G60

Development of Algorithms for Retrieving Cloud and Aerosol Microphysical Parameters from the GLI

- **Team**
  - PI: T. Nakajima (UT/CCSR, teruyuki@ccsr.u-tokyo.ac.jp)
  - CIs for Phase-II: T. Y. Nakajima (NASDA/EORC); A. Higurashi (NIES)
  - Collaborators: H. Masunaga (EORC), S. Katagiri (UT/CCSR)

- **Proposed activities**
  - Algorithm for retrieving cloud optical thickness and effective particle radius
  - Algorithm for retrieving aerosol optical thickness and size indices over dark target
  - Continental scale network of sky radiometers

- **Activities as the GLI scientist**

Perturbed Asia from cloud and aerosol results

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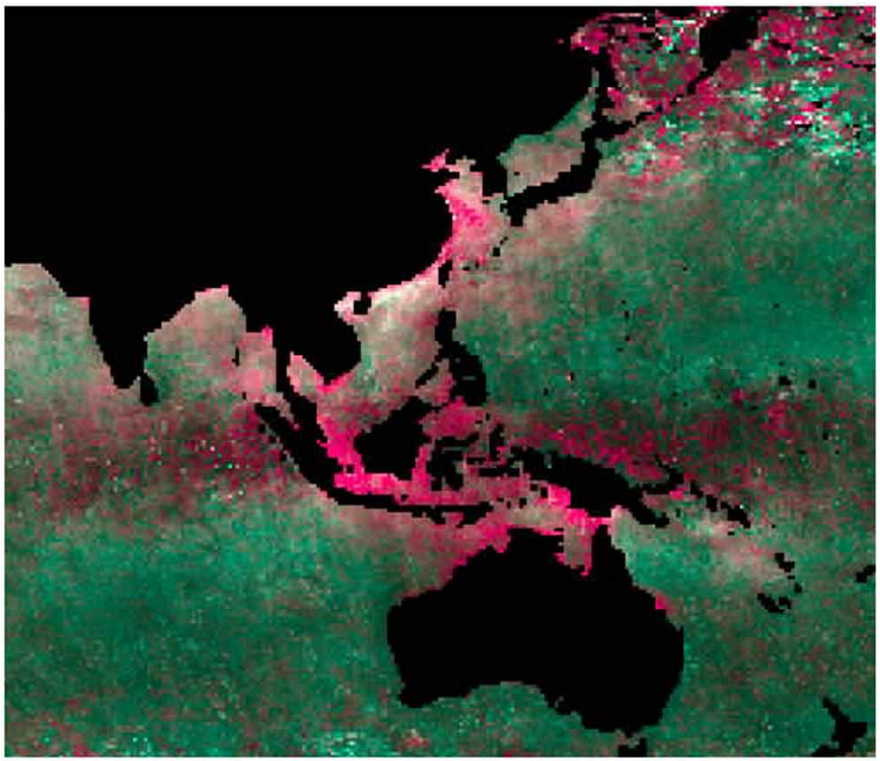
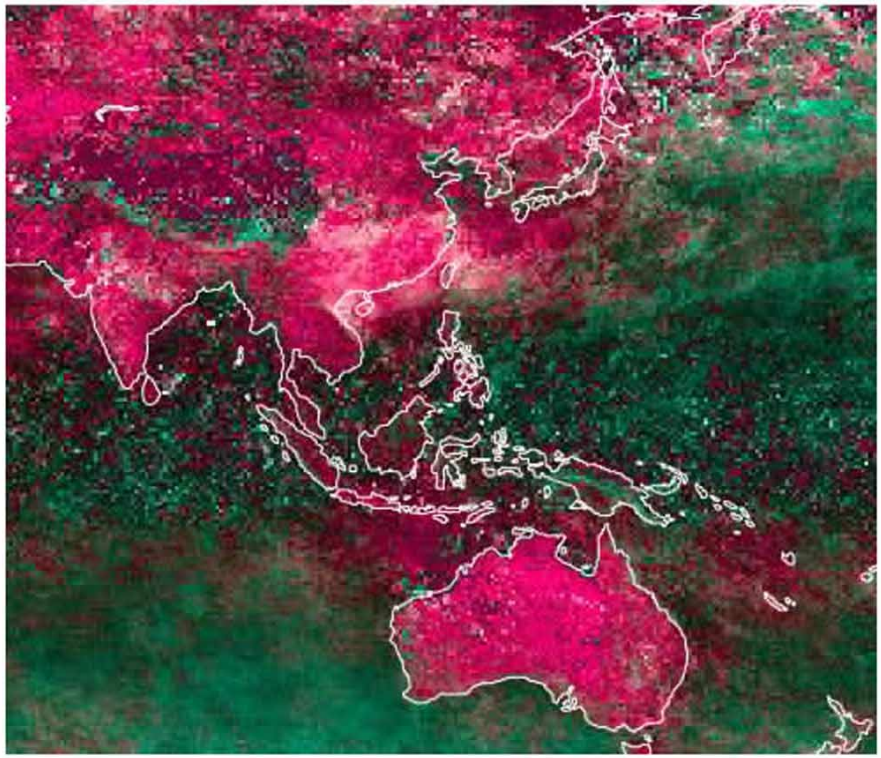
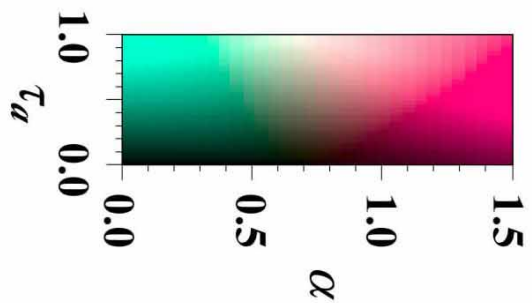
Aerosol

