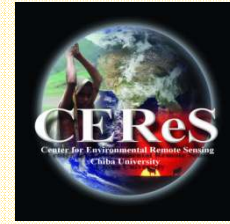


2nd MAHASRI/HyARC Workshop in  
Vietnam, Danang, Vietnam,  
5-7 Mar., 2009

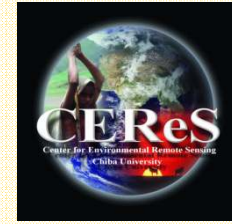


# **Connection of diurnal cycle in convective activity with seasonal march of vegetation activity over Sahel region, Africa revealed by several satellites data**

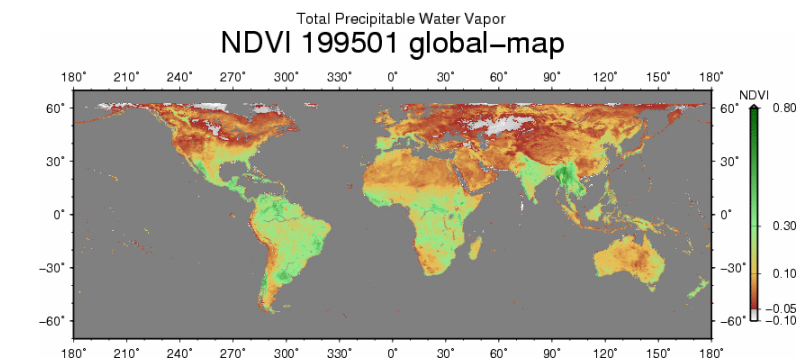
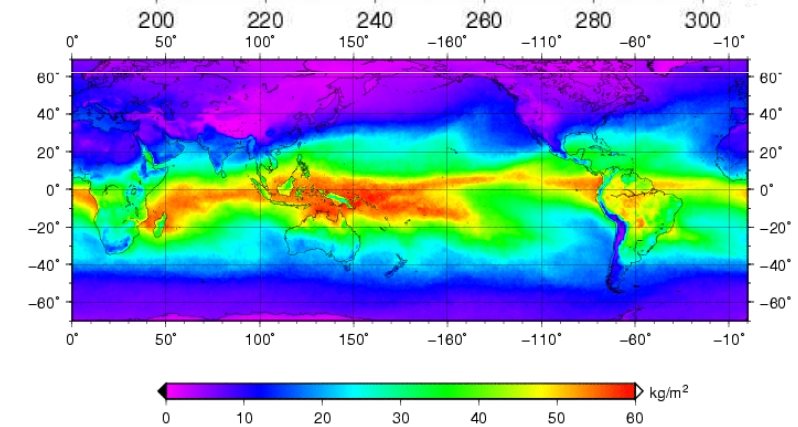
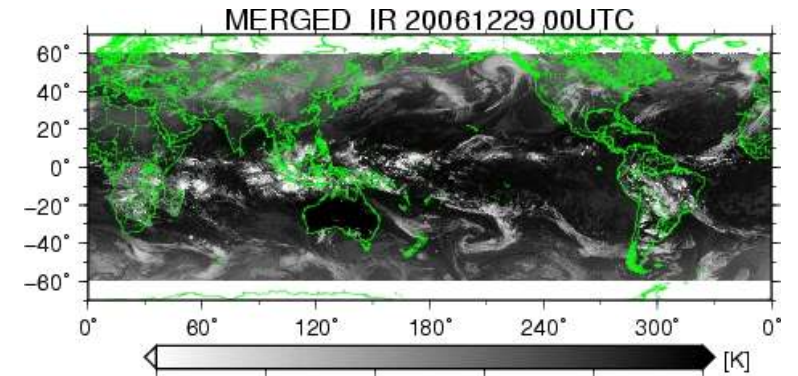
**Atsushi Higuchi, Yuuki Murayama,**  
Munehisa K. Yamamoto, Masamitsu Hayasaki  
*Center for Environmental Remote Sensing  
(CEReS), Chiba University, Japan*

# Key timescales

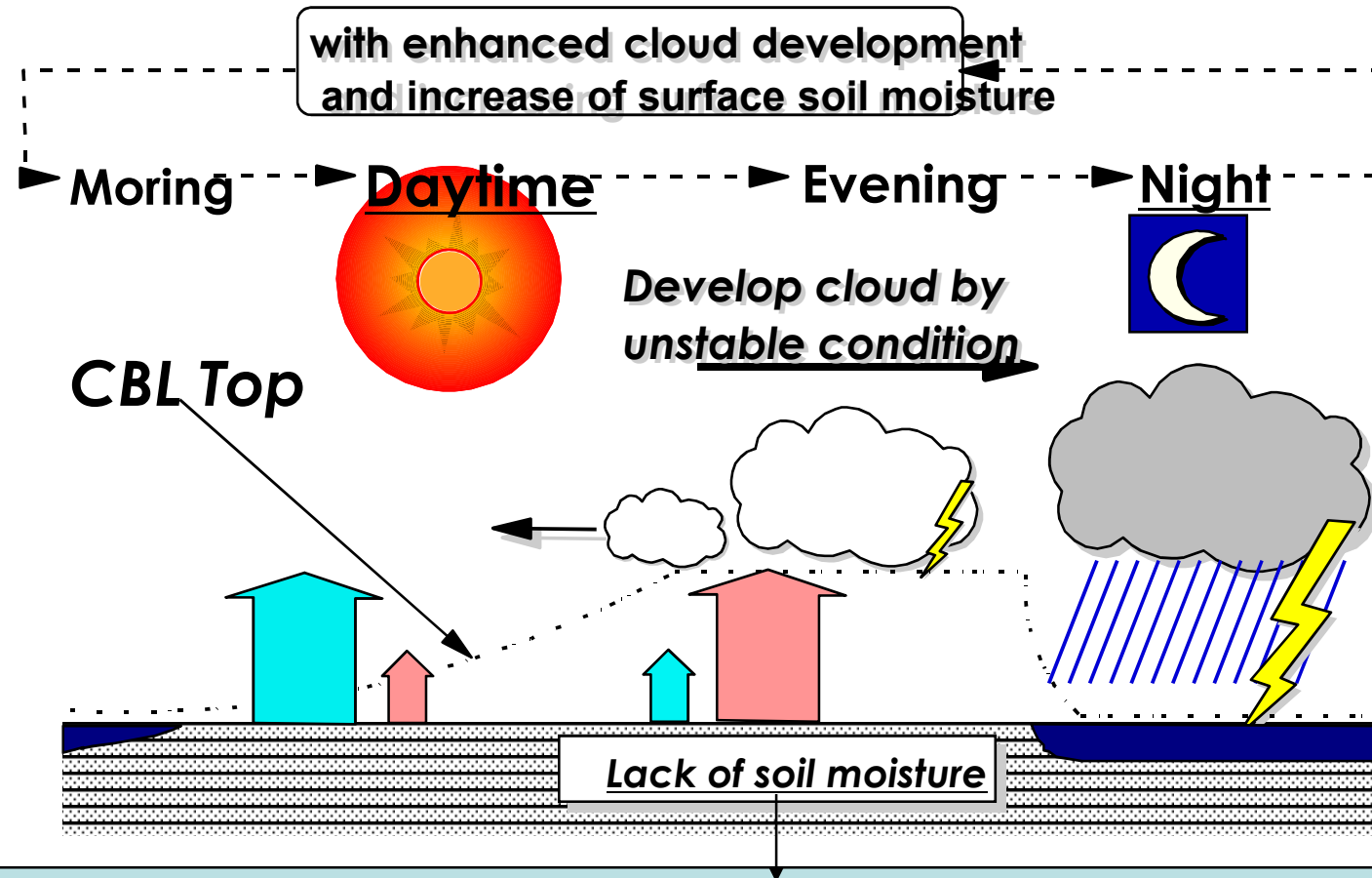
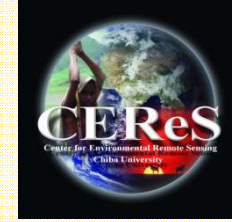
## How to capture?



