Fine-scale Characteristics of Summer Precipitation over Cang Mountain

Mengke Zhang, Jian Li and Nina Li

Chinese Academy of Meteorological Sciences, Beijing, China

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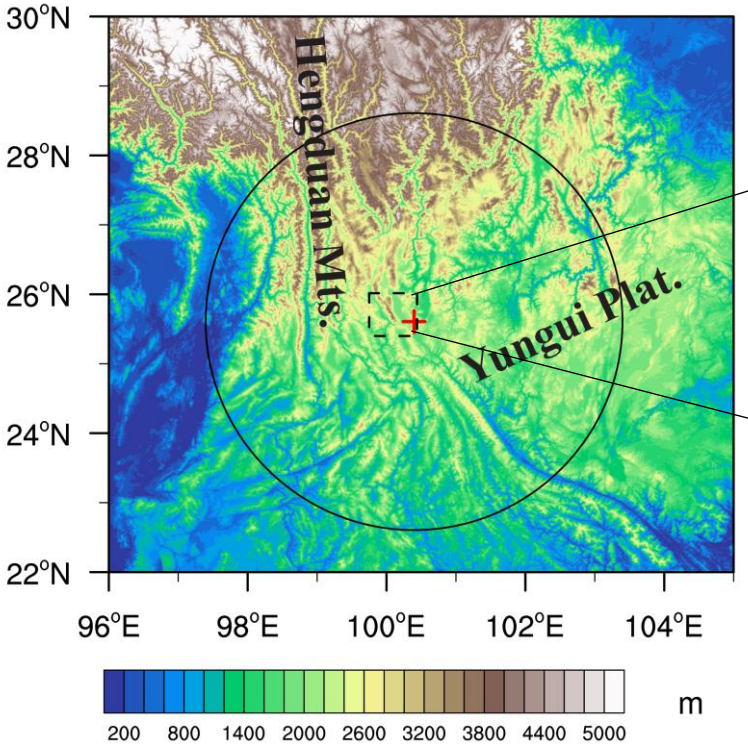
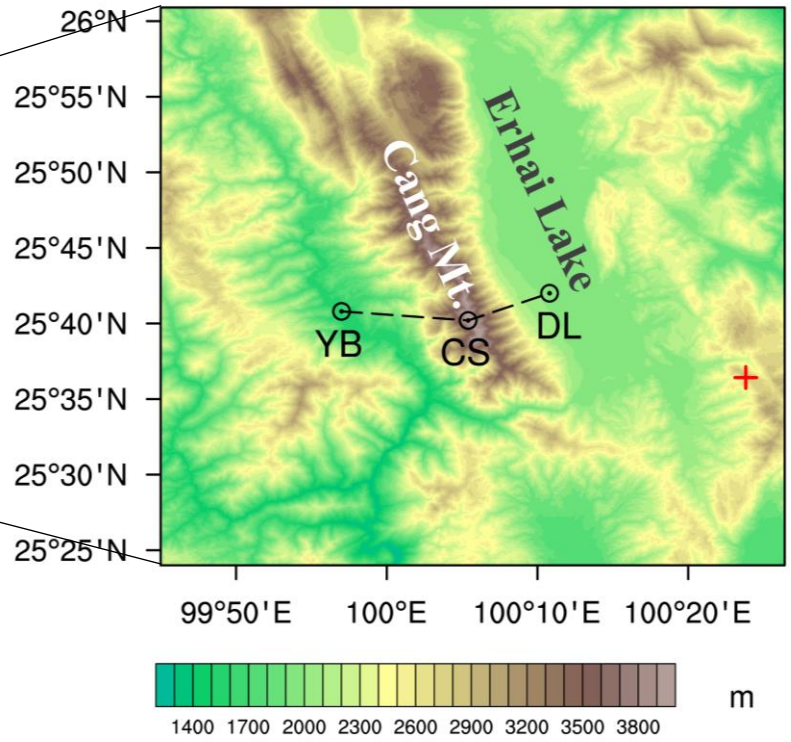
Motivation

- Frequent occurrence of mountain disasters
- to study and understand the fine-scale rainfall features over mountains

■ Southwest China: typical complex terrain area



■ Cang Mountain: typical small-scale mountain



- Large-scale topography with a succession of small-scale mountains oriented quasi-north-south
- Complex local circulation
- Small-scale mountain observation network

