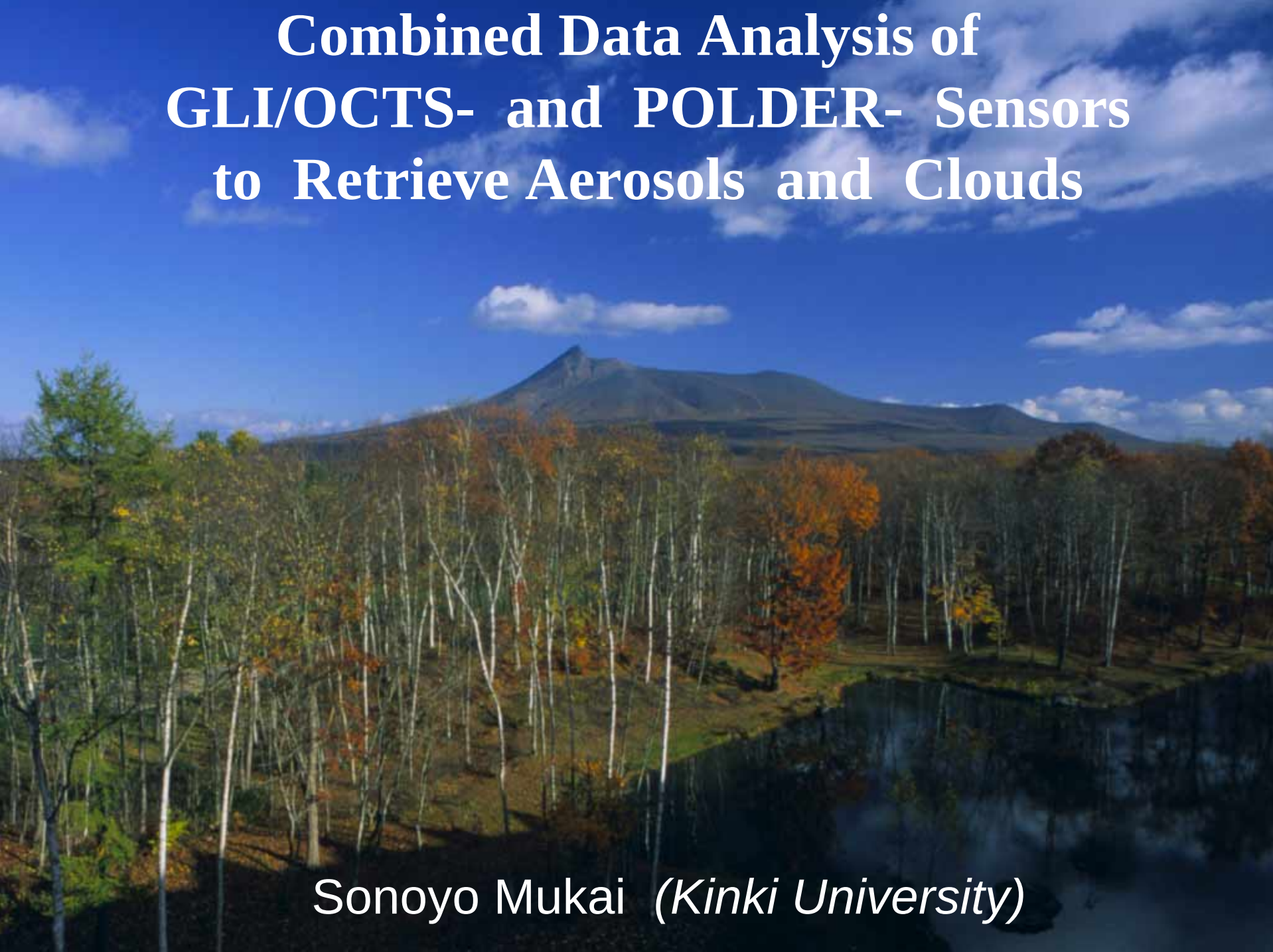
Combined Data Analysis of GLI/OCTS- and POLDER- Sensors to Retrieve Aerosols and Clouds



Sonoyo Mukai *(Kinki University)*

Contents

1...Aerosols NEW !

