

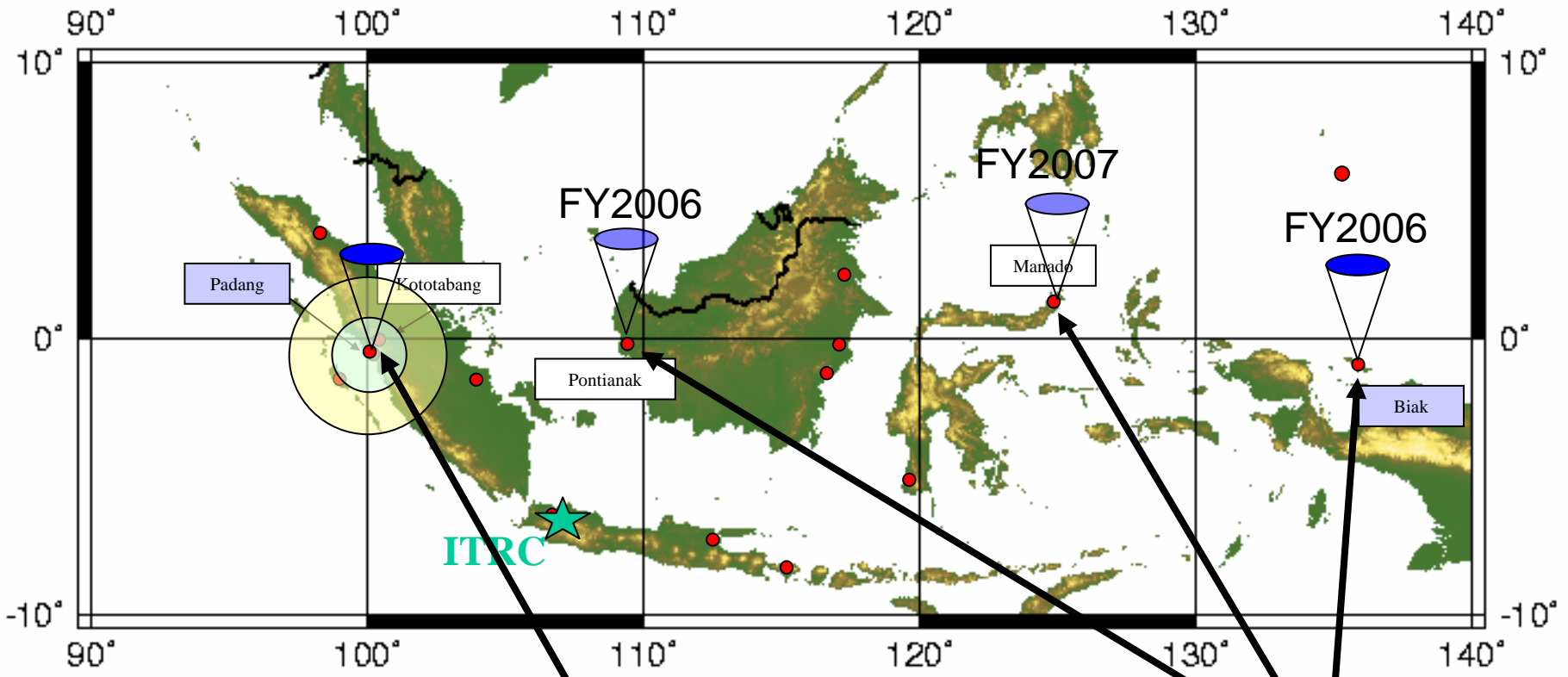
# 大気日変化が決める海大陸“Coastal Zones” (試論)



- 海大陸の大気日変化(→森、(伍)、、、、)
- “Coastal Zones”の意義
- 熱収支、水循環
- 海洋中の温度成層、陸起源物質拡散
- 季節変化との相似性