- Diurnal Cycle:
  - Item: **Geostationary Sat.**  
TRMM, (POS)
- Seasonal March:
  - Item: POS, (Reanalysis)
- Inter-annual variability:
  - Item: Long-term  
monitoring POS,  
(Geostationary Sat.)

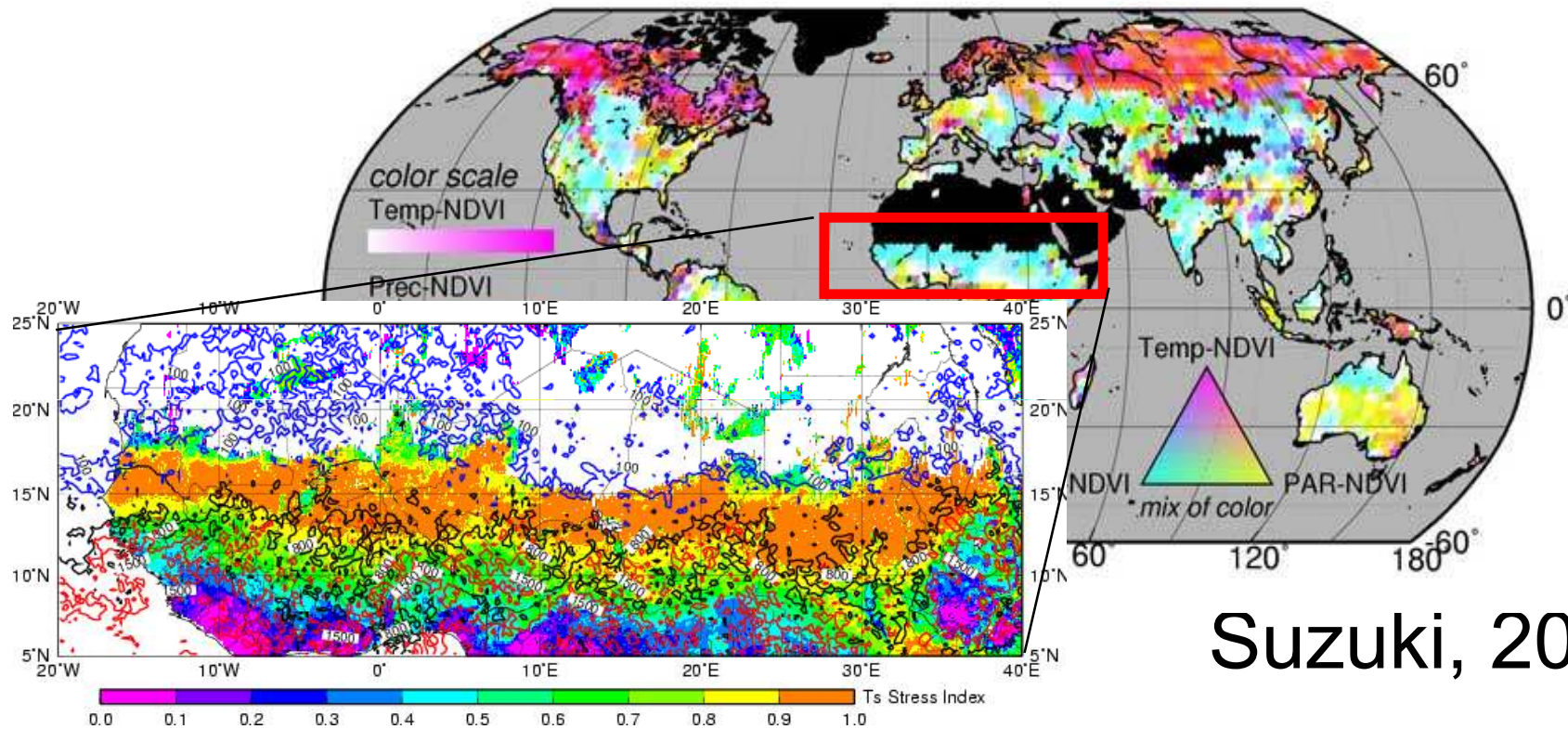
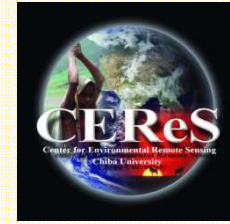


# Diurnal Cycle with Seasonal March over Land



- How about the “reaction” of land surface?
- How about the “key” time scale?

# Eco-Whether Map Sahel (Water Control)



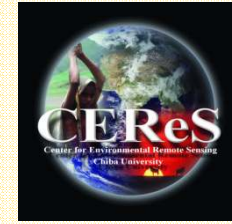
Suzuki, 2007

- 100mm/year is the boarder of desert or grassland
- 800mm/year is the boarder of vegetation “always” stressed or not
- 1500 mm/year is maybe forest or not

→ Sahel region is suitable to diagnose DC with L-A Interaction



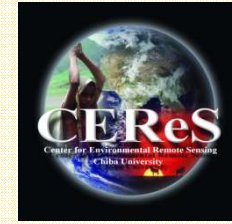
# Land-Atmosphere Interaction over Sahel via several Sat.



