

# 衛星データと現場観測に見られる ヤマセ雲の特徴について

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## 衛星観測からわかること

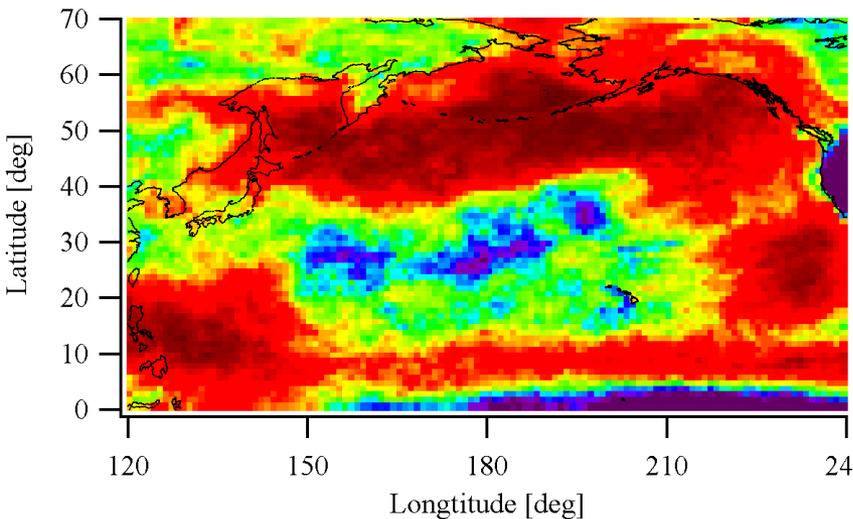
- 雲量(面積)
- 光学的厚さ
- 雲頂高度(気圧／温度)
- 雲粒有効半径(雲頂付近)
- 雲水量
- 雲の幾何学的厚さ
- 水と氷の判別、氷粒子の種類判別
- 放射収支(雲頂、大気上端、地表面での短波放射・長波放射は難あり)
  
- 広い領域をカバー
- 時間分解能の限界

## 地上(船舶)観測からわかること

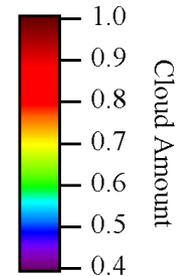
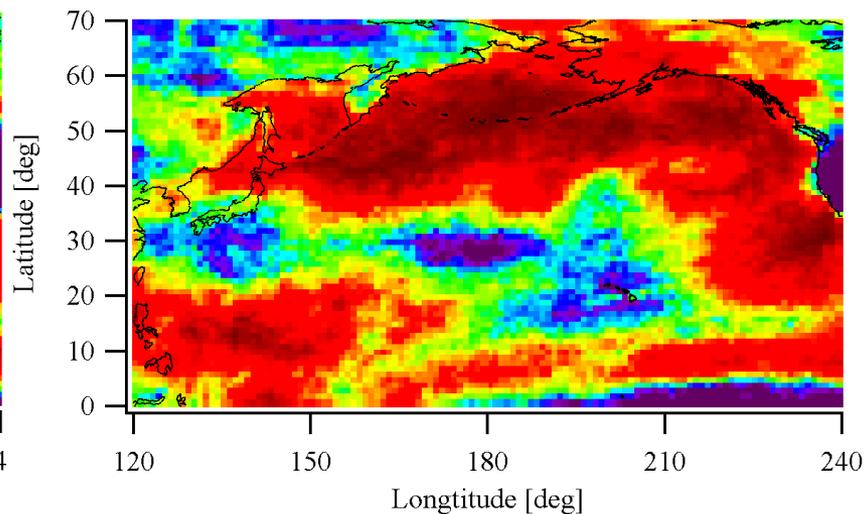
- 雲量(時間)
- 光学的厚さ
- 雲底高度(気圧／温度)
- 雲粒有効半径(用いる測器により定義は異なる)
- 雲水量
- 雲の幾何学的厚さ(雲レーダーがない場合は光学的に薄い雲のみ)
- 水と氷の判別、氷粒子の種類判別(巻雲が直接観測される場合)
- 放射収支(地上での短波、長波放射)
- 気温、湿度の鉛直プロファイル
  
- 1点または測線上での観測
- 連続観測

# 7月の雲量(2000~2003)

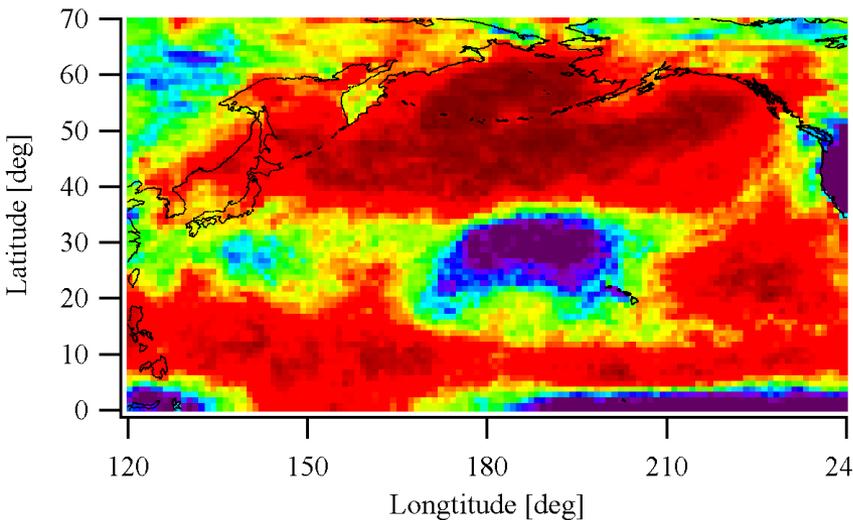
MODIS Cloud Amount ('00/07)



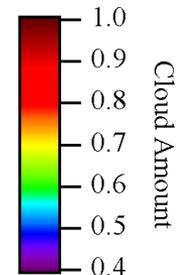
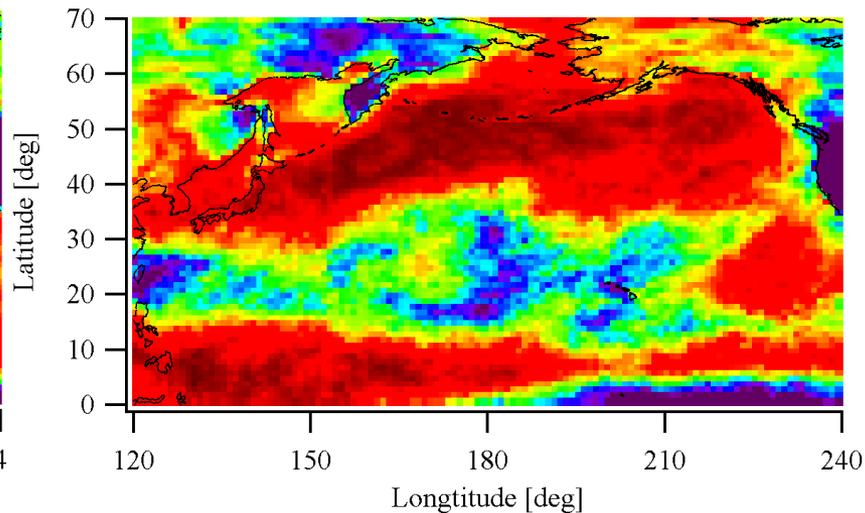
MODIS Cloud Amount ('01/07)



MODIS Cloud Amount ('02/07)

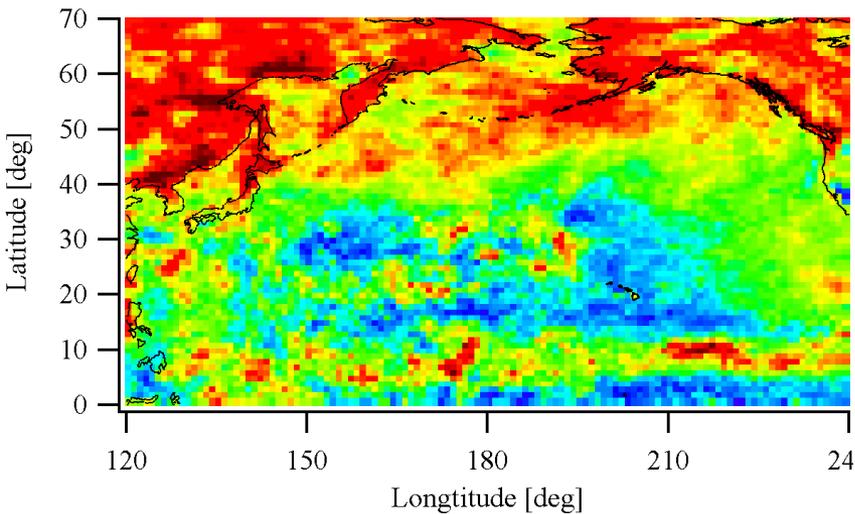


MODIS Cloud Amount ('03/07)