# Wind Profiler Network over Equatorial Indonesia

**HARIMAU (Hydrometeorological ARray for ISV-Monsoon AUtomonitoring)**  
**Japanese EOS Promoting Program (JEPP)**

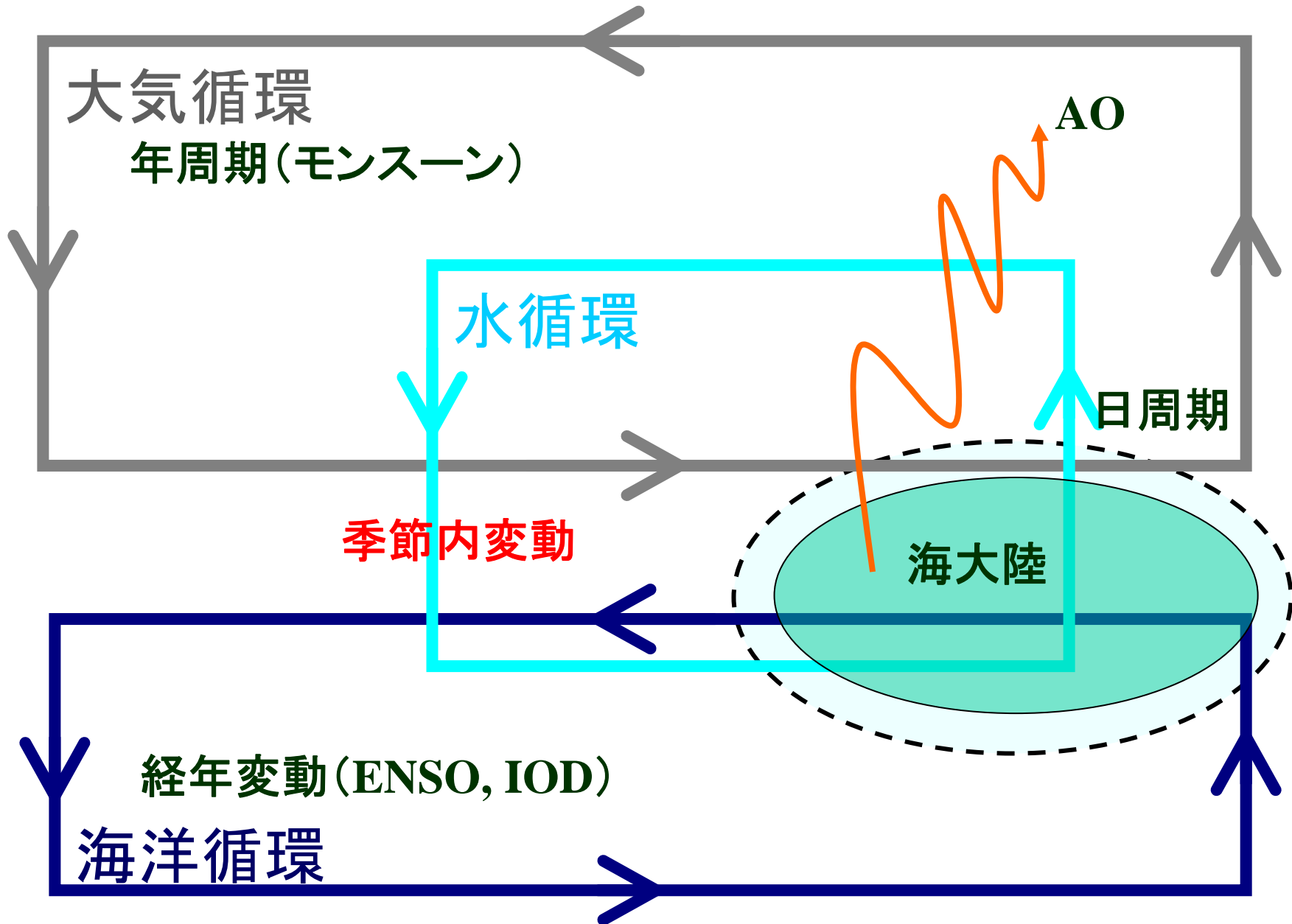


**47-MHz EAR**

**1.3-GHz BLR 1.3-GHz New BLR (LQ7)**



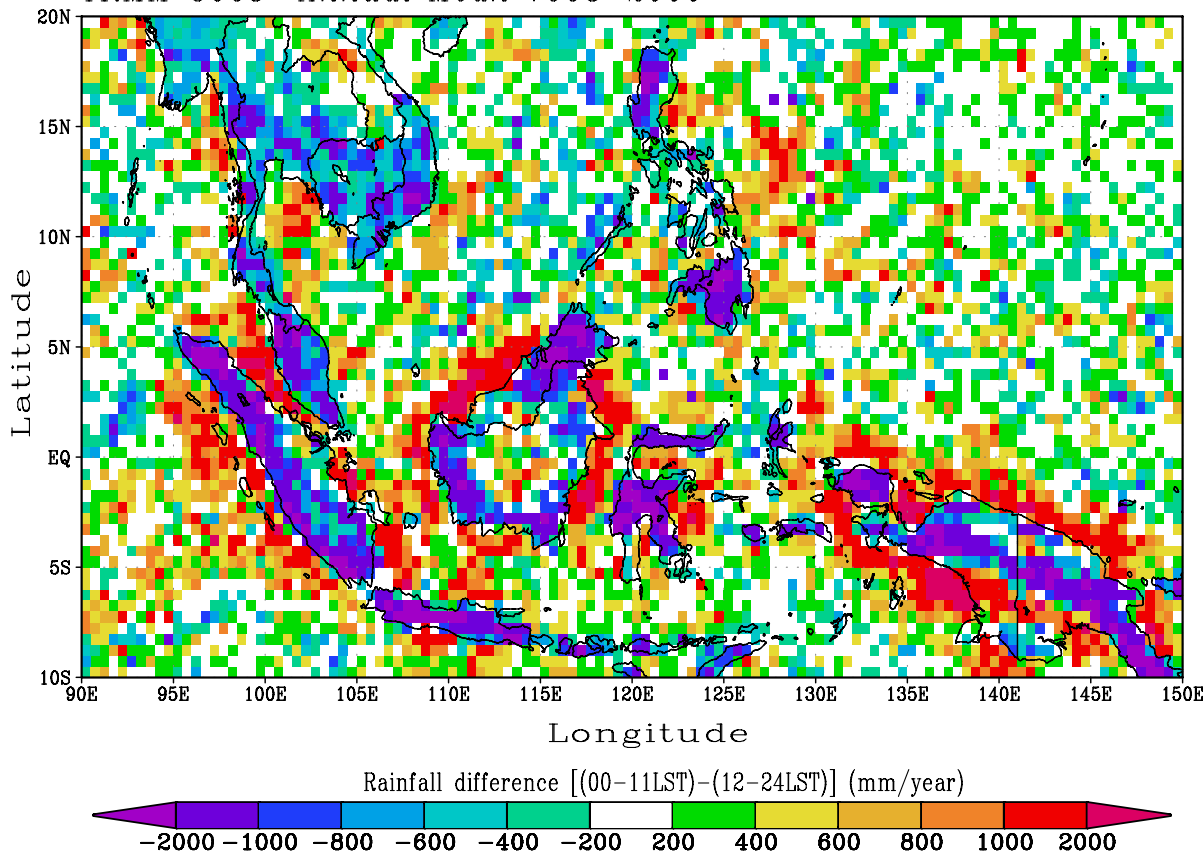
# 水循環 と 海大陸



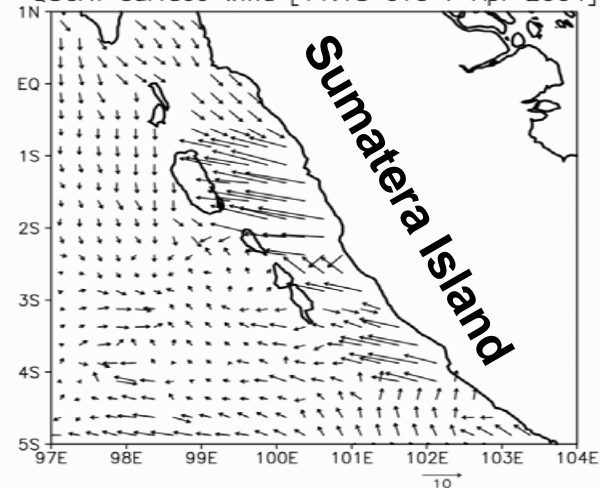
# 海大陸の日周期変動と“Coastal Zones”

- 大気／海洋大循環・気候に対する海大陸の実効的大きさを決める
- 海大陸陸上起源の大気・水・物質拡散／循環(生物圏・人間活動の直接影響範囲)
- 短周期水循環(海面蒸発量＝降水量)
- 海洋構造、混合層・温度躍層

TRMM 3G68 Annual Mean 1998-2000



QSCAT surface wind [11:18 UTC 7 Apr 2004]



(Wu et al., 2007, submitted to *JAS*)

(Mori et al., 2004, *MWR*)

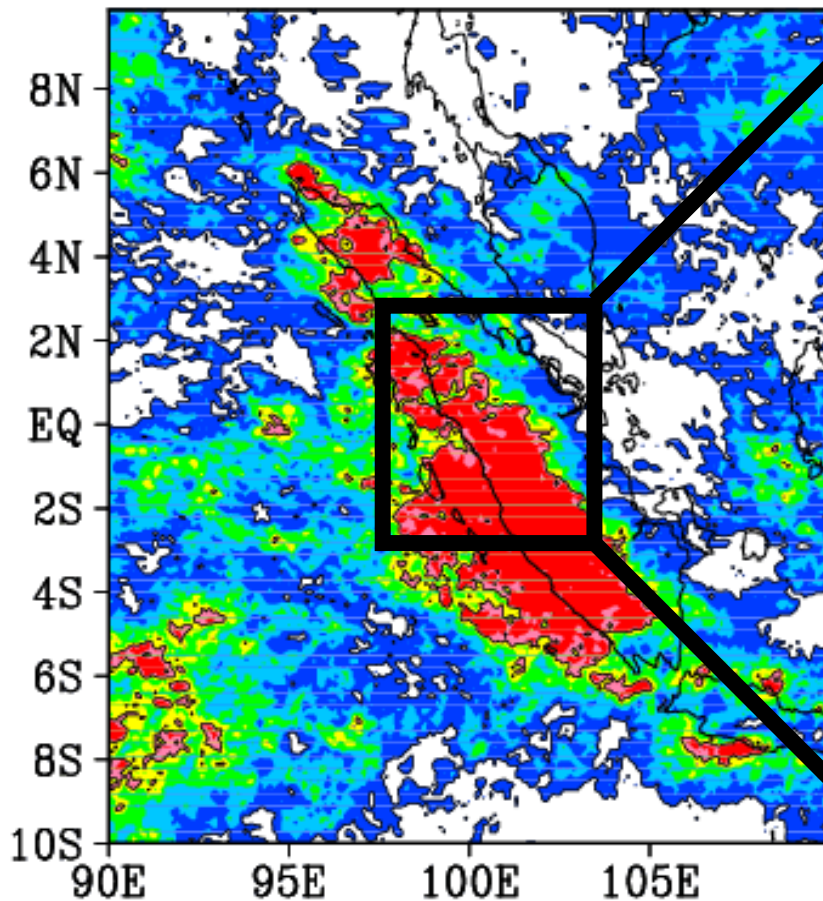
# Giant Diurnal Cycle over Sumatera

(Single station obs.: Renggono et al., 2001, *AG*; Murata et al., 2002, *JMSJ*; Wu et al., 2003, *JAM*)

## Satellite Observation

(Mori et al., 2004, *MWR*;  
Sakurai et al., 2005, *JMSJ*)