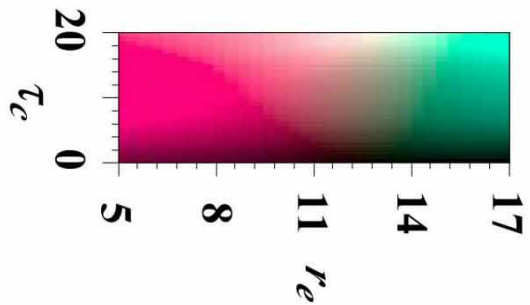
Low clouds





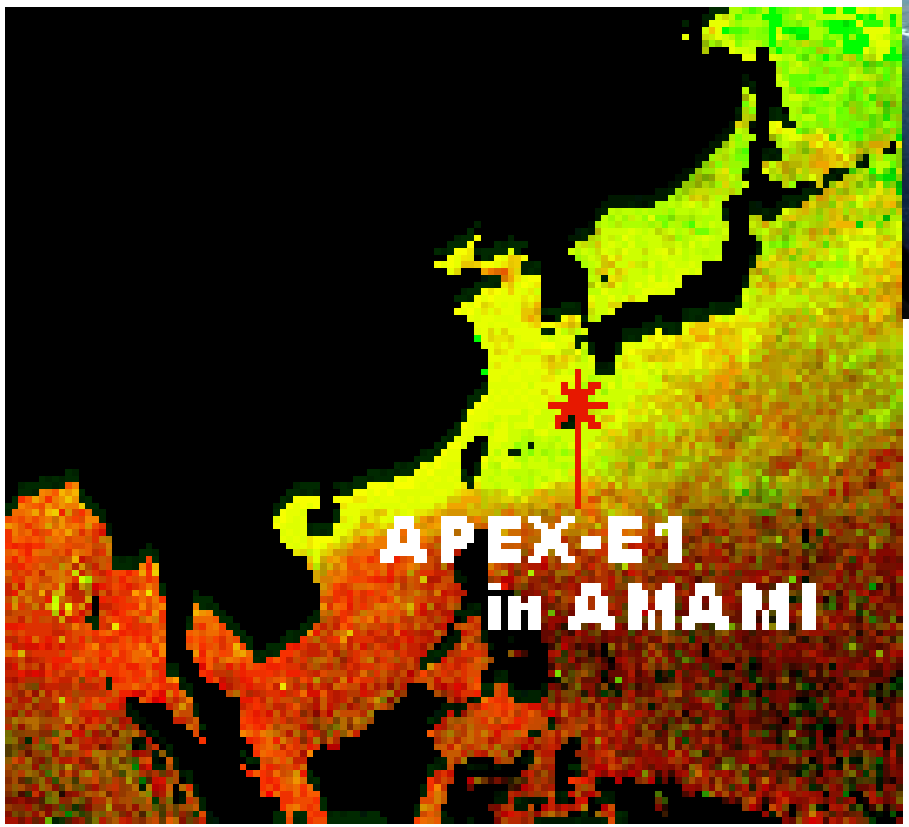


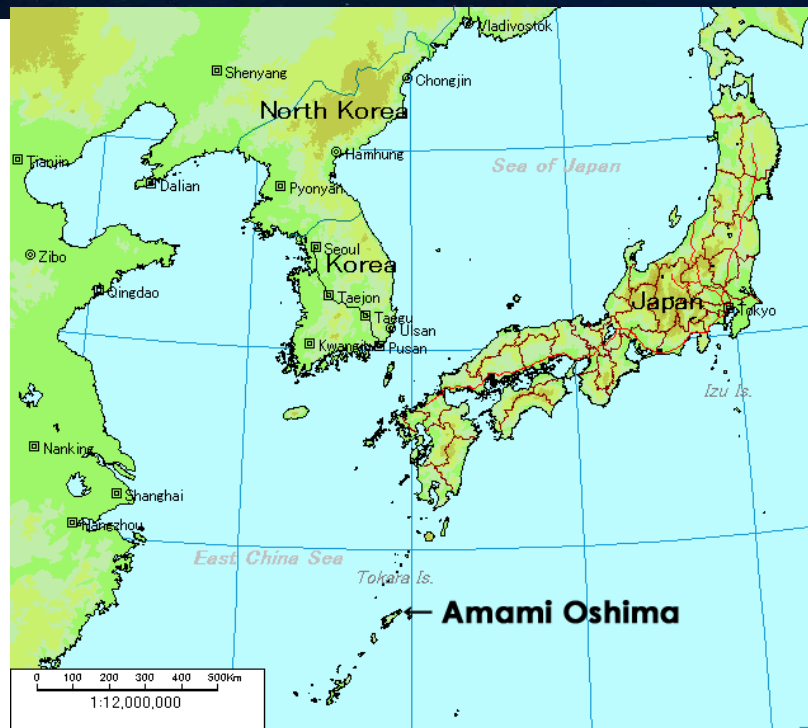
Red: small
Blue: large



APEX Experiment

- Amami-Oshima and Fukue-Jima Islands
- E1: 2000.12.13-25
- E2: 2001.4.1-30

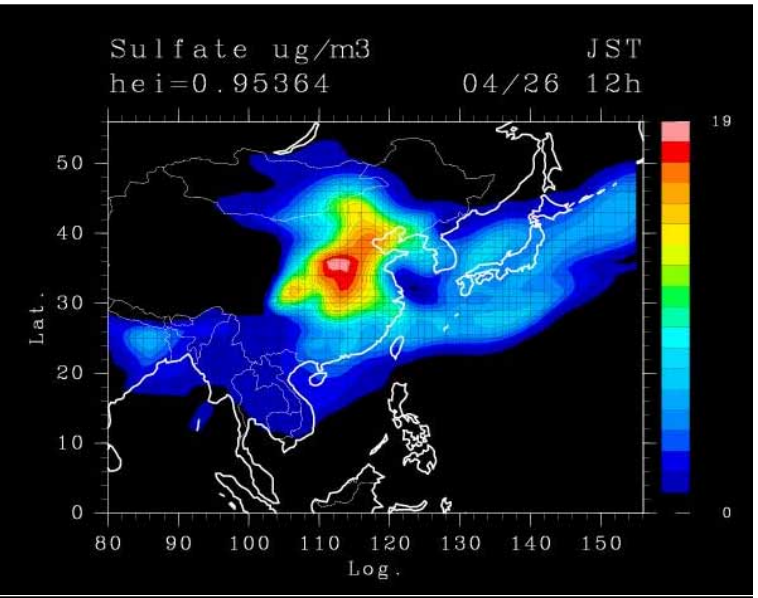


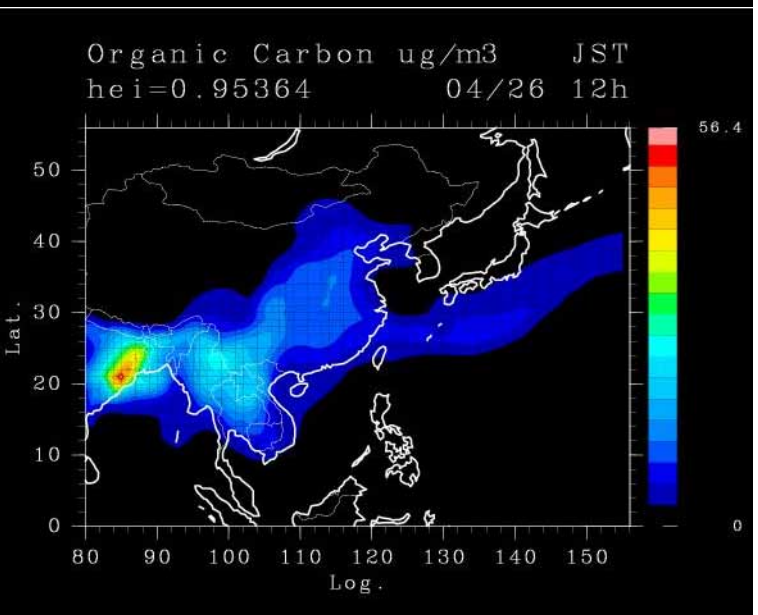


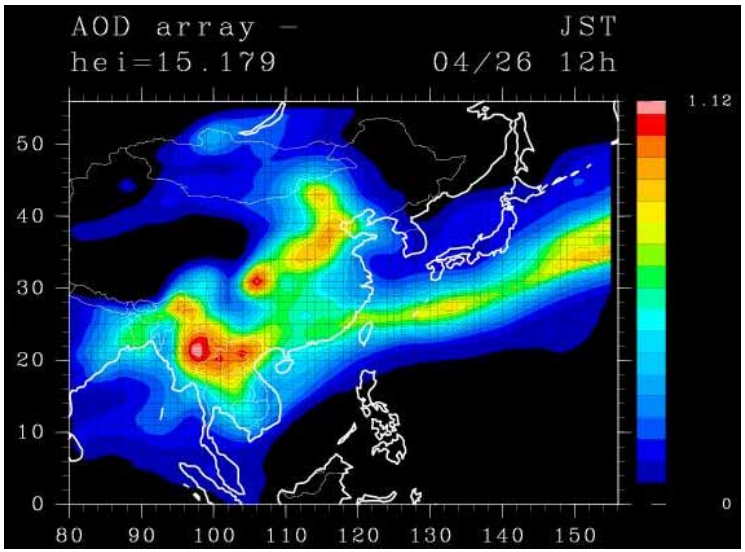
Yellow: large $N_{aerosol}$, large N_{cloud}

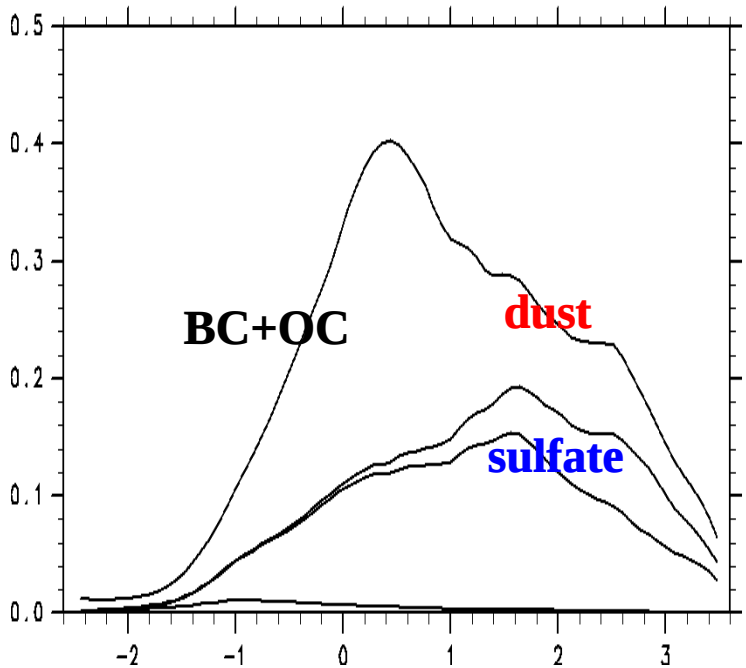
Red: large $N_{aerosol}$, small N_{cloud}

Large contrast between Cheju and Amami Islands



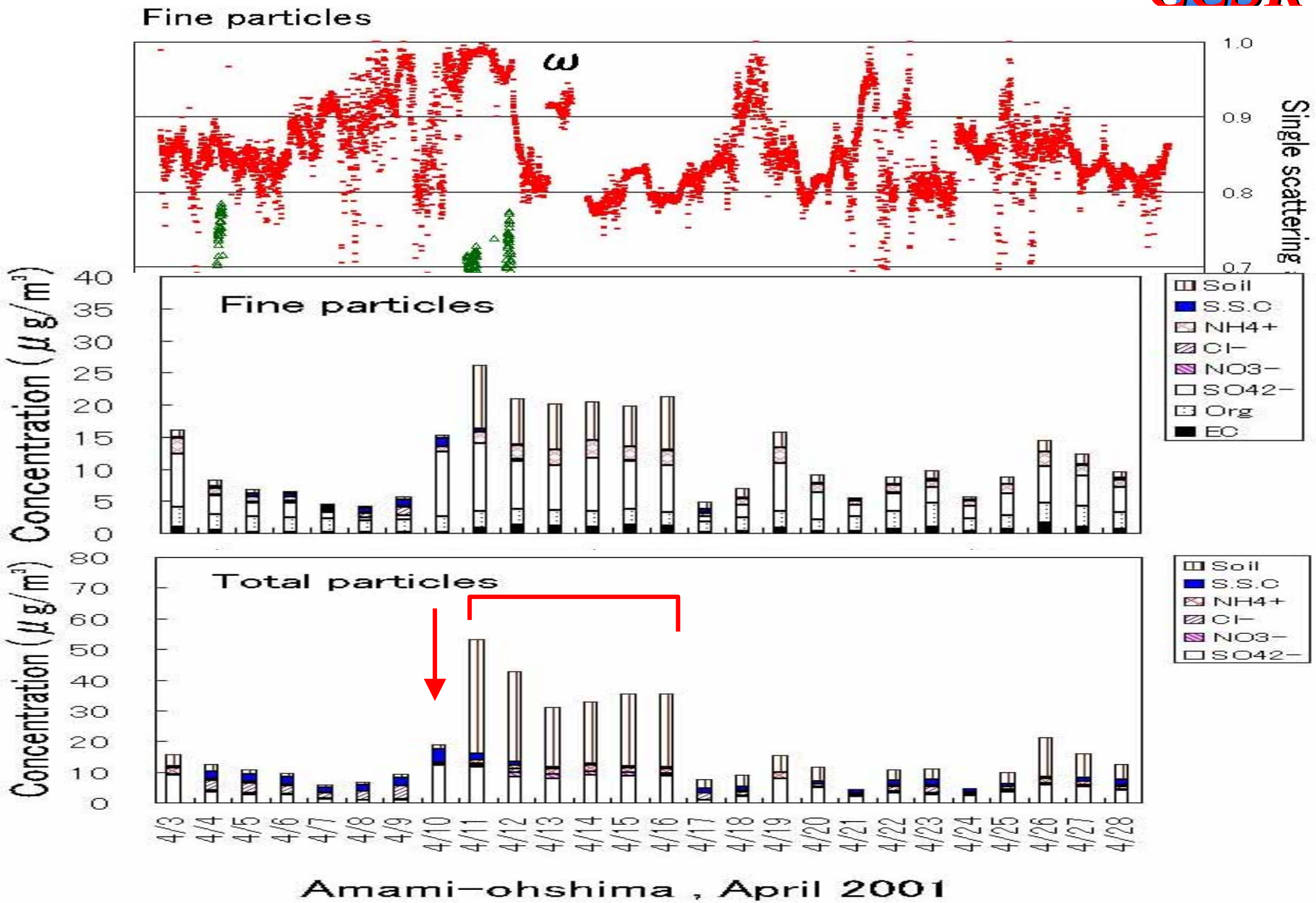






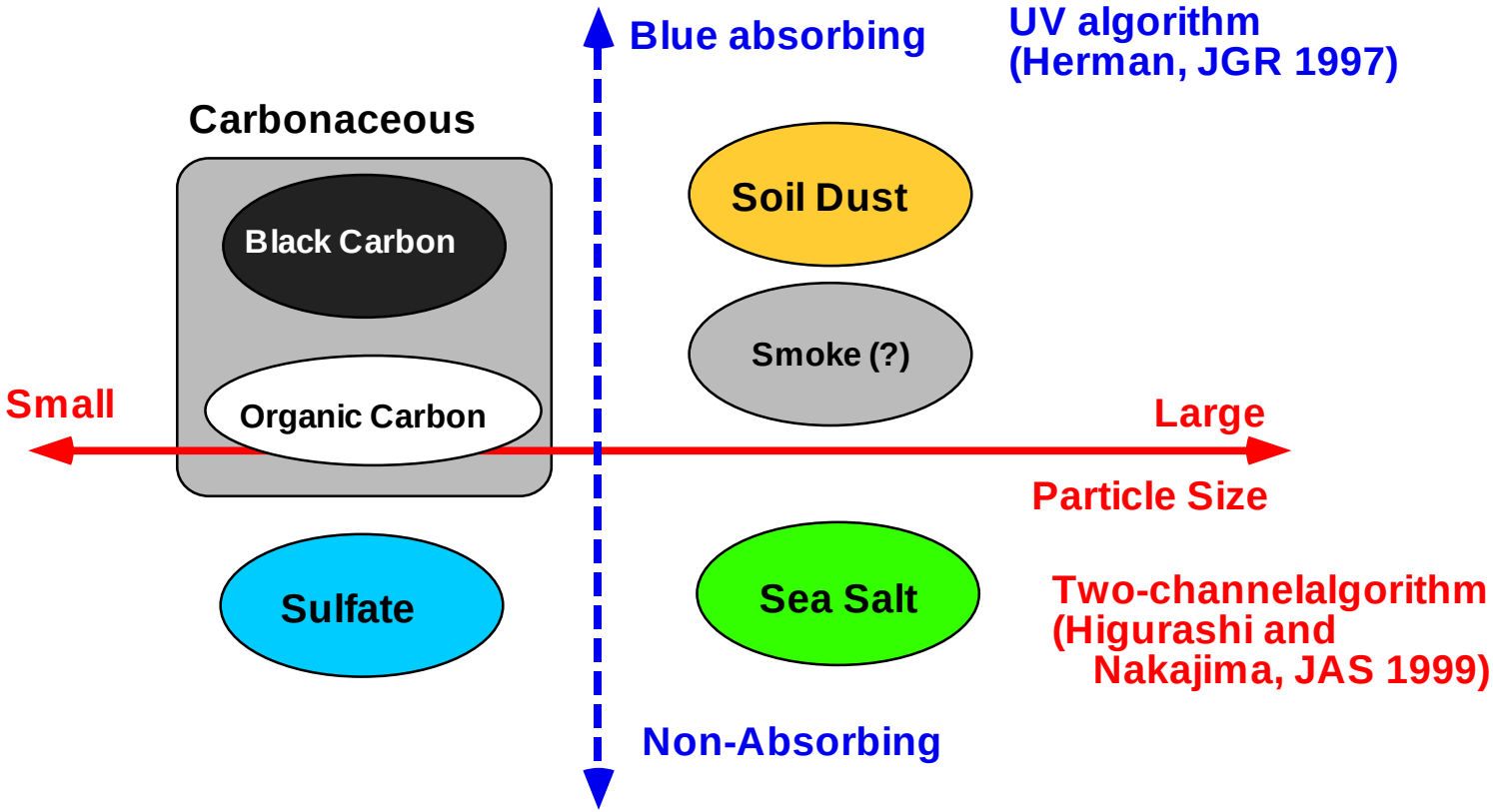
I. Uno (2001)

Events of 10 and 11-16 April at Amami



S. Ohta (2001)

Four channel aerosol algorithm



SeaWiFS channel to use:

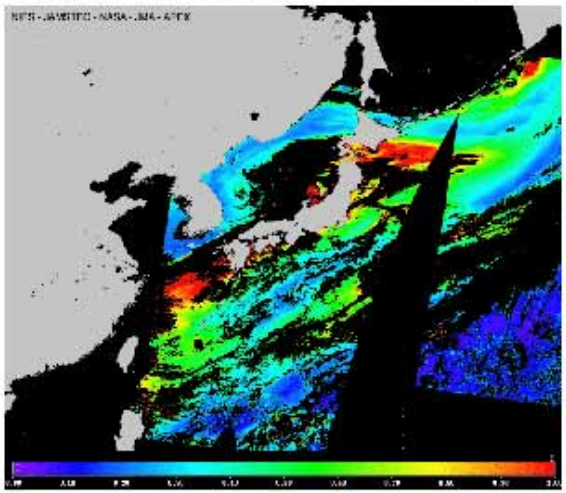
channel-1 (412nm), -2 (443nm), -6 (670nm), and -8 (865nm)

- Aerosol optical thickness
- Ångström exponent
- Absorbing /Non-absorbing

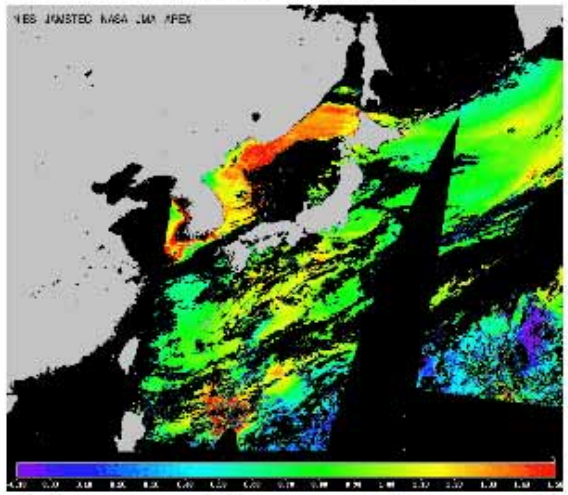
Application to SeaWiFS data

APEX, ACE-Asia
15 April 2001

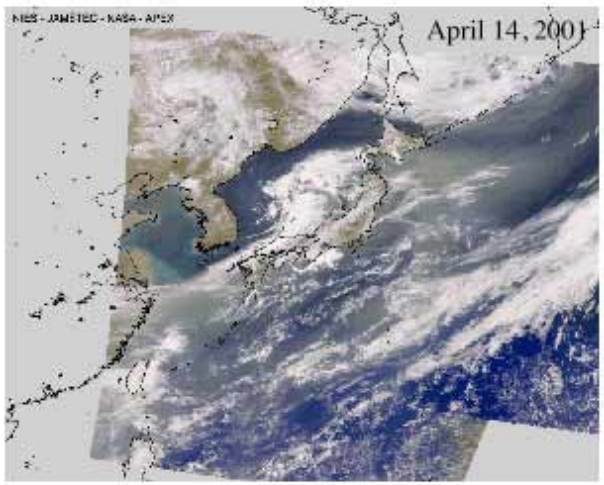
Aerosol Optical Thickness at 500nm



Ångström Exponent

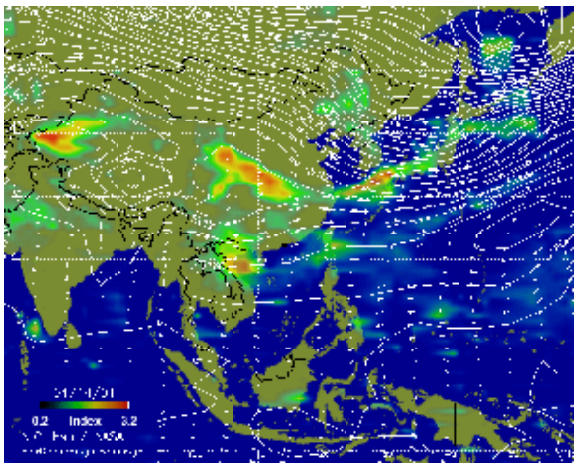


Browse Image



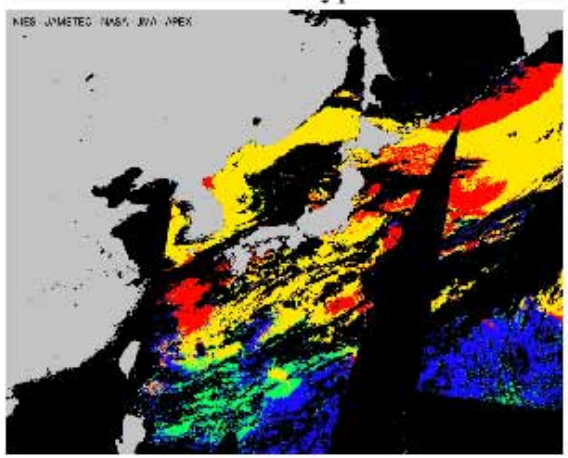
412nm: Blue, 555nm: Green, 670nm: Red

TOMS Aerosol Index



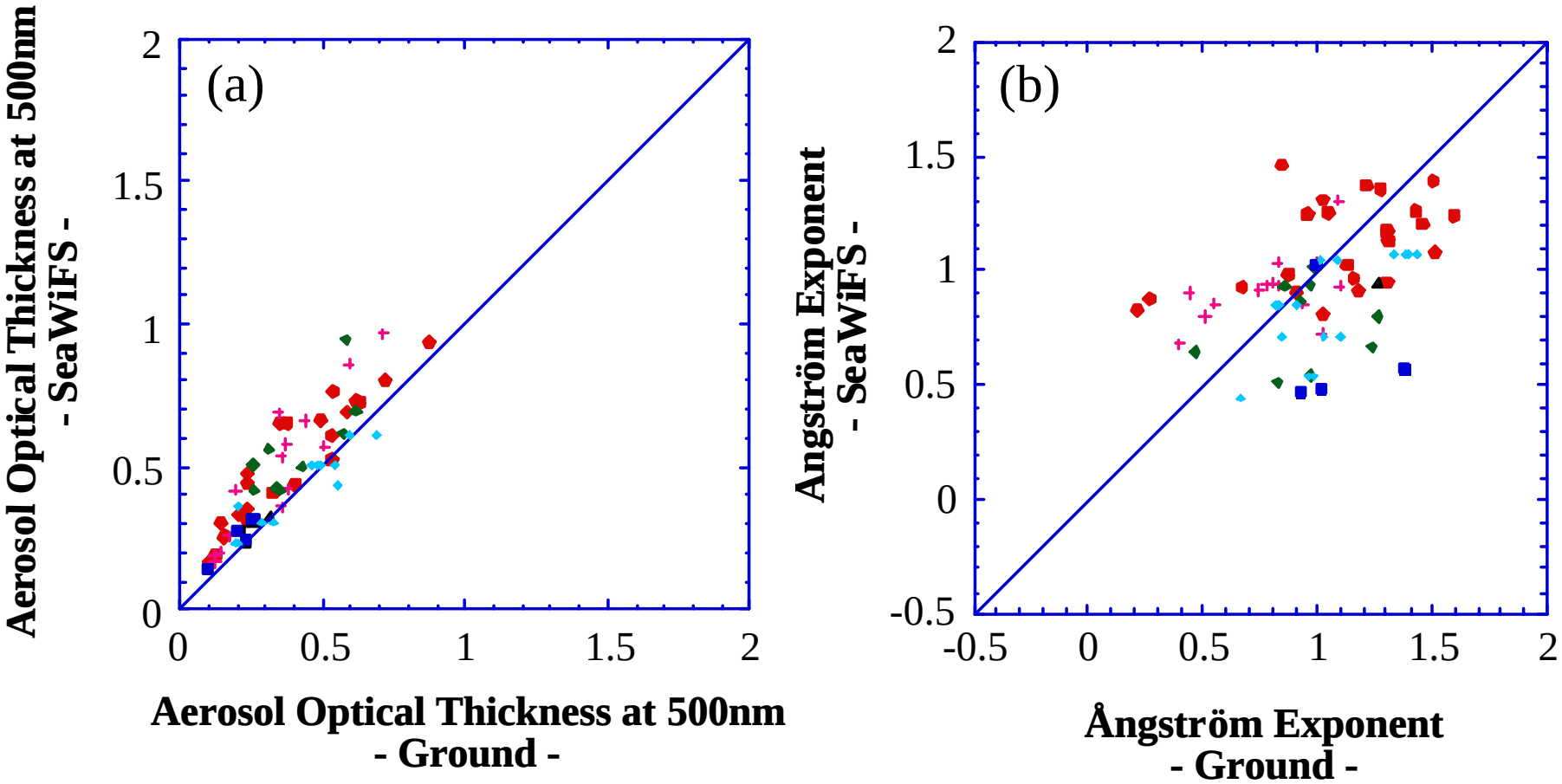
by Hsu, N. C. (NASA/GSFC)
(http://hyperion.gsfc.nasa.gov/Mission/ACEASIA/satellite)

Aerosol Types



Soil dust: Red, Carbonaceous: Yellow,
Sulfate: Green, Sea Salt: Blue

Comparison with ground-based values



Aerosol type classfication by SeaWiFS

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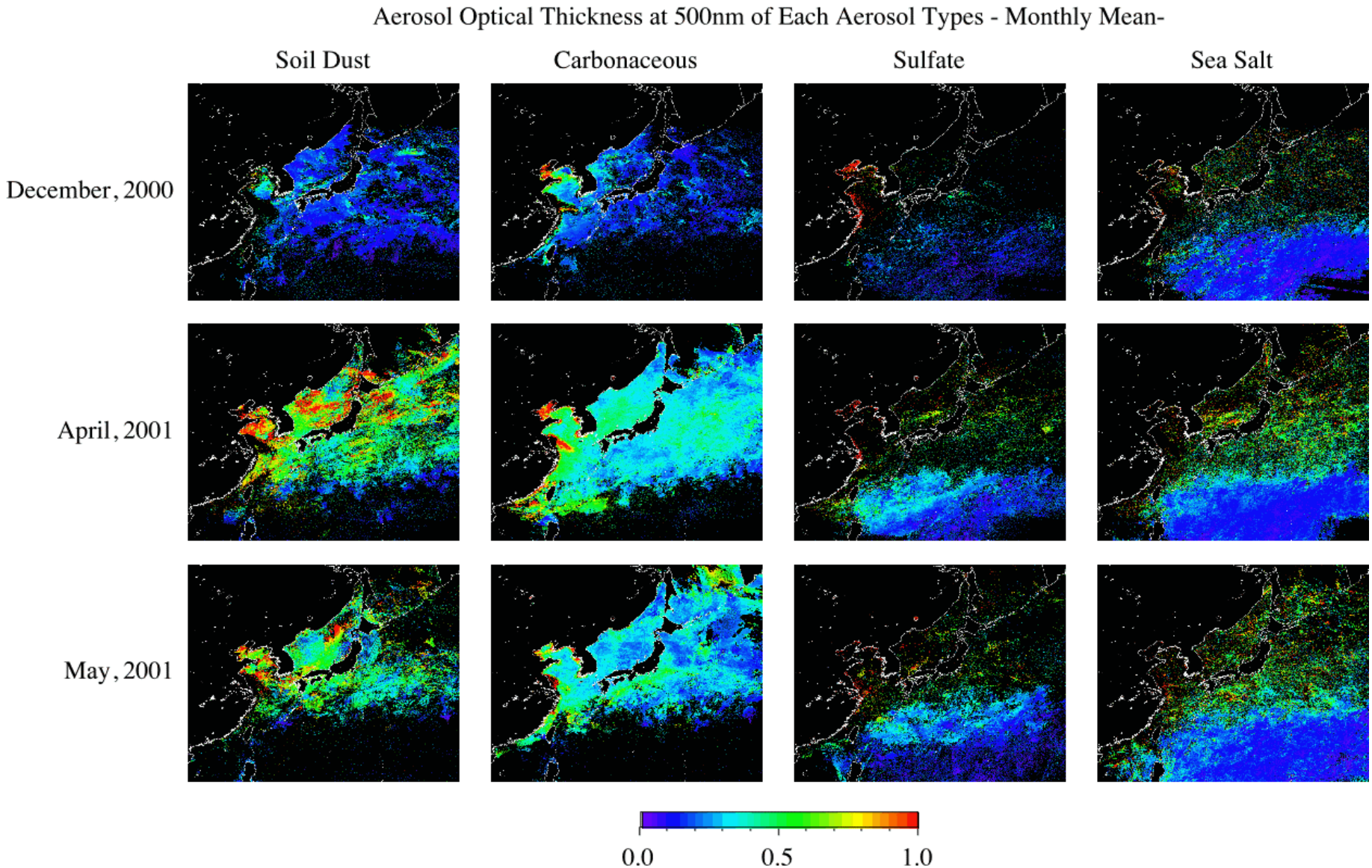

Higurashi (2001)

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MODIS Aerosol Parameters (Ver.2)

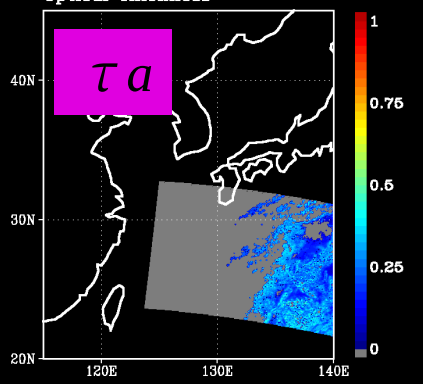
Date: 17 DEC 2000

MODIS Level-1b data provided by:
NASA-MODIS/GES-DAAC.