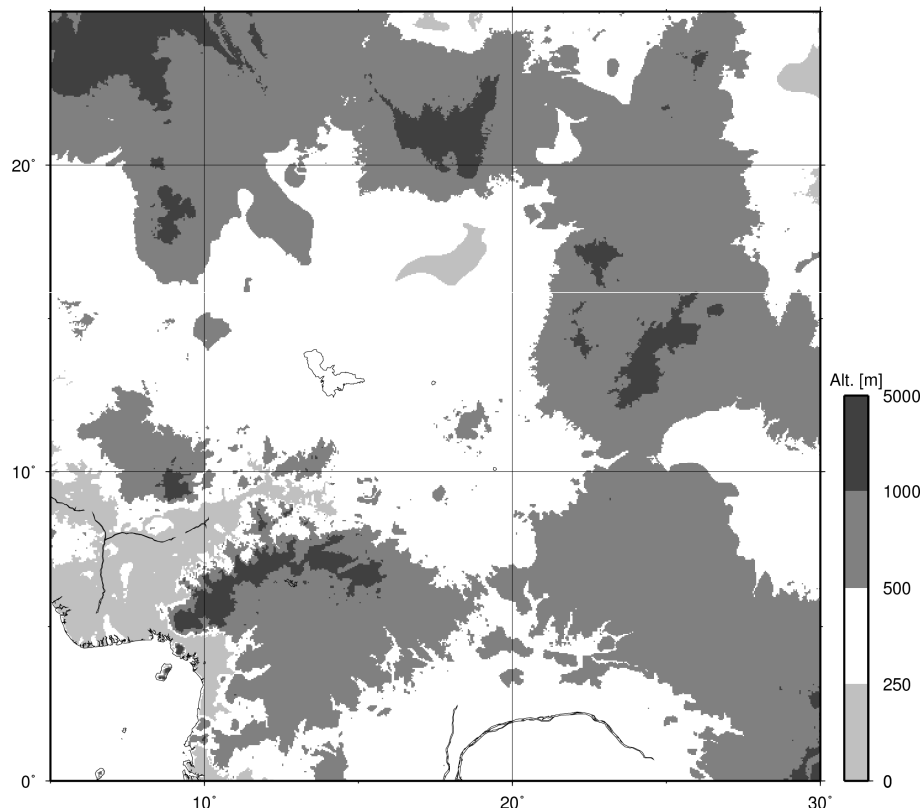
- Vegetation Activity:
  - Terra/Aqua MODIS 16 Days Composite VIs product: Use NDVI with adapted day flag
- Precipitation / Convective Activity
  - TRMM Merged Product (3B42)
  - Meteosat 5: Delta Tbb (Ohsawa et al., 2001)  
$$\text{Delta Tbb} = \text{Tbb}_{\text{thermal-IR}} - \text{Tbb}_{\text{Water Vapor}}$$
- Land cover: IGBP Ecomap
- Topography: Gtopo30

# General Feature (1)

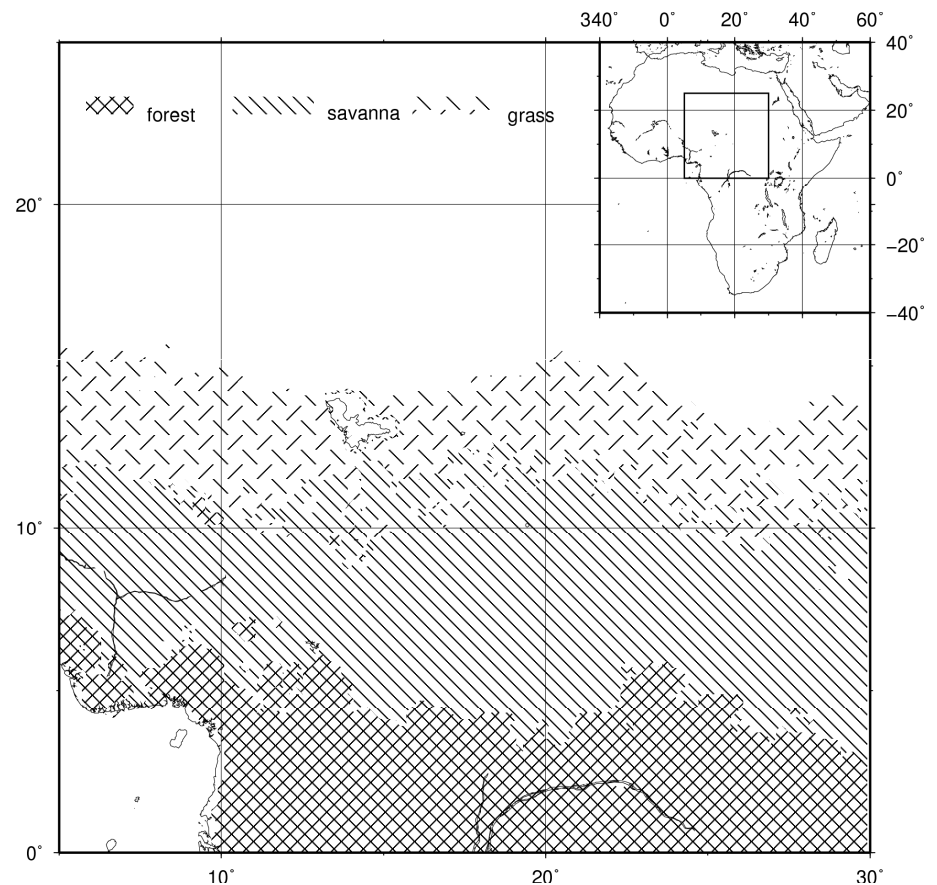
## (Topography, Land cover)