Improved retrieval

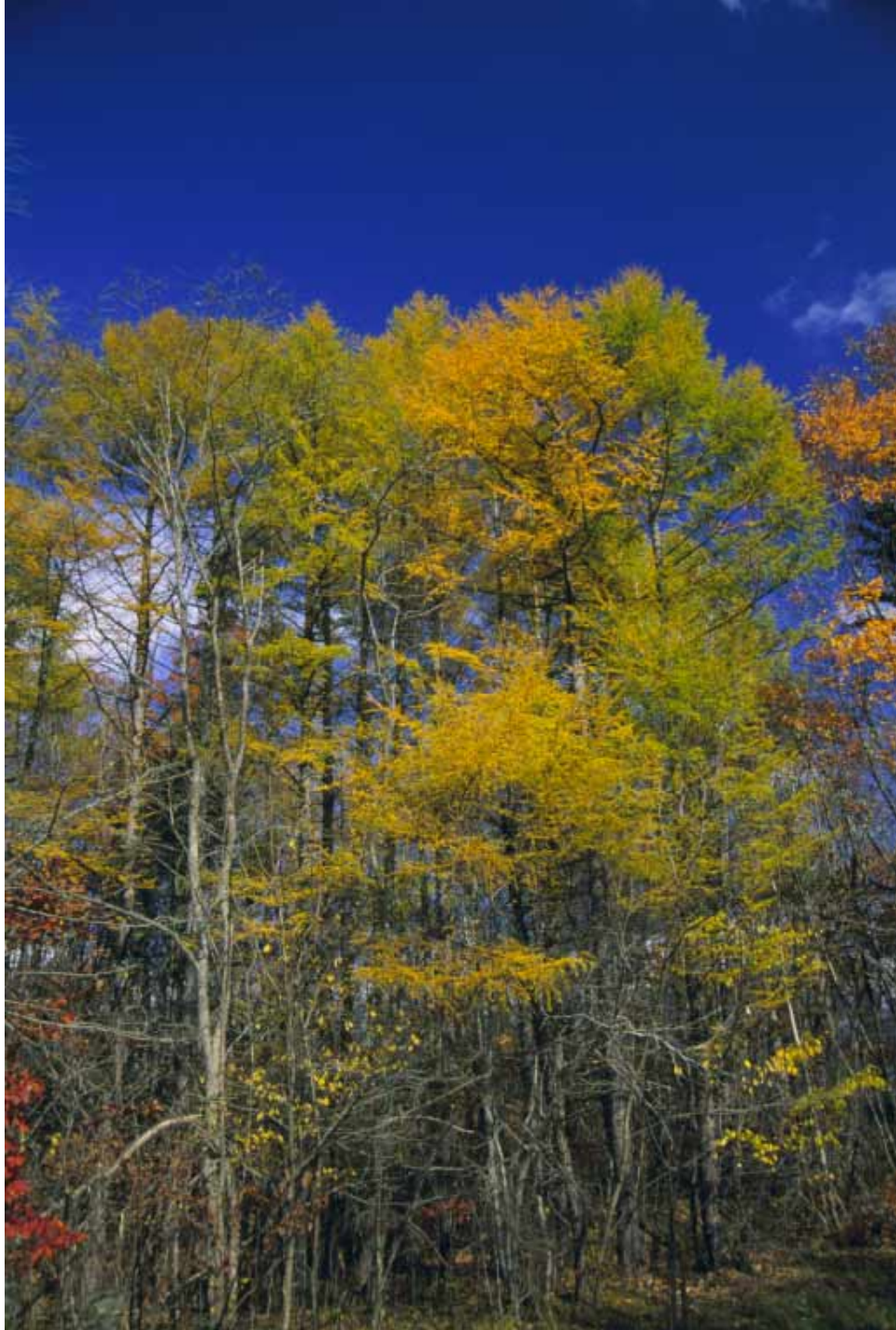
Ground polarimetry

NEW !

2...Soil water correction

3...Water vapor NEW !