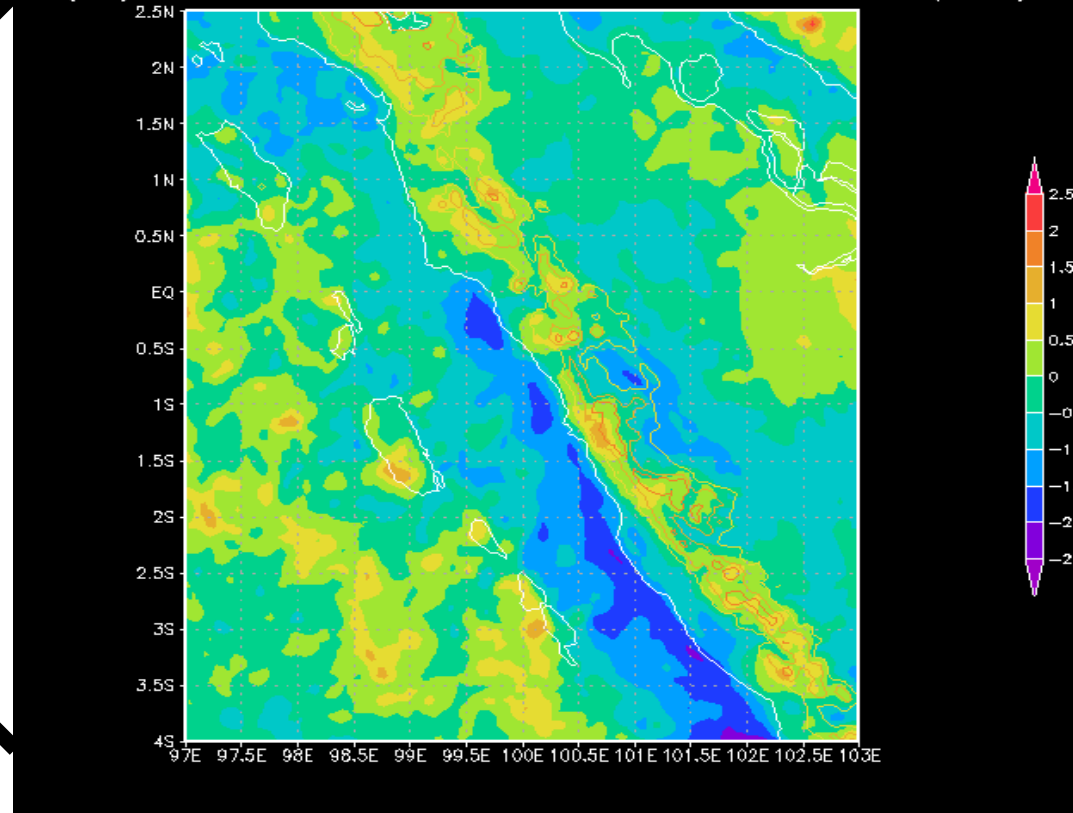
00 LST



## Numerical Modeling

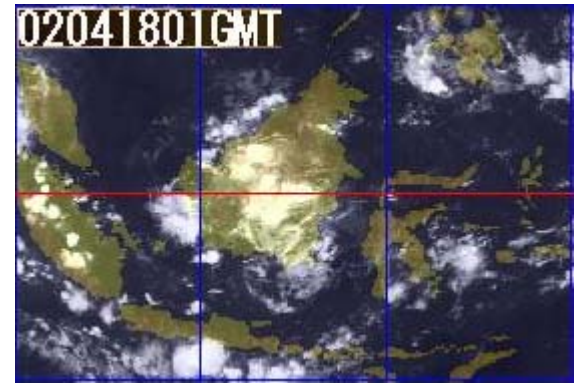
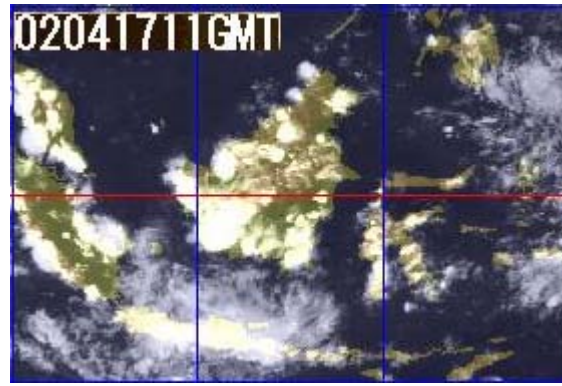
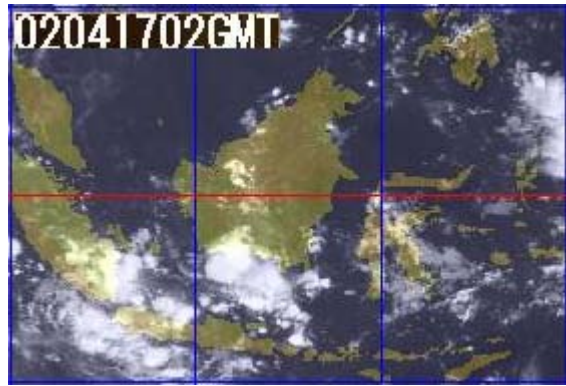
(Sasaki et al., 2004, *GRL*;  
Wu et al., submitted to *JAS*)

13(LT) at 105E PWV Deviation from Mean (mm)

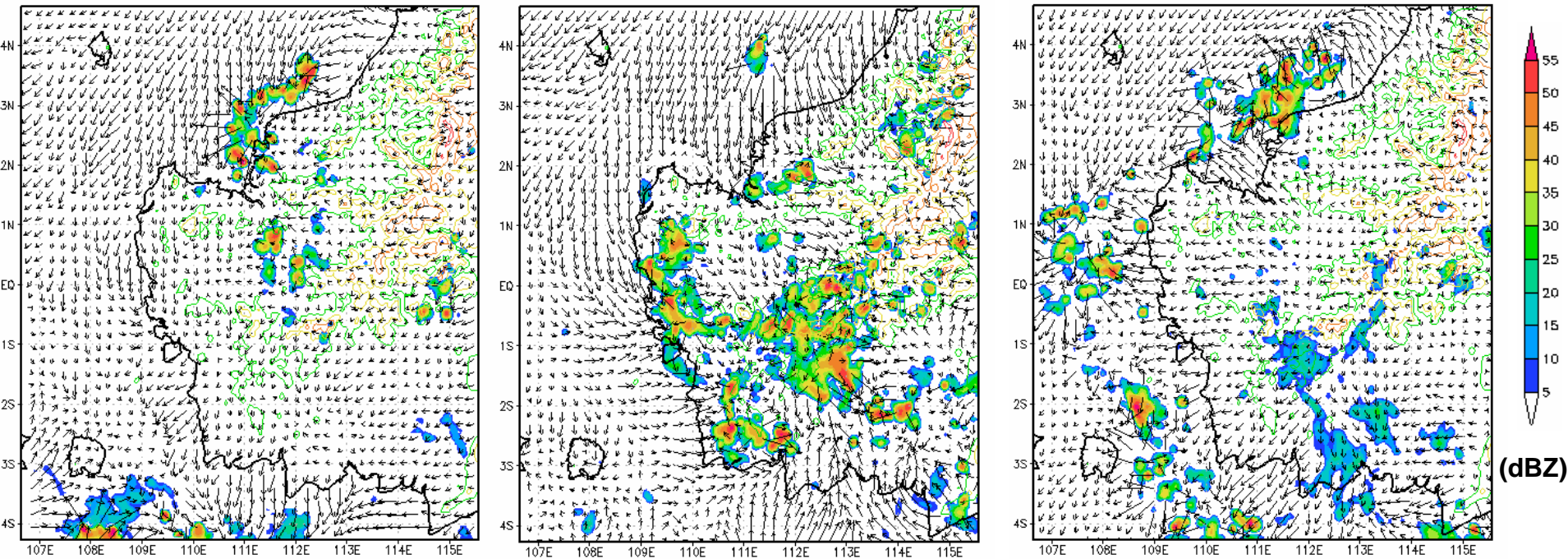




# Diurnal Cycle over Kalimantan



2002/04/17 09 LT cref, surface wind 2002/04/17 18 LT cref, surface wind 2002/04/18 08 LT cref, surface wind



<MM5による2002年4月のシミュレーション>

(Wu et al., 2007, in preparation)

GMSにより得られた対流日変化をきわめてよく再現 The model is successful.

