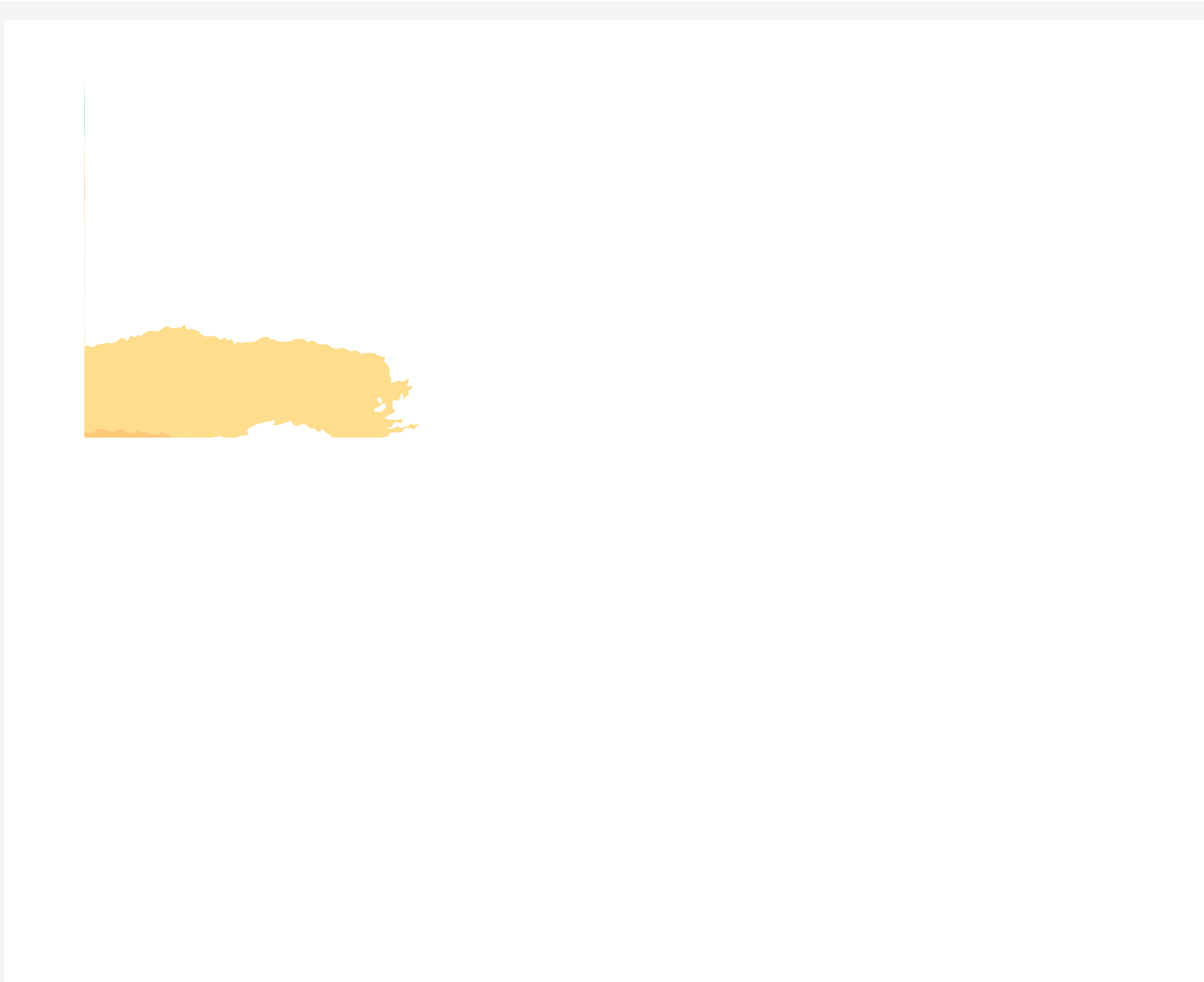
### ➤ Methods:

A horizontal wave activity flux diagnosis; Multivariate empirical orthogonal function; Regression; Correlation; Partial correlation; A two-tailed *t*-test

### ➤ Models:

Hybrid Single-Particle Lagrangian Integrated Trajectory (**HYSPLIT**) 5.0 model; A linear baroclinic model (**LBM**); The version 2 of the finite-volume atmospheric model of LASG, IAP, CAS (**CAS FGOALS-f2**)

## 3. Drought atmospheric circulation and transport of water vapor



**Fig 3.** (a) Climatological number of particles weighted by specific humidity arriving at the SEC for backward 10 d in August; (b) Anomalies of number of particles in August 2019; (c) Pressure of particles in August 2019; (d) 1000–300-hPa column-integrated water vapor flux anomalies and their divergence in August 2019.