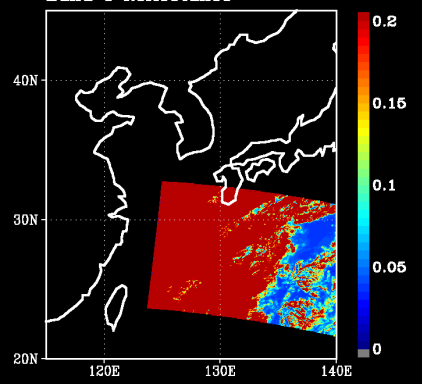
Retrieval Algorithm:
ATSK5 on the GLI system.

Processed by:
Yi Liu (EORC/NASDA)

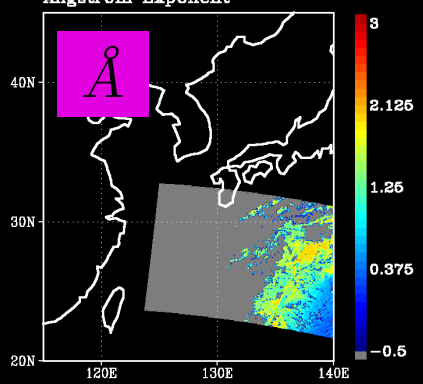
Optical Thickness



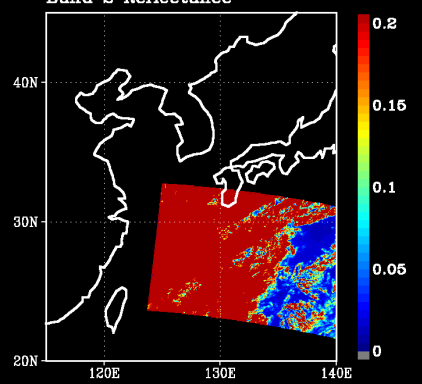
Band 1 Reflectance



Angstrom Exponent

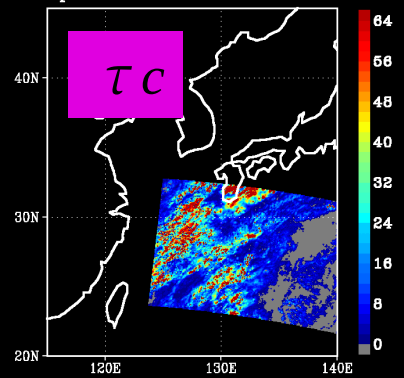


Band 2 Reflectance



MODIS Cloud Parameters (Ver.2)

Optical thickness



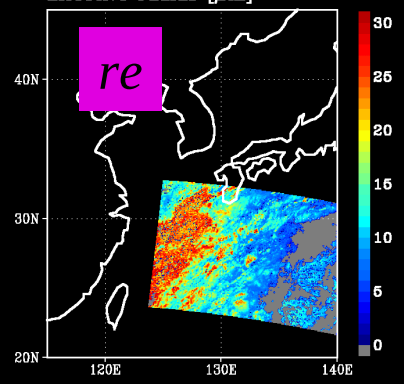
Date: 17 DEC 2000

MODIS Level-1b data provided by:
NASA-MODIS/GES-DAAC.

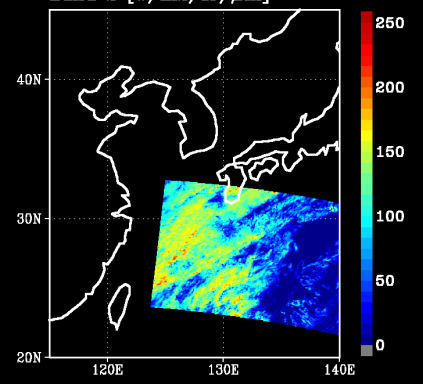
Retrieval Algorithm:
ATSK3_R on the GLI system.

Processed by:
Takashi Y. Nakajima (EORC/NASDA)

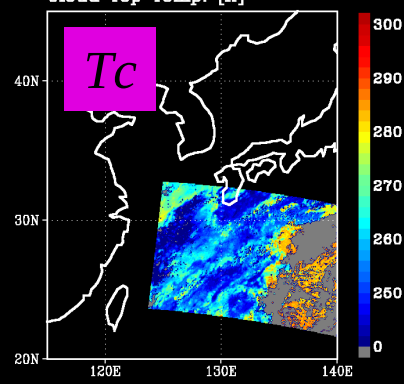
Effective radius [μm]



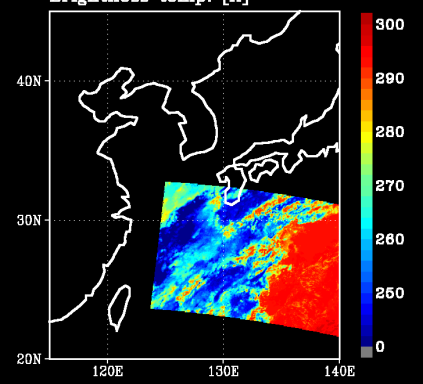
Band 2 [W/m2/sr/μm]



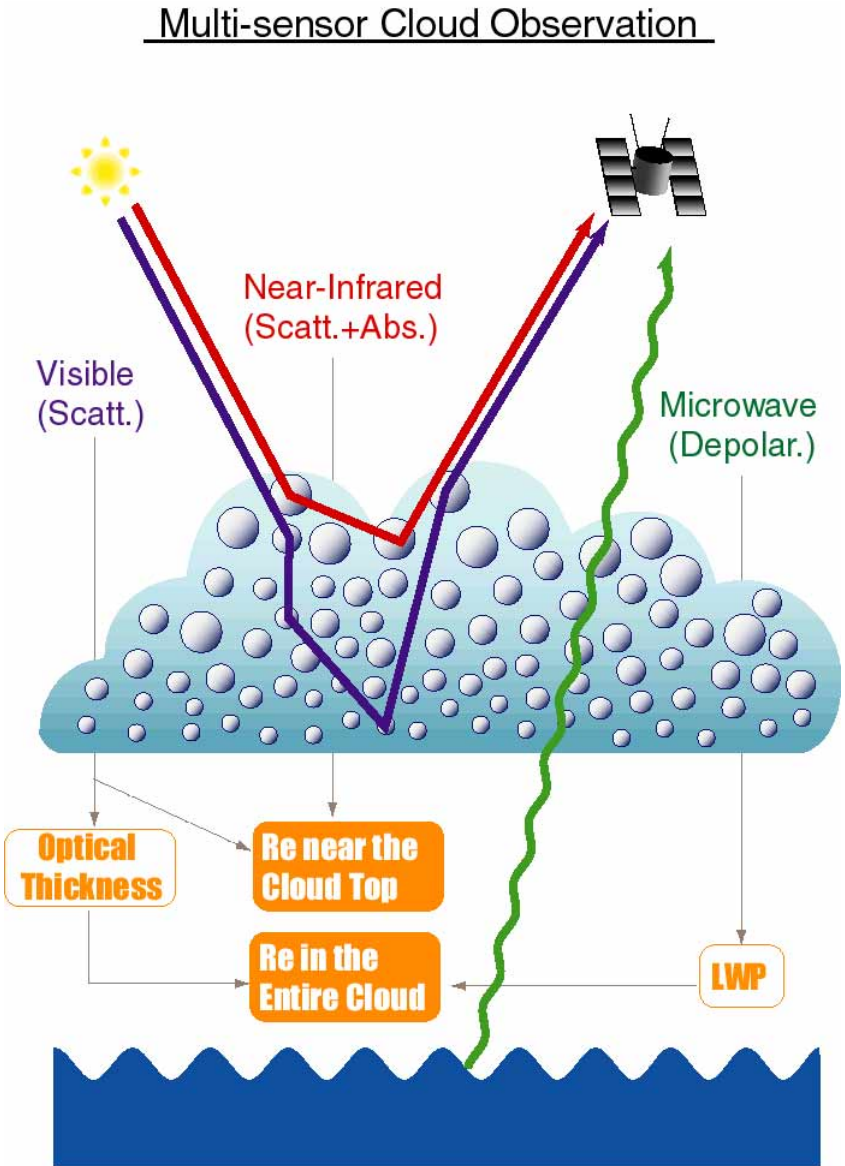
Cloud Top Temp. [K]

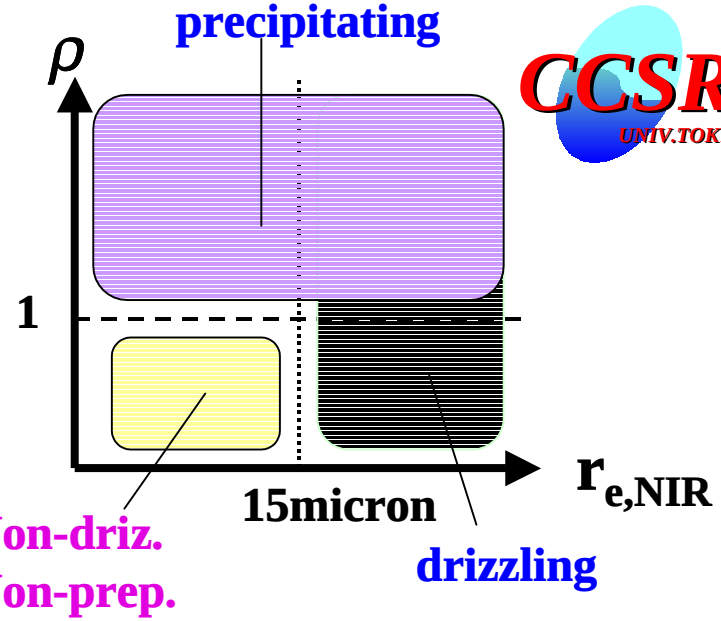


Brightness temp. [K]



Combined solar reflection and microwave cloud algorithm (GLI+AMSR)