島の存在と対流活動が作る局地循環 location and timing of convections handled well.

雨季であっても陸上では

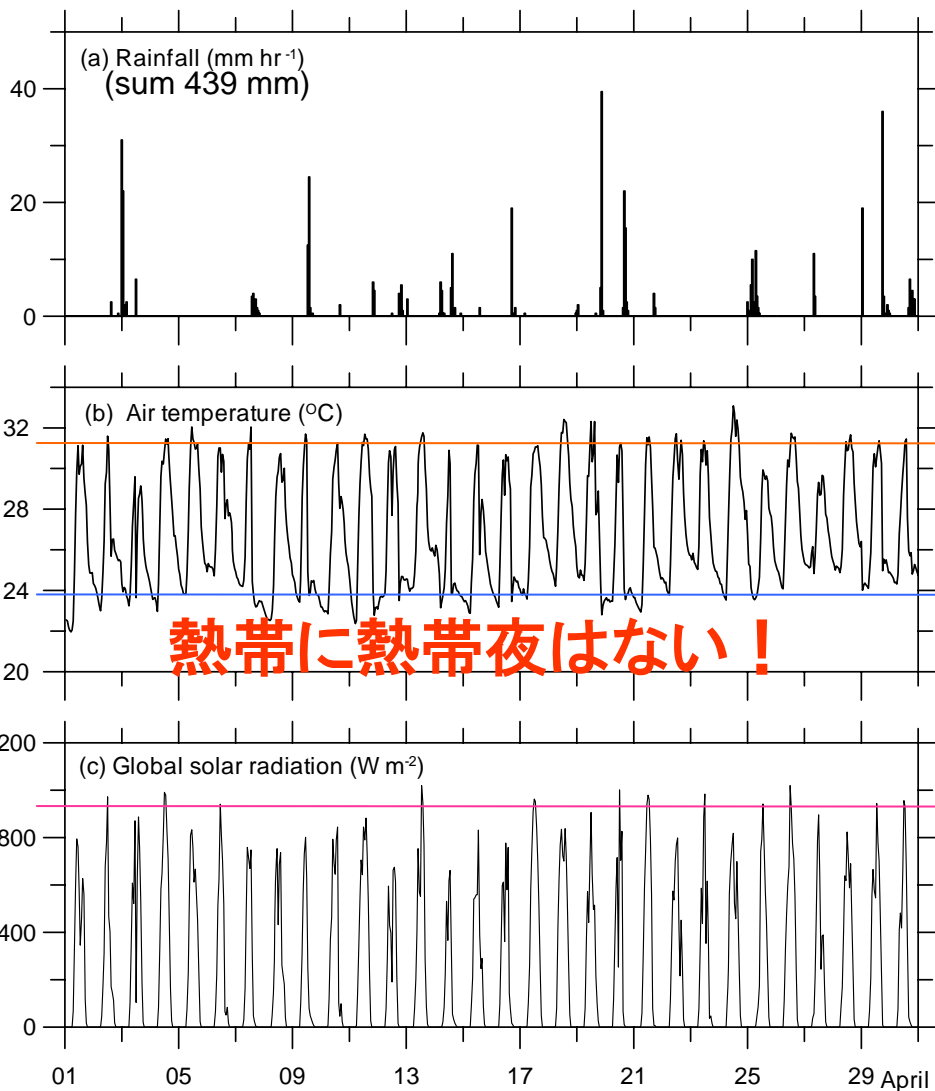
朝方の晴れ上がり、  
日射最強

↓  
午後の対流雲活発化、  
海風「的」循環、  
陸向き水蒸気輸送

↓  
夜の強い降雨、  
エアロゾル洗浄、  
大気透明度リセット

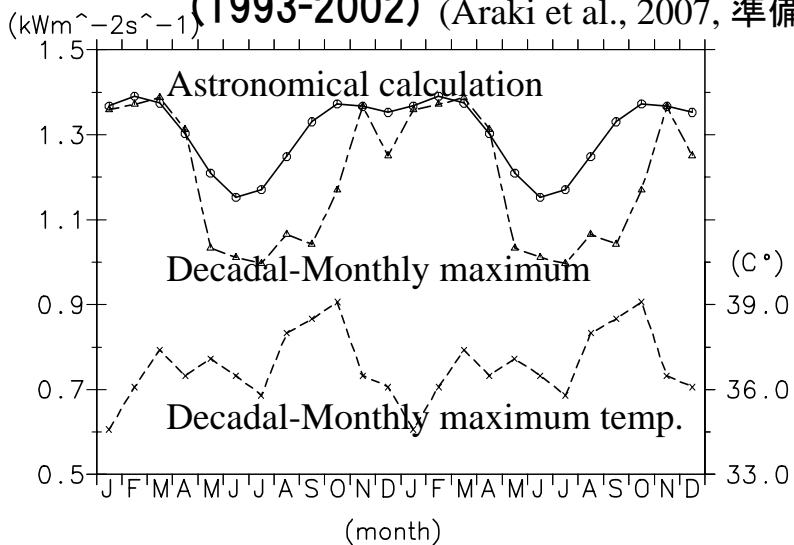
## 自励的な雨季の日変化

カリマンタン島Pontianak雨量・気温・全天日射  
(2002年4月の例) (Wu et al., 2007, 準備中)

