

Diurnal cycle of Southern China Monsoon: characteristics and preliminary simulation

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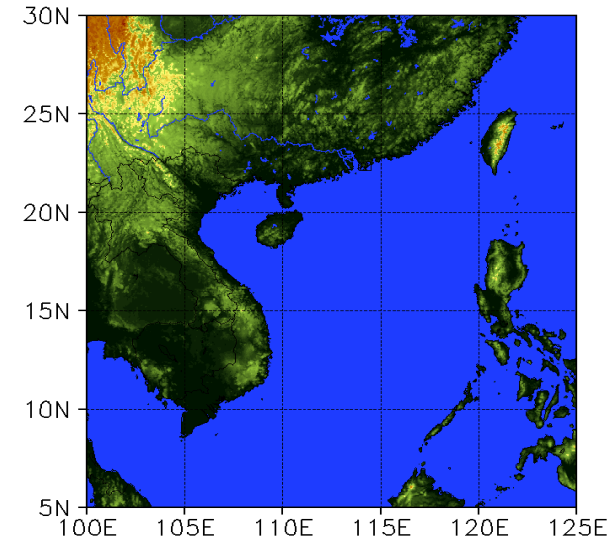
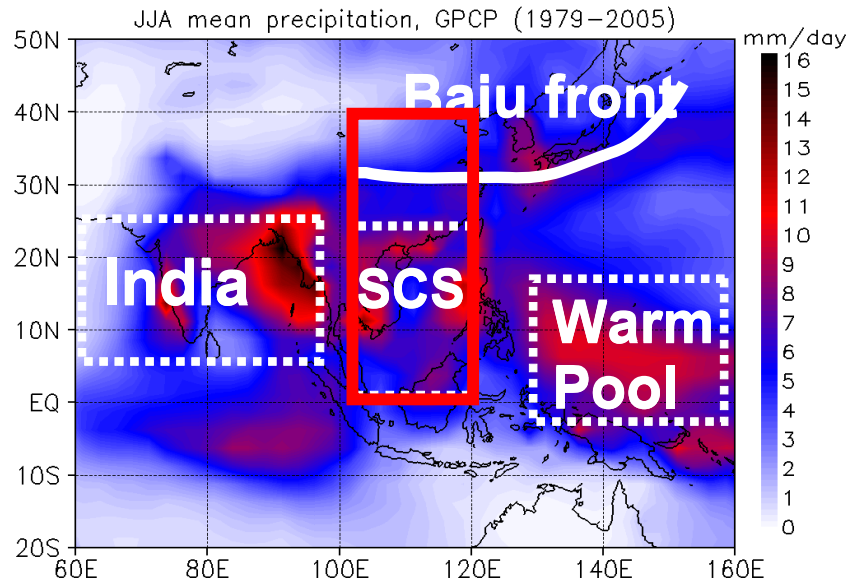
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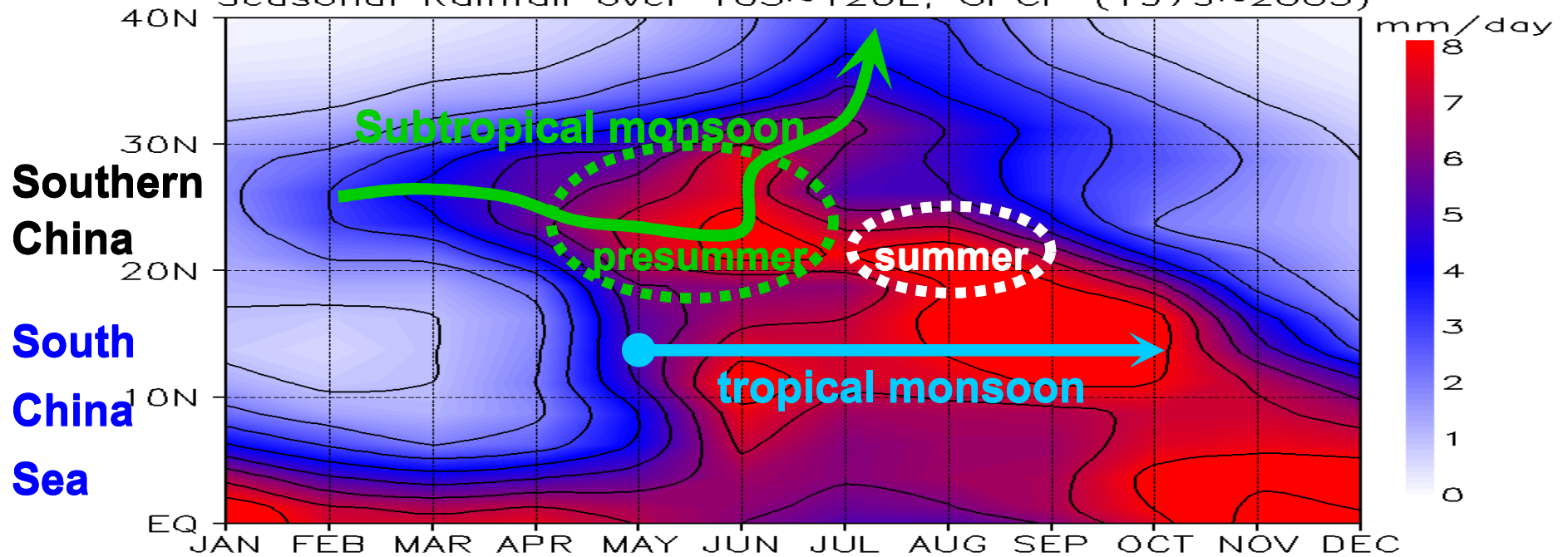
Outline

- 1. Briefly on Southern China Monsoon.**
- 2. Diurnal variations revealed by TRMM (1998~2006).**
- 3. Some results by the trial experiments.**
- 4. Summary and potential works.**