Data & Objective

- Time period : JJA 2013-2017

- Rain gauge data

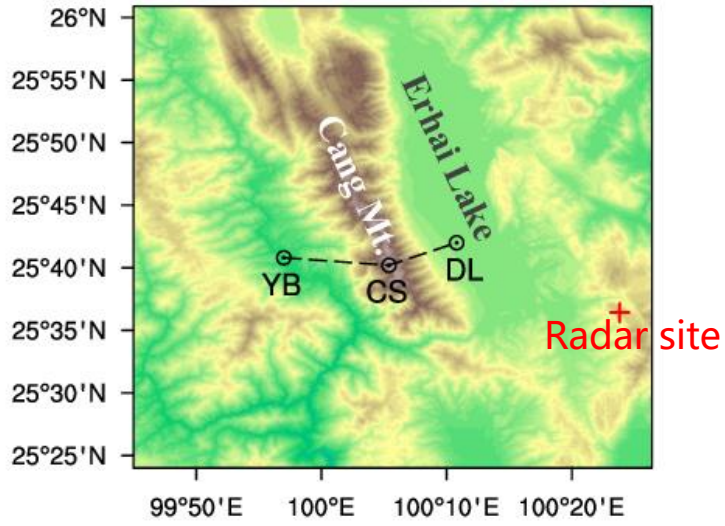
Station name	Longitude	Latitude	Altitude	Time resolution
Yangbi station	99.95°E	25.68°N	1626.1 m	
Cang mountain station	100.09°E	25.67°N	4092.0 m	Hourly，6-minute
Dali station	100.18°E	25.70°N	1990.5 m	

- Radar data

Site	Scanning radius	Spatial resolution	Time resolution
100.397°E 25.607°N	300km	0.01°× 0.01°	6-minute

- ERA5 data

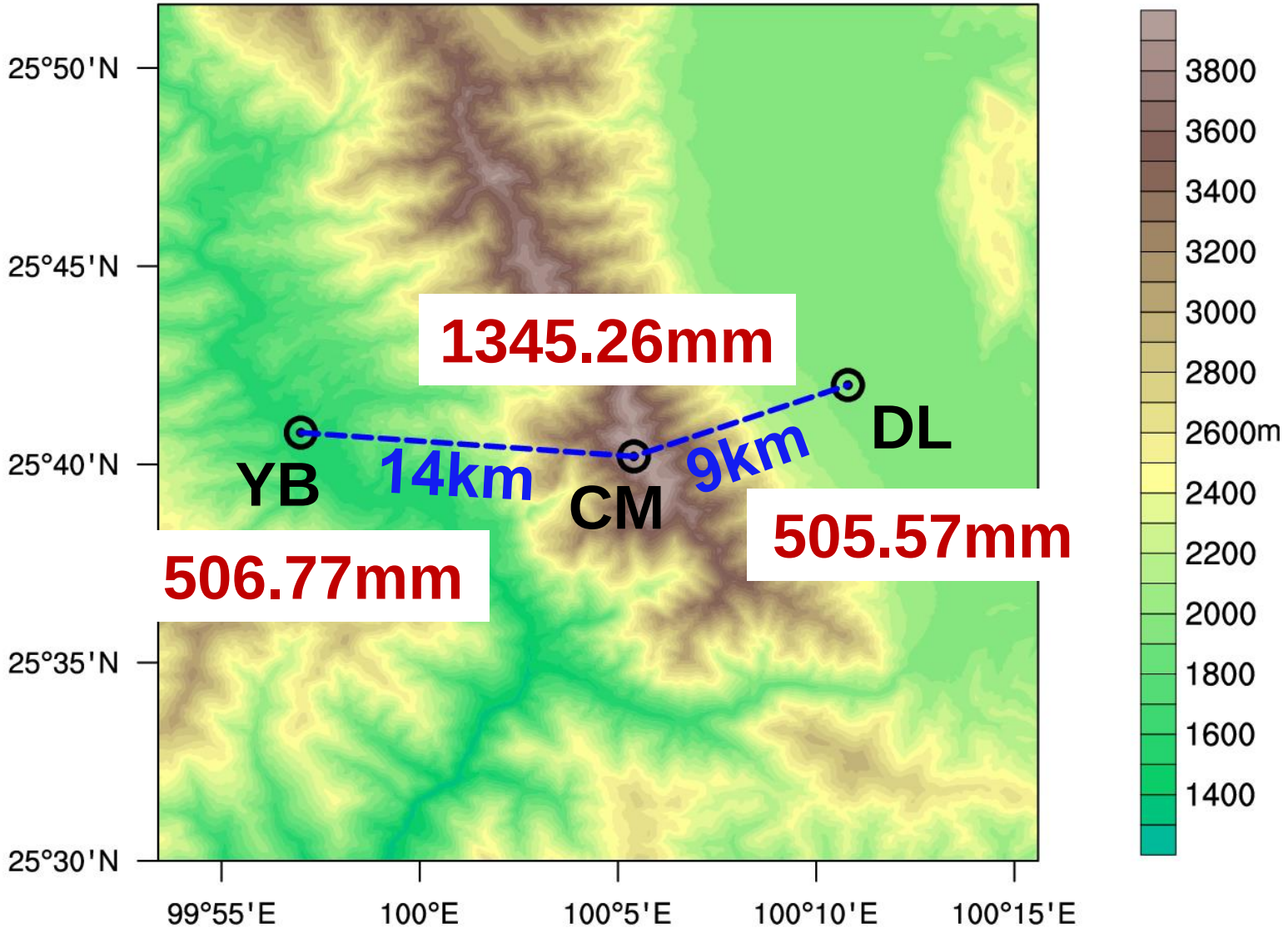
Spatial resolution	Time resolution
0.25°× 0.25°	Hourly