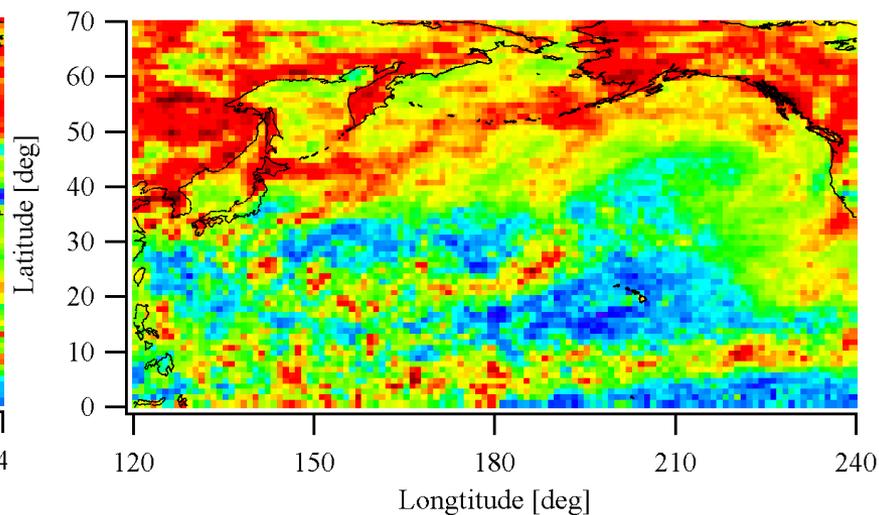


# 7月の雲の光学的厚さ(2000~2003)

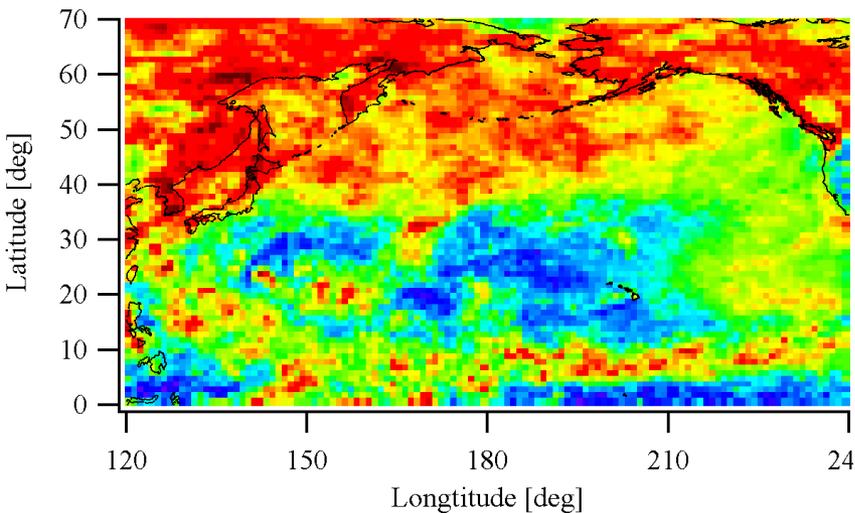
MODIS Cloud Optical Thickness ('00/07)



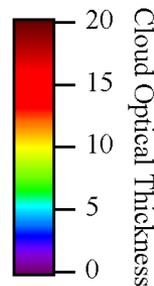
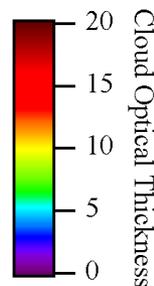
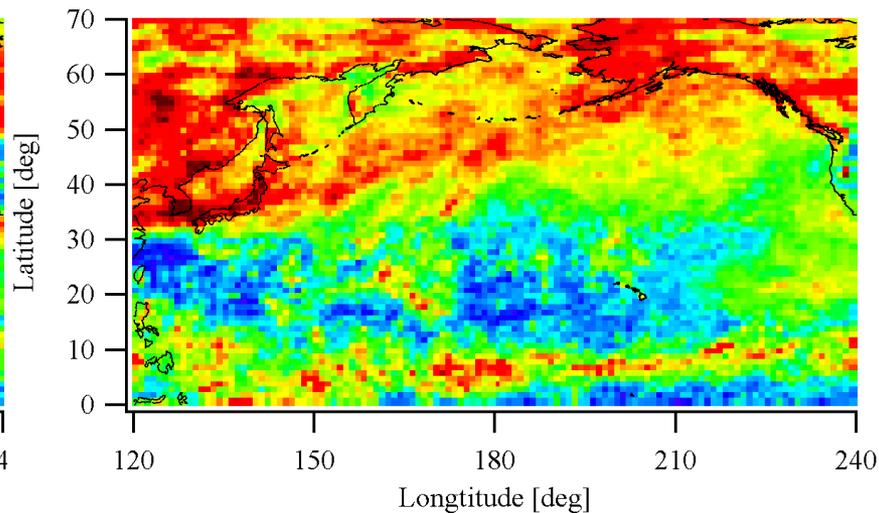
MODIS Cloud Optical Thickness ('01/07)



MODIS Cloud Optical Thickness ('02/07)

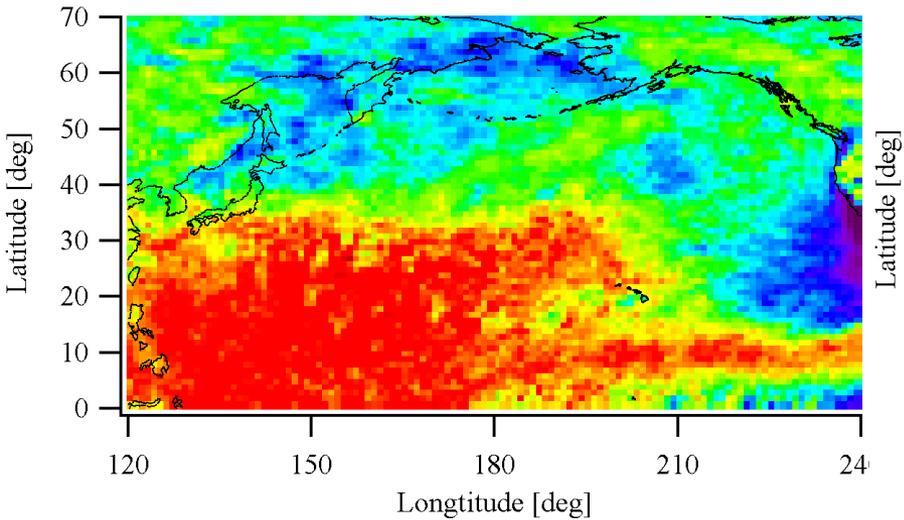


MODIS Cloud Optical Thickness ('03/07)

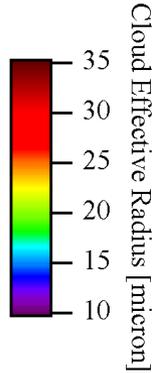
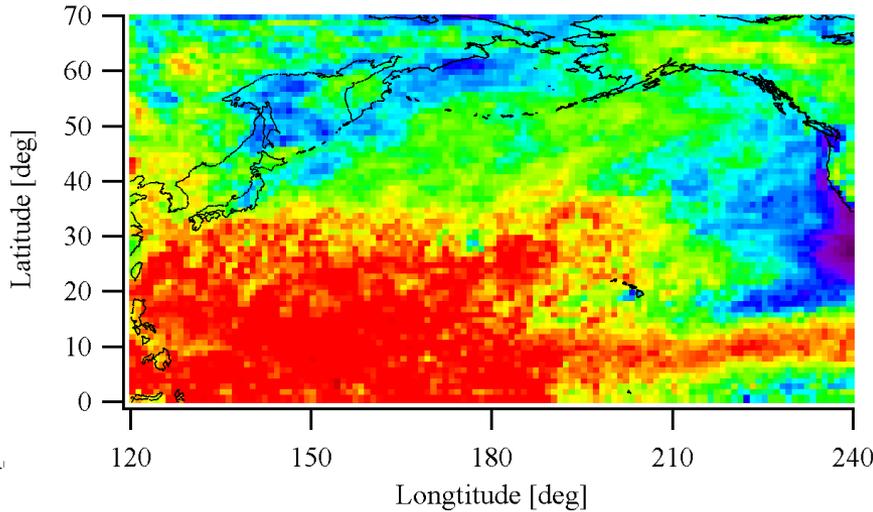


# 7月の雲粒有効半径(2000~2003)

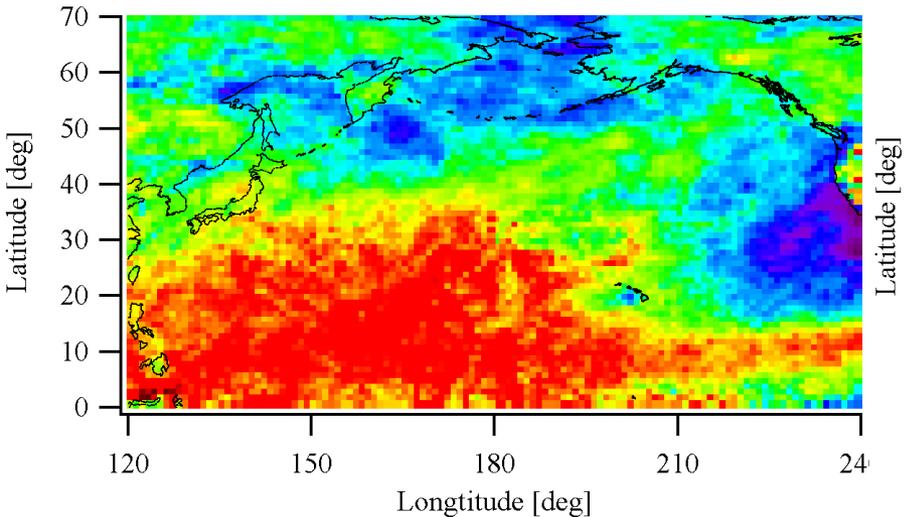
MODIS Cloud Effective Radius ('00/07)



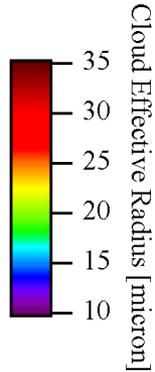
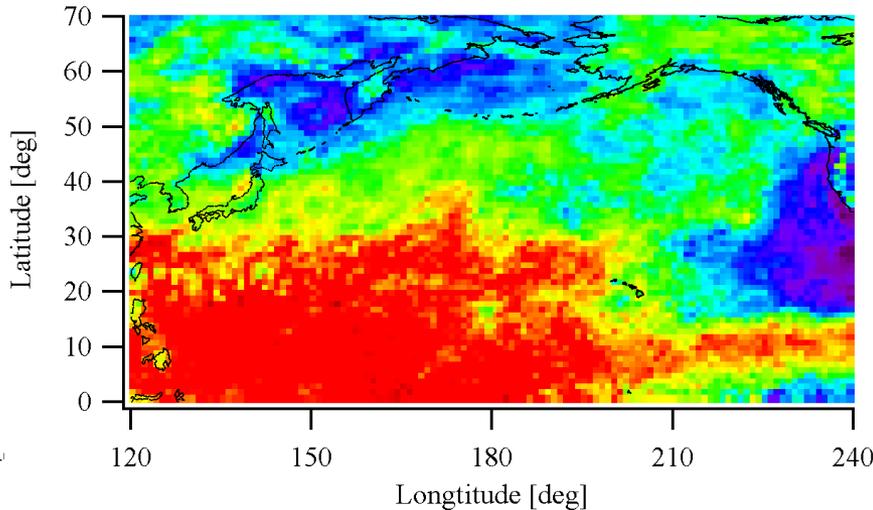
MODIS Cloud Effective Radius ('01/07)



MODIS Cloud Effective Radius ('02/07)