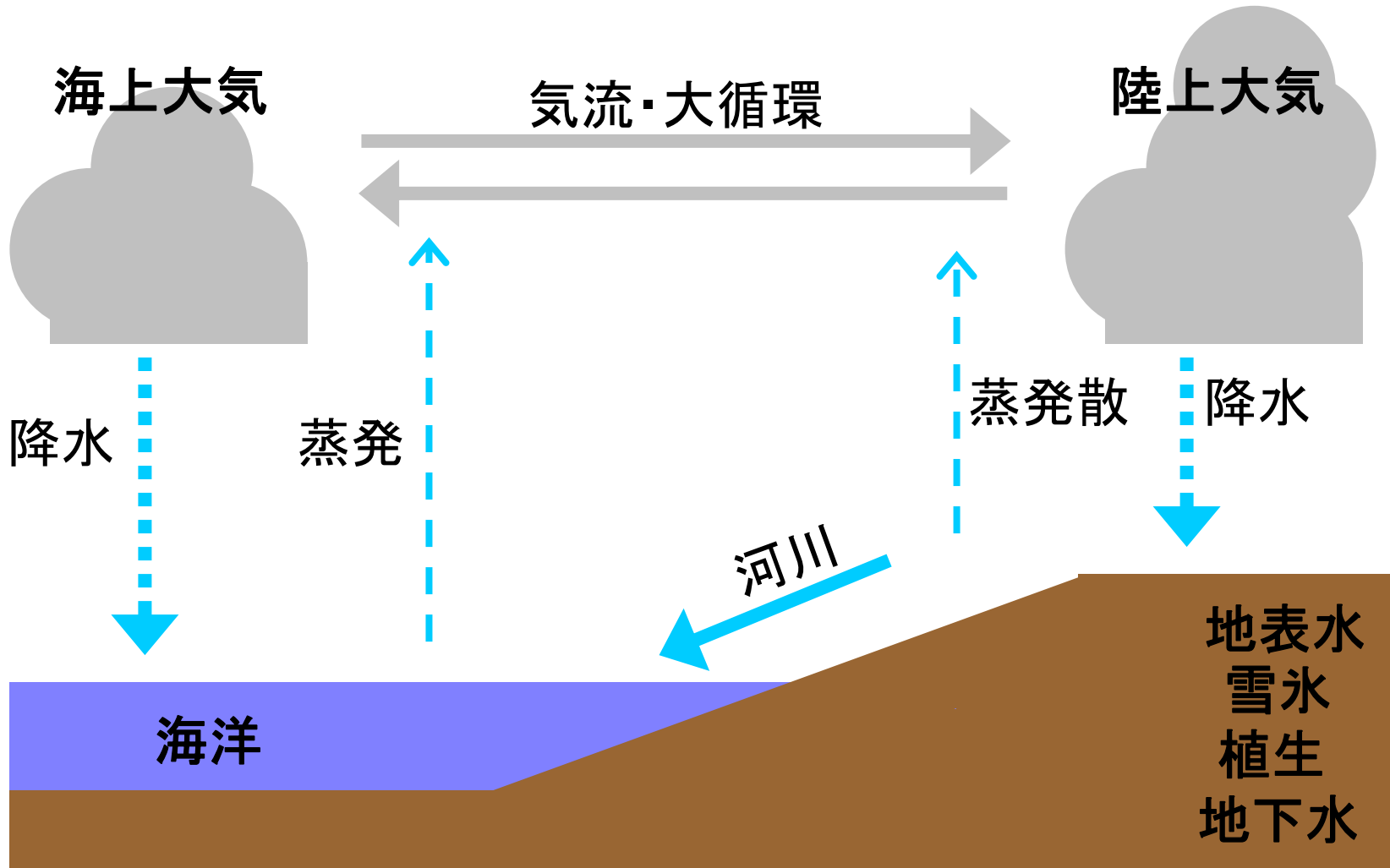


ジャワ島Serpong11-13LT日射

(1993-2002) (Araki et al., 2007, 準備中)



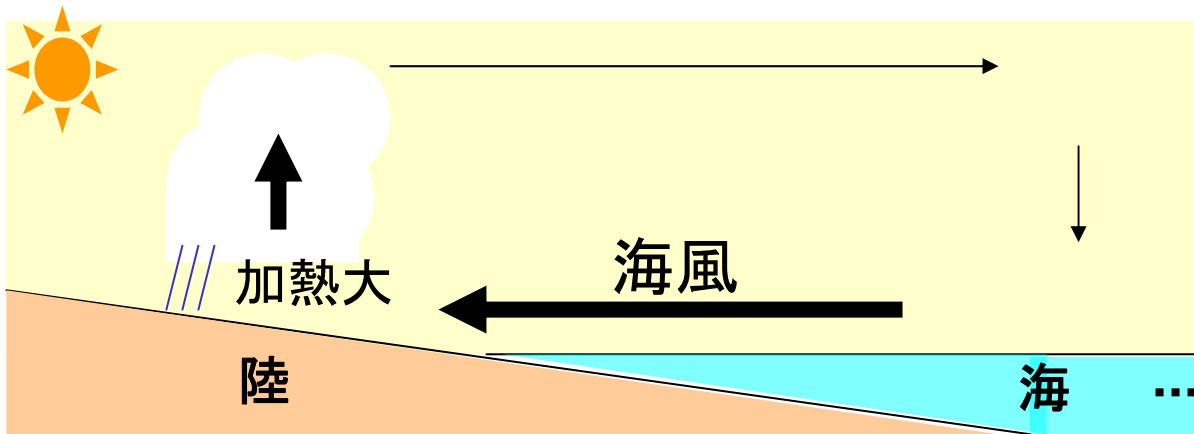
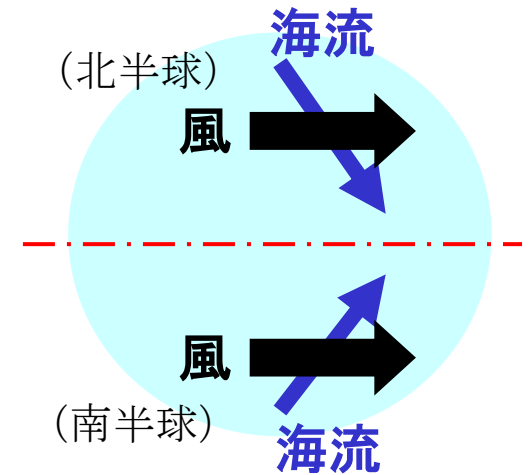
# “Coastal Zone”の水収支(未完成)



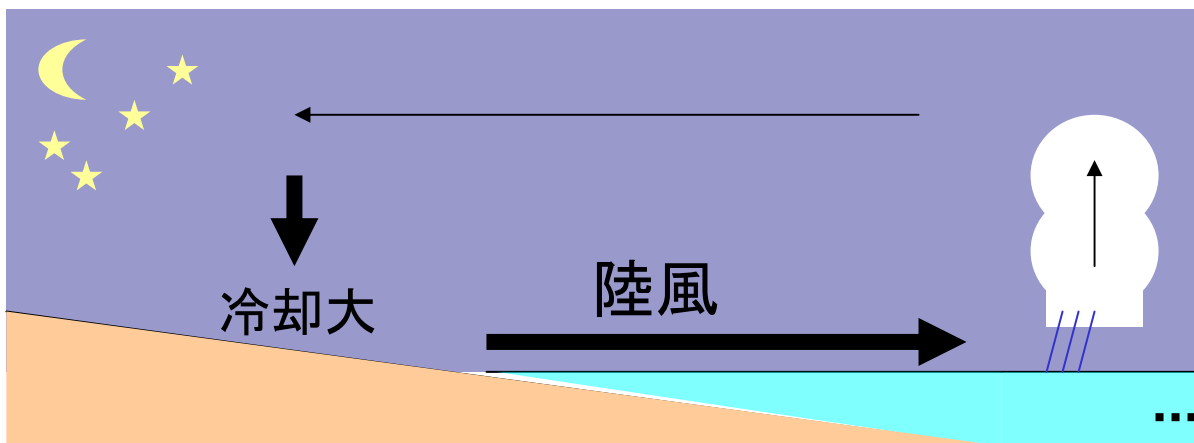


# “Coastal Zone”における大気海洋相互作用

- 大気運動方程式系：  
熱力学方程式 = 加熱  
水蒸気連続式 = 蒸発 - 降水
- 海洋運動方程式系：  
水平運動方程式 = 吹送  
熱力学方程式 = 塩分



蒸発促進  
岸向き吹送  
(西岸：赤道向き  
東岸：極向き)  
塩分濃縮



蒸発抑制  
沖向き吹送  
(西岸：極向き  
東岸：赤道向き)  
塩分希釈

# 日射加熱(緯度と時間(季節・地方太陽時)の関数)

太陽定数 $S_0$ , 平均公転半径(天文単位) $d_0$ , 太陽距離 $d$ ,

$$Q = S_0 \left( \frac{d_0}{d} \right)^2 \cos \theta_s$$

$$\left( \frac{d_0}{d} \right)^2 = 1.000110 + 0.034221 \cos \frac{2\pi t}{1\text{year}} + 0.000719 \cos 2 \frac{2\pi t}{1\text{year}} + \Lambda$$

$$+ 0.001280 \sin \frac{2\pi t}{1\text{year}} + 0.000077 \sin 2 \frac{2\pi t}{1\text{year}} + \Lambda$$

太陽天頂角  $\theta_s$ 、太陽赤緯(太陽天頂南中緯度)  $\varphi_s$

$$\cos \theta_s = \sin \varphi_s \sin \varphi + \cos \varphi_s \cos \varphi \cos \tau \quad (-\tau_0 \leq \tau \leq \tau_0)$$

$$\varphi_s = 0.006918 - 0.399912 \cos \frac{2\pi t}{1\text{year}} - 0.006758 \cos 2 \frac{2\pi t}{1\text{year}} - \Lambda$$

$$+ 0.070257 \sin \frac{2\pi t}{1\text{year}} + 0.000907 \sin 2 \frac{2\pi t}{1\text{year}} + \Lambda$$