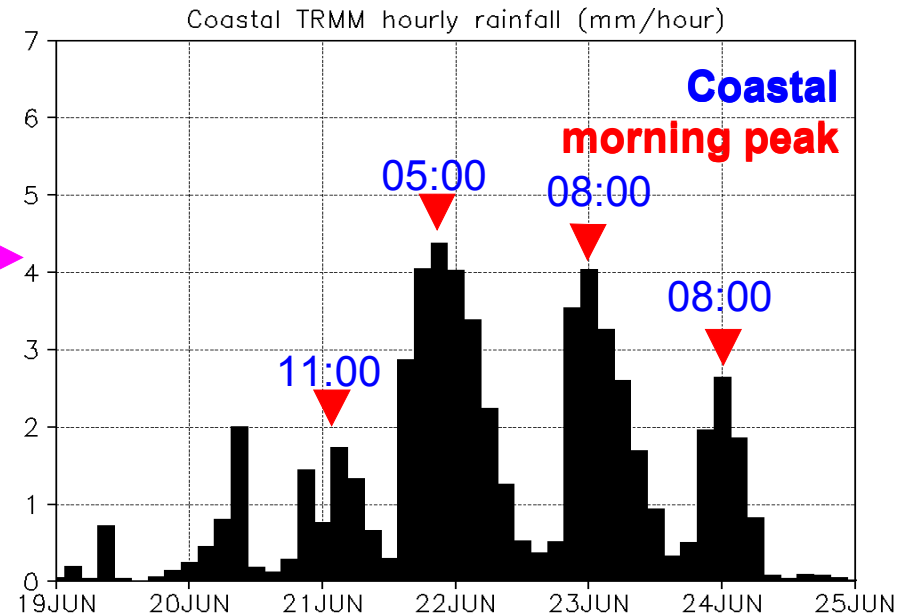
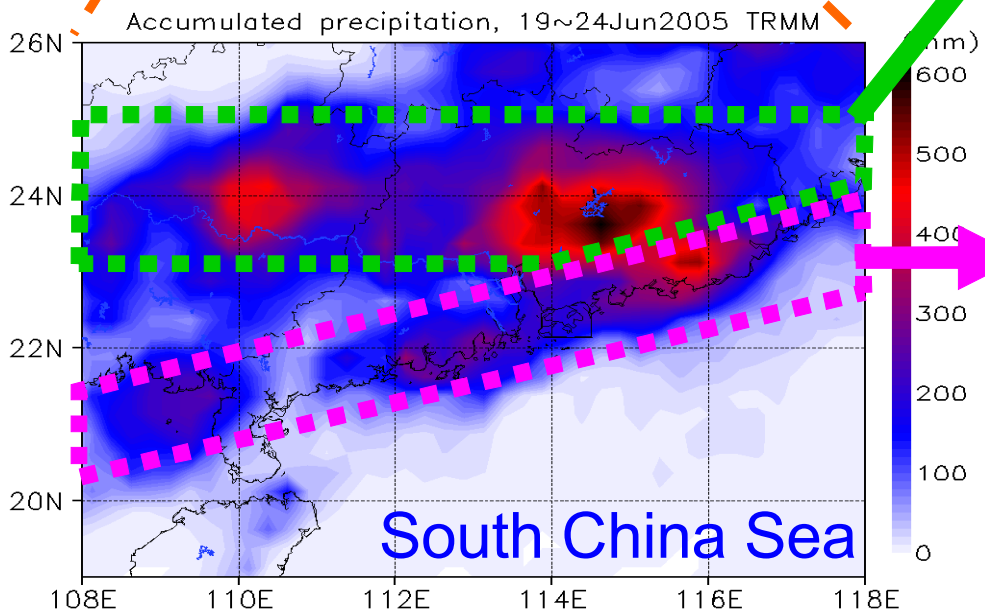
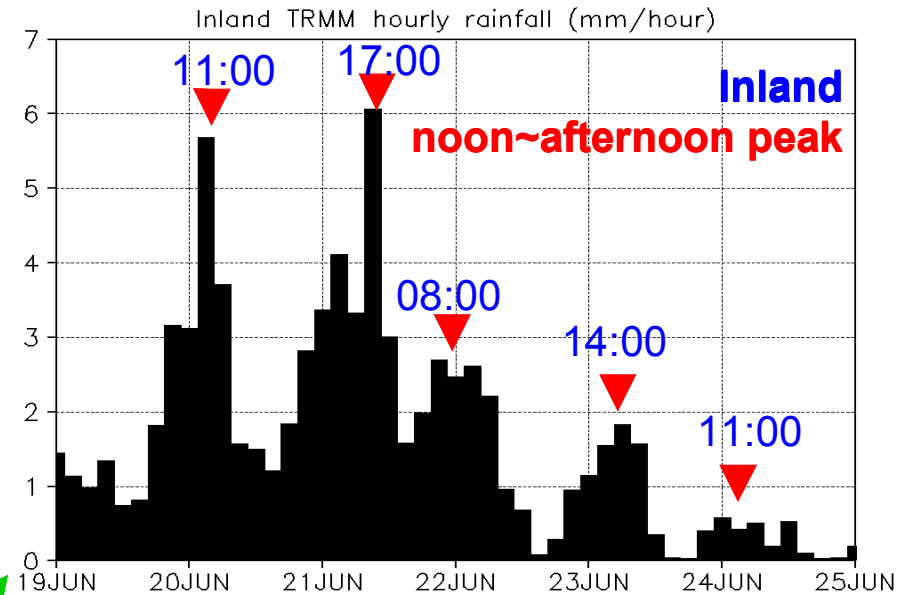
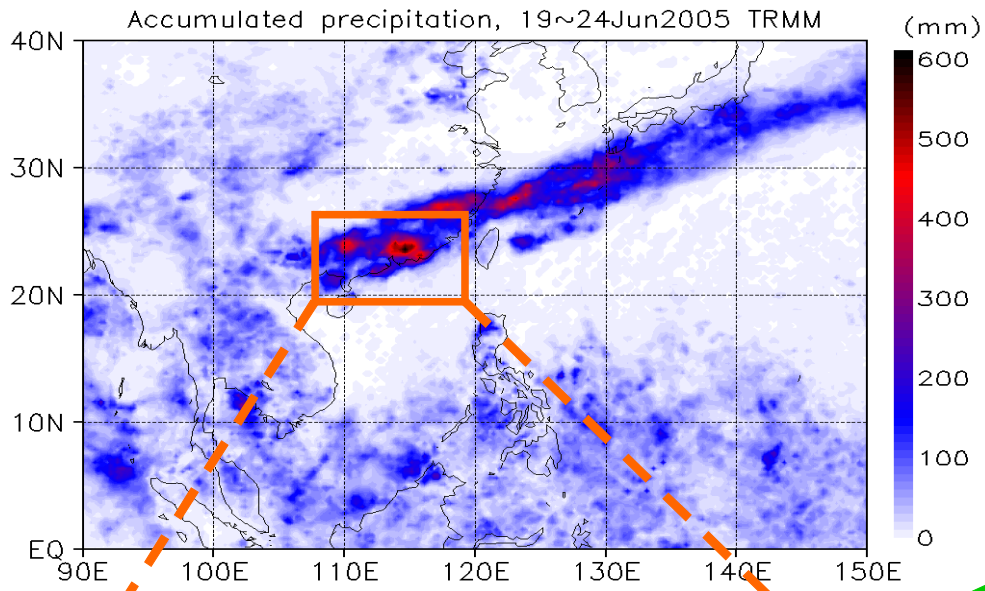
Seasonal rainfall and topography around southern China