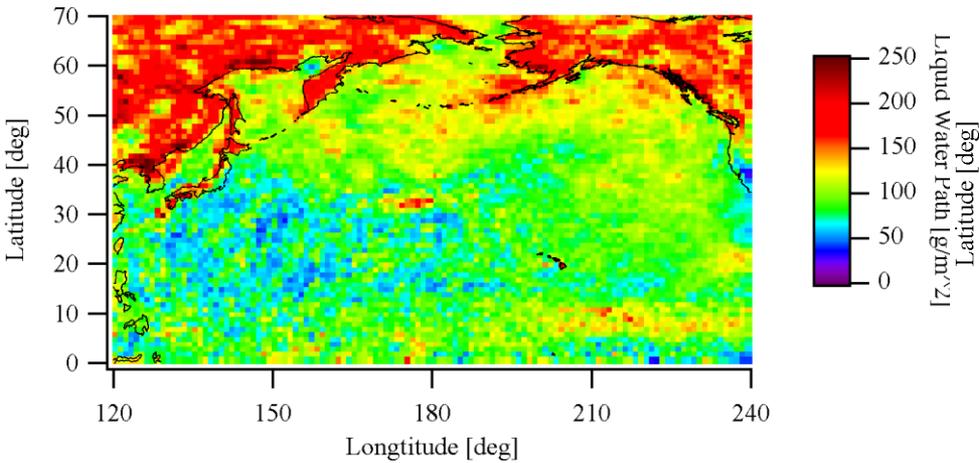


MODIS Cloud Effective Radius ('03/07)

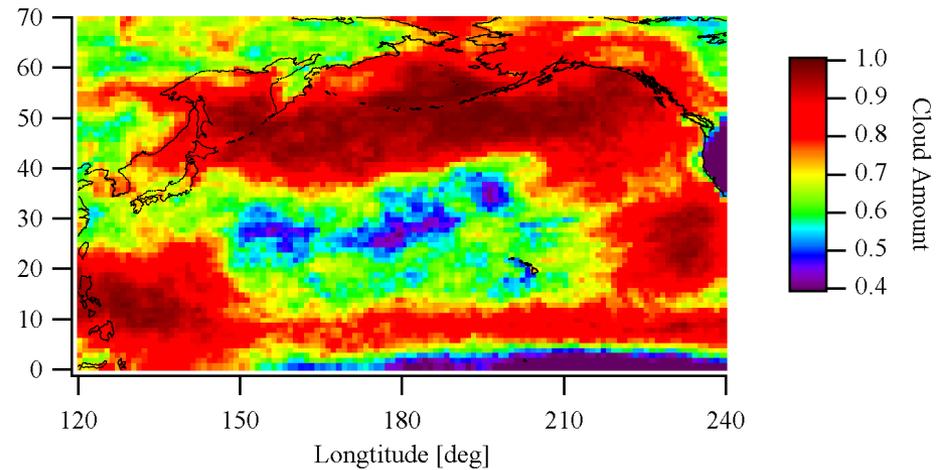


# 鉛直積算雲水量 (2000年7月)

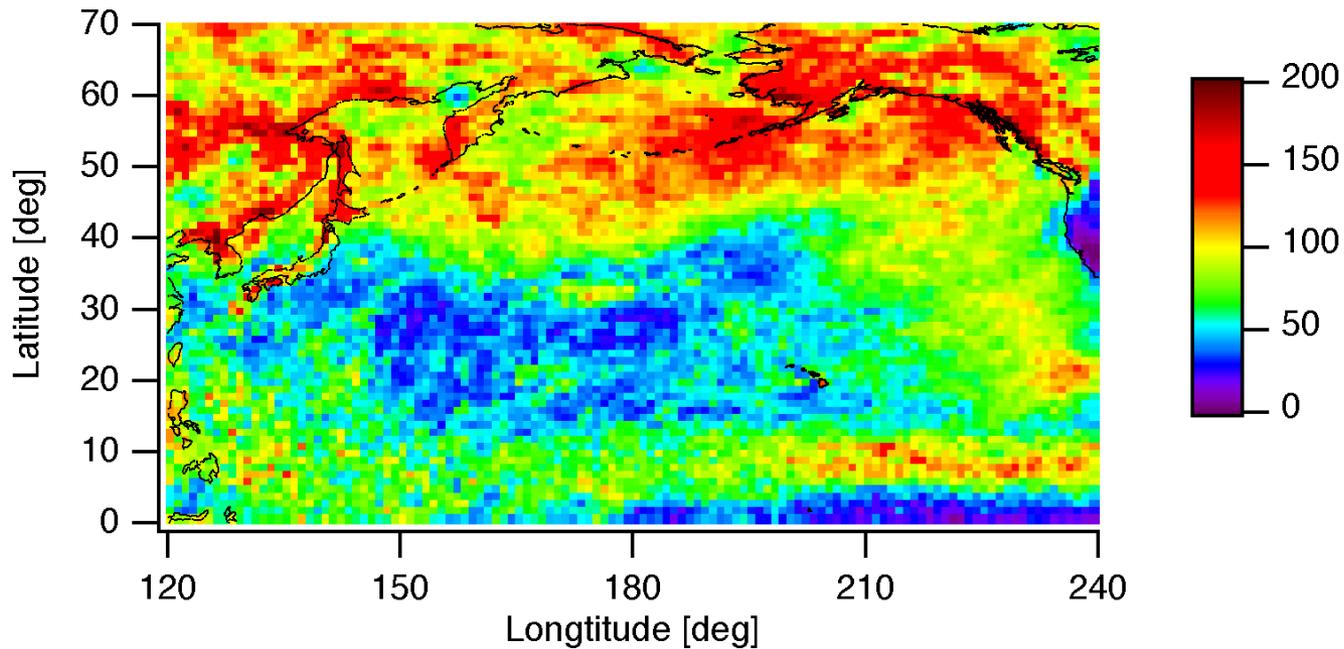
MODIS Liquid Water Path ('00/07)



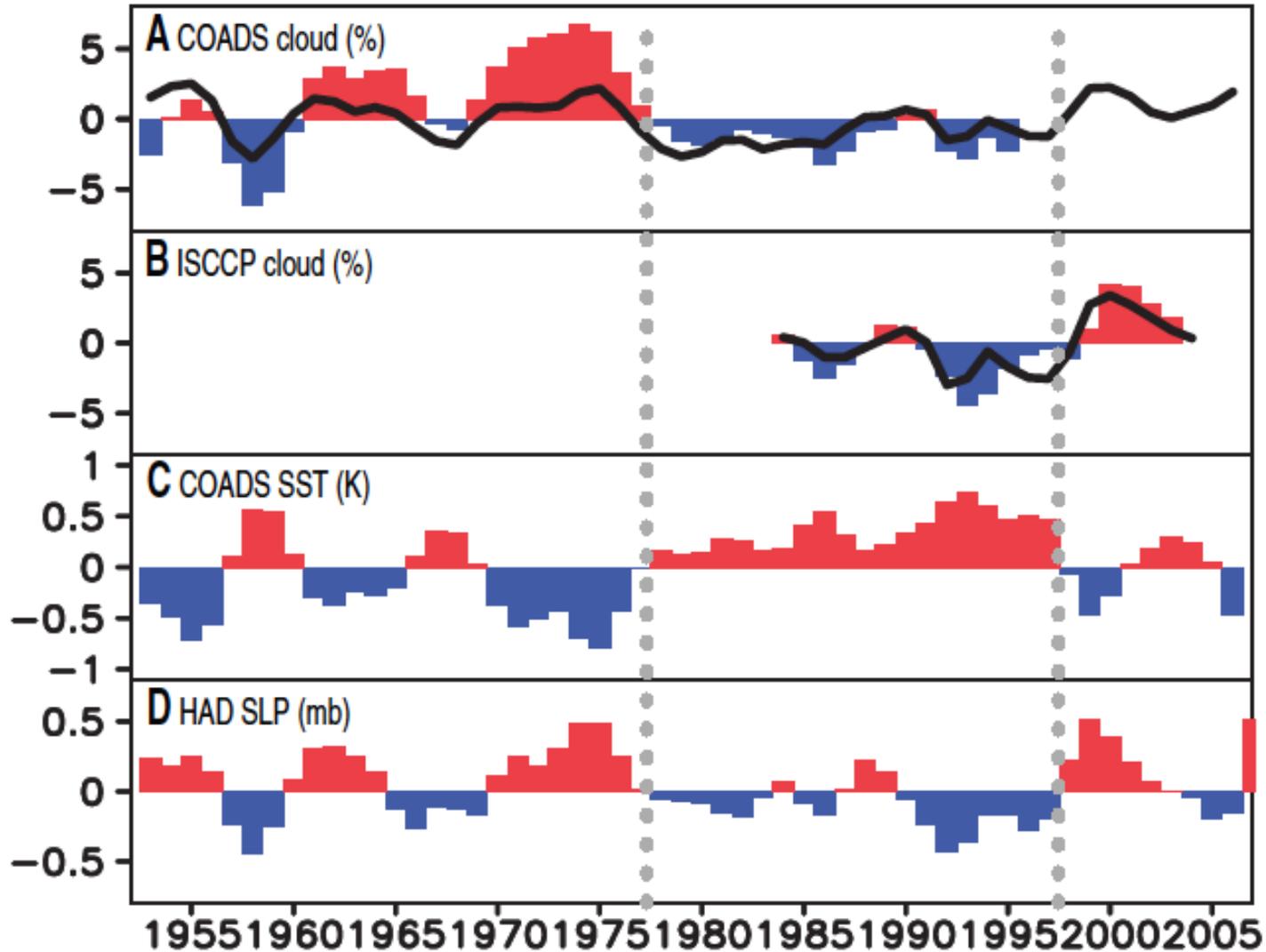
MODIS Cloud Amount ('00/07)