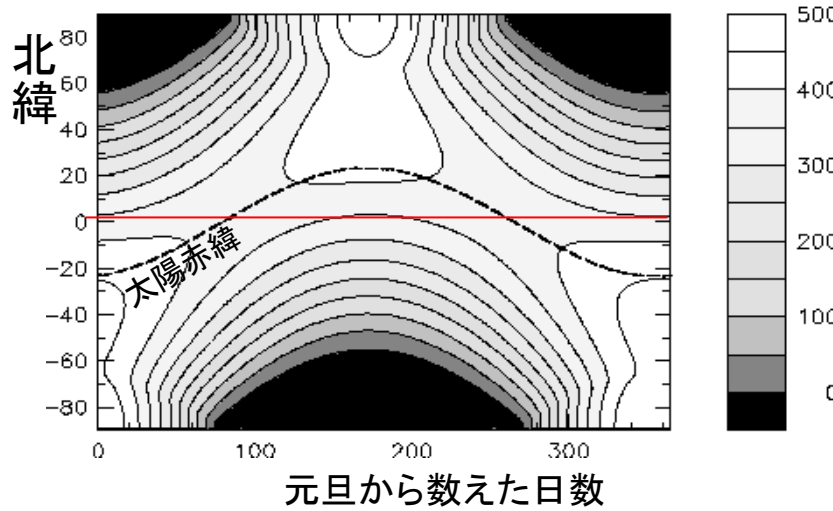
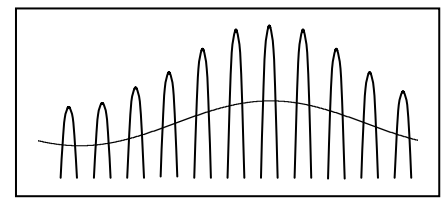
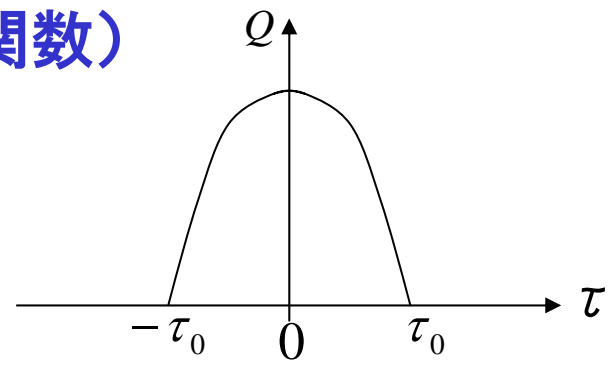
正午(太陽南中時刻)からの時間  $\tau$ , 日没時刻  $\tau_0$

$$\cos \tau_0 = -\tan \varphi_s \tan \varphi$$

日平均値

$$\bar{Q}^{\text{daily}} \equiv \frac{\int_{-\tau_0}^{\tau_0} Q d\tau}{\int_{-\pi/2}^{\pi/2} d\tau} = \frac{S_0}{\pi} \left( \frac{d_0}{d} \right)^2 \left( \sin \varphi_s \cdot \tau_0 \sin \varphi + \cos \varphi_s \cdot \sin \tau_0 \cos \varphi \right)$$

赤道反対称                      赤道対称

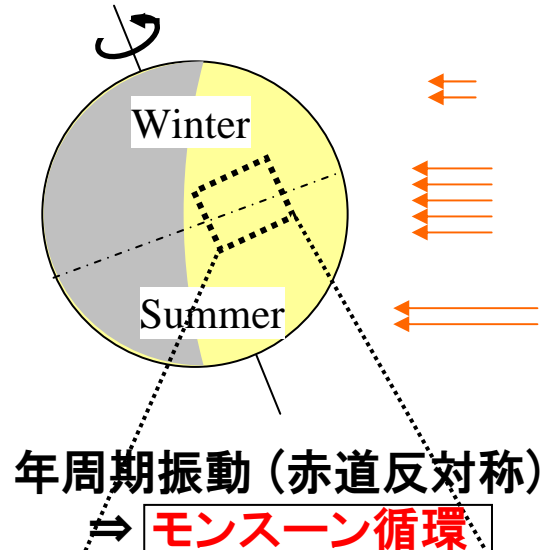
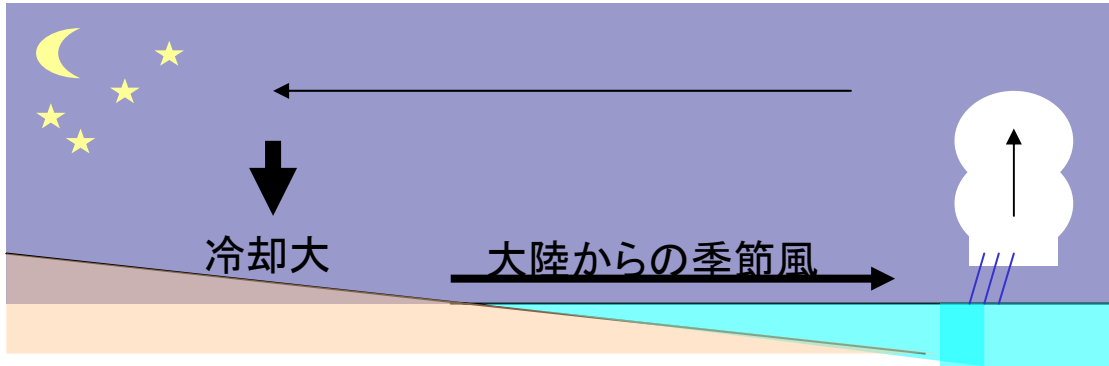


# “惑星的”モンスーン

(夏冬半球間の日射加熱差による軸対称全球規模子午面循環)

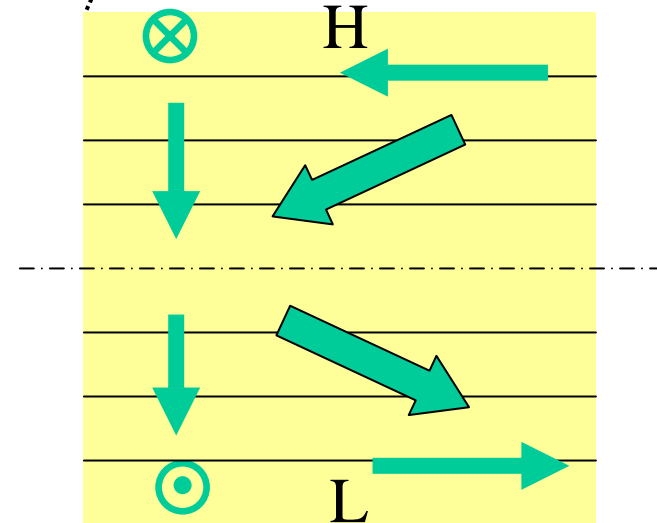
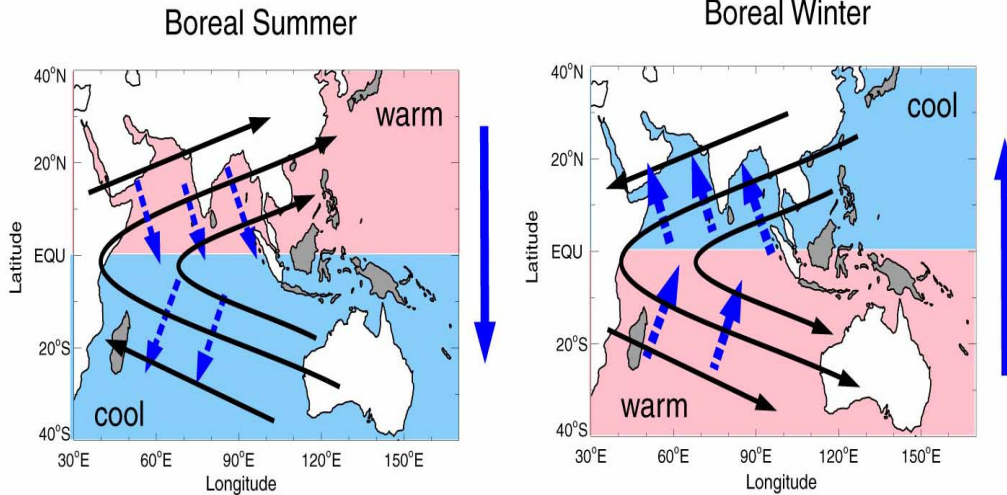
## “地球的”モンスーン

(大規模海陸風)