- **Objective:** the regional difference of precipitation over the Cang Mountain

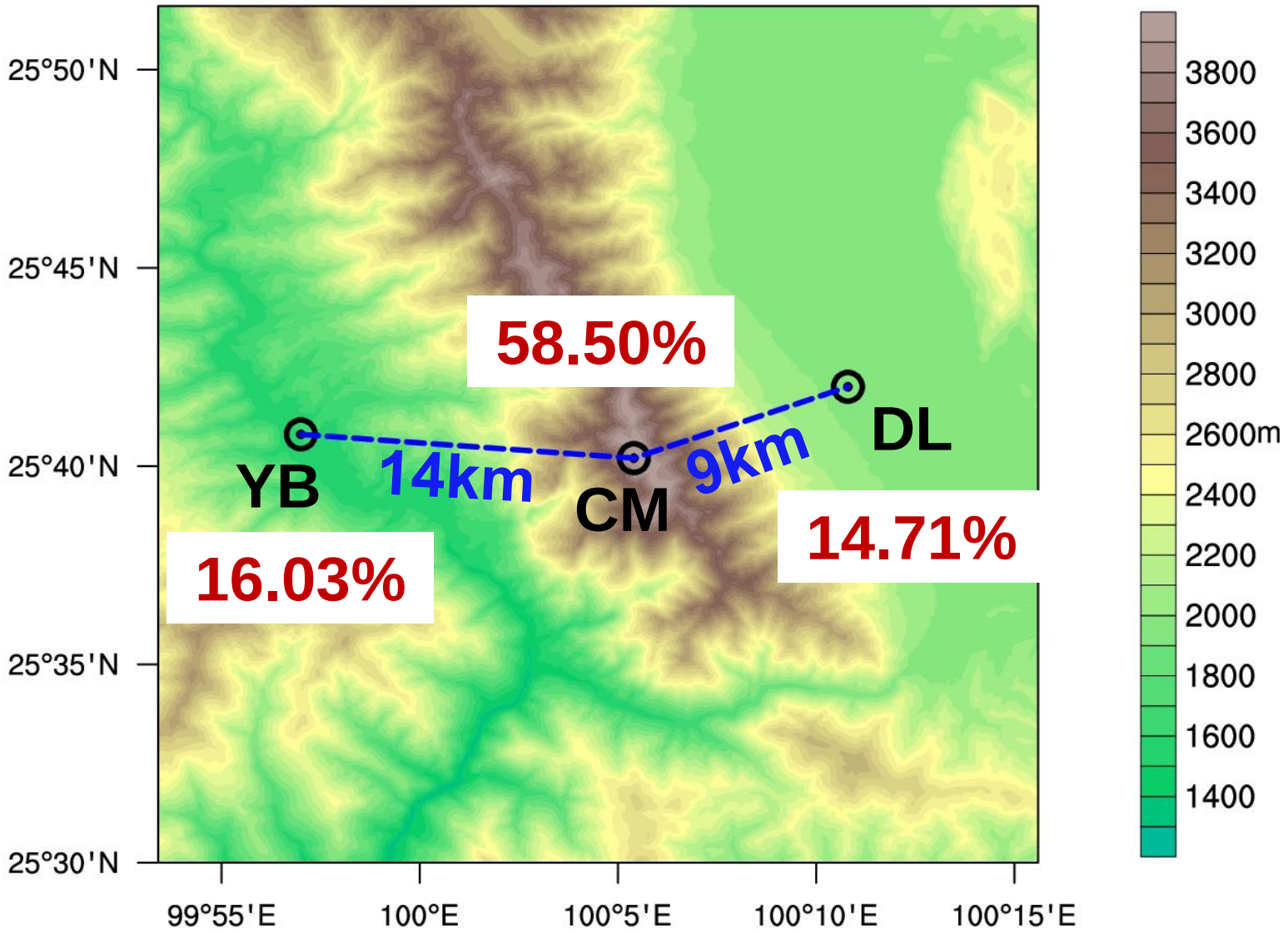
  ridge V.S. valley / the west side of Cang Mt. V.S. the east side of Cang Mt.