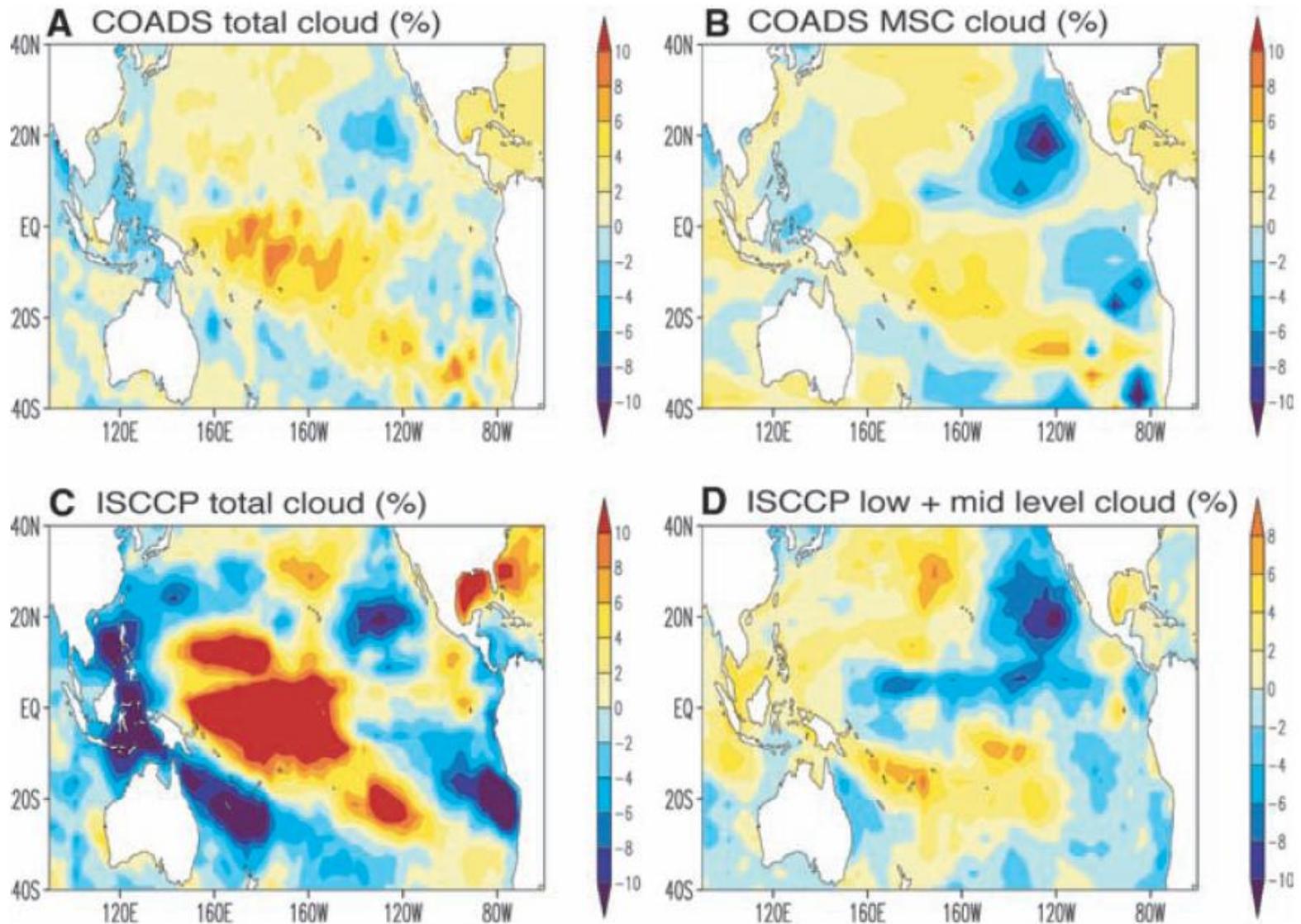
MODIS Cloud Amount x Liquid Water Path ('00/07)



# 雲量と海面水温 (SST)、海面気圧 (SLP) の関係

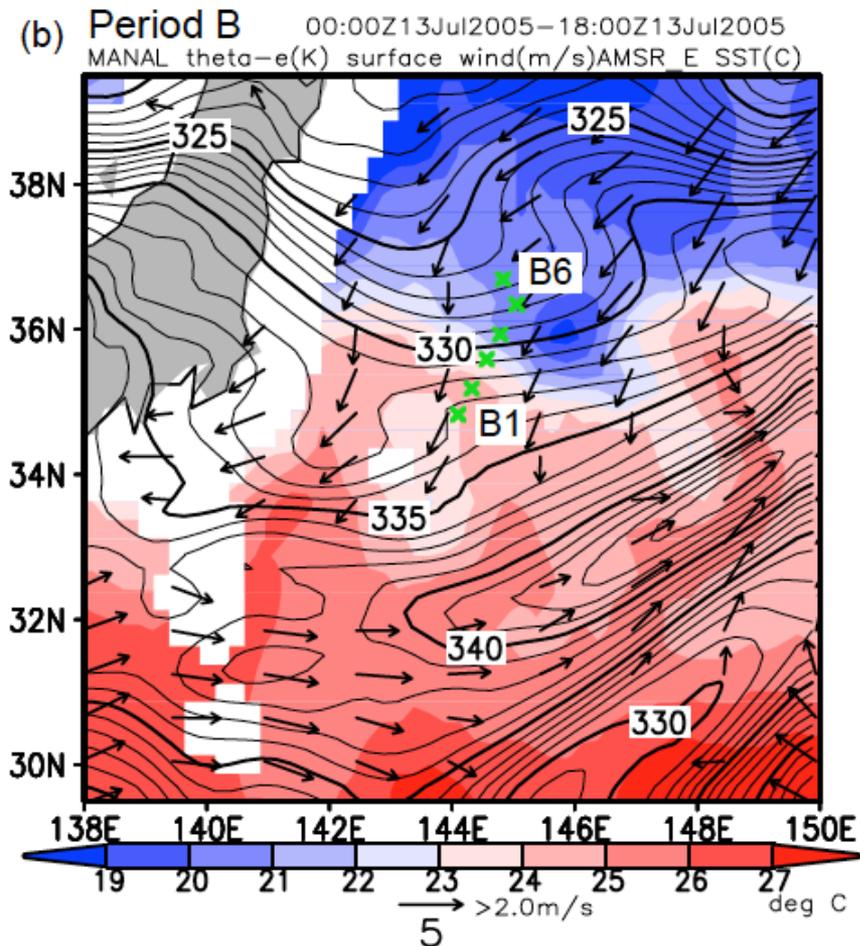
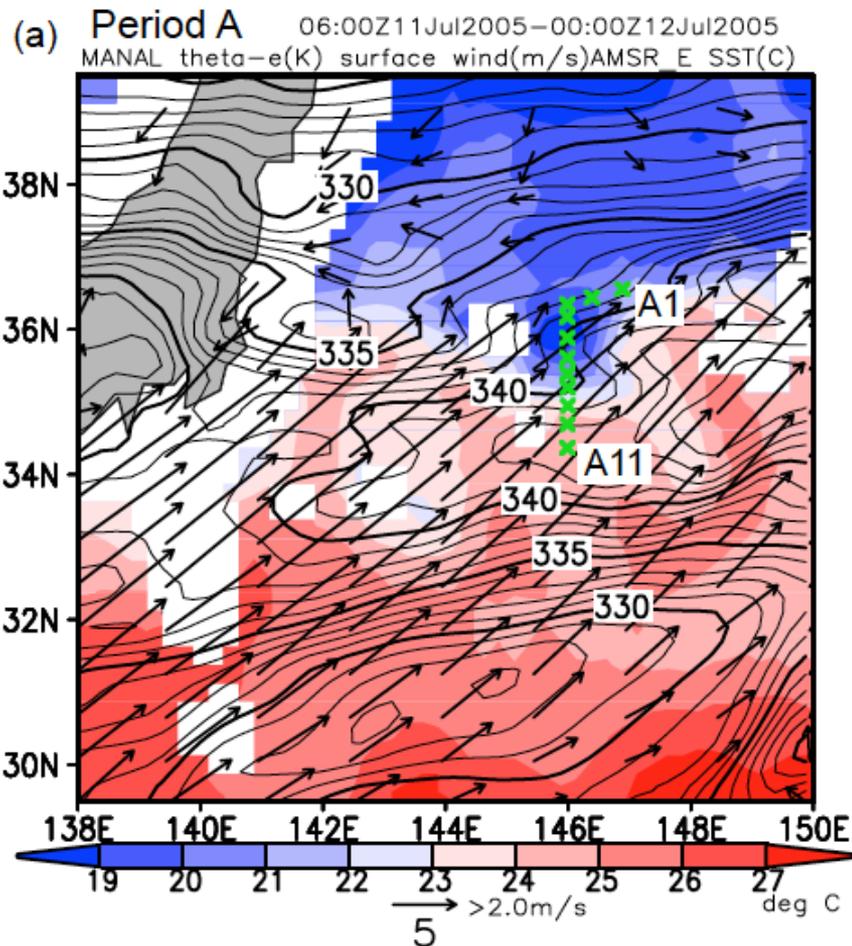