## モンスーンと海洋の相互作用

(Webster, 1999)



# 季節変化

夏冬半球間  
大陸海洋間

モンスーン循環

↓↑

雨季

夏半球＋海大陸, 等

年々

Interannual

日射不均一

風

↓↑

雲

変質例

変動

# 日変化

(山谷間)  
海陸間

局地循環

↓↑

夕立

海風卓越, 等

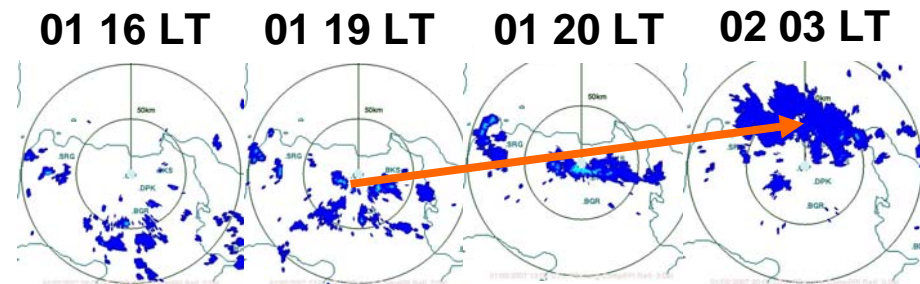
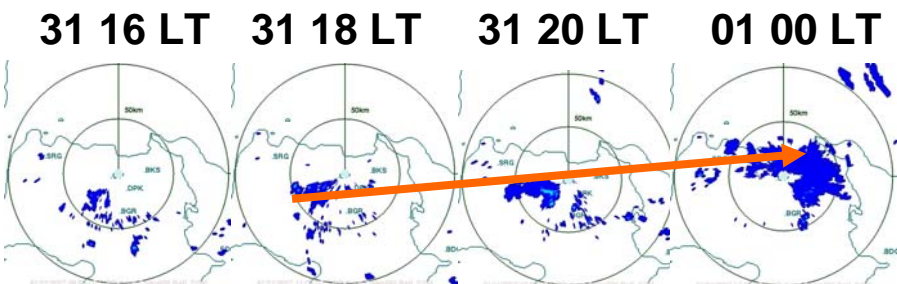
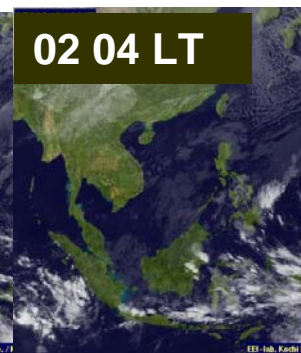
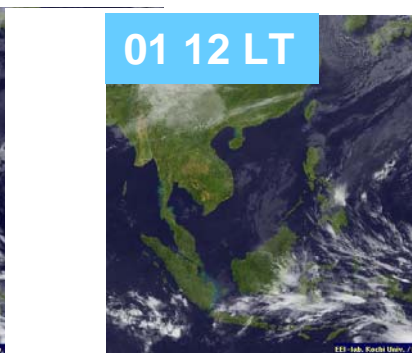
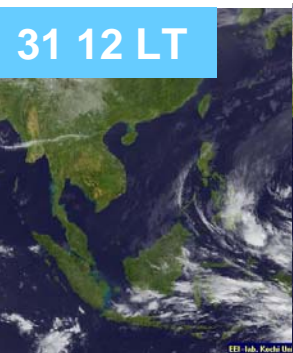
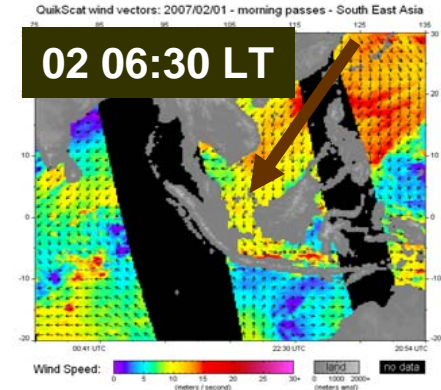
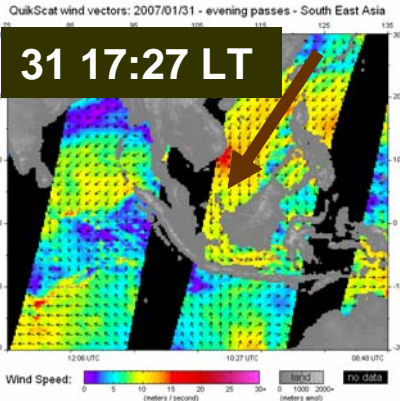
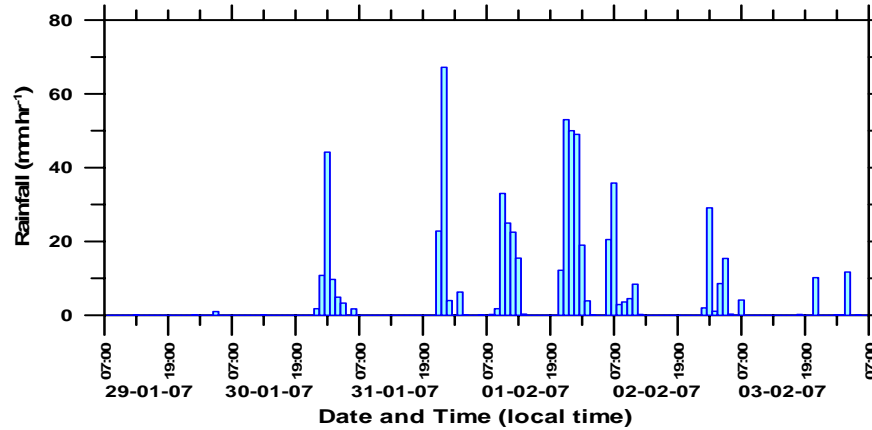
日々

Intraseasonal

# 日周期とモンスーンとの相乗効果 (07年1~2月ジャカルタ豪雨の例)

(Wu et al., 2007, 準備中)

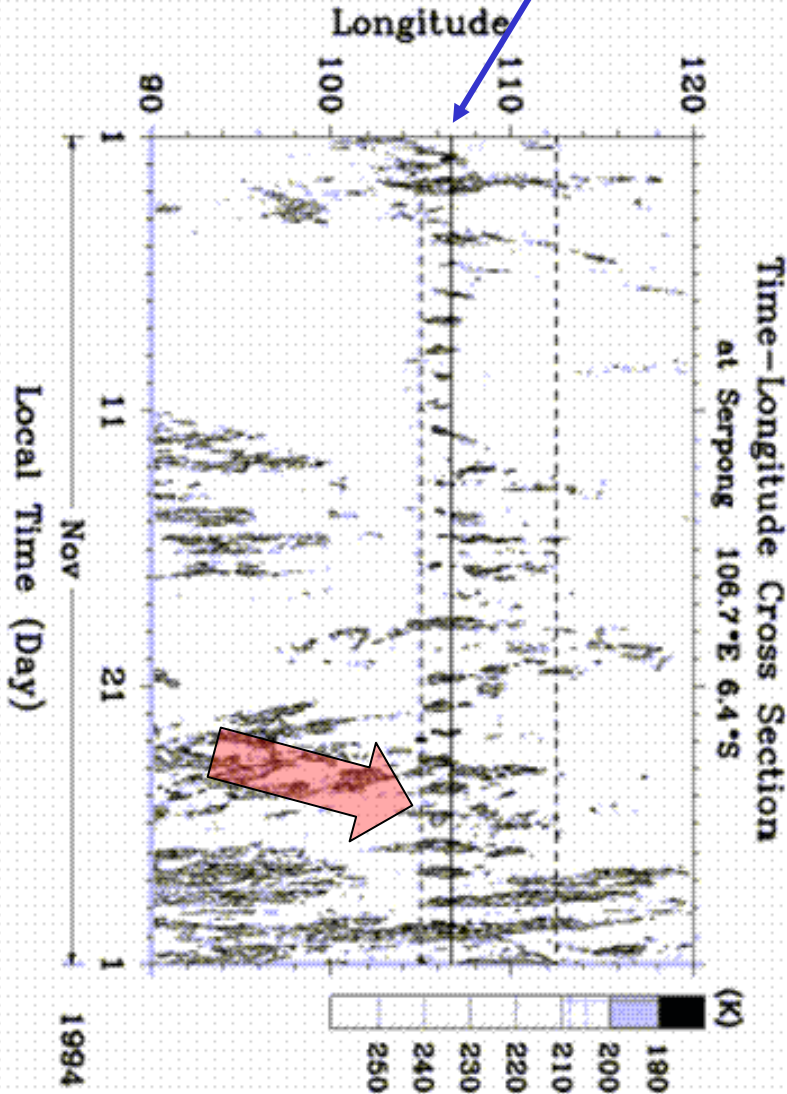
Pondok Betung Observatory (Jakarta)