(c) Topography



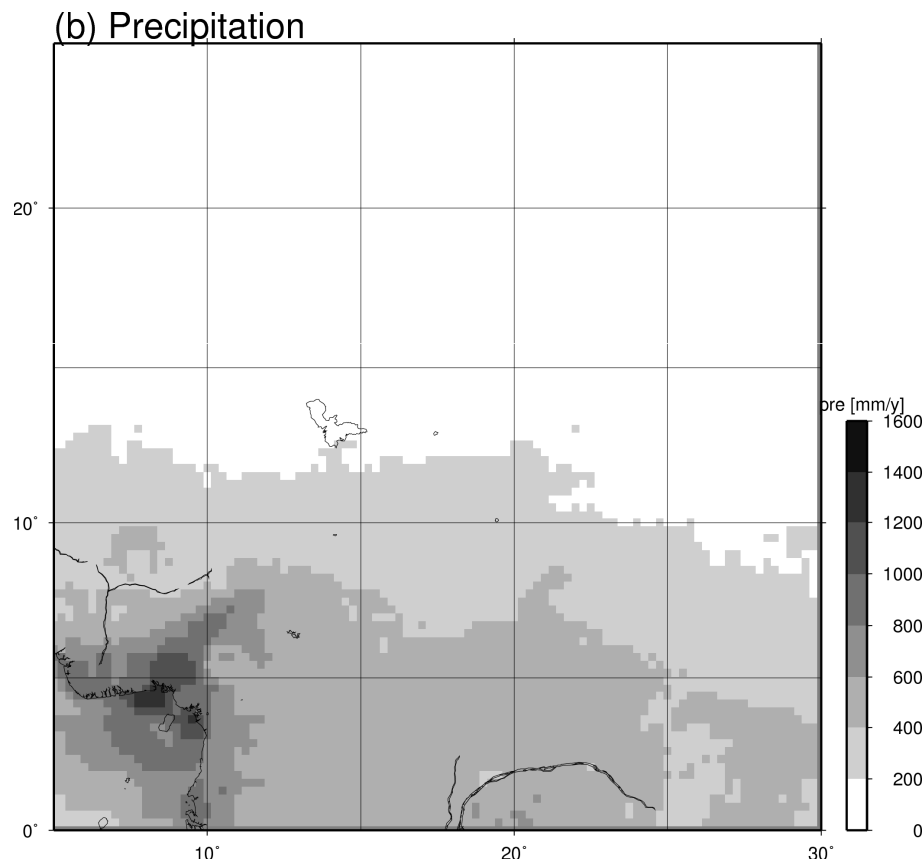
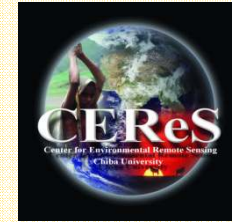
Topography (relatively flat)



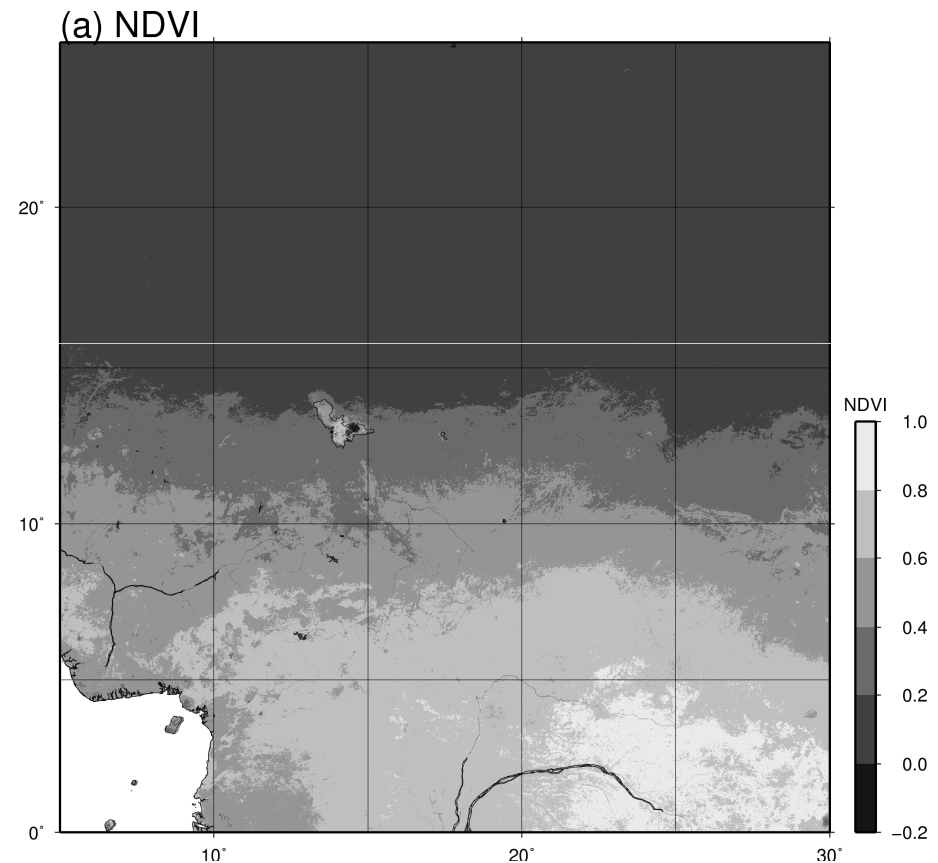
Land cover

# General Feature (2)

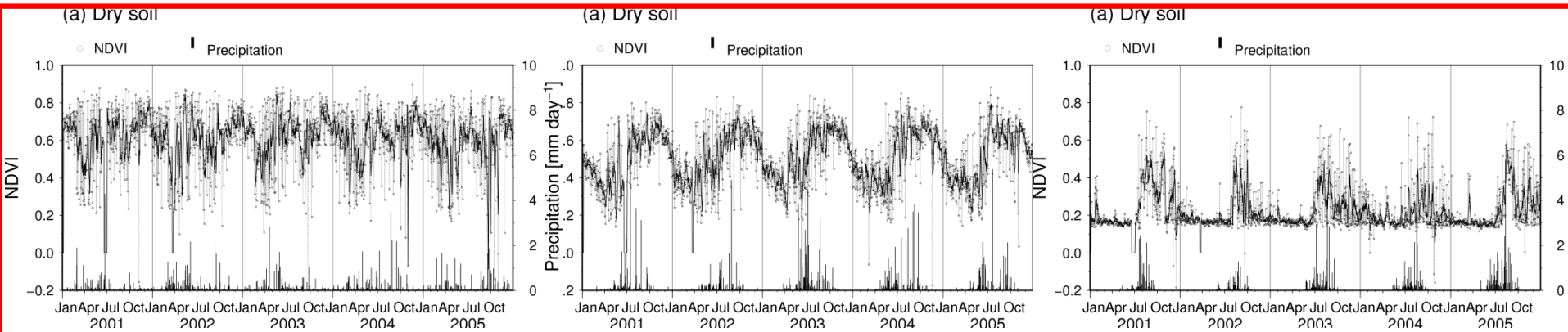
## (Rain [3B42], NDVI [MODIS])



Precipitation (3B42; 2000-2005)



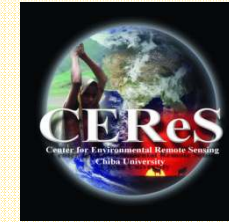
NDVI (Terra/Aqua MODIS; 2000-2005)