# 雲量と海面水温 (SST)、海面気圧 (SLP) の関係



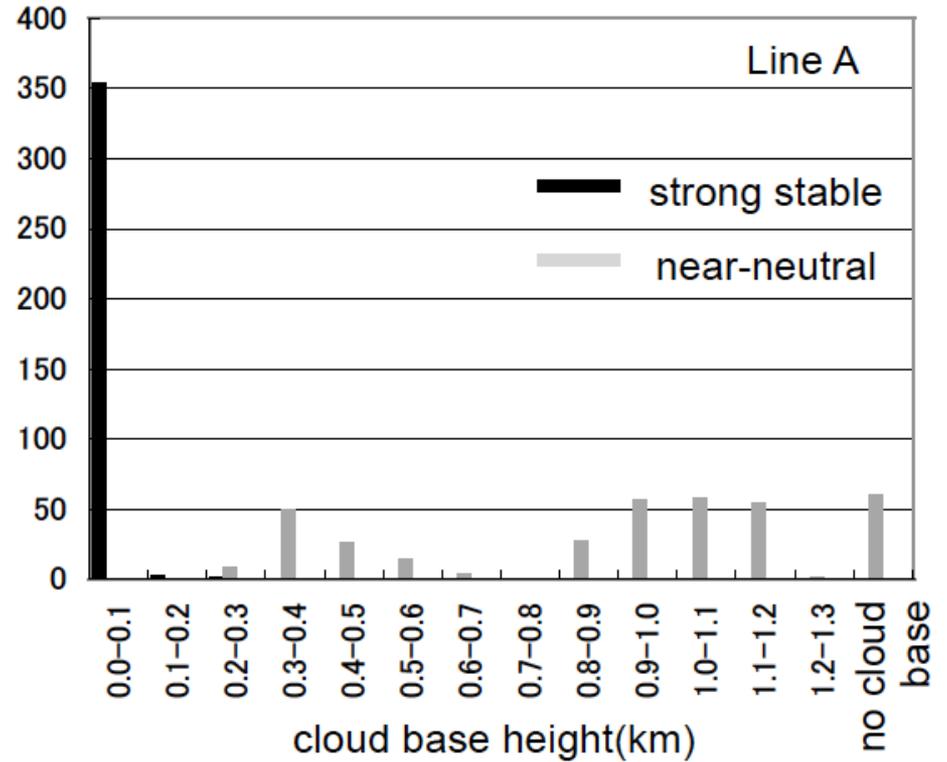
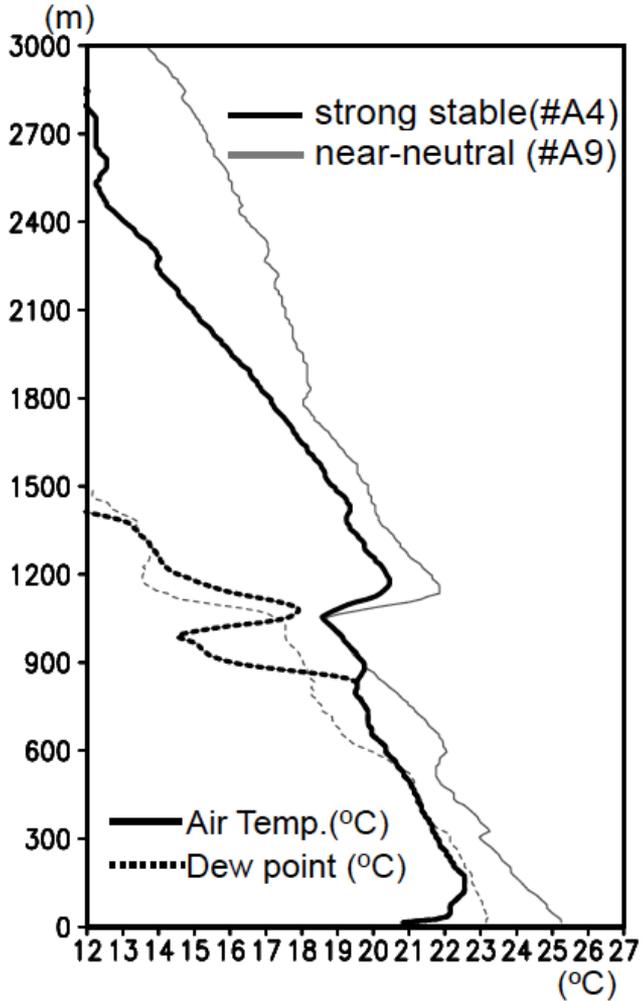
(Clement et al., Science2009)

# ヤマセ雲の船舶観測例



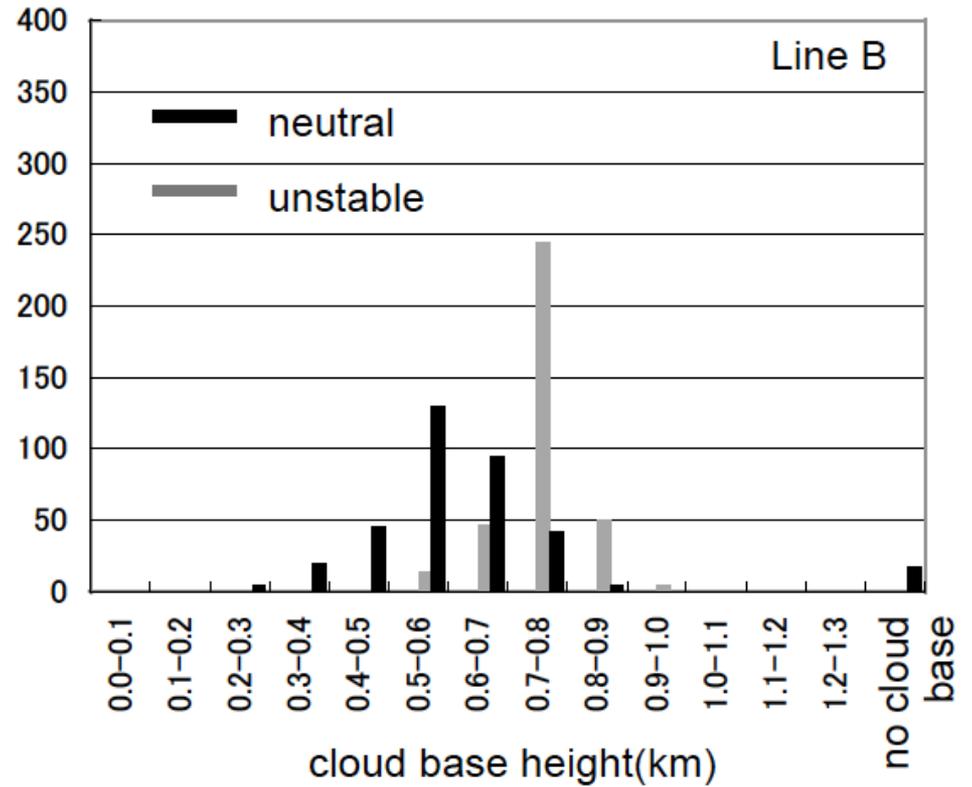
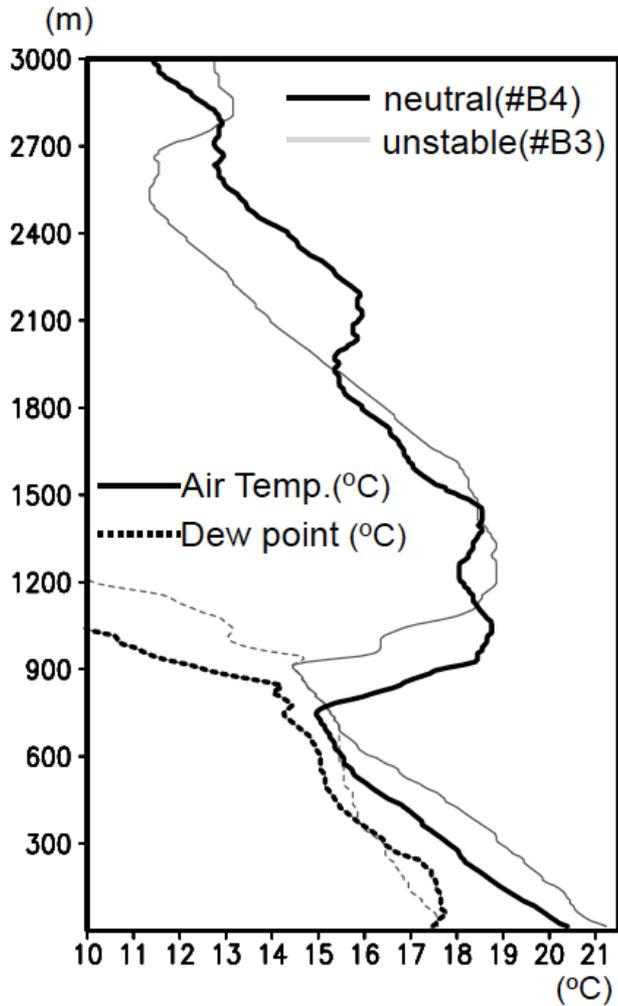
(Tanimoto et al., JC2009)

# 大気の安定度と雲底高度(1)



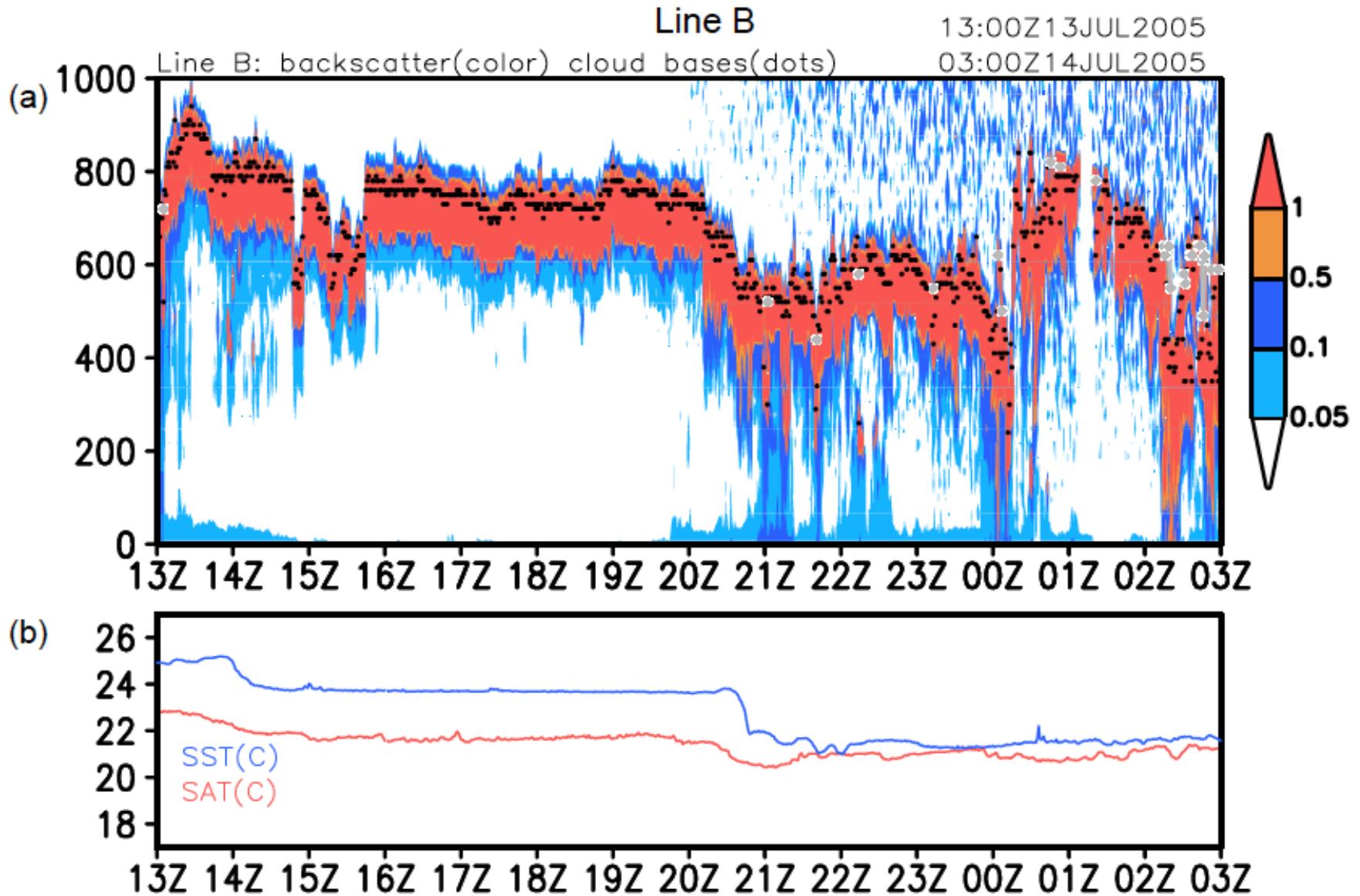
(Tanimoto et al., JC2009)