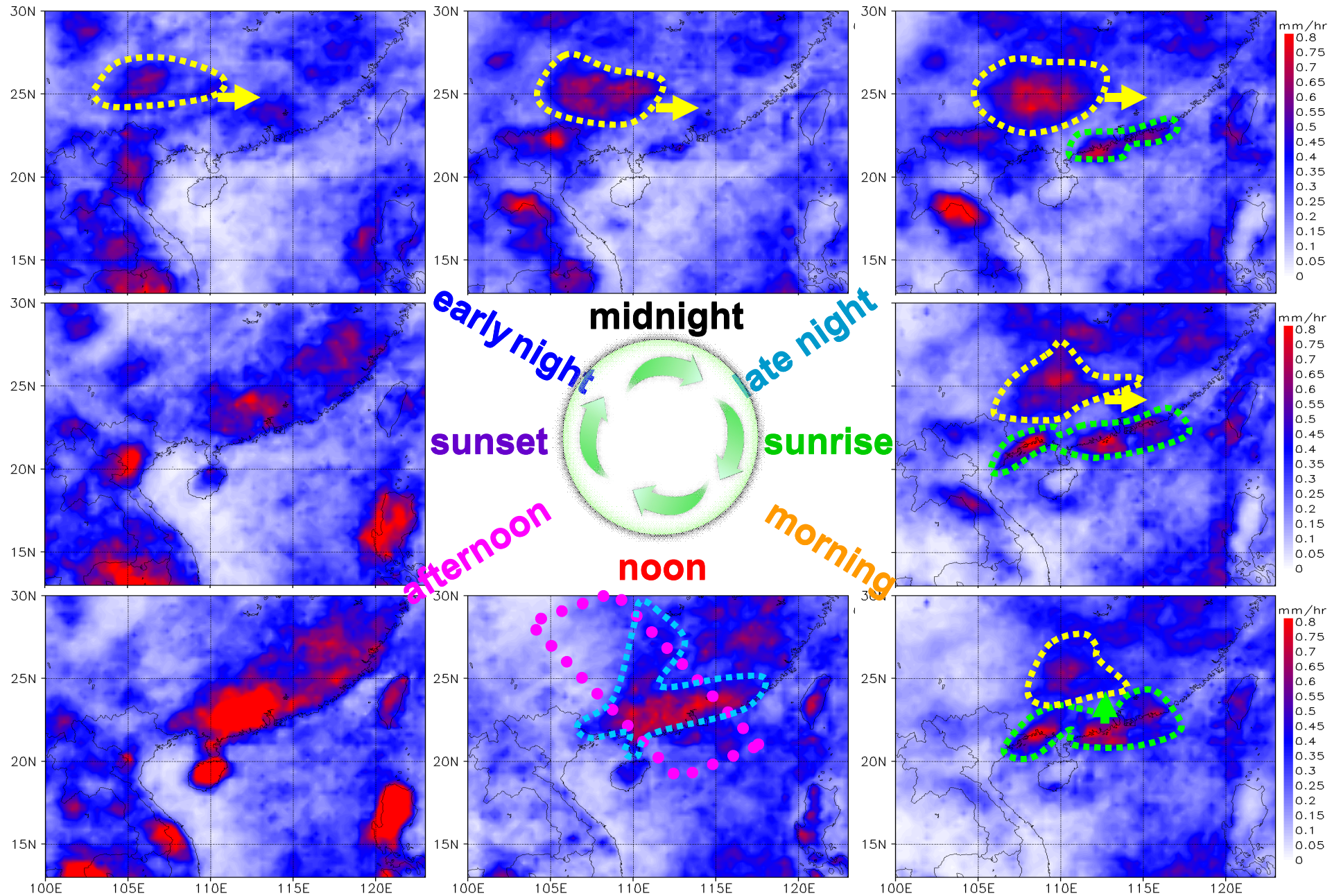
Seasonal Rainfall over 105~120E, GPCP (1979~2005)



A heavy rain case, 19~24 June, 2005



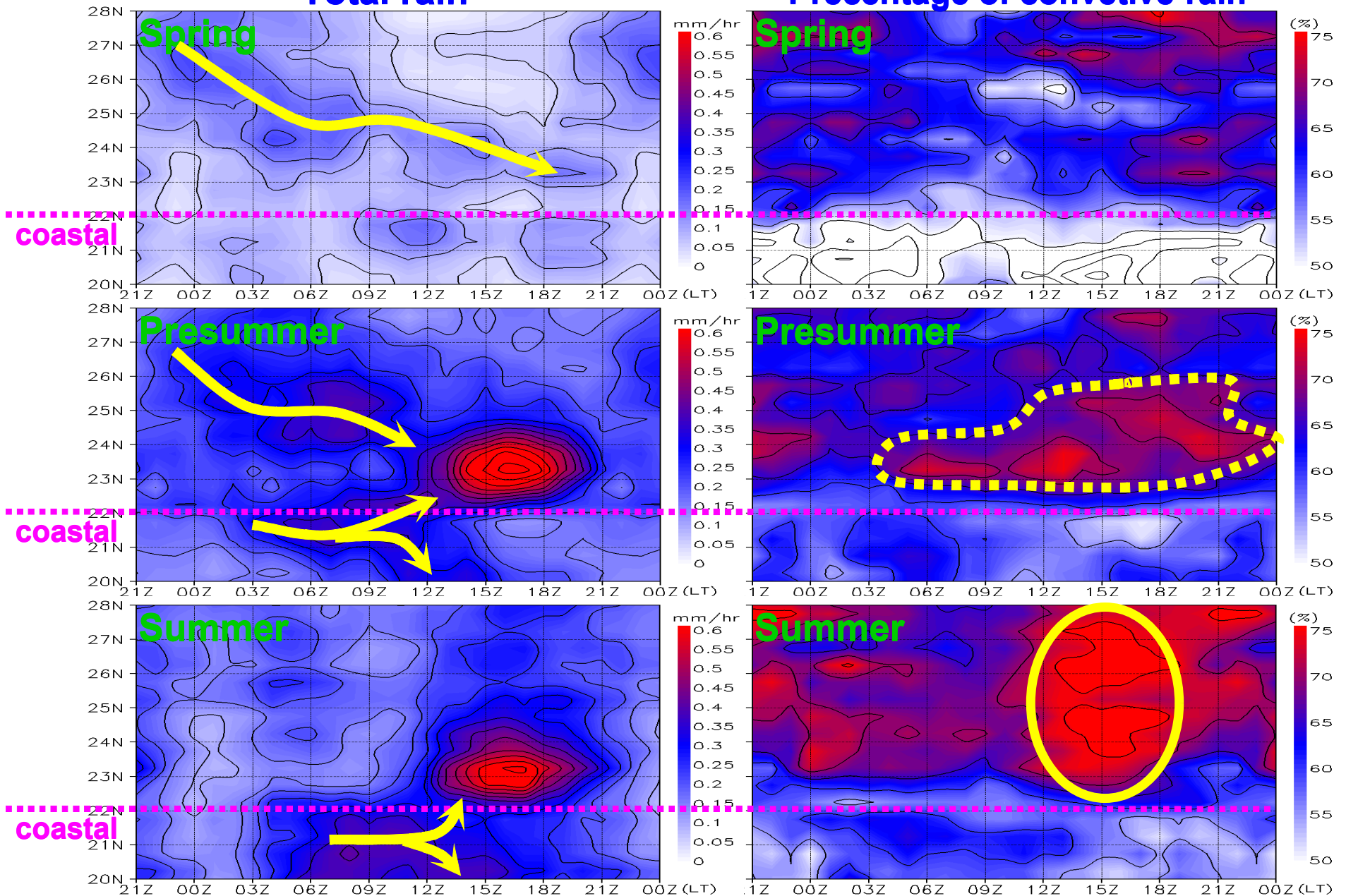
Diurnal cycle of rain rate in presummer (TRMM 1998~2006)