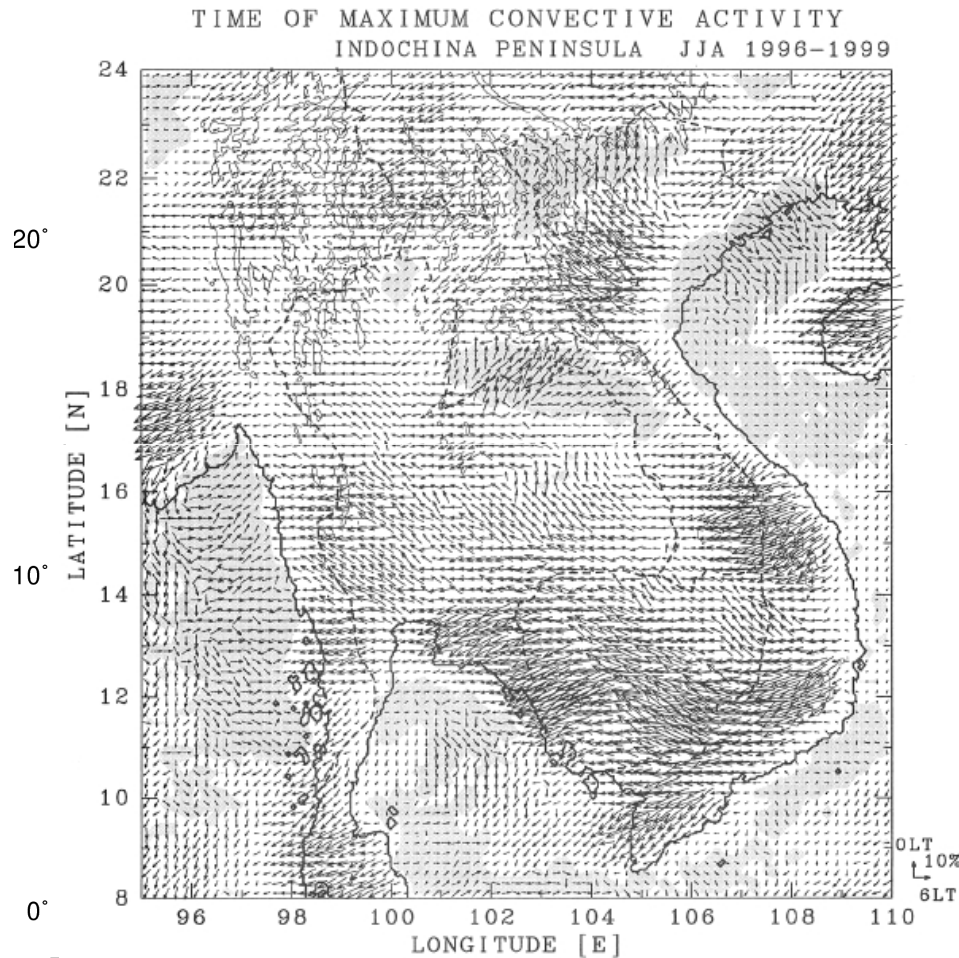
# Grassland



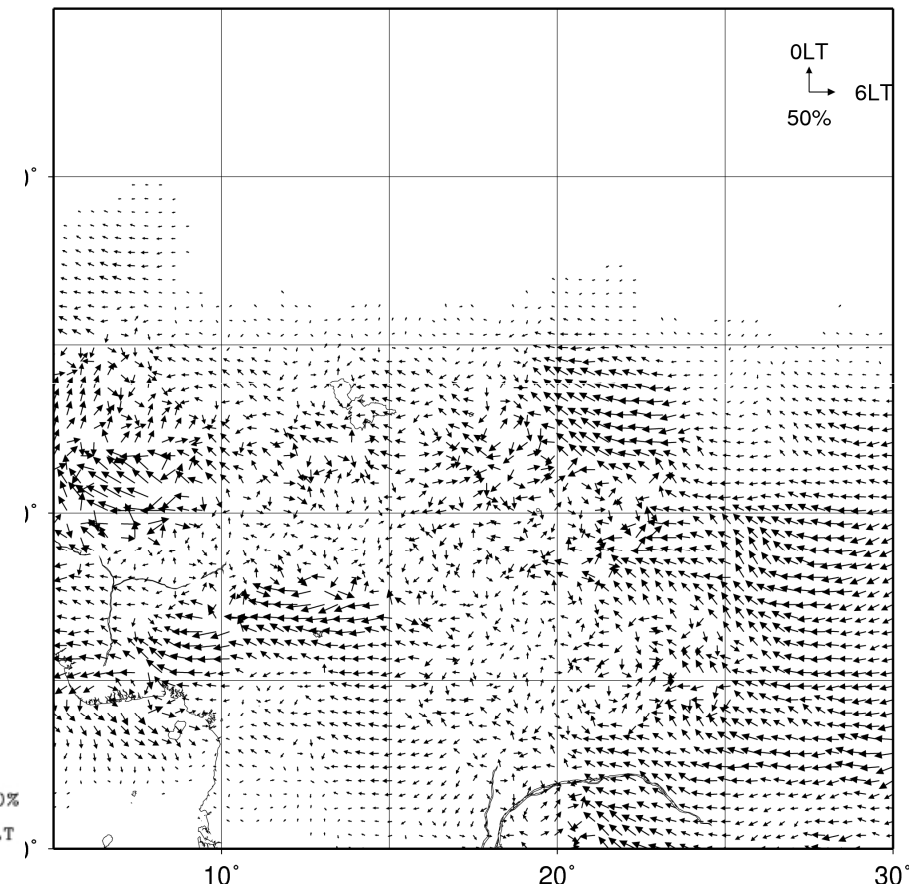
## Results (2): Peak-time Convection derived from hourly geostationary sat.



(a) Spring (MAM)