Distinct regional difference of rainfall amount



- The rainfall amount on the mountaintop is **2.7 times** that of the valleys

Distinct regional difference of rainfall frequency



- The rainfall frequency on the mountaintop is **3.8 times** that of the valleys

Classification of events with different initial stations

Classification of events with different initial stations on a 6-min time scale

Types	Initial stations	Percentage of events
The **west side** of Cang Mountain	YB-originated events	22.6%（78/346）
The **crest** of Cang Mountain	CM-originated events	62.1%（215/346）
The **east side** of Cang Mountain	DL-originated events	15.3%（53/346）

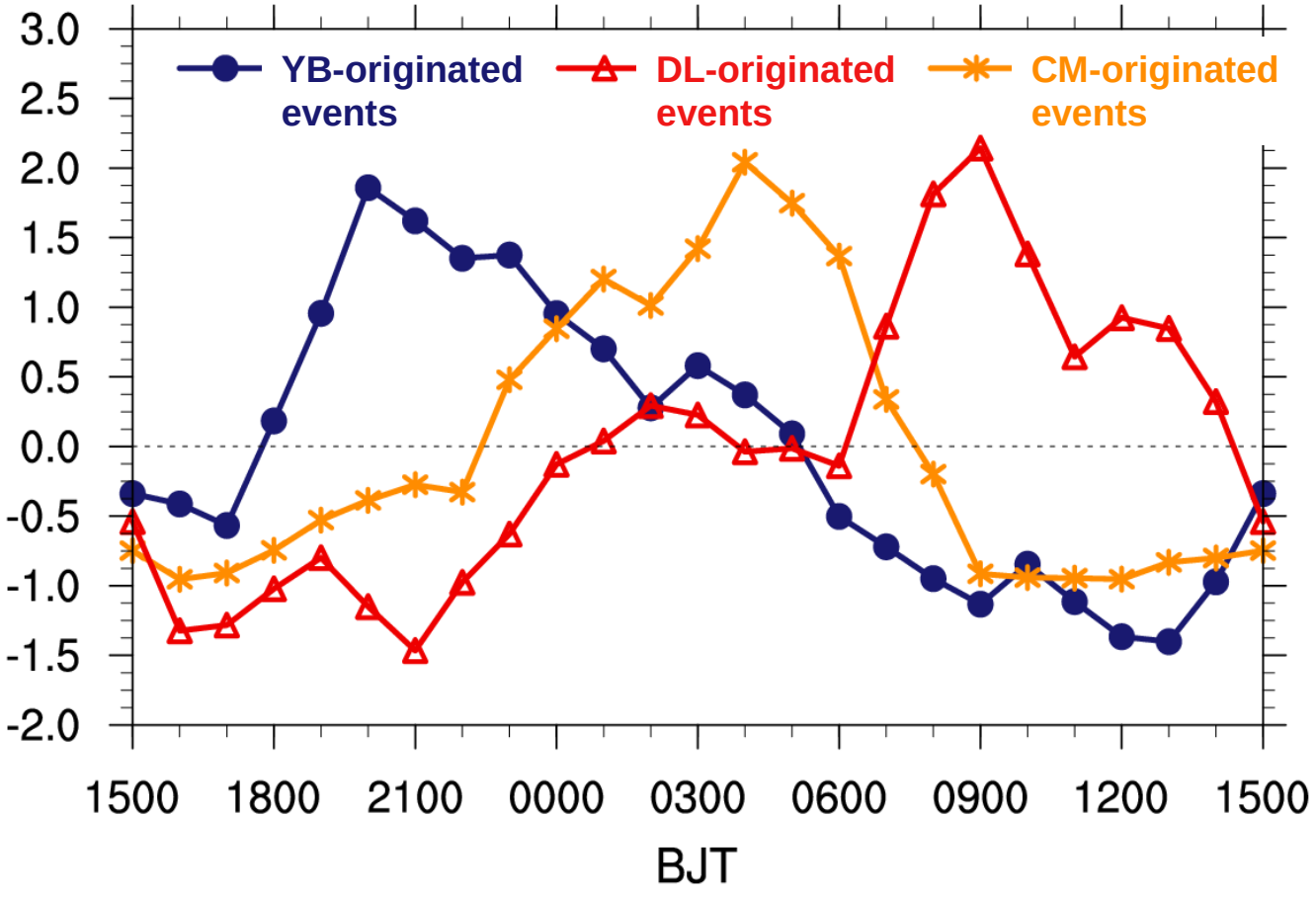
Diurnal peak time:

YB-originated events: Late afternoon

CM-originated events: Night

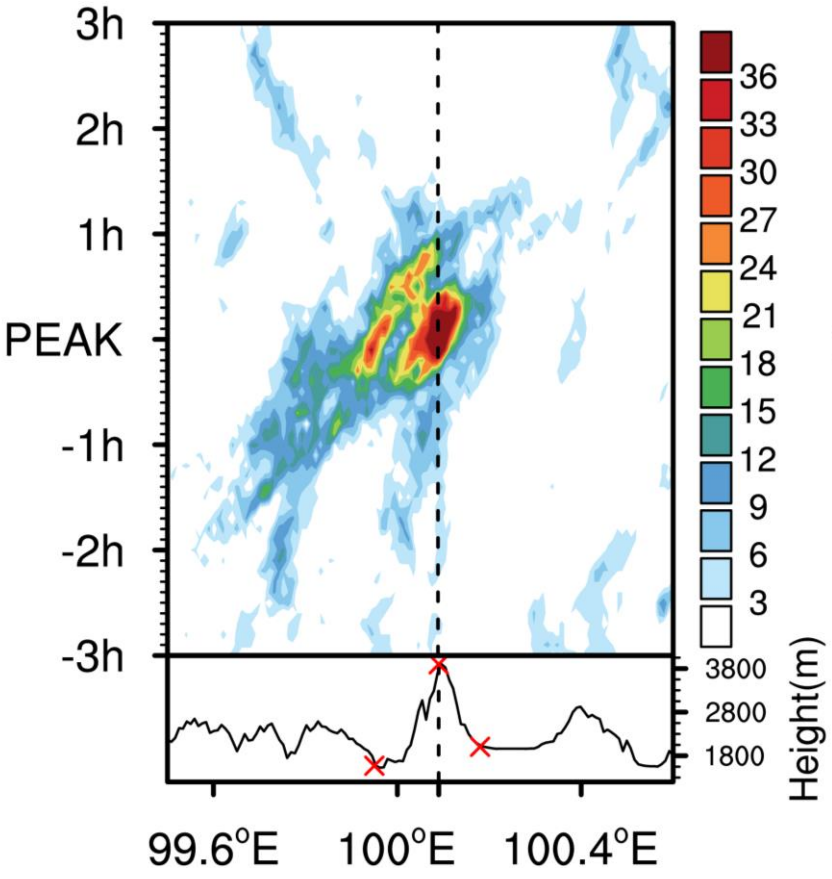
DL-originated events: Morning

Diurnal variations of the normalized rainfall accumulation



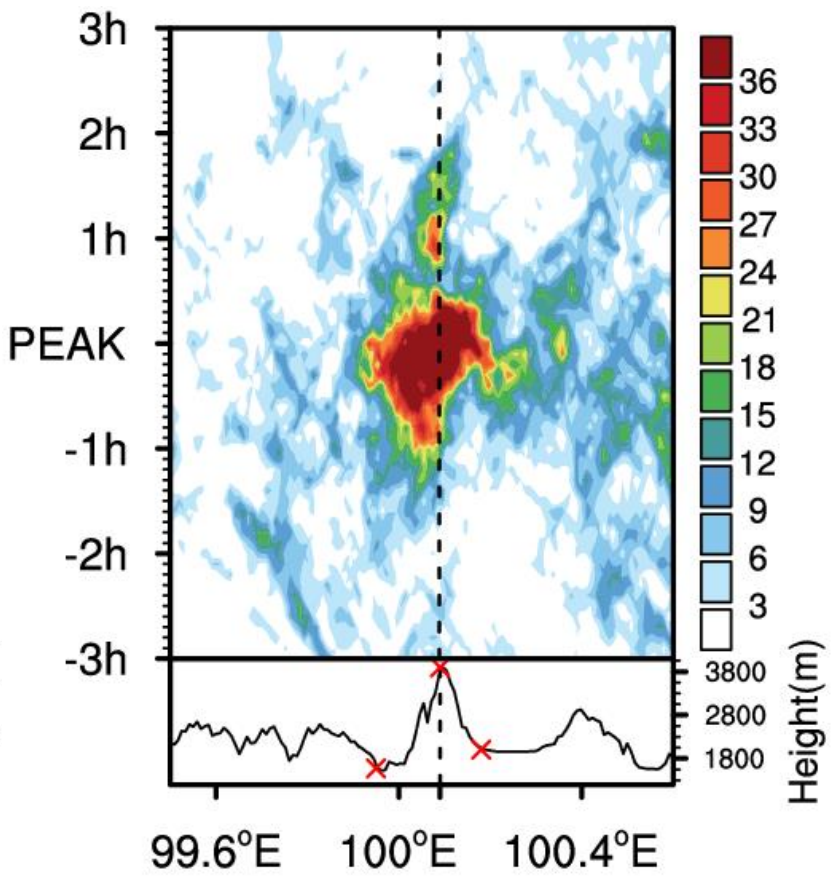