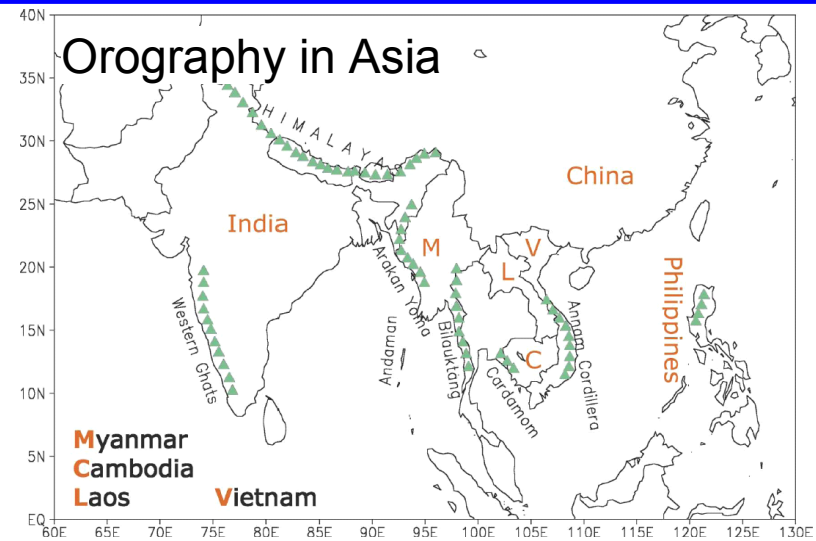
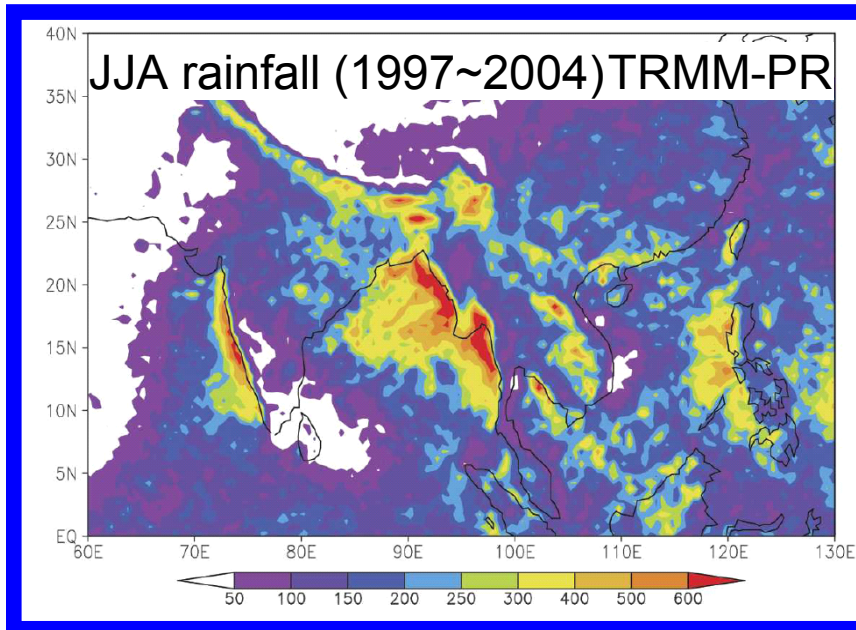
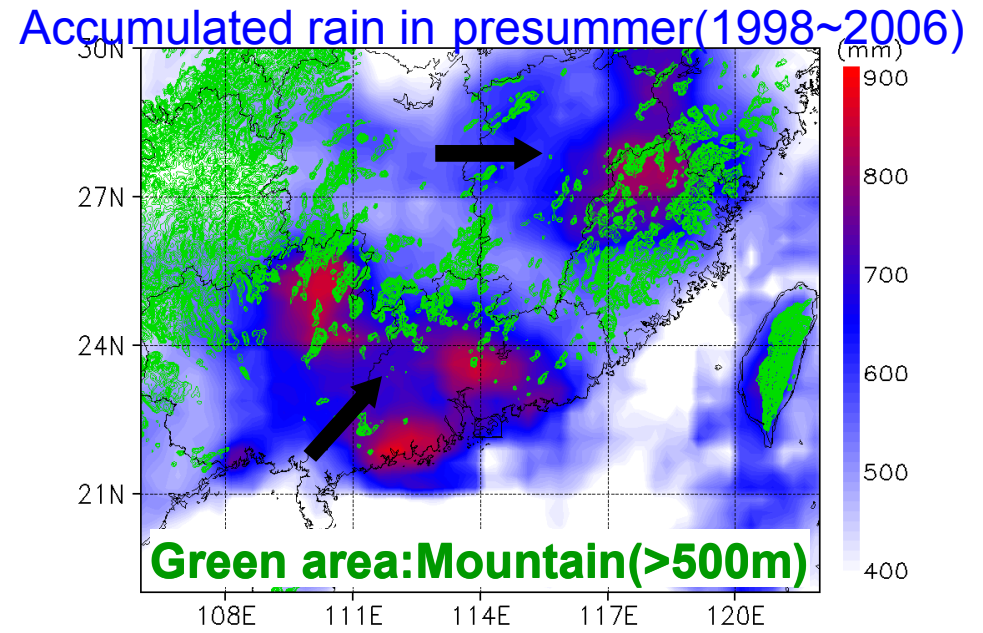
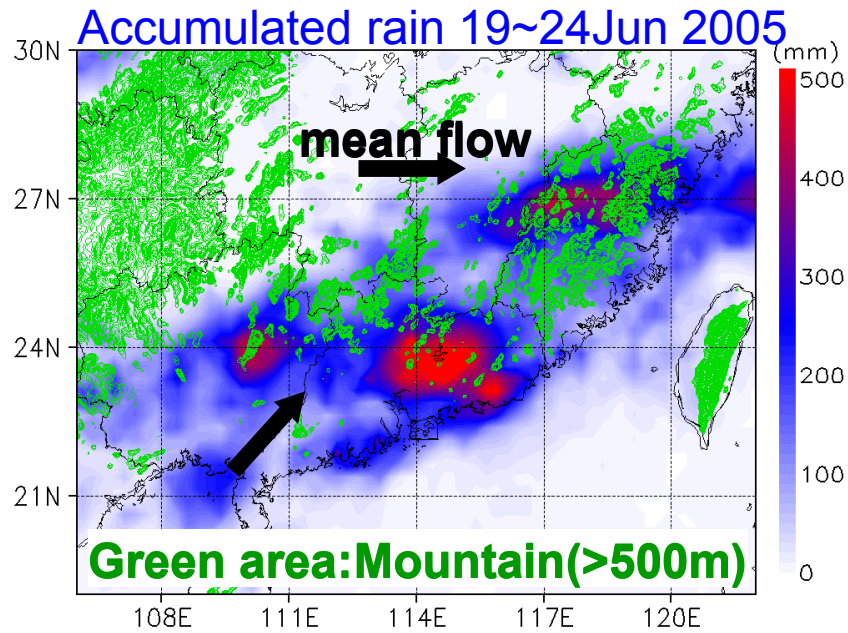
Regional variation of diurnal rainfall cycle