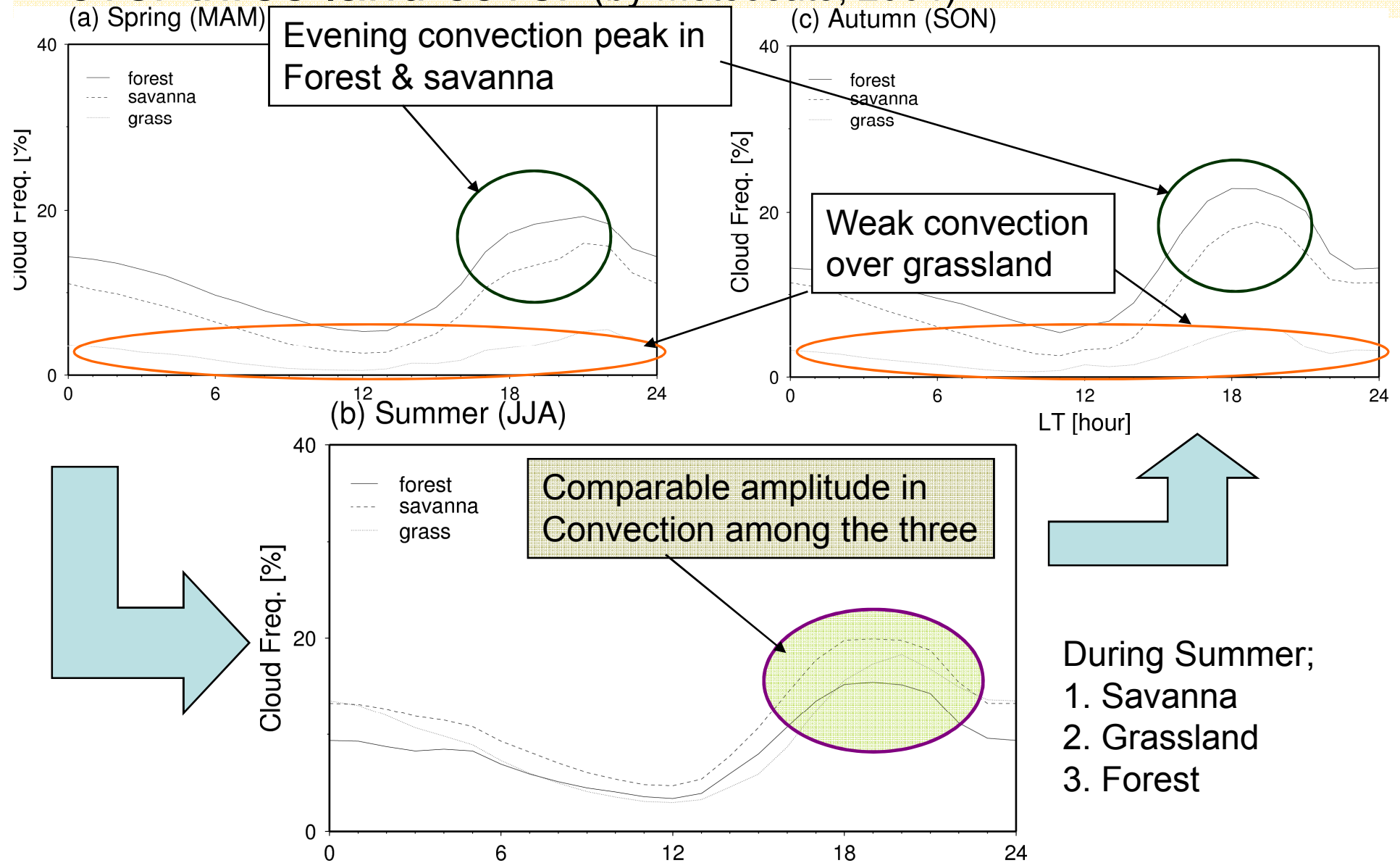
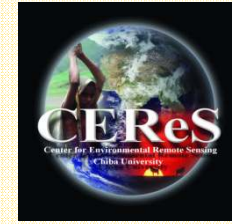


(b) Summer (JJA)

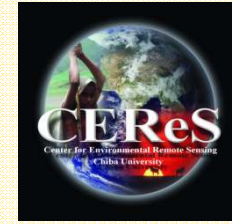


- 18 LT to 20 LT peak-time (evening) convections are dominant
- Primary controlled by topography (orographic convection) but more uniform

# Results (3): Diurnal variation in Fc over three land cover (by meteosat5, 2004)



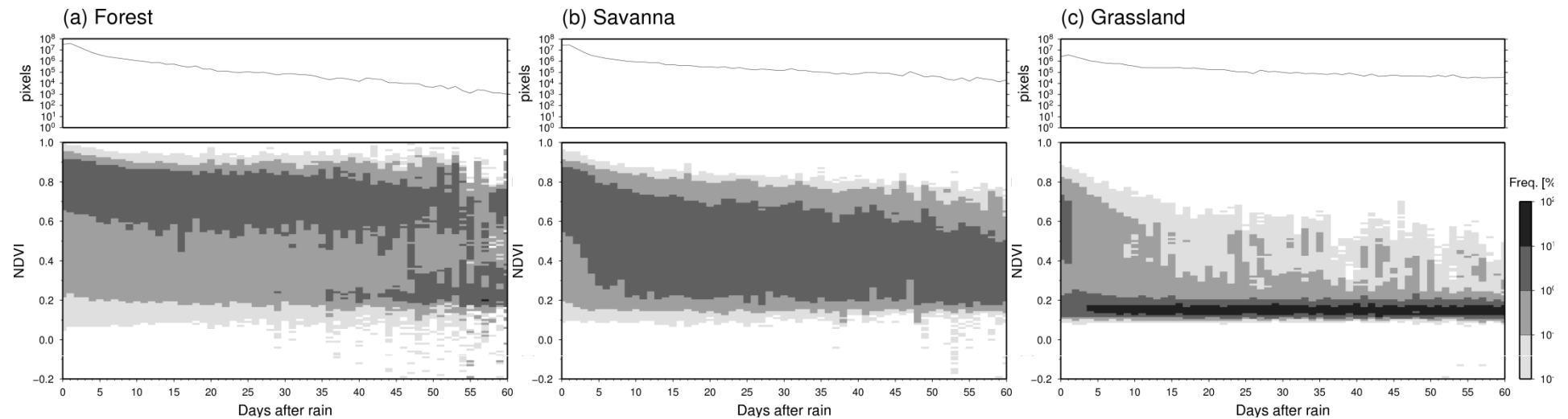
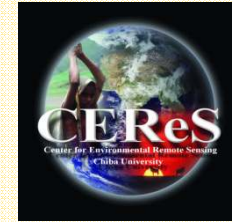
# Key Questions



- Different behavior in dry and wet conditions on three land covers (forests, savanna, grass)
  - Reaction deference mainly due to root depth?
- Amplitude of convective activity with seasonal march
  - Why forest is lowest in mature season?
  - Forest is a kind of water vapor source for adjacent regions (like savanna, grass)?
  - Delay in peak time in convective activity over grass is move or re-generation of convection?