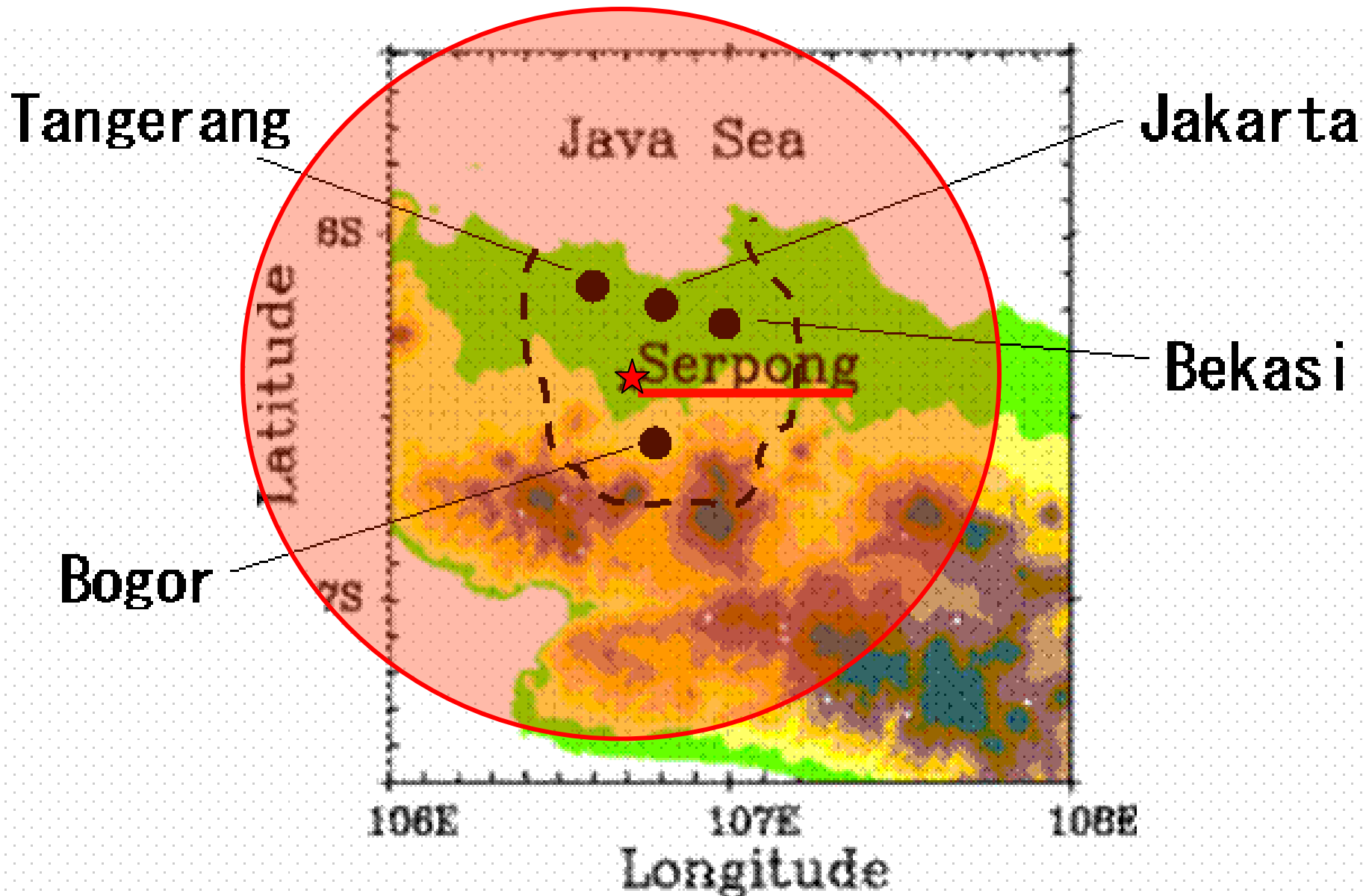


# CDR transferred from NICT

To be re-installed near **Jakarta**,  
an area of most dominant  
**ISV-diurnal cycle interactions**



# HARIMAU Serpong CDR and JABOTABEC



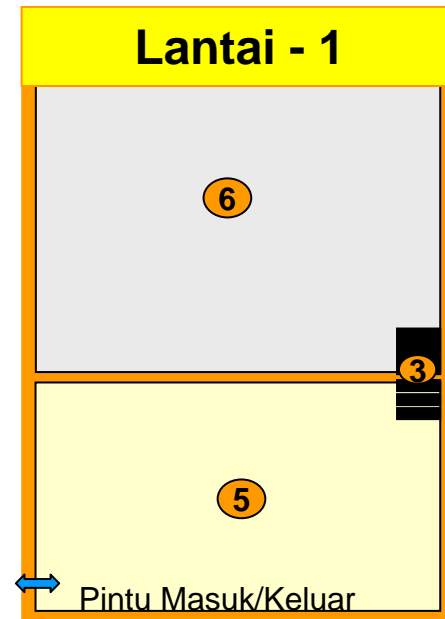
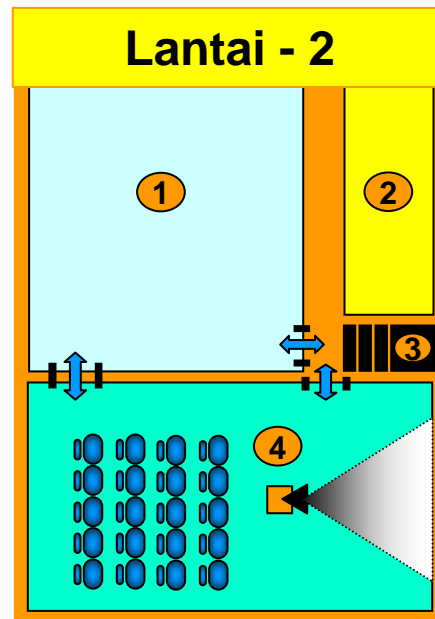
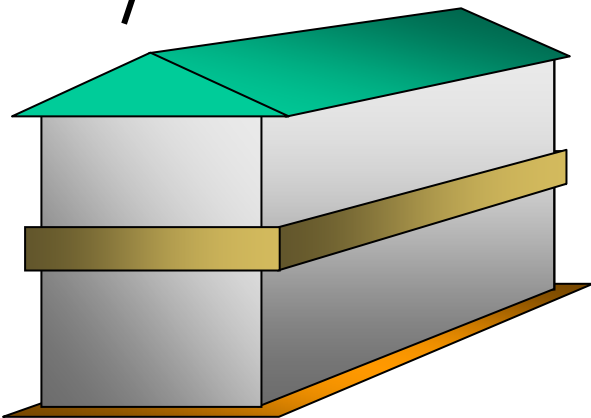
# Planned HARIMAU HQ

GEOTECH  
PUSPIPTEK/Serpong  
(constructed in 2008)



BLR (a WPR since 1992)  
with AWS

CDR (installed in 2007)



1. Ruang Kerja
2. Gudang Peralatan
3. Tangga
4. Ruang seminar
5. Kantor
6. Ruang Serbaguna