Total rain

Percentage of convective rain



Topographic impacts on rainfall amplification



(proposed by Xie et al. JC 2006)

Introduction on DS³(Down Scaling Simulation System)



DS³ (a 'small' JMA):
NHM model (dx=15km→4km→1km)
Coupled with CFD•LES model (dx~100m)

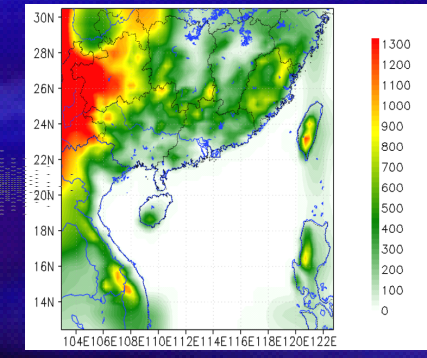
Schemes for two trial experiments:

00z19June2005 DS³-30km(72*72) 00z24June2005

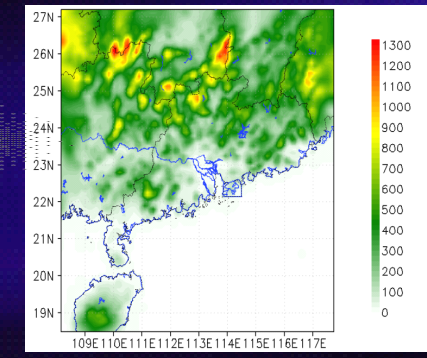
Initial & boundary: JMA-GSM, NOAA-OISST
Convection scheme: Kain-Fritsch
Cloud physics: mixed-phase, graupel process simplified
Time step: 60 Sec

00z19June2005 DS³-10km(102*102) 00z24June2005

elevation of domain 1



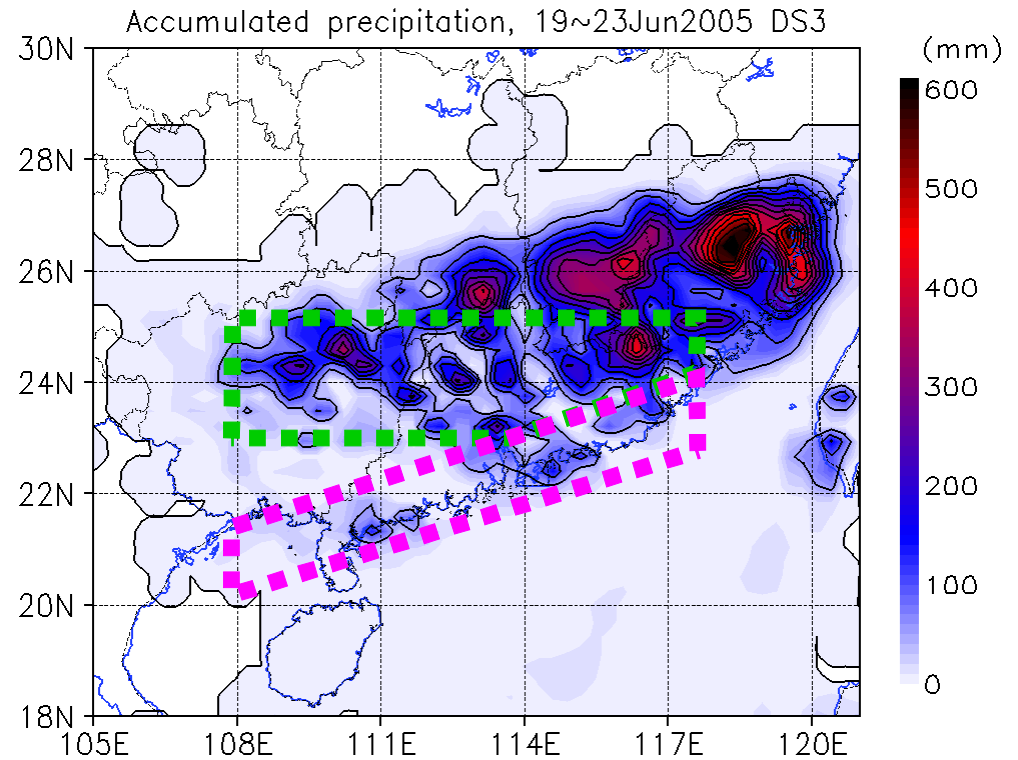
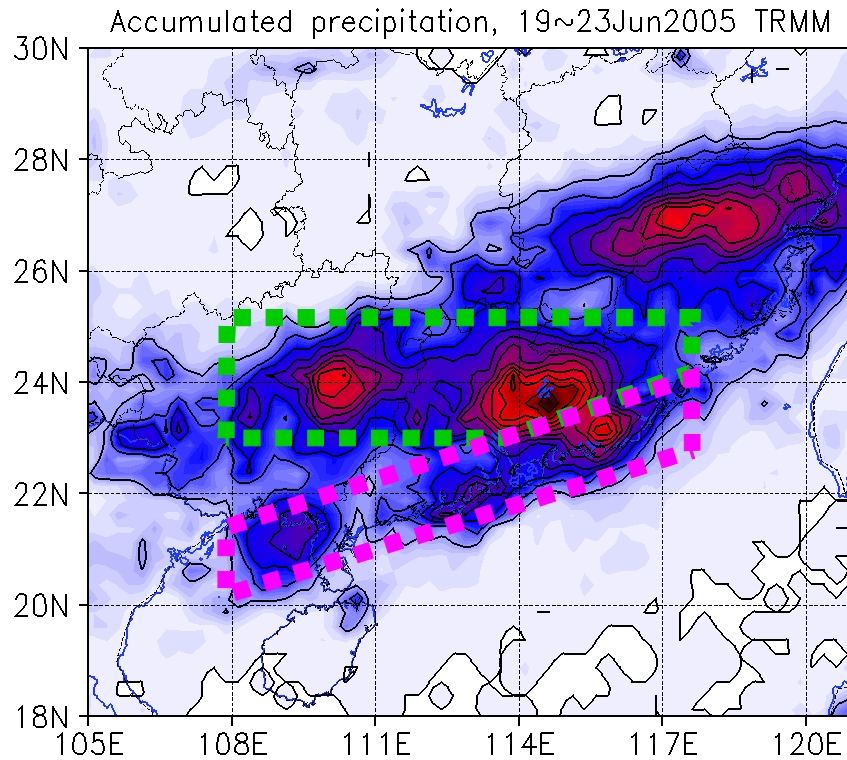
elevation of domain 2