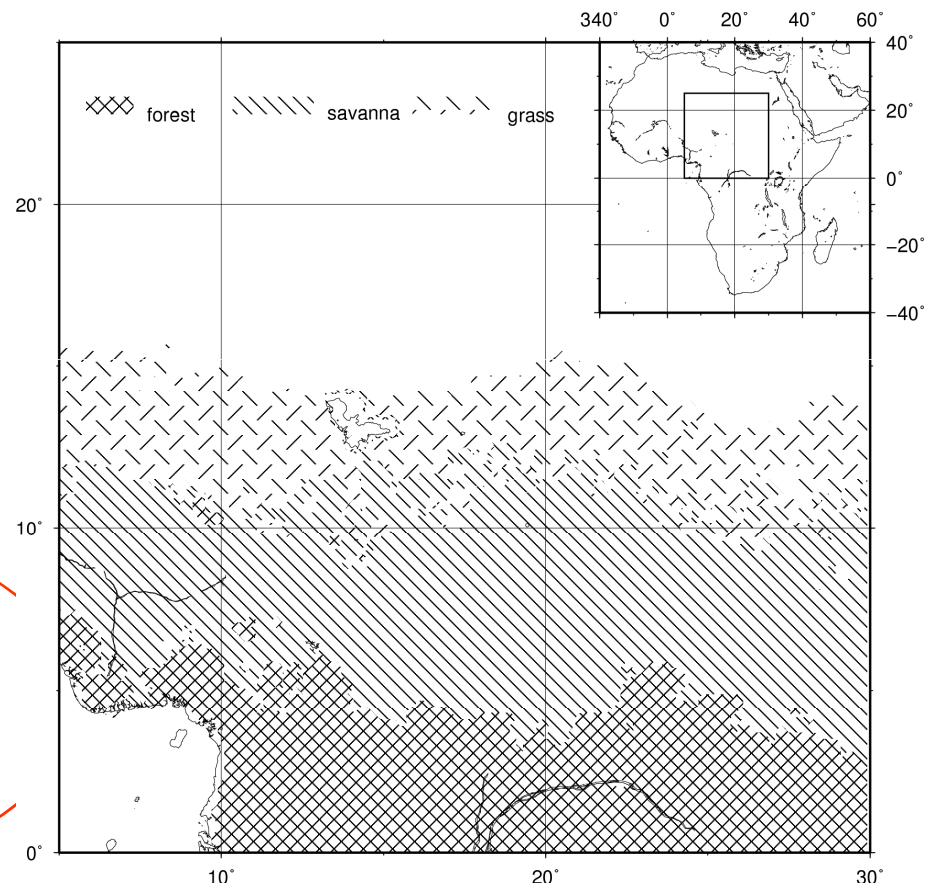
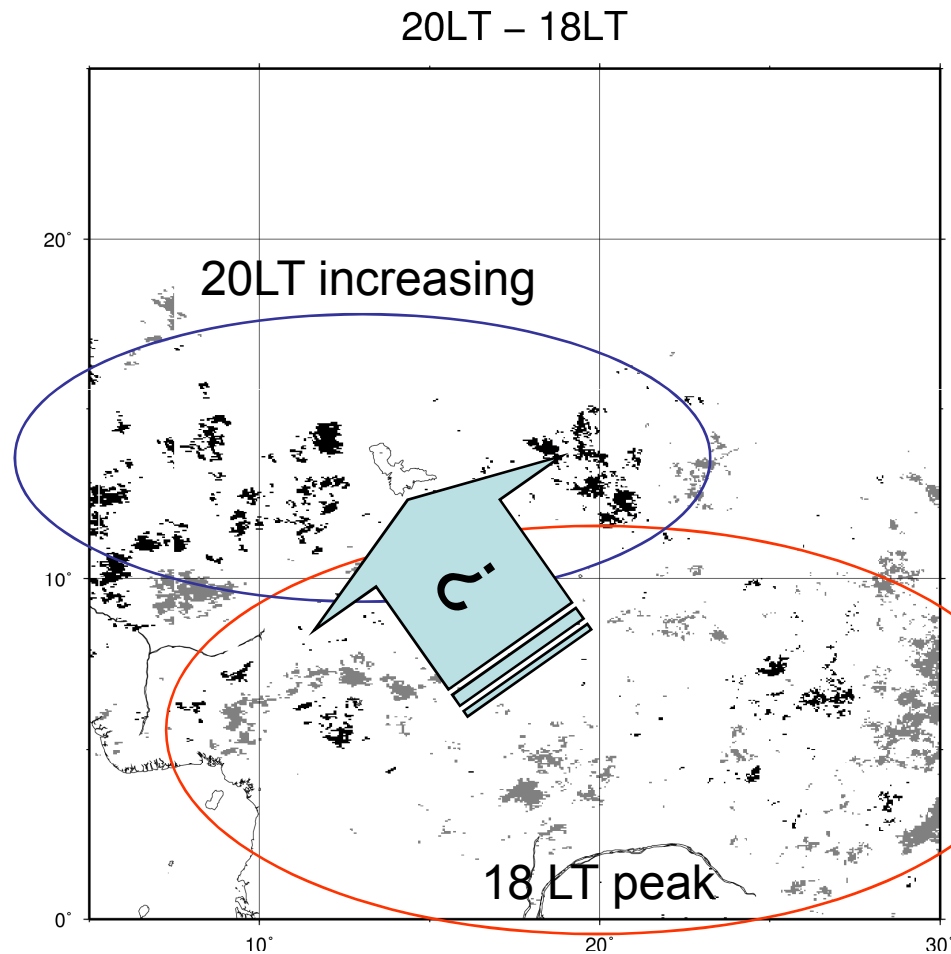
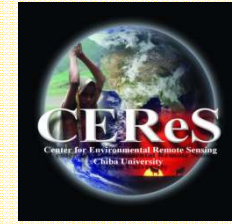


# Reaction from vegetation (NDVI) as a function of non-rainy days

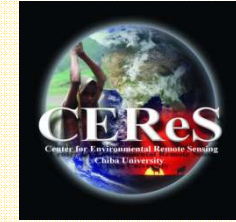




# Peak delay in convection

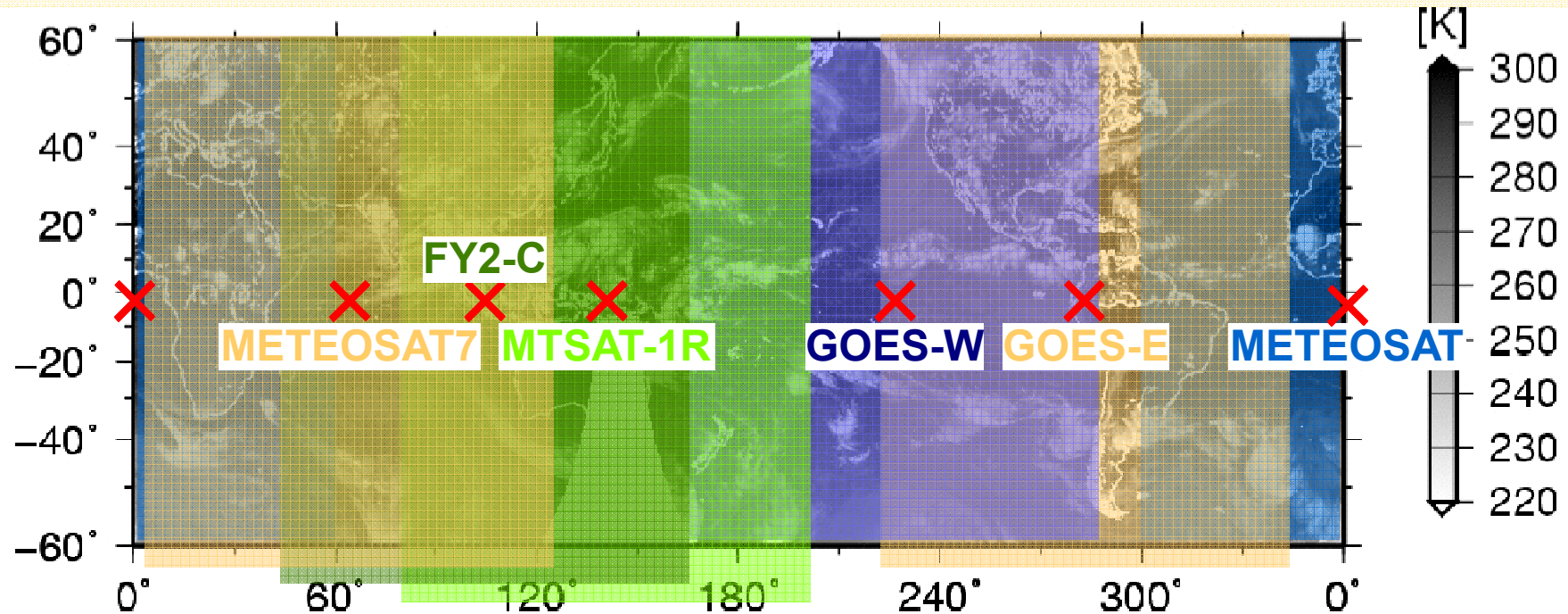
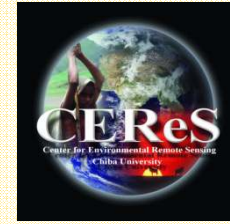