4...Cloud retrieval



Aerosol Model

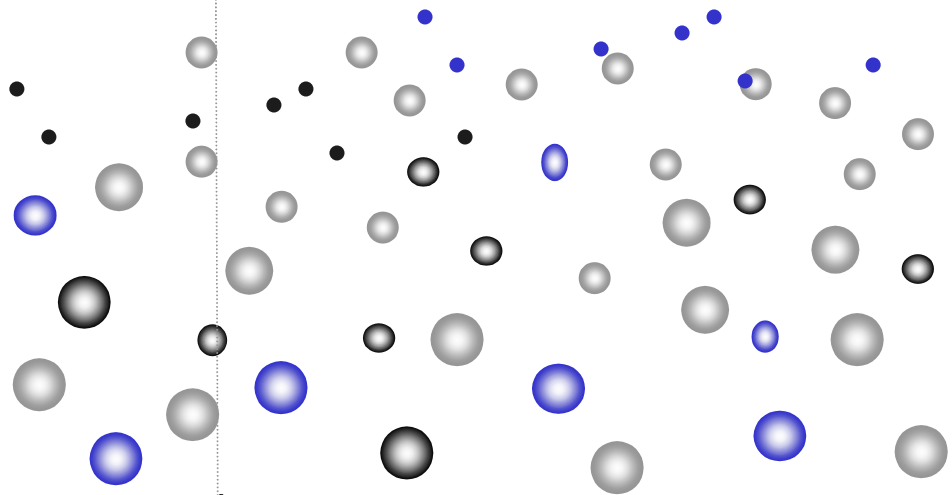
Size

Composition

Shape
(~sphere)