## 大気の安定度と雲底高度(2)



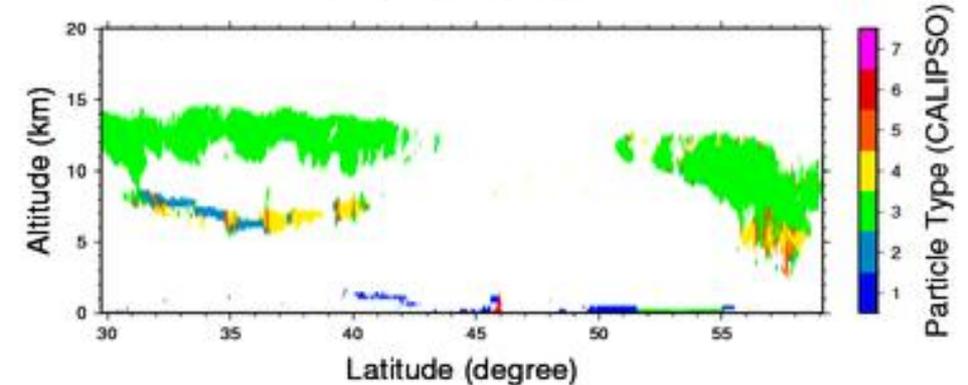
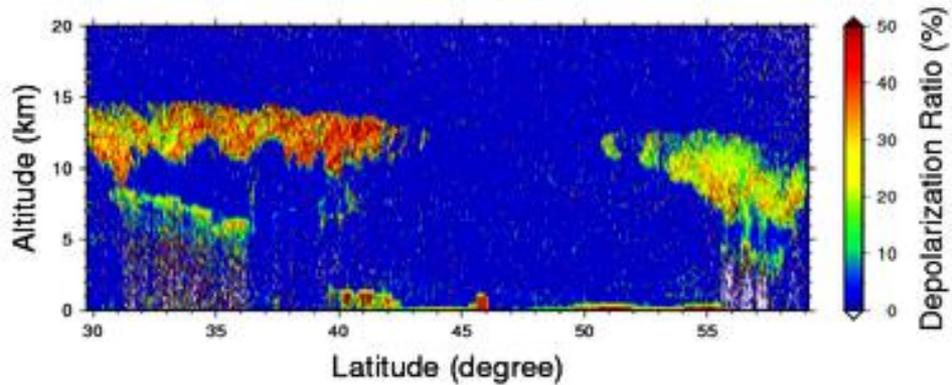
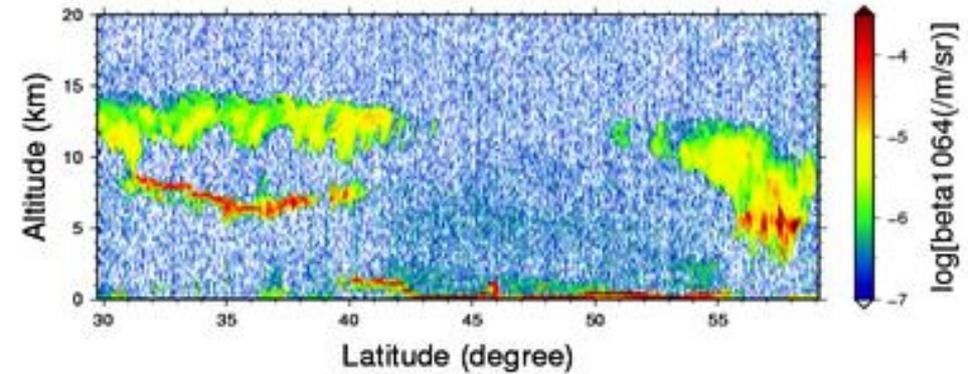
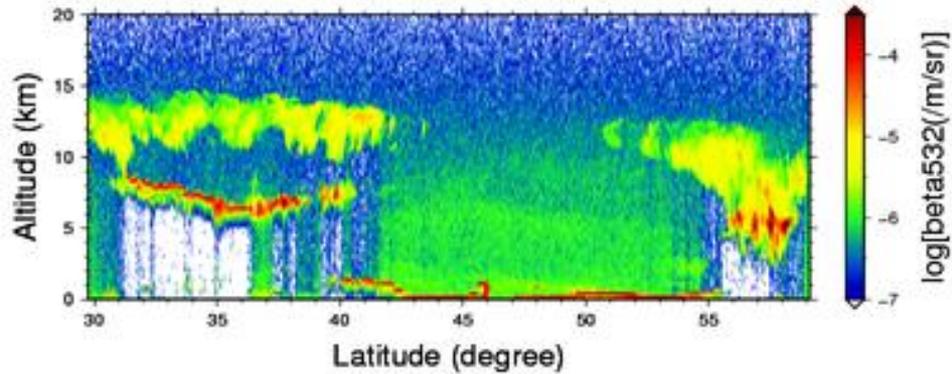
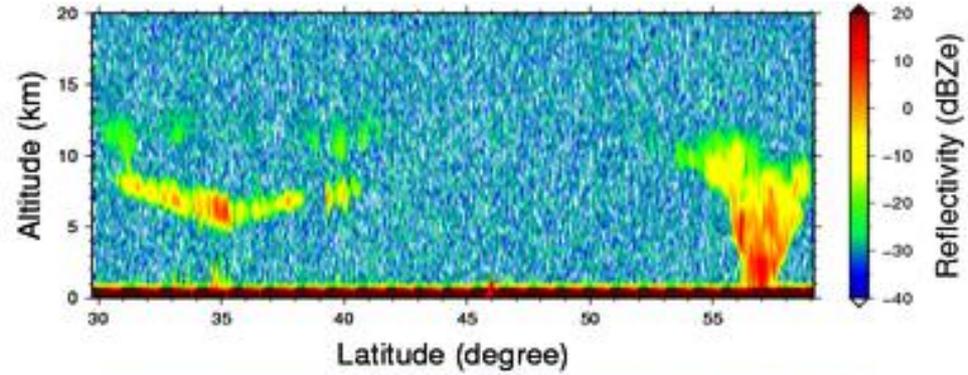
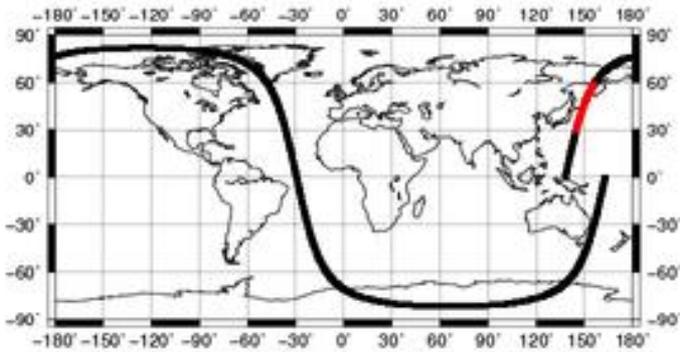
(Tanimoto et al., JC2009)