Accumulated precipitation

TRMM-3G42

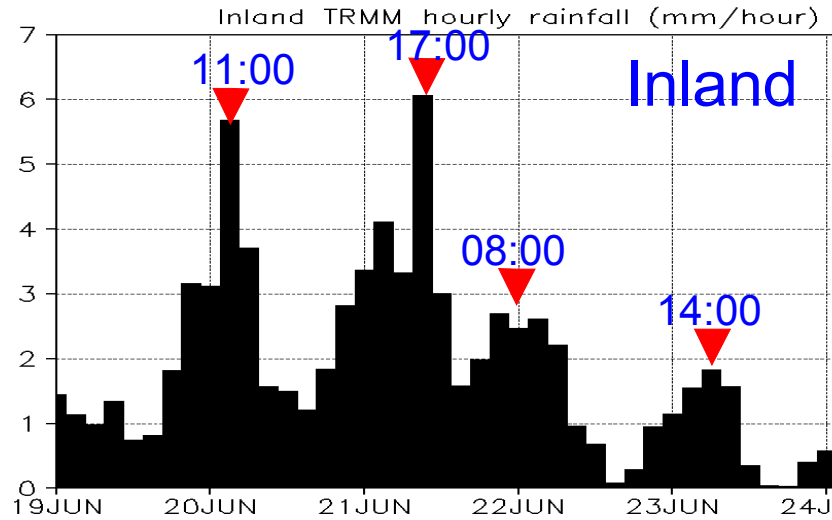
simulated by DS³(30km)



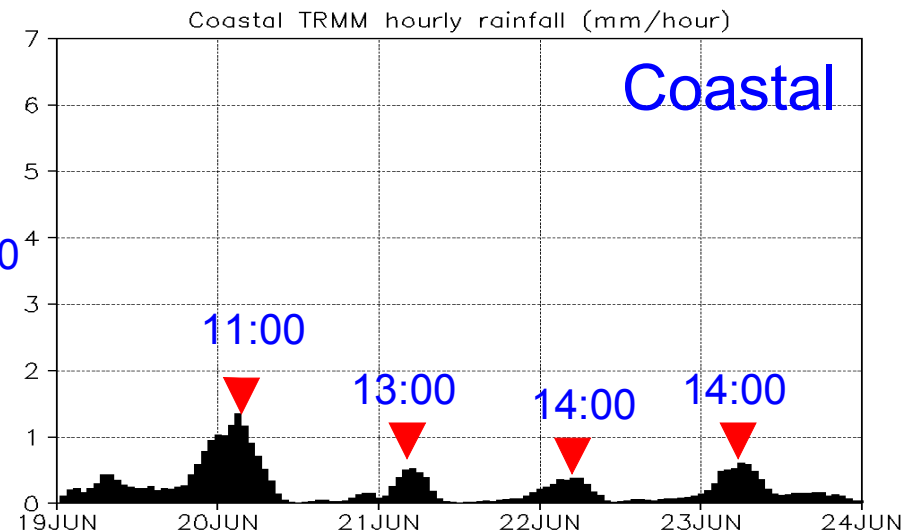
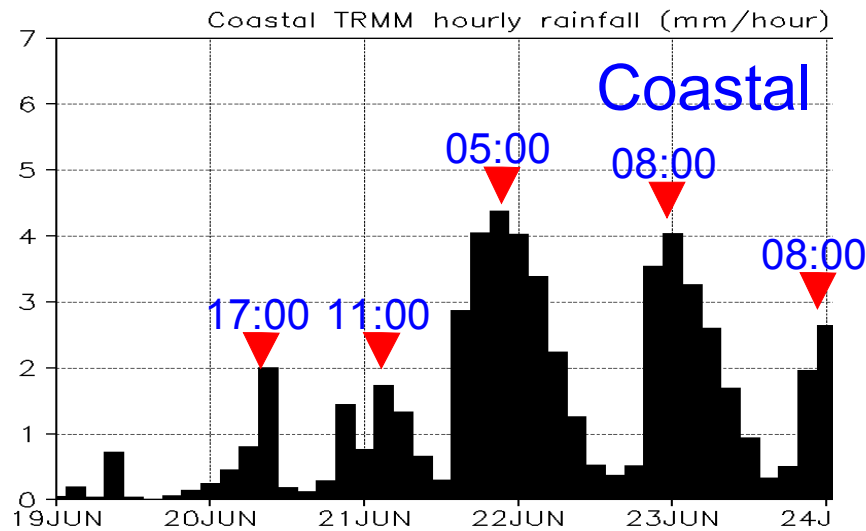
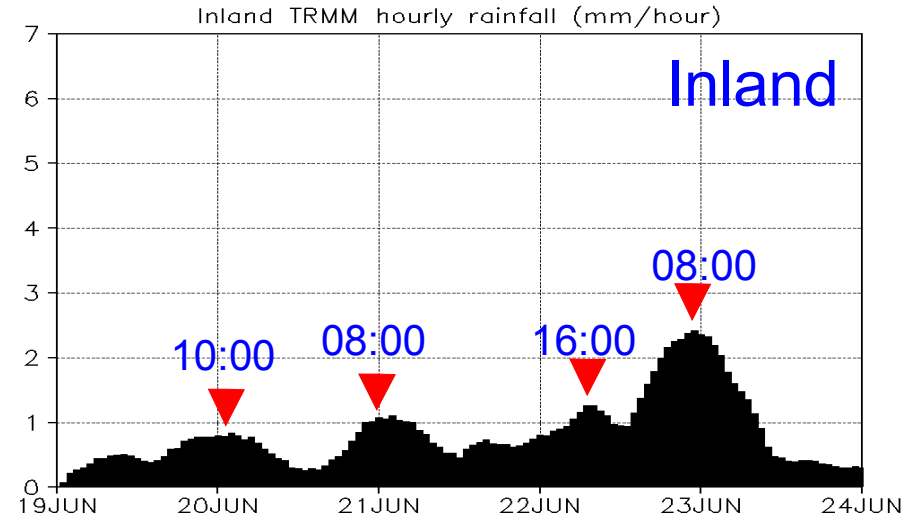
North rainbelt along baroclinic front is good.
Rainfall due to mountains are weak.
South rainbelt along coast is too weak.