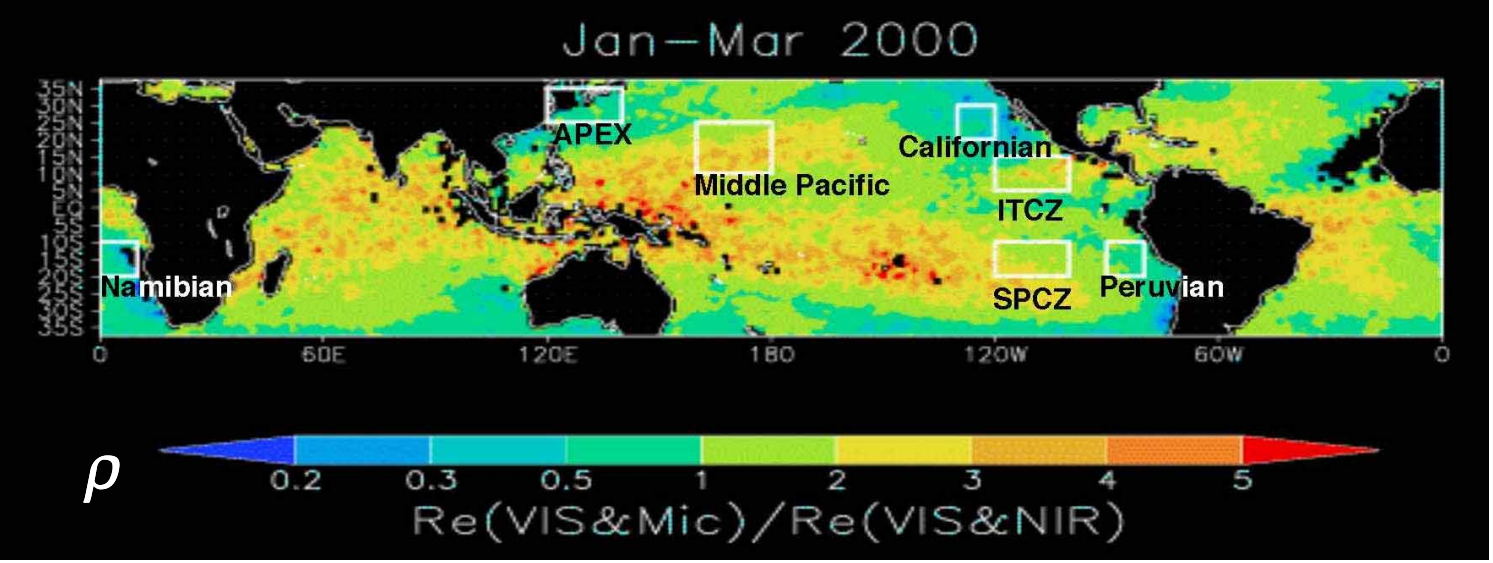
$$\tau_c = 2\pi < r^2 N > \approx L_{VIS}$$

$$LWP = W(t_{MC})$$

$$r_{e,NIR} = r(\omega) \approx L_{NIR}(top)$$

$$r_{e,MC} = 3W / 2\tau_c$$

$$\rho = r_{e,MC} / r_{e,NIR}$$



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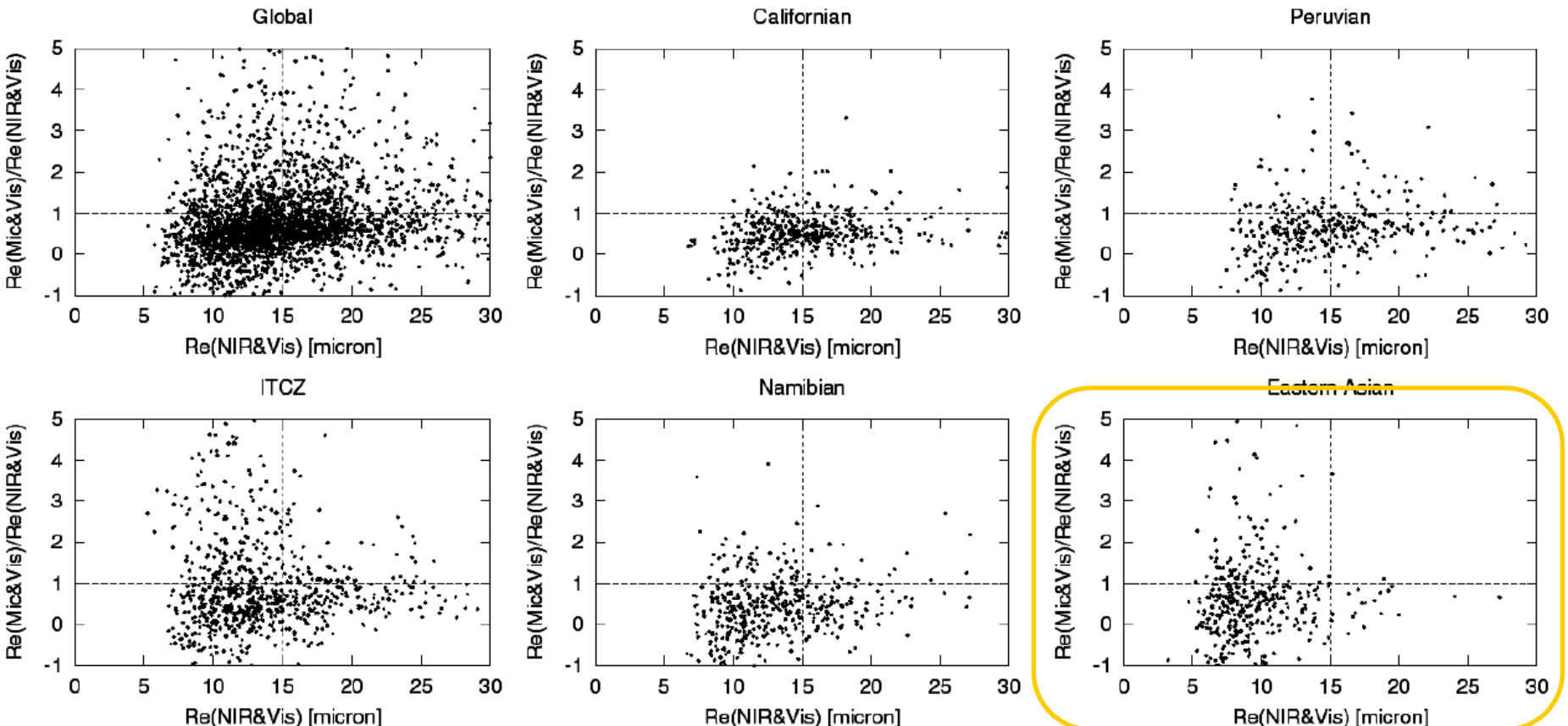
Masunaga et al. (JGR2002)



Example of drizzle quenching in the APEX/ACE-Asian region

H. Masunaga (2001)

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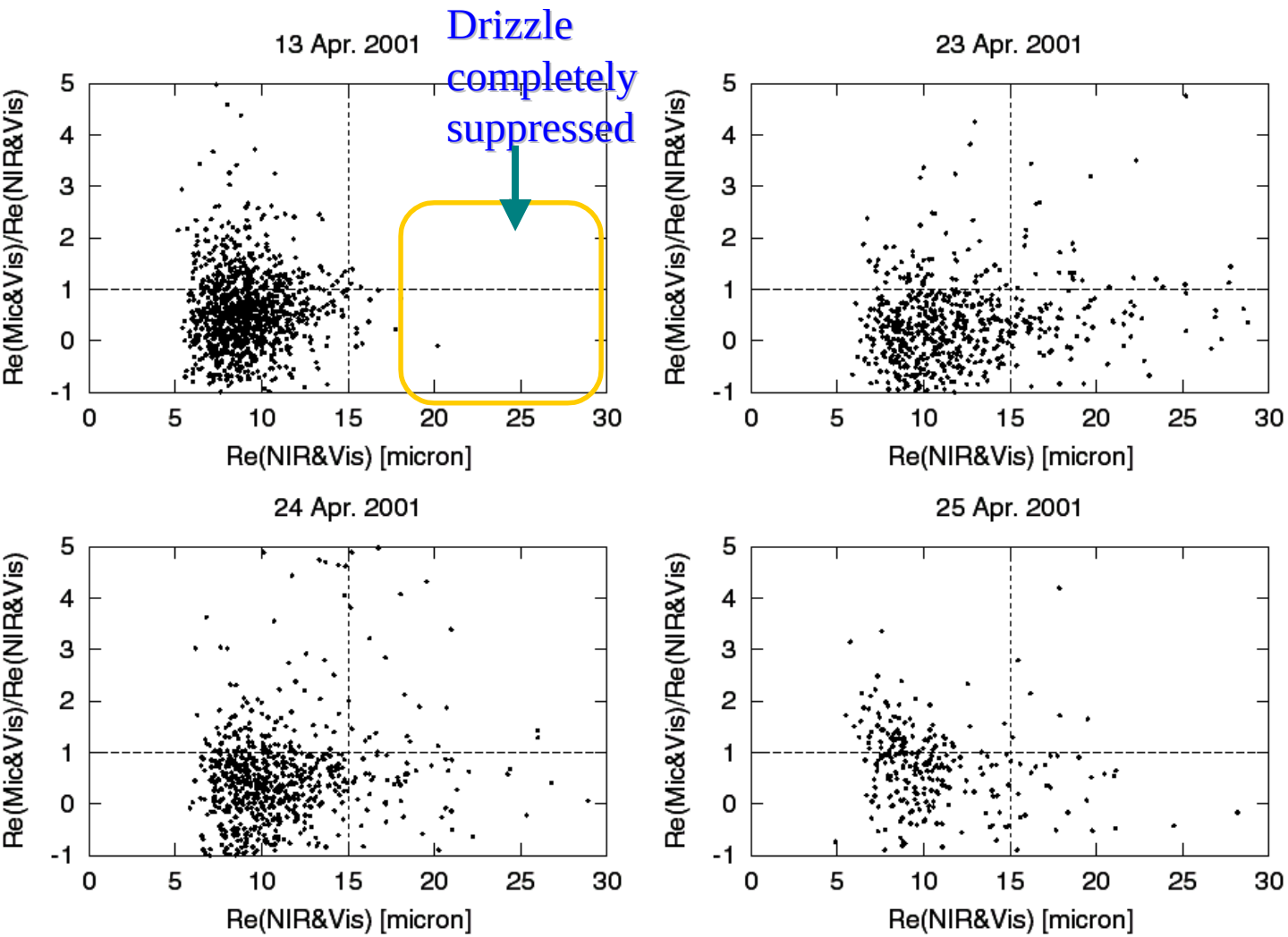
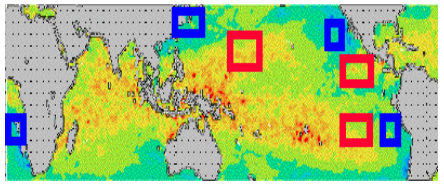
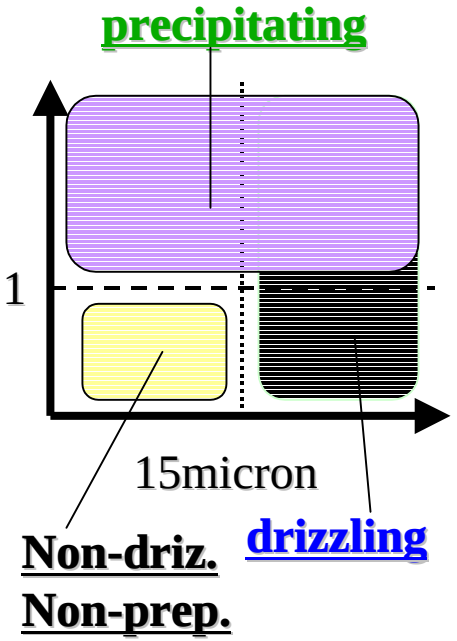
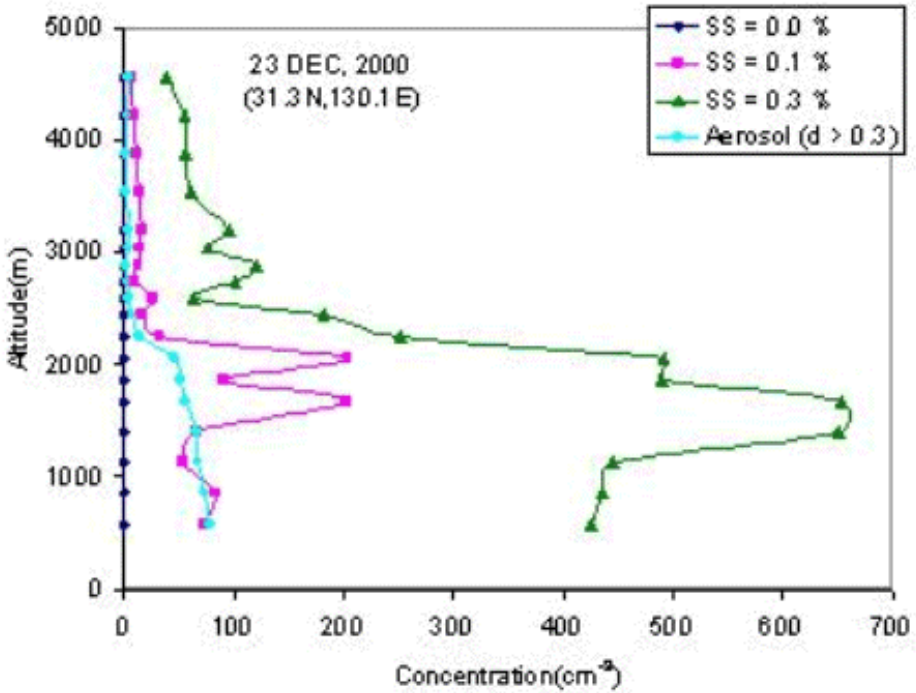
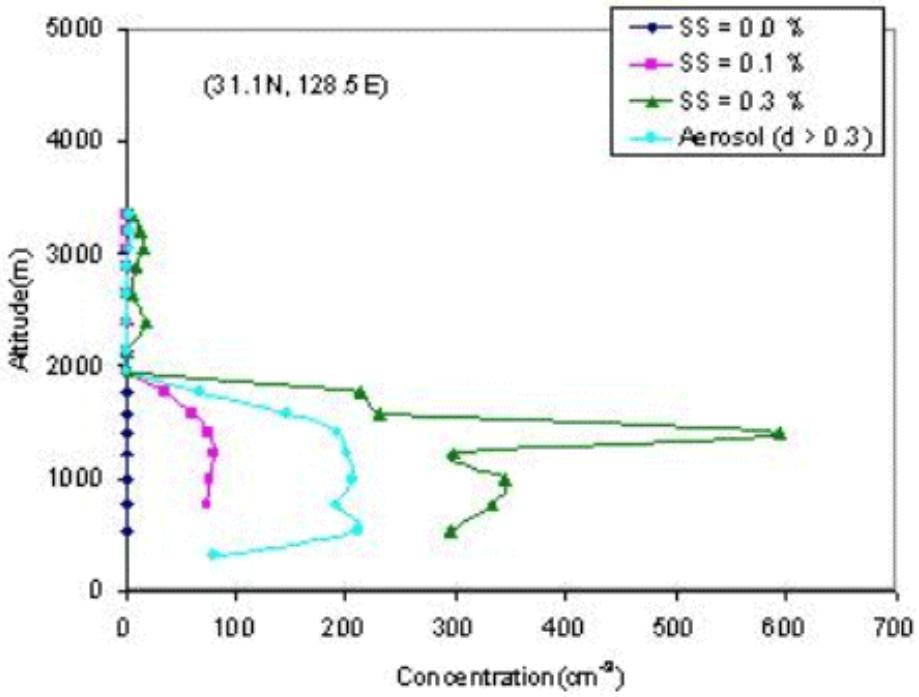