Evolution Features

Eastward propagation



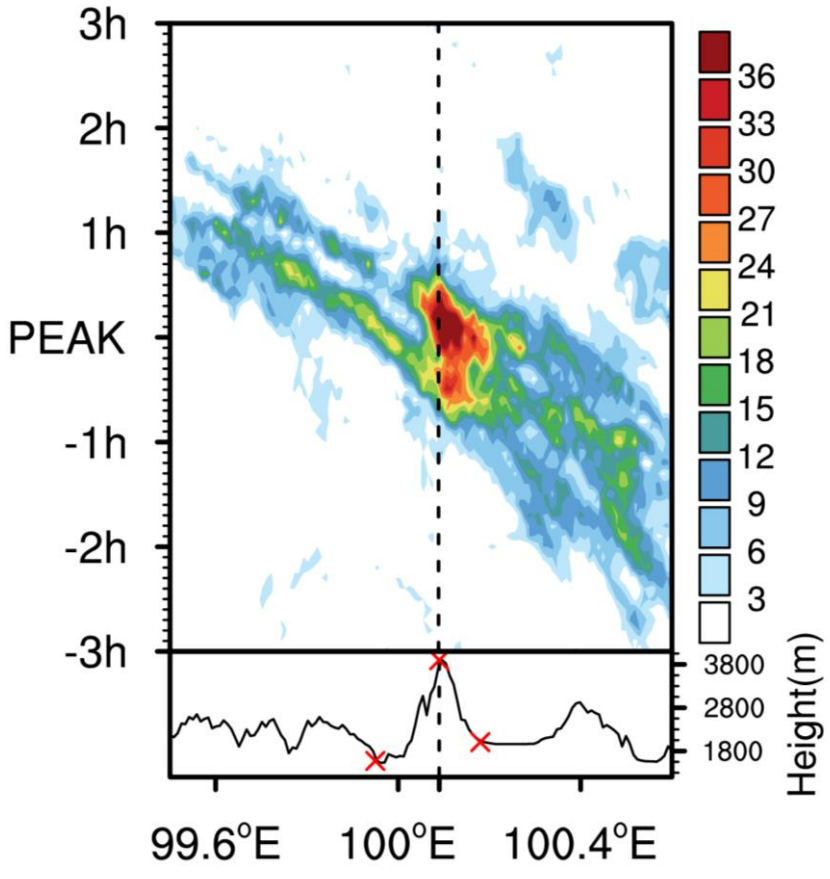
YB-originated events

High-altitude area



CM-originated events

Westward propagation



DL-originated events

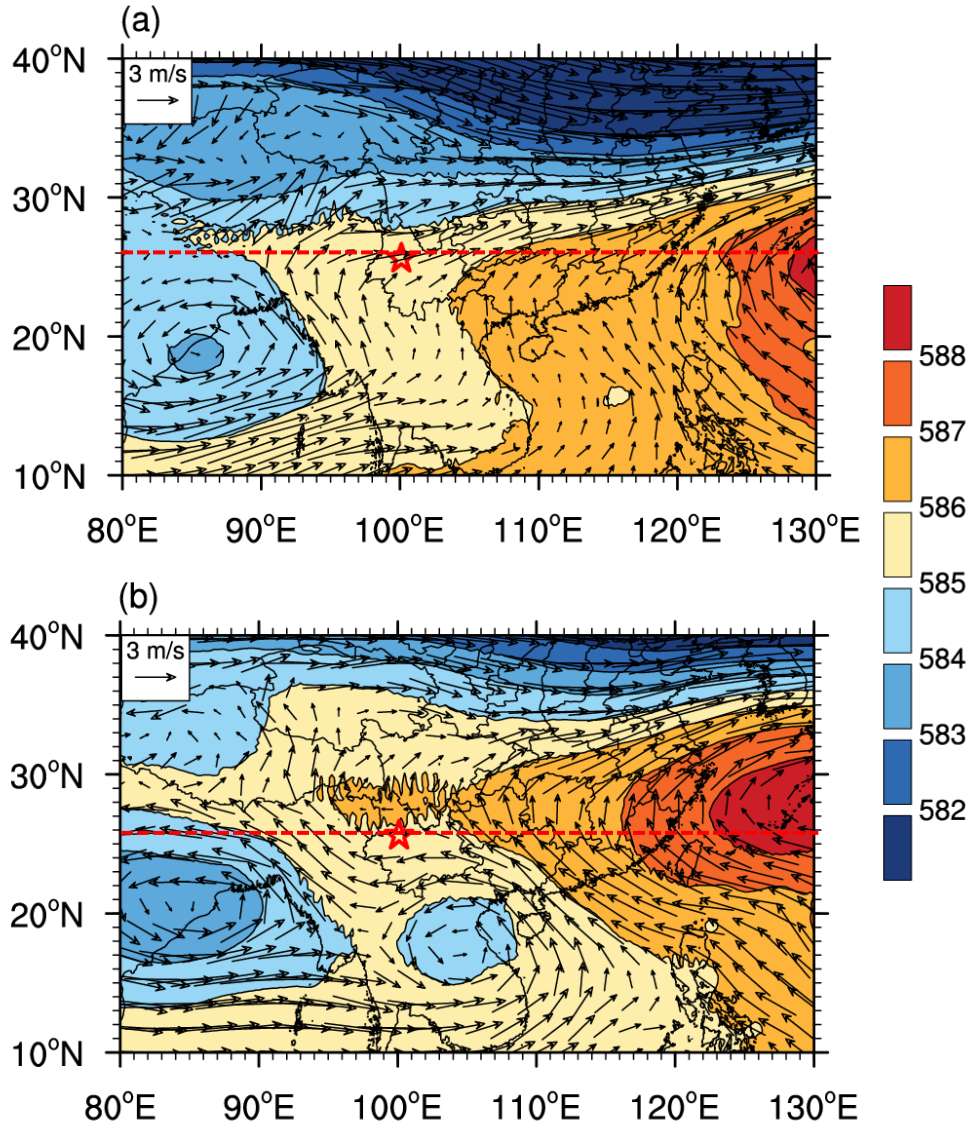