Evolution of precipitation

TRMM-3G42



simulated by DS³(30km)

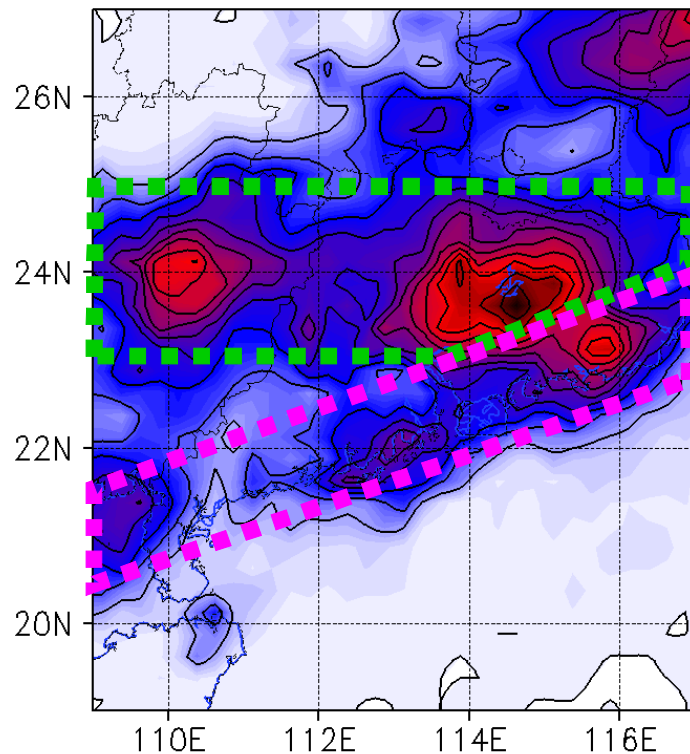


Accumulated precipitation

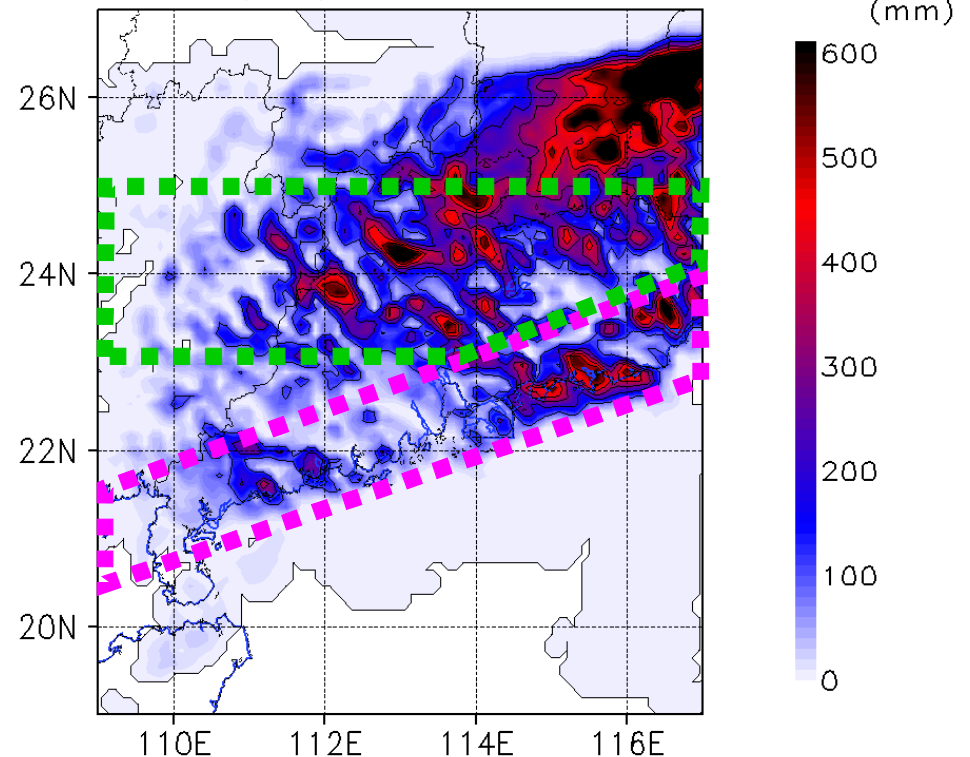
TRMM-3G42

simulated by DS³(10km)