# 海面水温と雲底高度

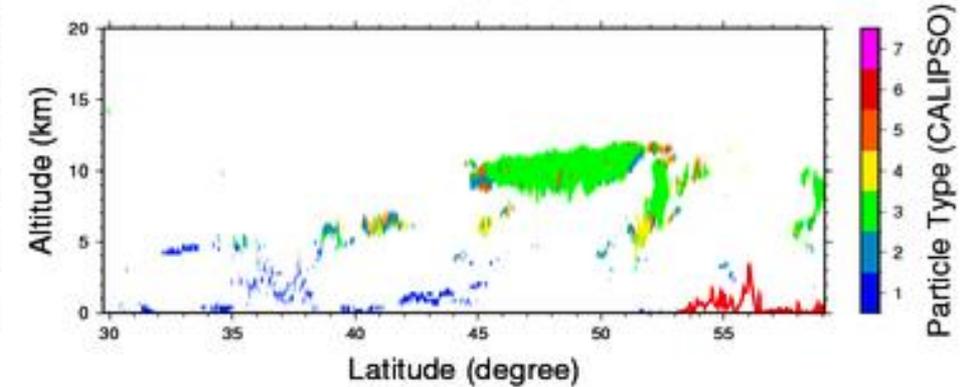
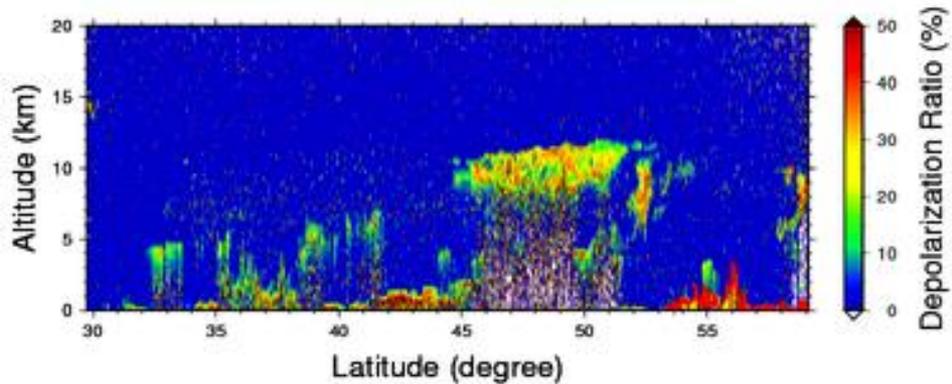
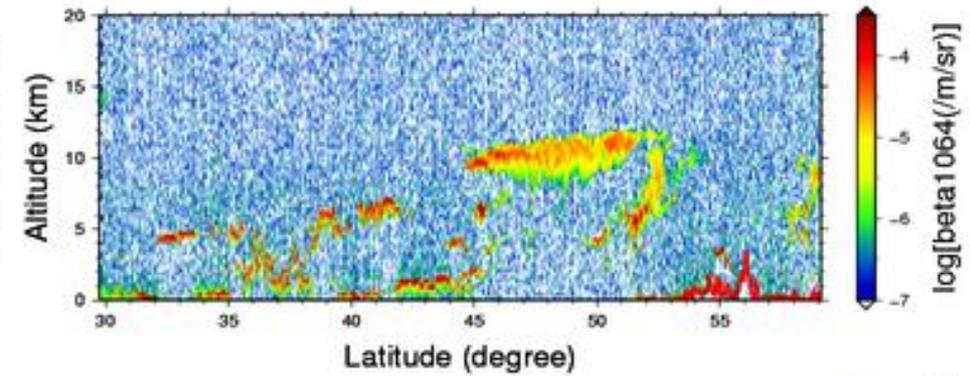
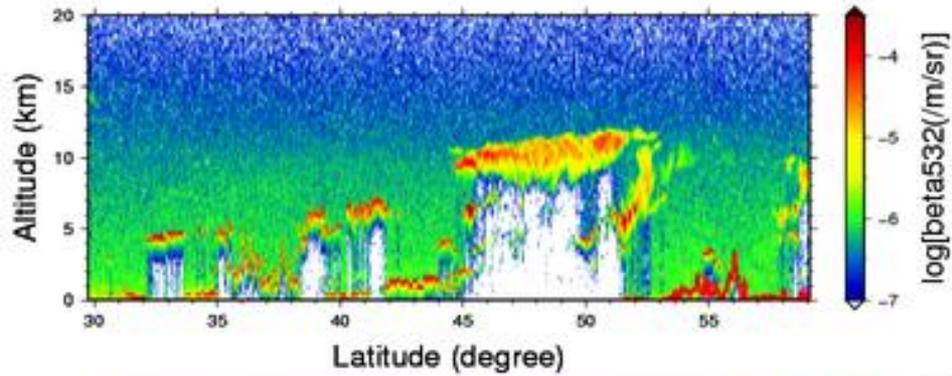
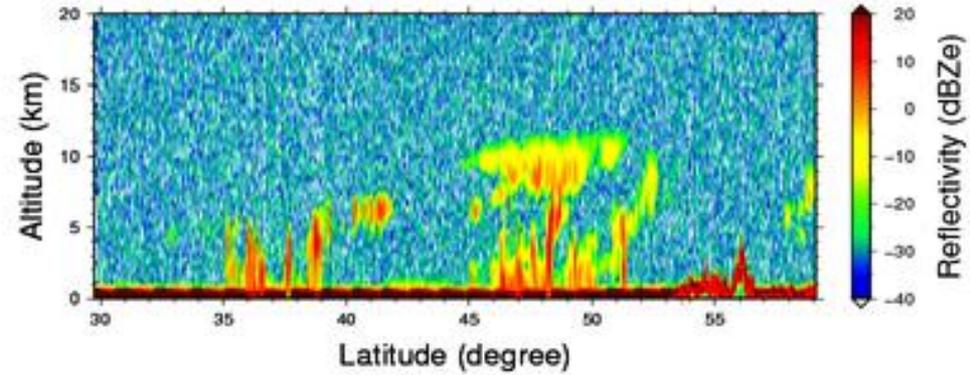
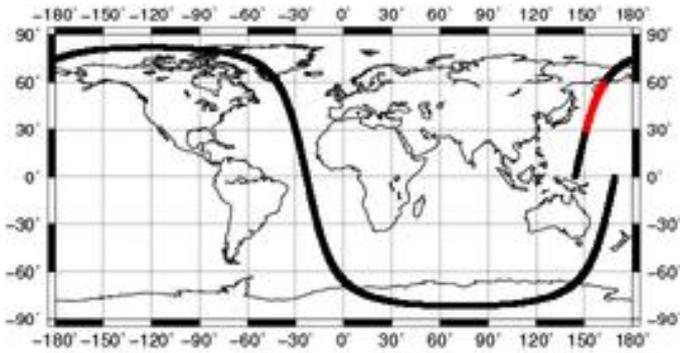


(Tanimoto et al., JC2009)

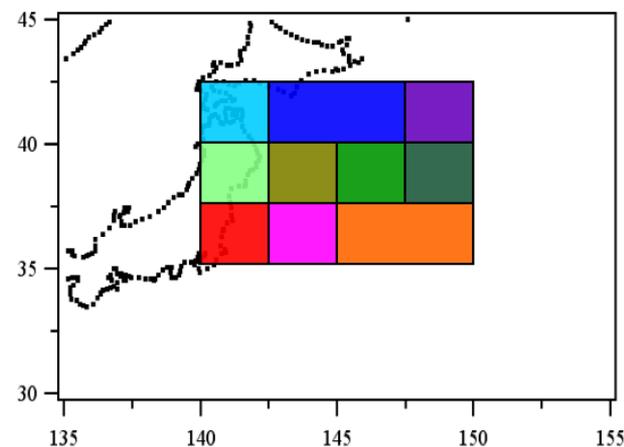
# CALIPSO 15 June 2006



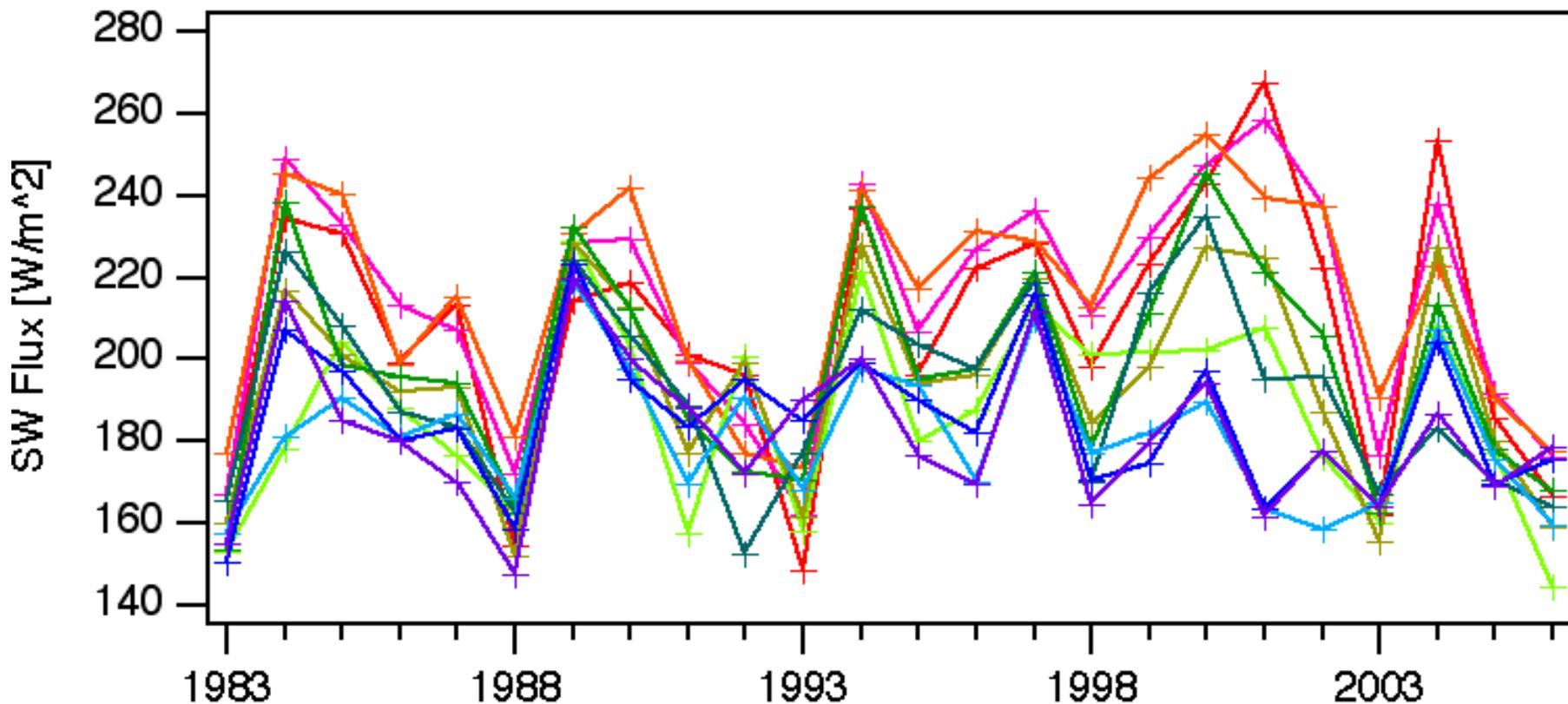
# CALIPSO 19 June 2006



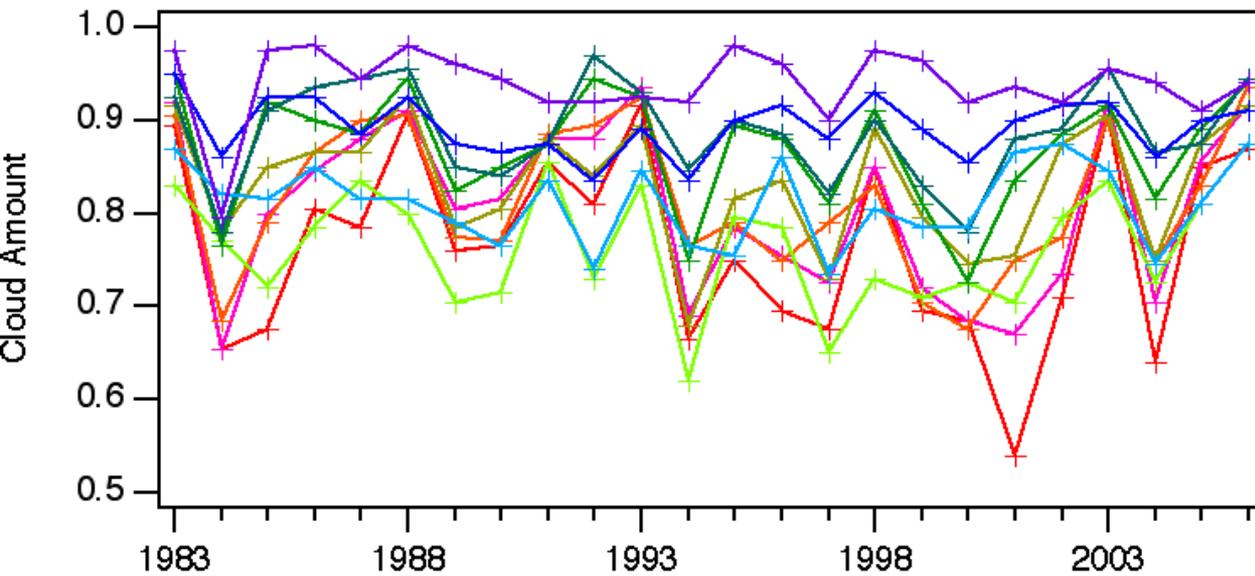
ヤマセ領域の7月の日射量の  
年々変動 (ISCCP-FDによる)