APEX-E1 (Dec. 2000)





Low supersaturation CCN counter (Ishizaka, Y., 2000)

Large difference in growth rate off Kyushu Island (east and west)

Relationship between CCN and SO_2/Aerosol particles under 1km in altitude over the sea near the Southwest Islands areas in April 2001

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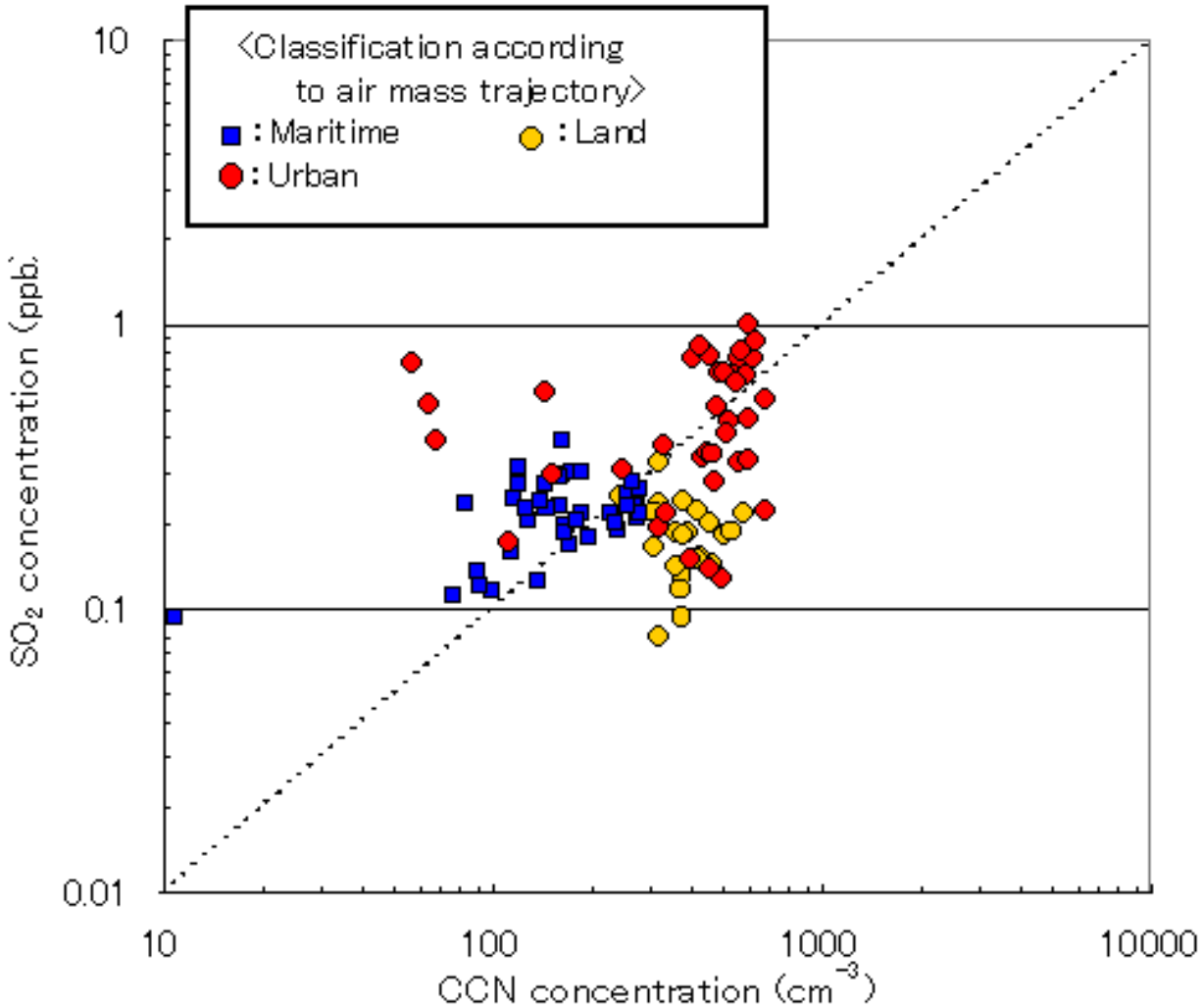
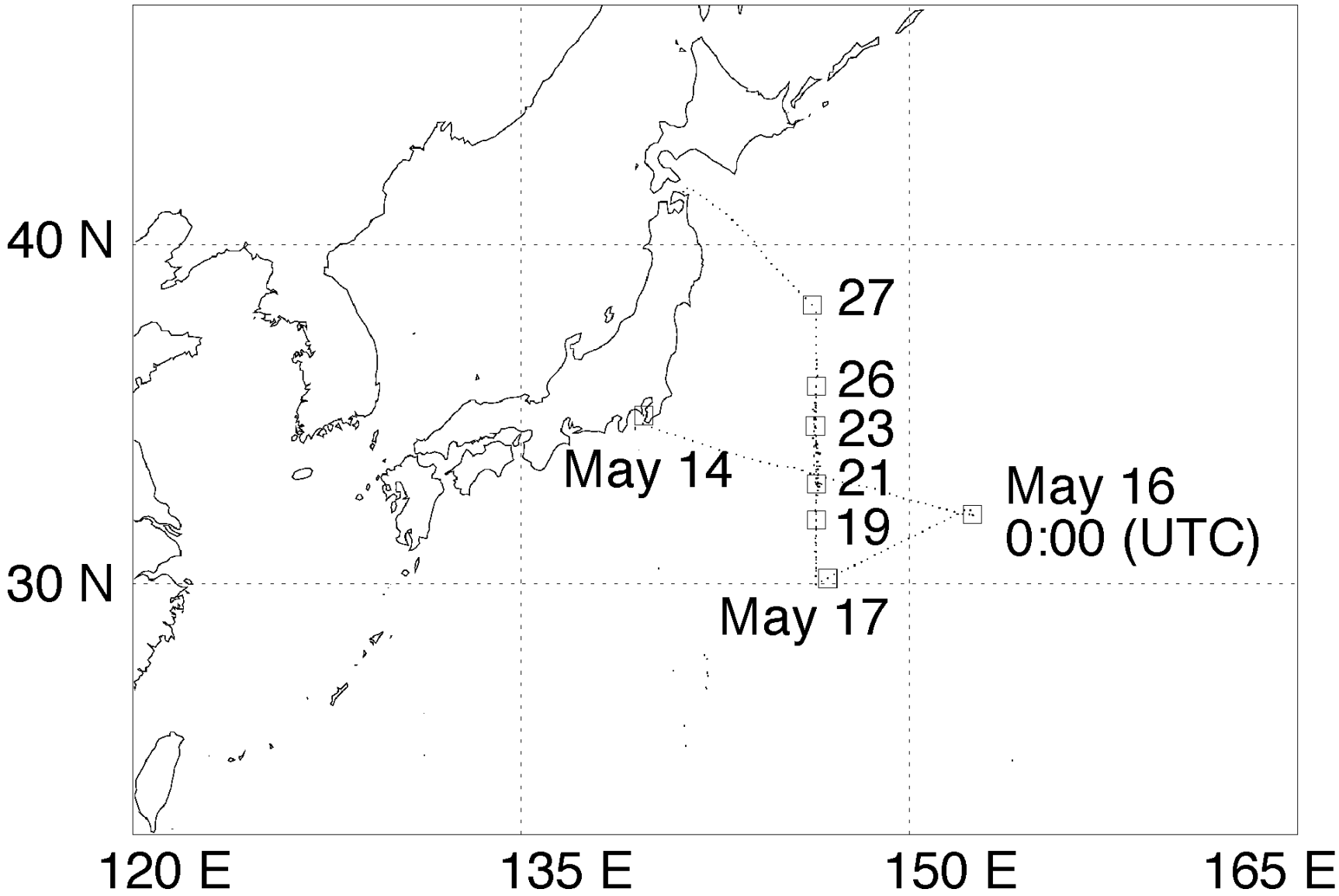
(1) Between number concentration of CCN (SS:0.3%) and SO_2 concentration