Accumulated precipitation, 19~23Jun2005



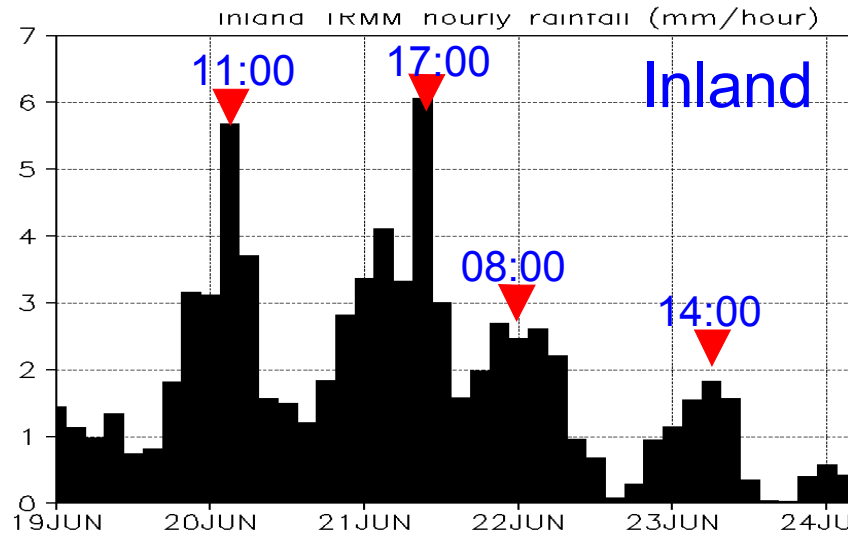
Accumulated precipitation, 19~23Jun2005 DS3



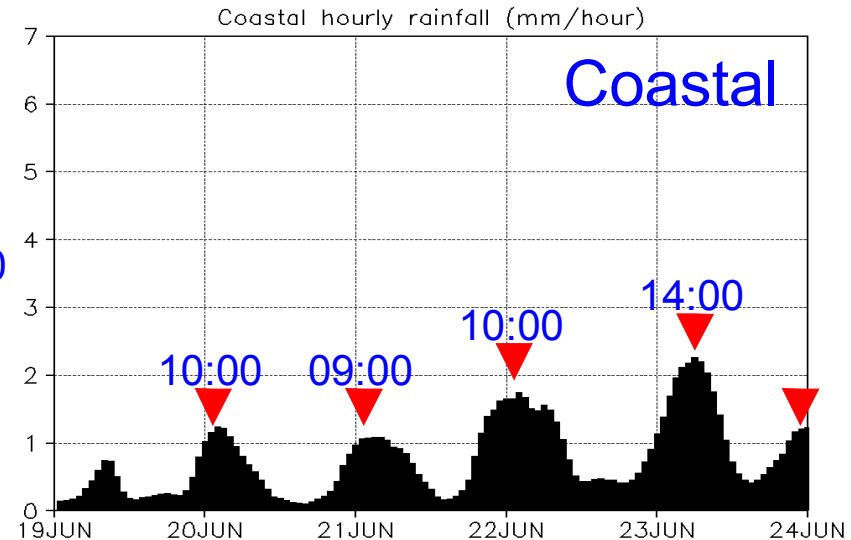
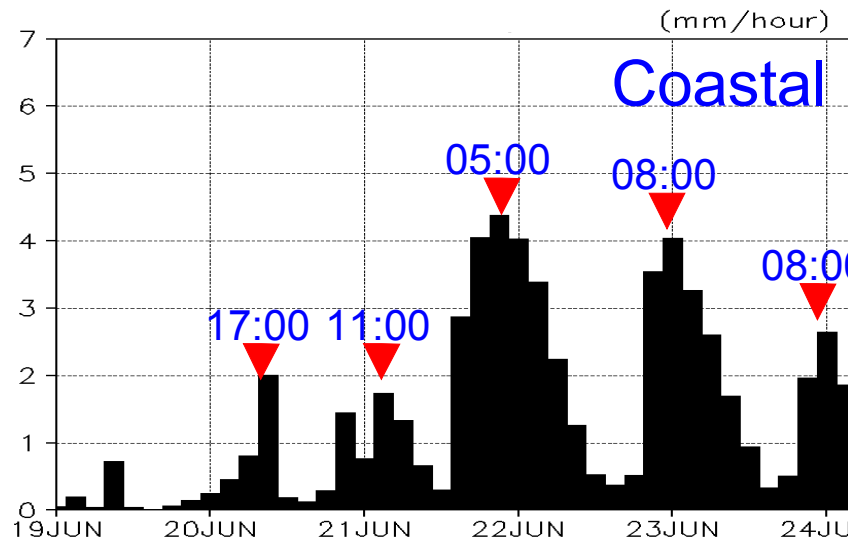
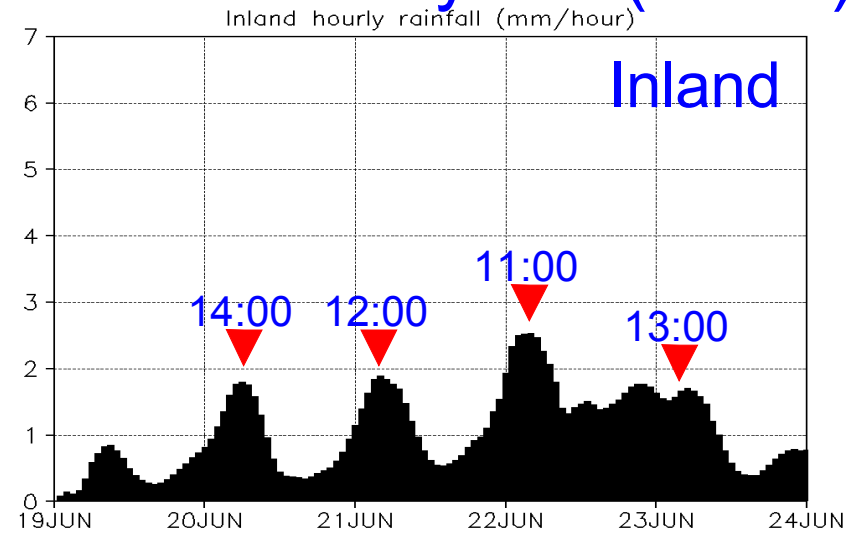
North rainbelt along baroclinic front is weak.
Rainfall due to mountains are weak.
South rainbelt along coast is good.

Evolution of precipitation

TRMM-3G42



simulated by DS³(10km)



Summary and potential works

1. Monsoon on southern China has distinct diurnal variations with **morning peak in coast & noon~afternoon peak over inland.**
 2. Along with surface heating, disturbances developed in coast & eastern Tibetan plateau may merge to bring the noon~afternoon peak over inland in presummer season.
 3. With topographic effects, these diurnal cycles play an important role on the location and timing of heavy rains.
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With DS³, high resolution experiments with are on the way:

- (1) Sensitive Exp. on interactions between baroclinic system, monsoon flow and local land-sea breeze;
- (2) Sensitive Exp. on topographic impacts (small mountains & complex coast) on disturbance genesis and rainfall amplification;
- (3) Sensitive Exp. on convection, radiation schemes & surface processes and their impacts on diurnal rainfall cycle.