**Introduction**

Diurnal cycle of precipitation is an important aspect of regional climate. The regular occurrence of precipitation at a particular time of the day is connected with both regional and large-scale dynamical and thermal conditions.

- Summer rainfall over China has pronounced diurnal variation with considerable regional features. However, there are no uniform diurnal peaks of the summer rainfall among different stations in central eastern China.
- Regional averaged results show two comparable peaks.
- The rainfall of East Asian summer monsoon exhibits pronounced subseasonal transitions.

**Linkage of long-duration rainfall and early morning rainfall with monsoon rain belt**

1. Is there any differences in the contributions of the long- and short-duration rainfall to the monsoon rain belt?
2. Does the rainfall in the monsoon rain belt present any unique diurnal feature?
3. Is there any linkages between the diurnal features of rainfall and large-scale circulation?

**Diurnal features in the active and break monsoon period**

**Active monsoon period:** the time period when the summer monsoon rainfall belt locates in the target region.

**Break monsoon period:** the time period when the monsoon rainfall belt moves out of the target region.

**1. Is there any differences in the contributions of the long- and short-duration rainfall to the monsoon rain belt?**

- During the active period, monsoon rainfall is dominated by the long-duration events with early-morning diurnal peak.
- During the break period, monsoon rainfall is dominated by shorter duration events with late-afternoon diurnal peak.
- The different diurnal variation of monsoon rainfall between the active and break monsoon periods can explain the two comparable diurnal peaks averaged in summer central eastern China.

**2. Does the rainfall in the monsoon rain belt present any unique diurnal feature?**

- The long-duration rainfall event usually has the hourly maximum around early morning and short-duration event gets the maximum around late afternoon in this area.
- The late-afternoon peak of short-duration rainfall events may be explained by the diurnal variation of low-level atmospheric stability caused by solar heating, but the physical mechanisms of the prevailing early morning long-duration rainfall events have not been clearly understood up to date.
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**3. Is there any linkages between the diurnal features of rainfall and large-scale circulation?**

- The combination of the cyclonic vorticity and enhanced moisture transported by the southwesterly provides a favorable environment for the nocturnal rainfall systems to develop and maximize in the early morning.

**Active period at 08 BJT:**

- Southwesterly anomalies over southern China and northeasterly ones over the north of Yangtze River Valley
- The different diurnal variation of monsoon rainfall between the active and break monsoon periods can explain the two comparable diurnal peaks averaged in summer central eastern China.

**Break period at 08 BJT:**

- The convergence locate at the south to the monsoon rain belt.

**Summary**

1. The long-duration rainfall experiences similar subseasonal movement to that of monsoon monsoon rainfall belt. The short-duration events mainly occur in July and August over most of central eastern China.
2. The early-morning rainfall shows subseasonal movement coinciding with that of monsoon rain belt. The late-afternoon rainfall peaks generally locate to the south and north of the rain belt.
3. Rainfall at different latitudes of central eastern China exhibits similar diurnal features when partitioned into active and break periods. During the active period, monsoon rainfall is dominated by the long-duration events with early-morning diurnal peak. During the break period, monsoon rainfall is dominated by shorter duration events with late-afternoon diurnal peak.
4. The different diurnal variation of monsoon rainfall between the active and break monsoon periods can explain the two comparable diurnal peaks averaged in summer central eastern China.