Downward SW Flux at Surface in July

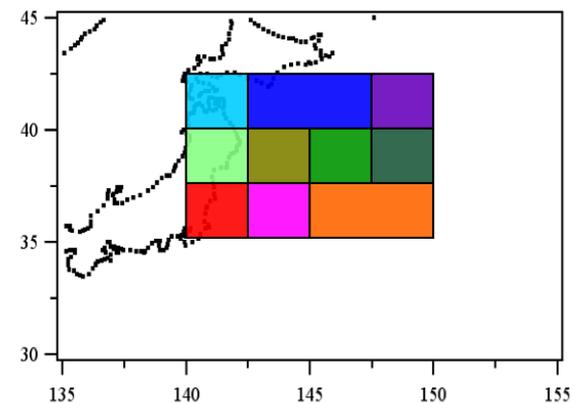
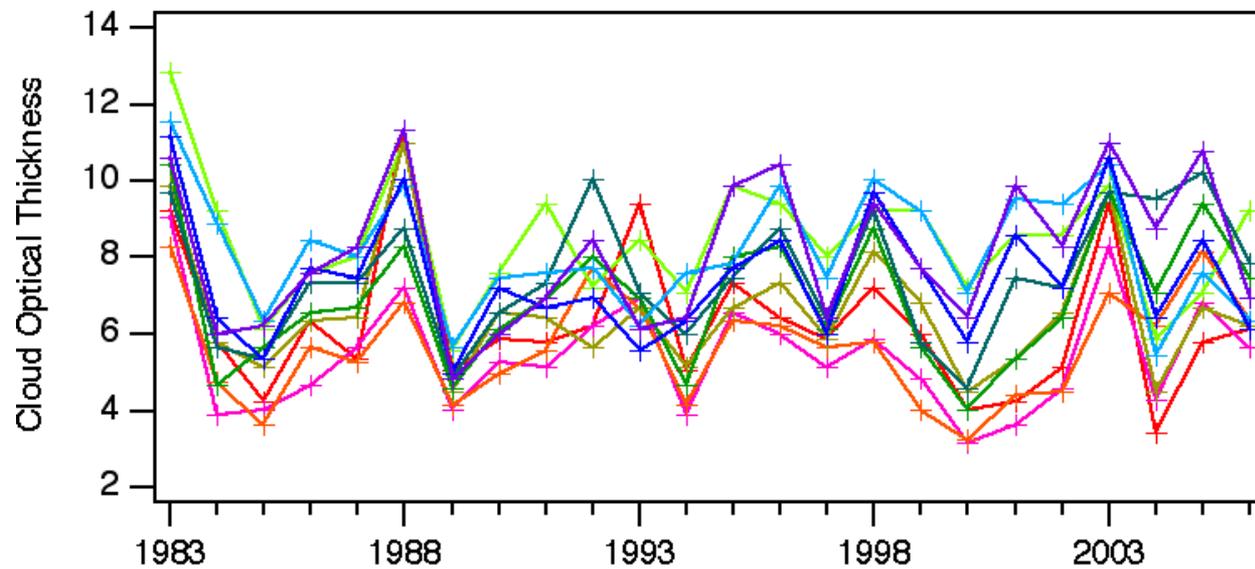


Cloud Amount in July

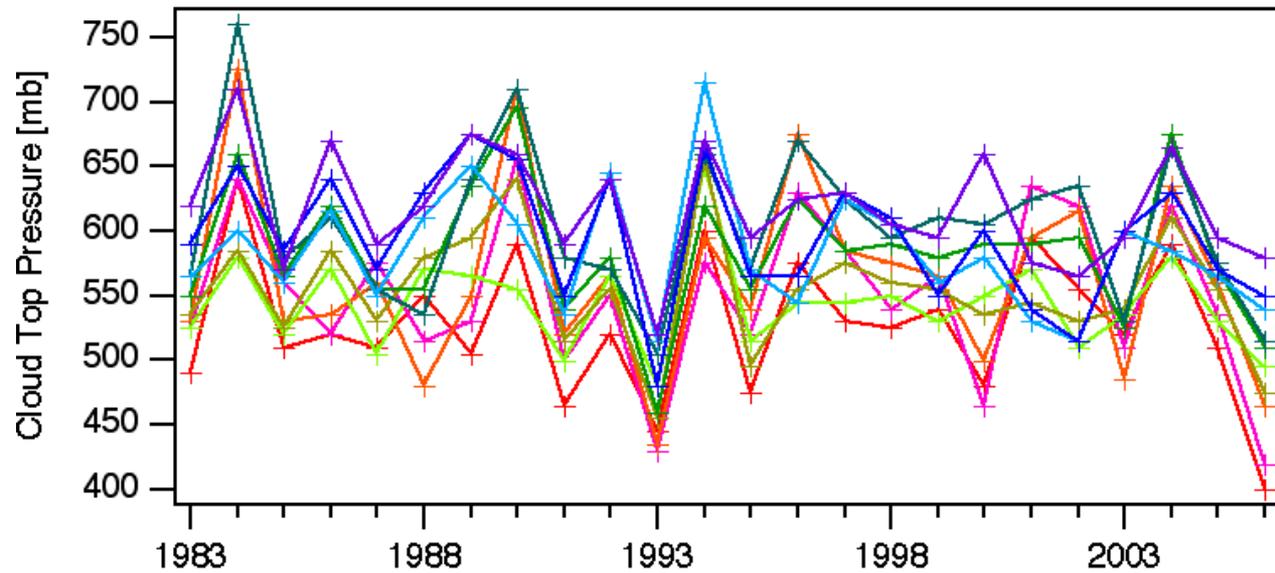


ヤマセ領域の  
7月の雲量と  
光学的厚さの  
年々変動  
  
(ISCCP)

Cloud Optical Thickness in July



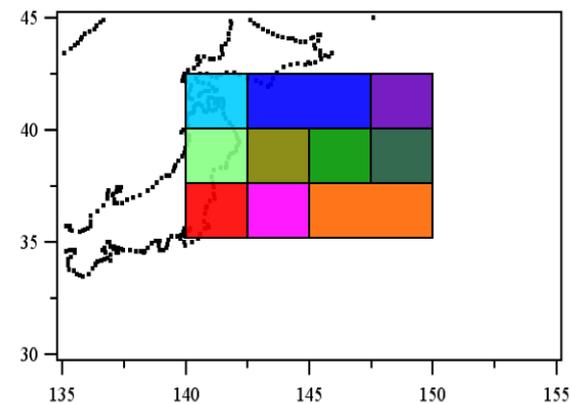
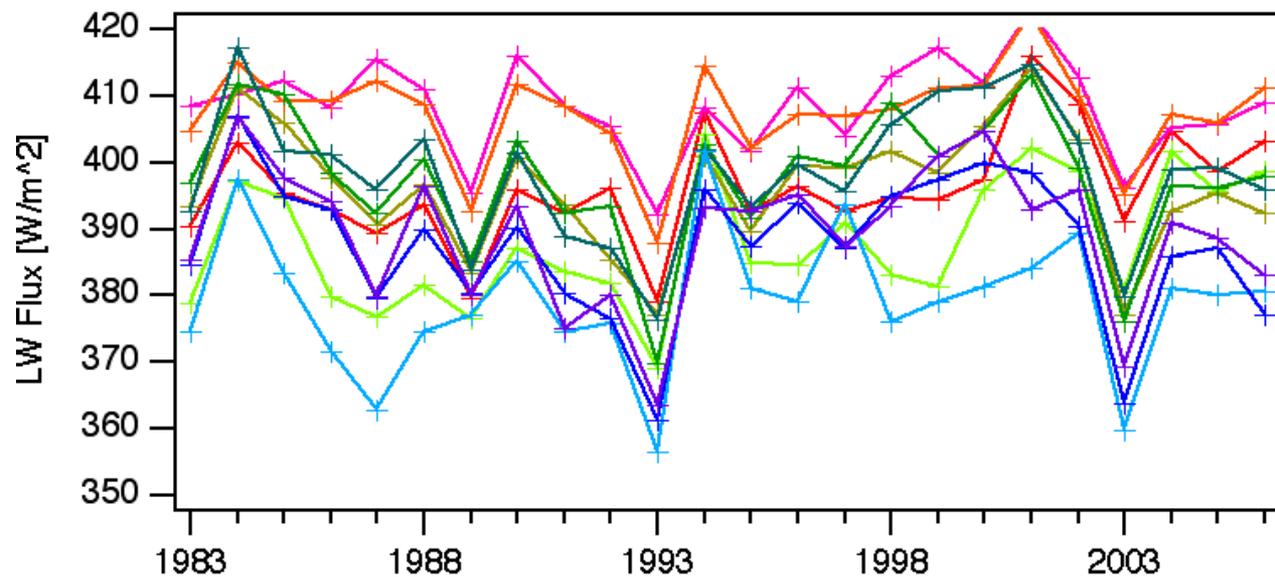
Cloud Top Pressure in July



ヤマセ領域の7月の  
雲頂気圧と地表面下  
向き長波放射の年々  
変動

(ISCCP)

Downward LW Flux at Surface in July



# 研究課題

- 雲微物理特性(雲粒粒径分布、雲水量等)
- 雲・放射収支の詳細な時空間スケール変動
- 北太平洋全域スケールの雲・放射収支の変動
- 雲・放射収支の長期変動→全球気候変動との関係
- 雲の様々な特性と海面水温、気象条件との関係
- その他