# Concluding Remarks



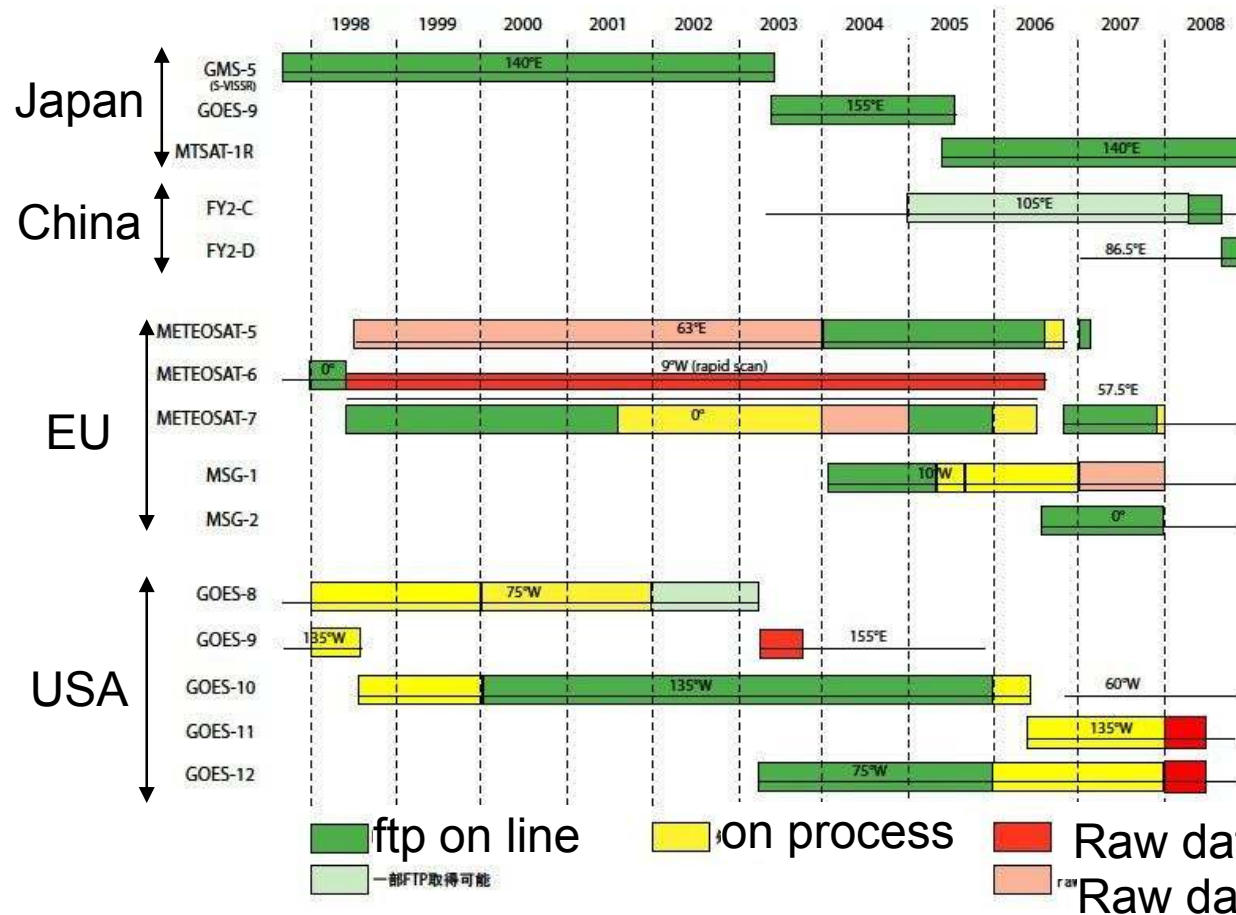
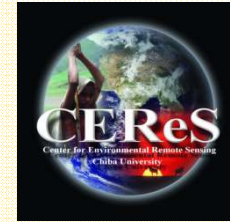
- Analysis of several Satellite data over Sahel
  - Peak time delay: Forest is “water source” during mature season?
  - Reaction of vegetation for available water: Forest has approx. 1.5 mon (compare: grass 2 days) → As a function of moderation in climate?
  - Peak time in convection: 18-20 LT is universal feature?
    - Delay in convection: re-generation (early morning) or moving (mid-night)
      - Have to check the life time of convection (e.g., Kondo et al., 2006)

# Global geostationary data by 4 Univ. VL activity



- *Under the formation of CCSR, HyARC, CAOS & CEReS (Virtual Labo.; VL), our team archive & publish “global” geostationary satellite dataset.*
- *Not only IR, WV, VIS mid-IR channels dataset is target to archive & releasing (<http://www.cr.chiba-u.jp/~4vl/>)*

# Current Archive & published status (as of 25 Feb 2009)



<ftp://gms.cr.chiba-u.ac.jp/>

<ftp://mtsatsat-1r.cr.chiba-u.ac.jp/>

<ftp://fy.cr.chiba-u.ac.jp/>

<ftp://meteosat.cr.chiba-u.ac.jp/> \*

\*: Due to publish policy of EU METSAT, can not published

<ftp://goes.cr.chiba-u.ac.jp/>

- Most of geostationary “geo-coded” data can download via **anonymous** ftp servers (without any fee!)