Time-zonal section of the cumulative frequency of radar reflectivity ≥30 dBZ

Composite circulation

The events originating from the **west side** of Cang Mountain

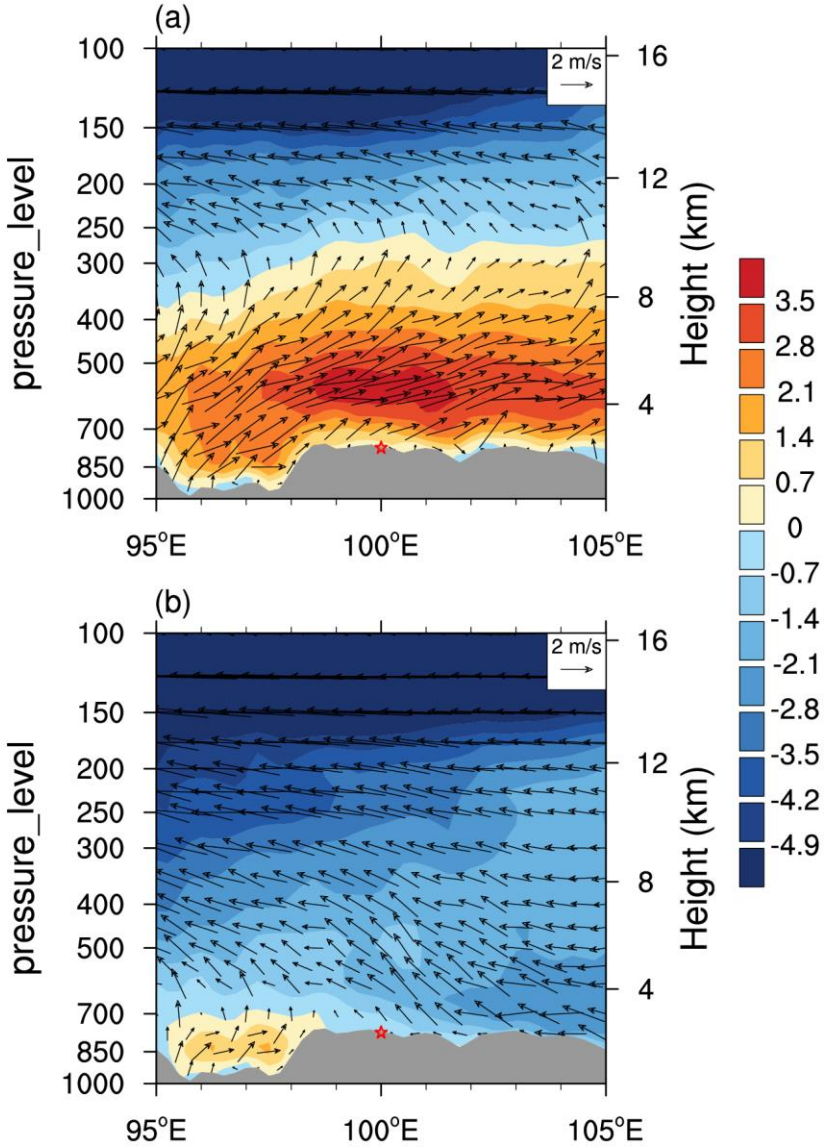
The events originating from the **east side** of Cang Mountain