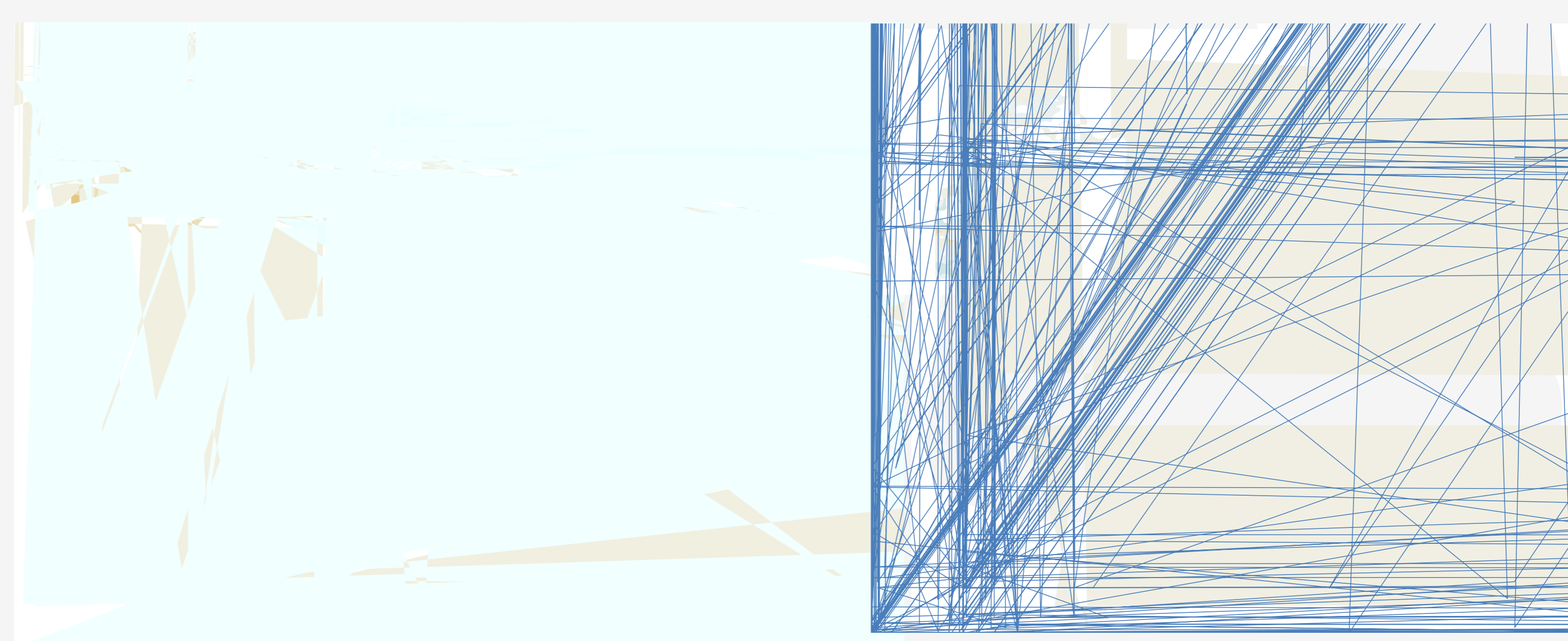
### ➤ Tropical SSTAs

**Fig.4** (a) SSTA and 10 m wind anomalies in August 2019; (b) Time series of IOD and El Niño Modoki index in 2019; (c) Meridional-vertical circulation anomalies averaged between 85°–110°E; (d) for 110°–135°E.

### ➤ Mid-latitude dynamics

**Fig.5** (a) Location of heating source in the LBM; (b) Response of 200-hPa stream function and wind in LBM; (c) 200-hPa geopotential height and wave activity flux anomalies in August 2019; (d) Regression pattern against the North Atlantic tripole SSTA index in August.

## 5. Relationship between the tropical convection and SEC drought



## 6. Summary and discussion