Y. Ishizaka (2001)

Japanese ACE-Asian cruise with MIRAI



Aerosol plumes observed by the lidar

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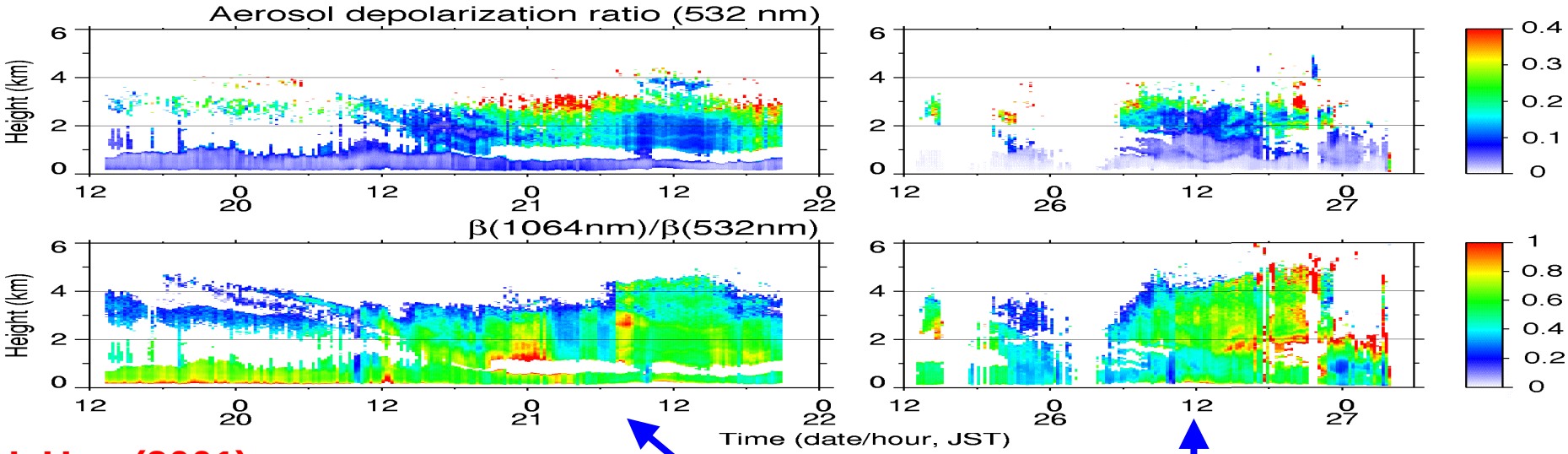
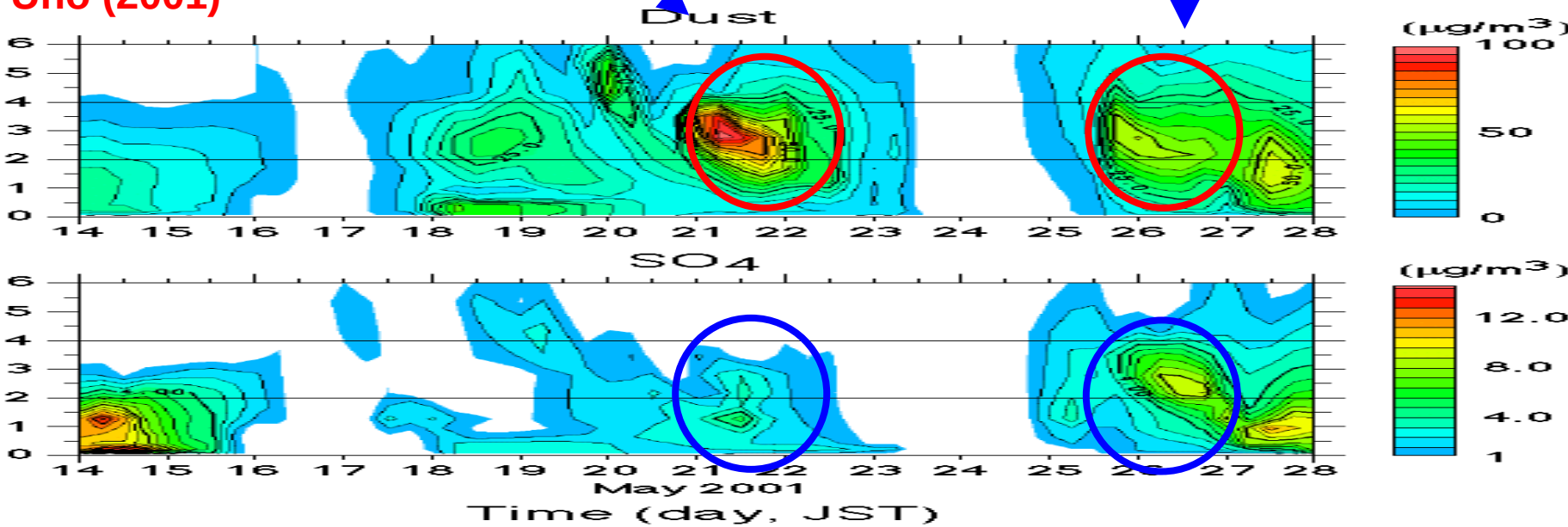
N. Sugimoto (2001)



I. Uno (2001)



Upper dust and lower fine particles

Emission cloud algorithm

- **IR method**
  - **Implementation finished**
- **AVHRR analysis**
  - **Long term analysis: 1986-1994**
  - **Radiative forcing of cirrus**

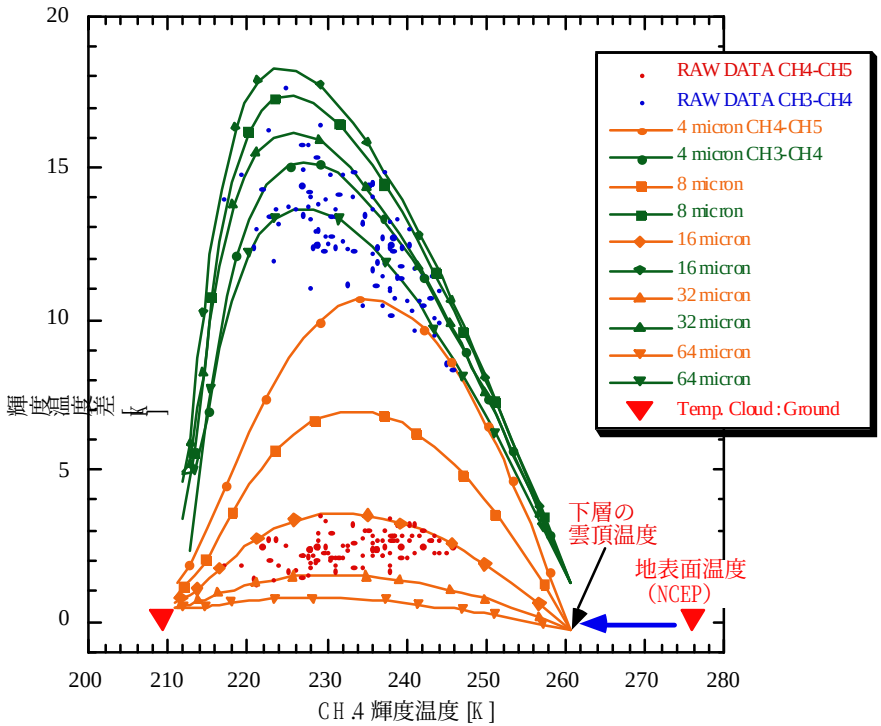


図５．９　下層の雲の雲頂温度を合わせた例

Cirrus from AVHRR: 1986-1994

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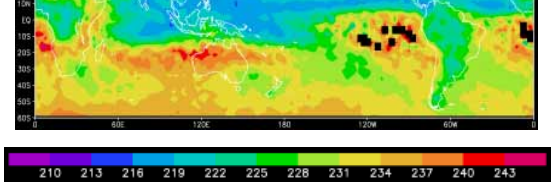
1） 1月

2） 4月

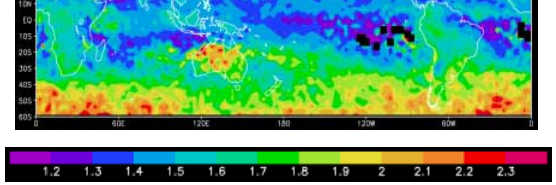
3） 7月

4）１０月



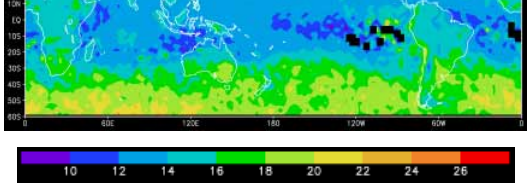
光学的厚さτ

図6．7　雲頂温度の平均値　１９８６－１９９４年



光学的厚さτ

図6．6　光学的厚さの平均値　１９８６－１９９４年



有効粒径 Re[μm]