500hPa



geopotential height (shaded, dagpm) winds (vectors, m/s)

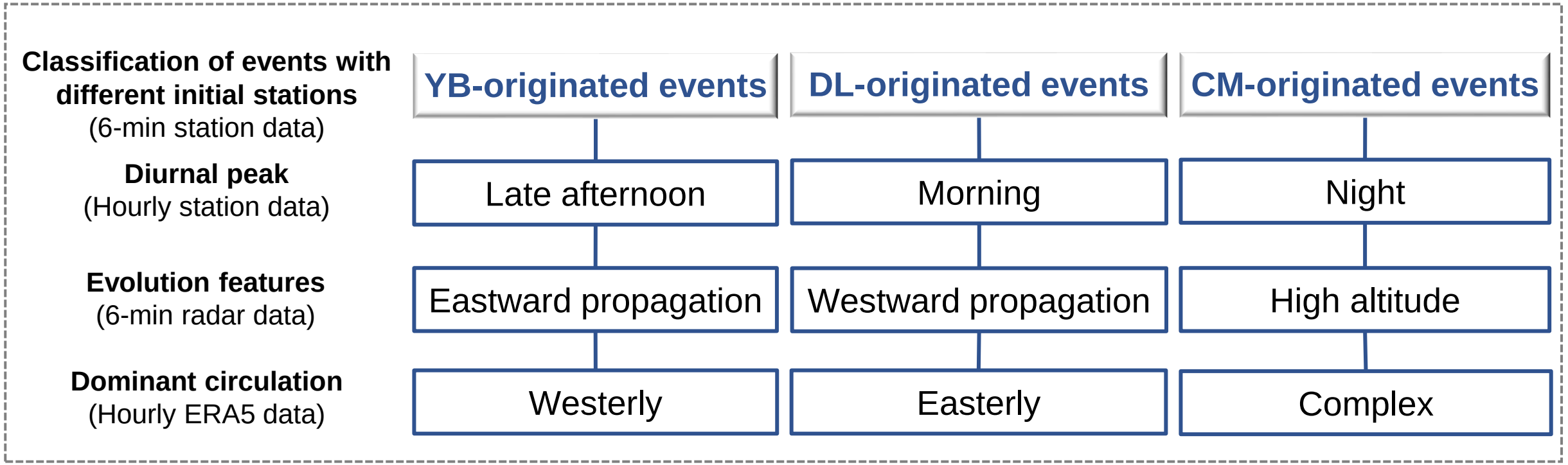
Vertical-zonal section



u (shaded, m/s) u+ω*100 (vectors, m/s)

Conclusion & Outlook

- Summer rainfall features on the mountaintop: heavy amount, high frequency
- Fine-scale features of the three rainfall processes with different initial stations



- What next?

  For the CM-originated events, initiation mechanisms of precipitation at night over the mountain

Thank you for your attention!

- Zhang, M.K., Li, J., and Li, N.N. (2021). Fine-Scale Characteristics of Summer Precipitation over Cang Mountain. Journal of Applied Meteorology and Climatology, 60(9), 1285–1300, https://doi.org/10.1175/JAMC-D-20-0220.1.