図6．5　有効粒径の平均値　１９８６－１９９４年

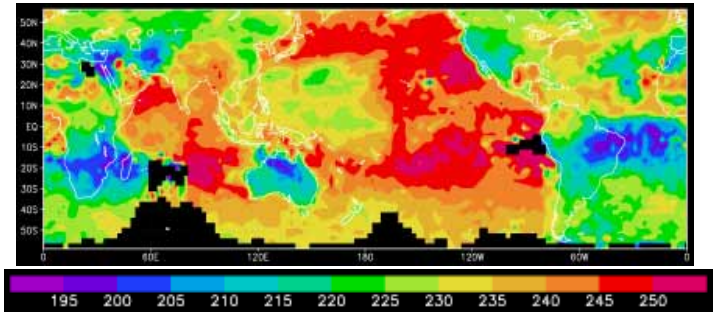


図６．１８　ISCCP D2 データでの巻雲の雲頂温度T[K]　１９９２年７月

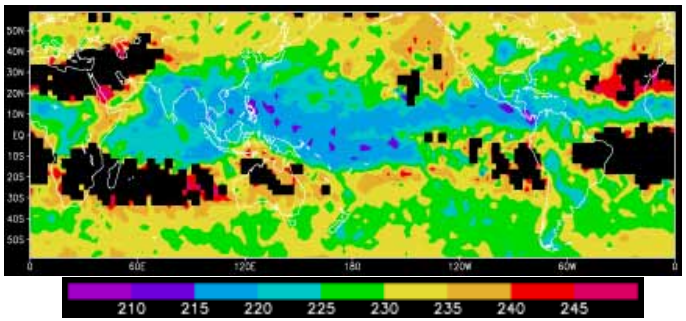


図６．１９　本研究で得られた雲頂温度T[K]　１９９２年７月

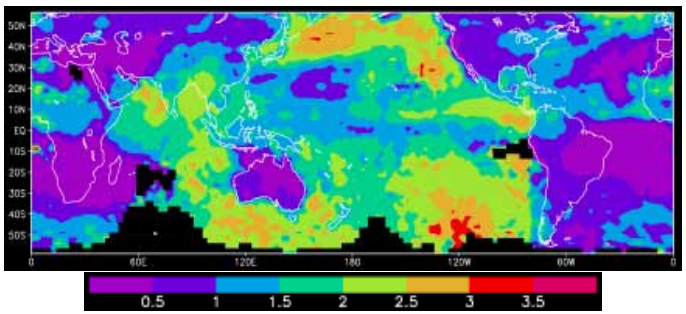


図６．２０　ISCCP D2 データでの巻雲の光学的厚さτ１９９２年７月

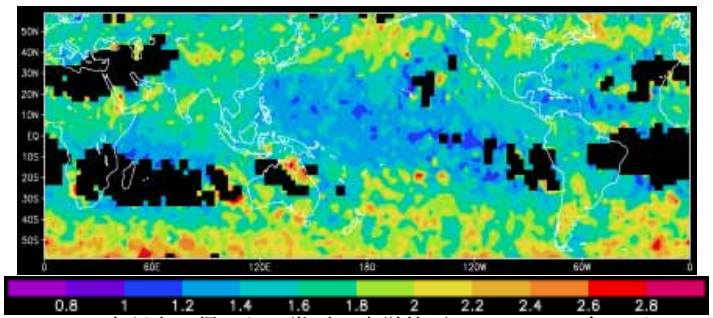


図６．２１　本研究で得られた巻雲の光学的厚さτ１９９２年７月

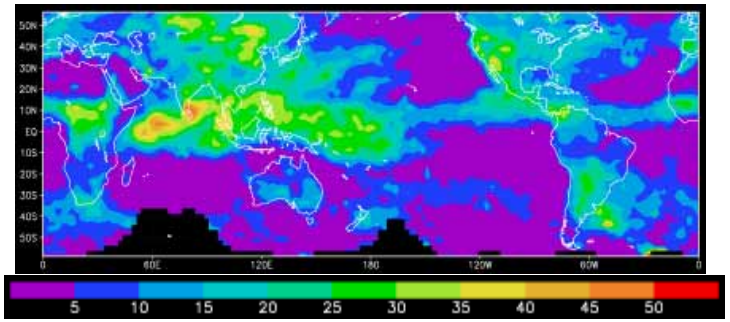


図６．２２　ISCCP D2 データでの巻雲の雲量[%] １９９２年７月

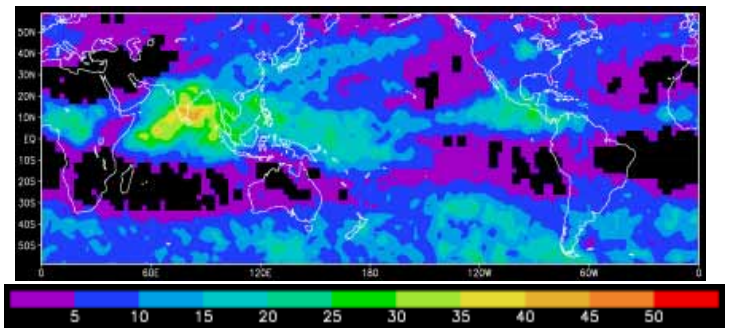
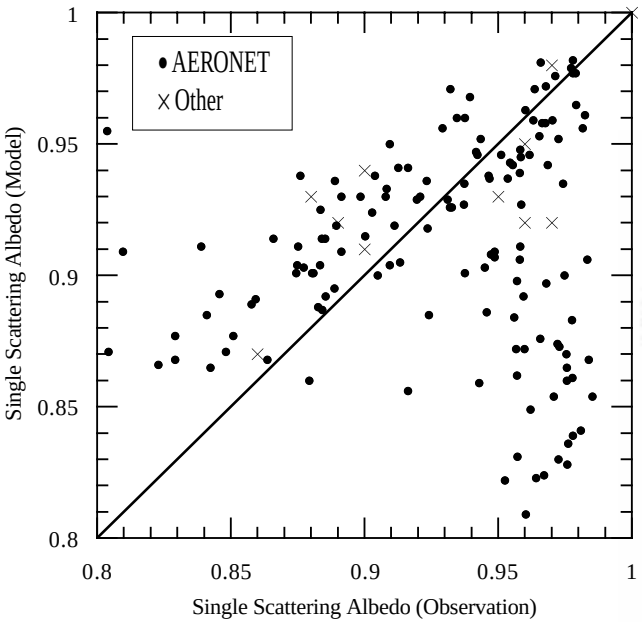
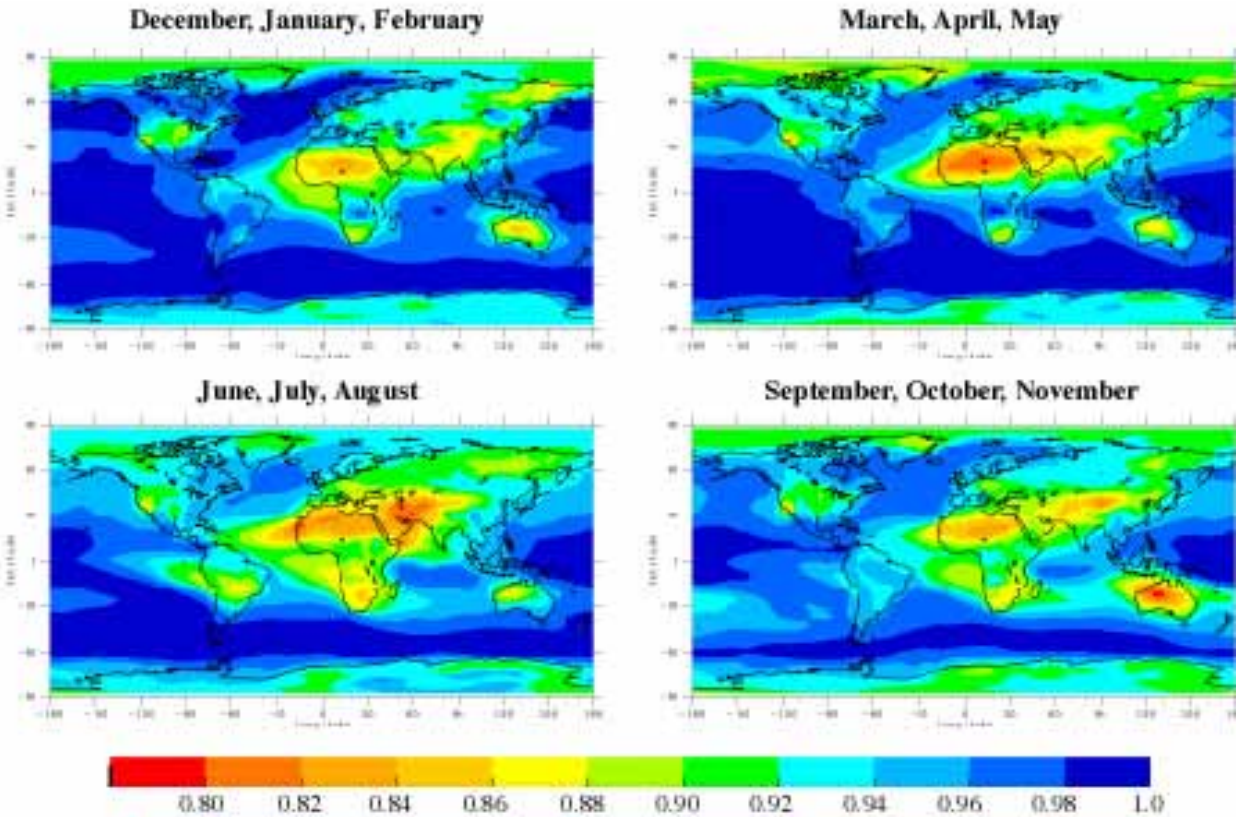


図６．２３　本研究で得られた巻雲の雲量[%] １９９２年７月

Comparison with other products

Simulation of the single scattering albedo with CCSR/NIES Aerosol Climate Model





Takemura et al. (JC, in press)

Radiative forcing of high clouds

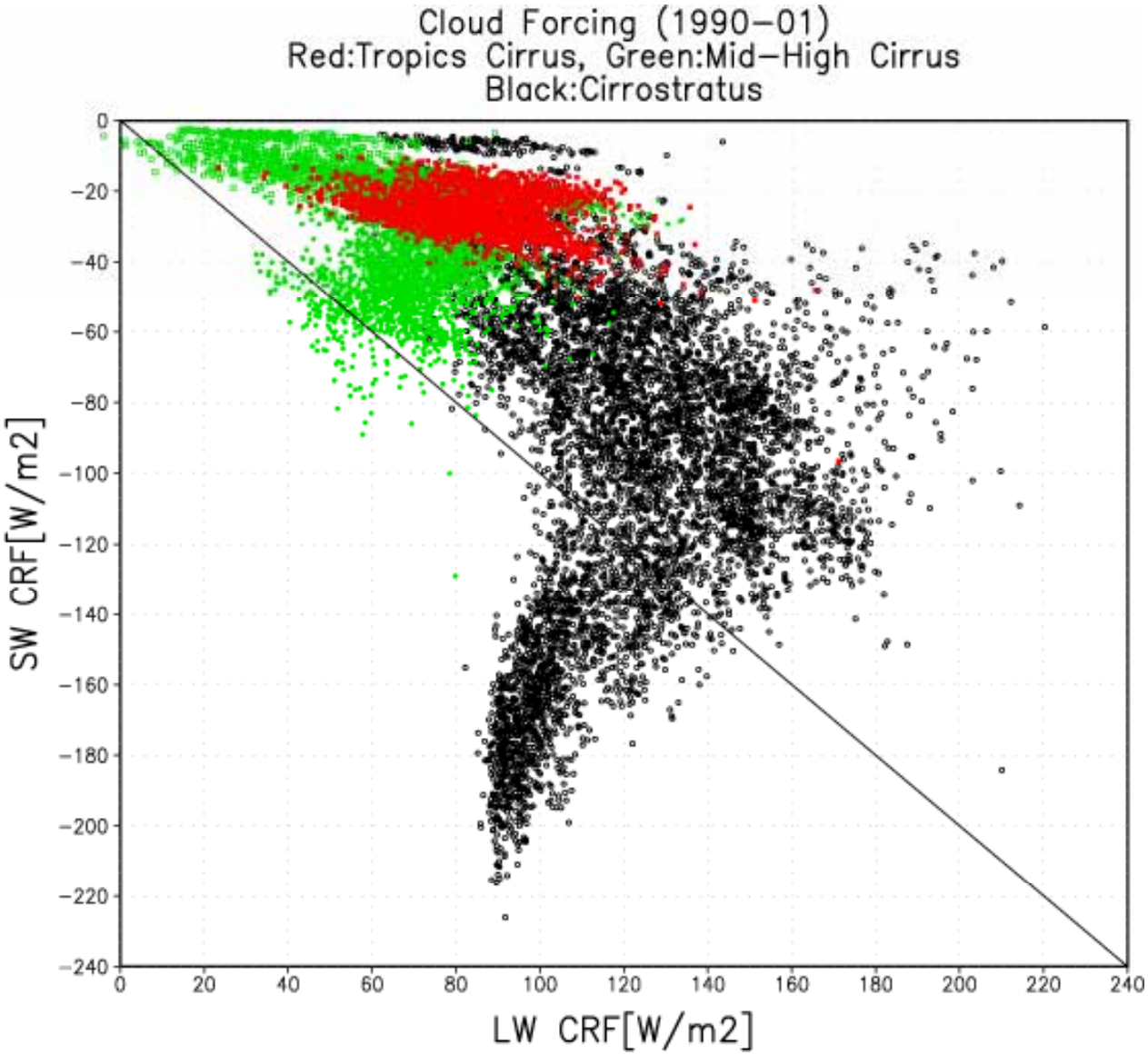
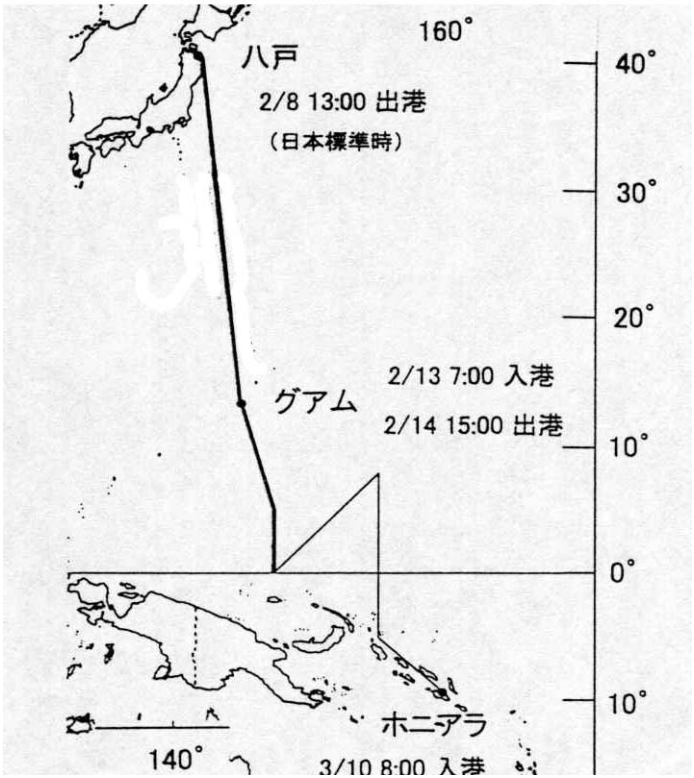
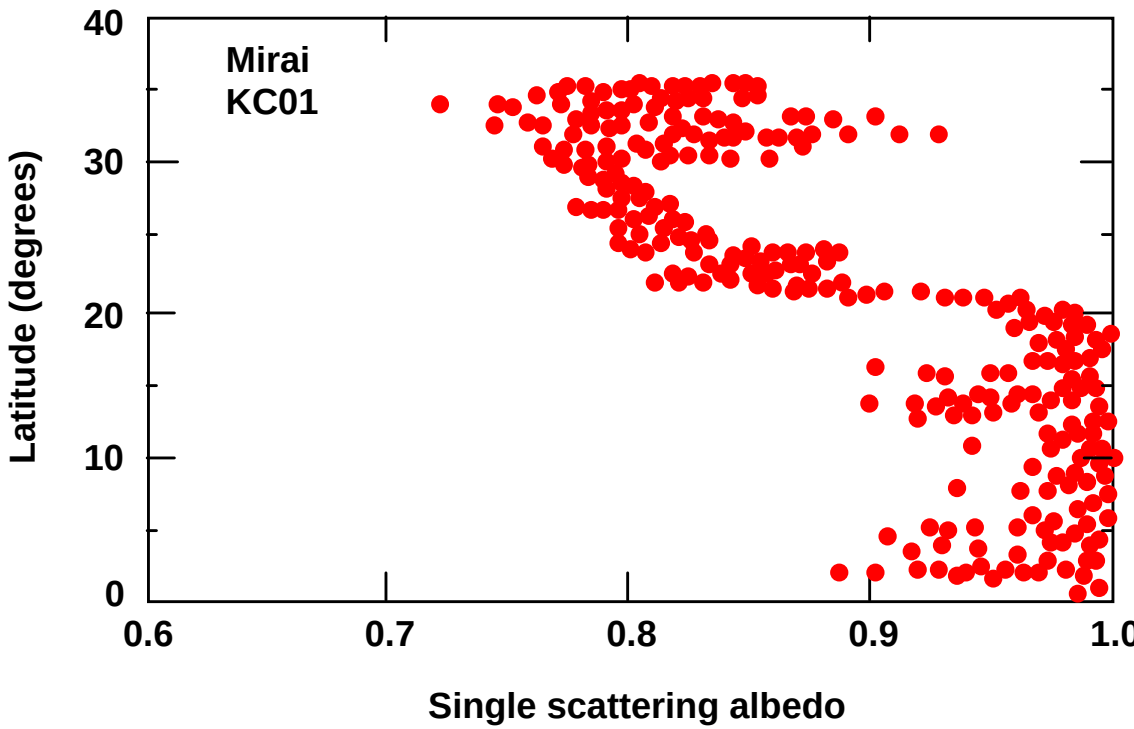


図７．１１　雲量１の巻雲、巻層雲の放射強制力の散布図

SSA measurements





Mirai RM99-K01
PREDE: 99.2.8-3.10

S. Ohta (2000)