Concentration

size
distribution



Ångström
exponent

Refractive
Index

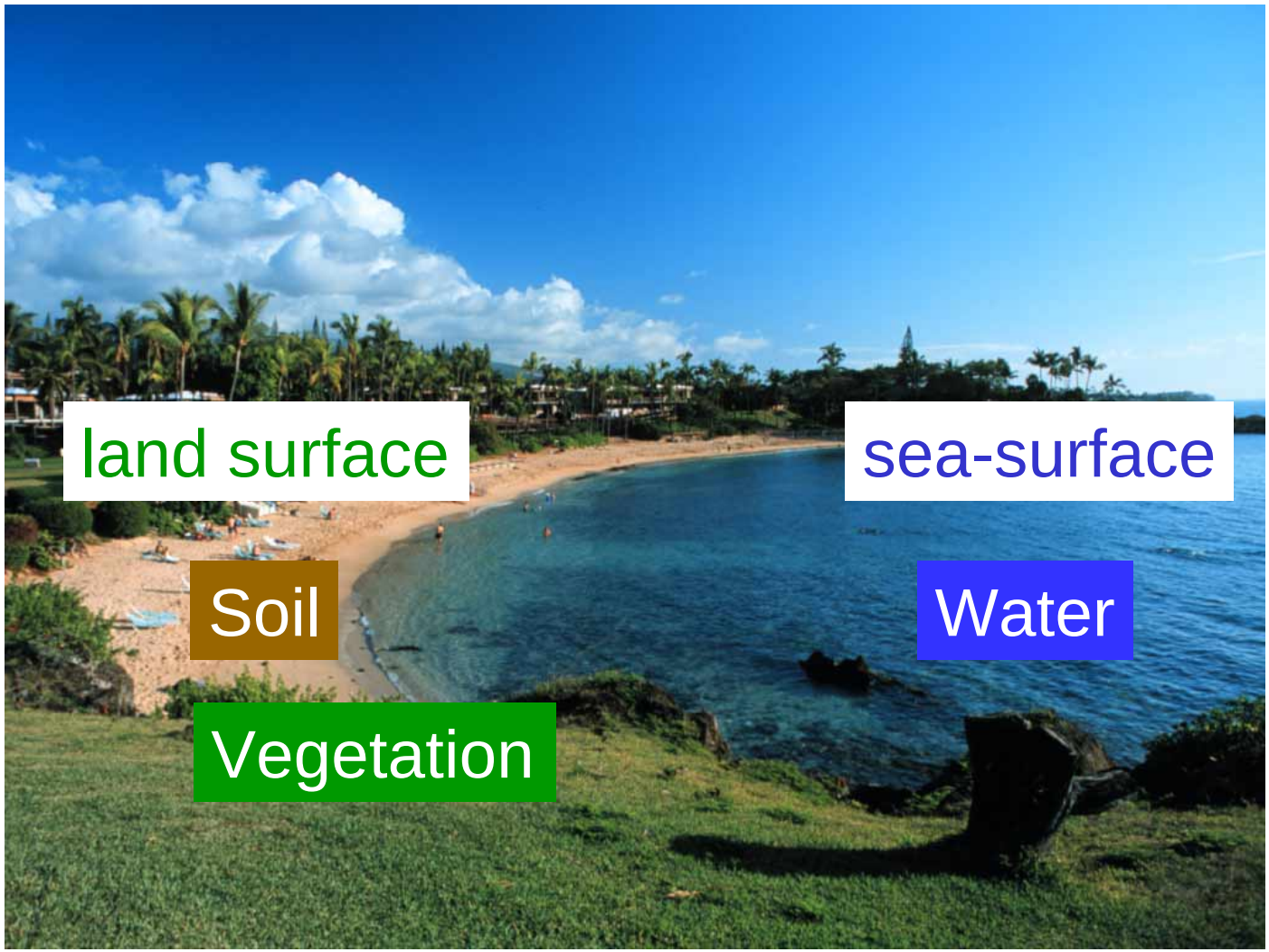
Optical
Thickness

α

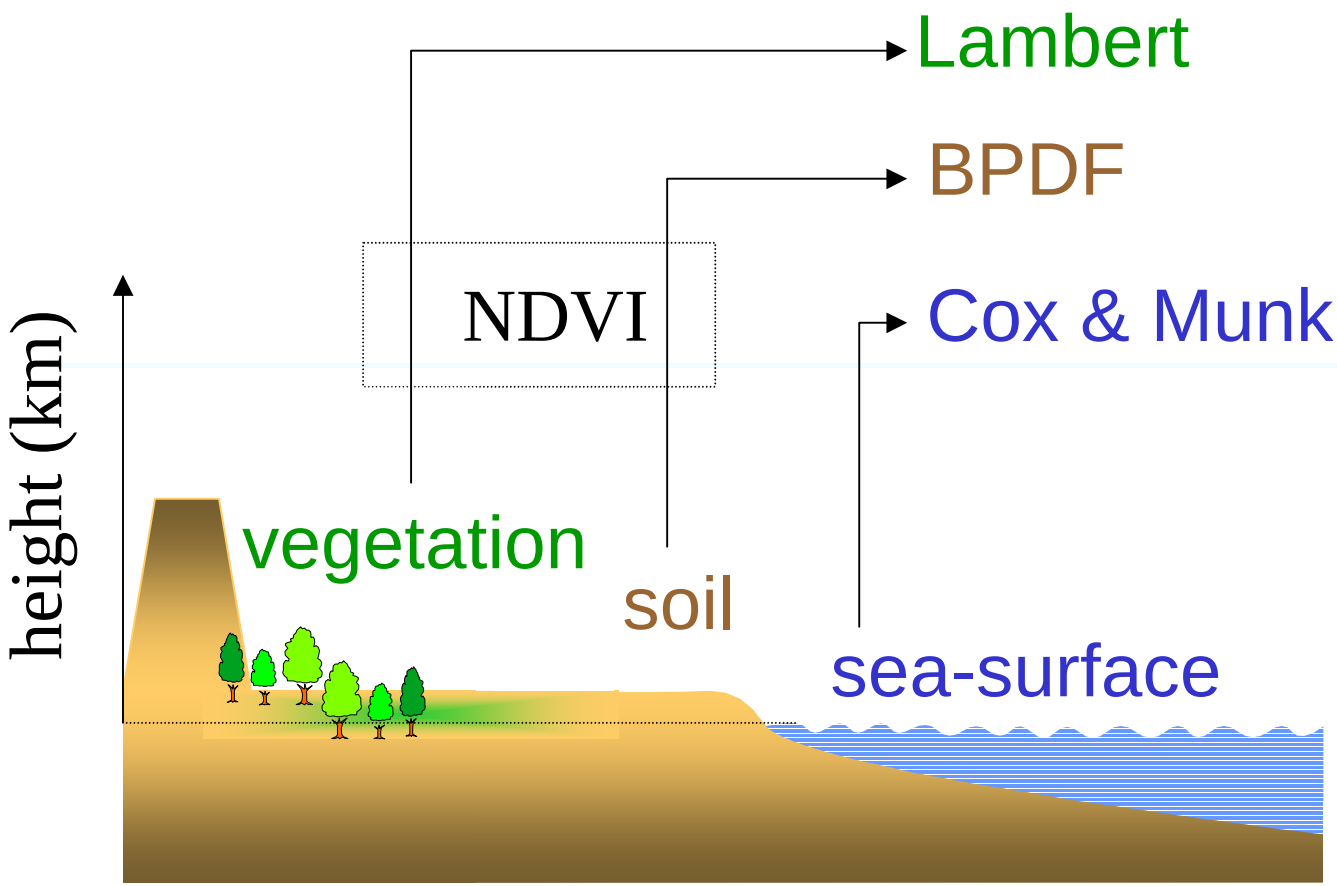
m = n-ki

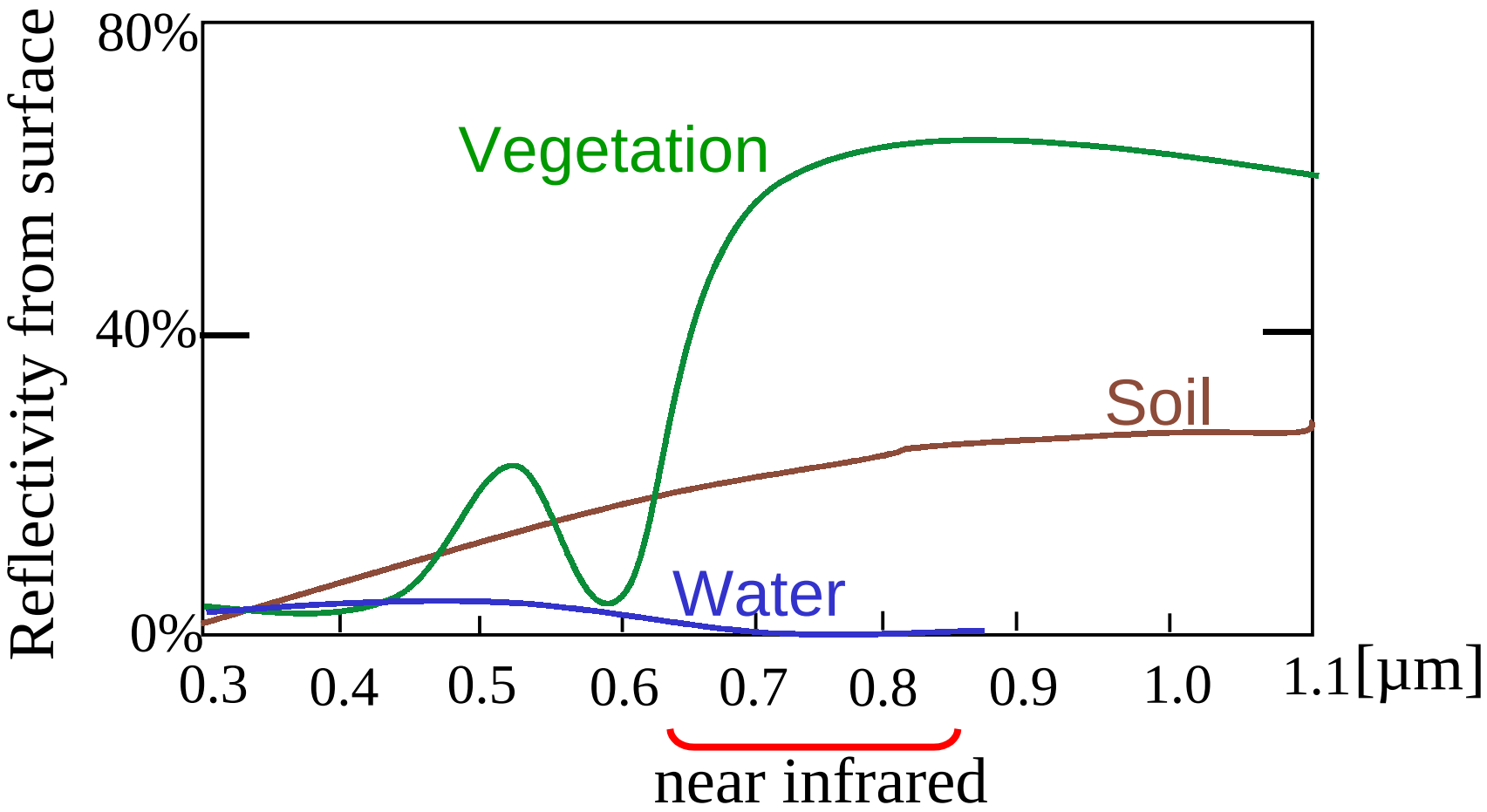
τ

Improved aerosol retrieval for atmosphere - surface model



Surface Model



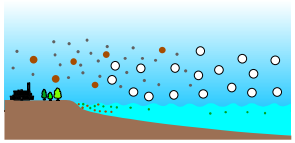


polarized radiance

aerosols over land

aerosols over ocean

2-channel algorithm for aerosol retrieval
(0.670 μm and 0.865 μm)

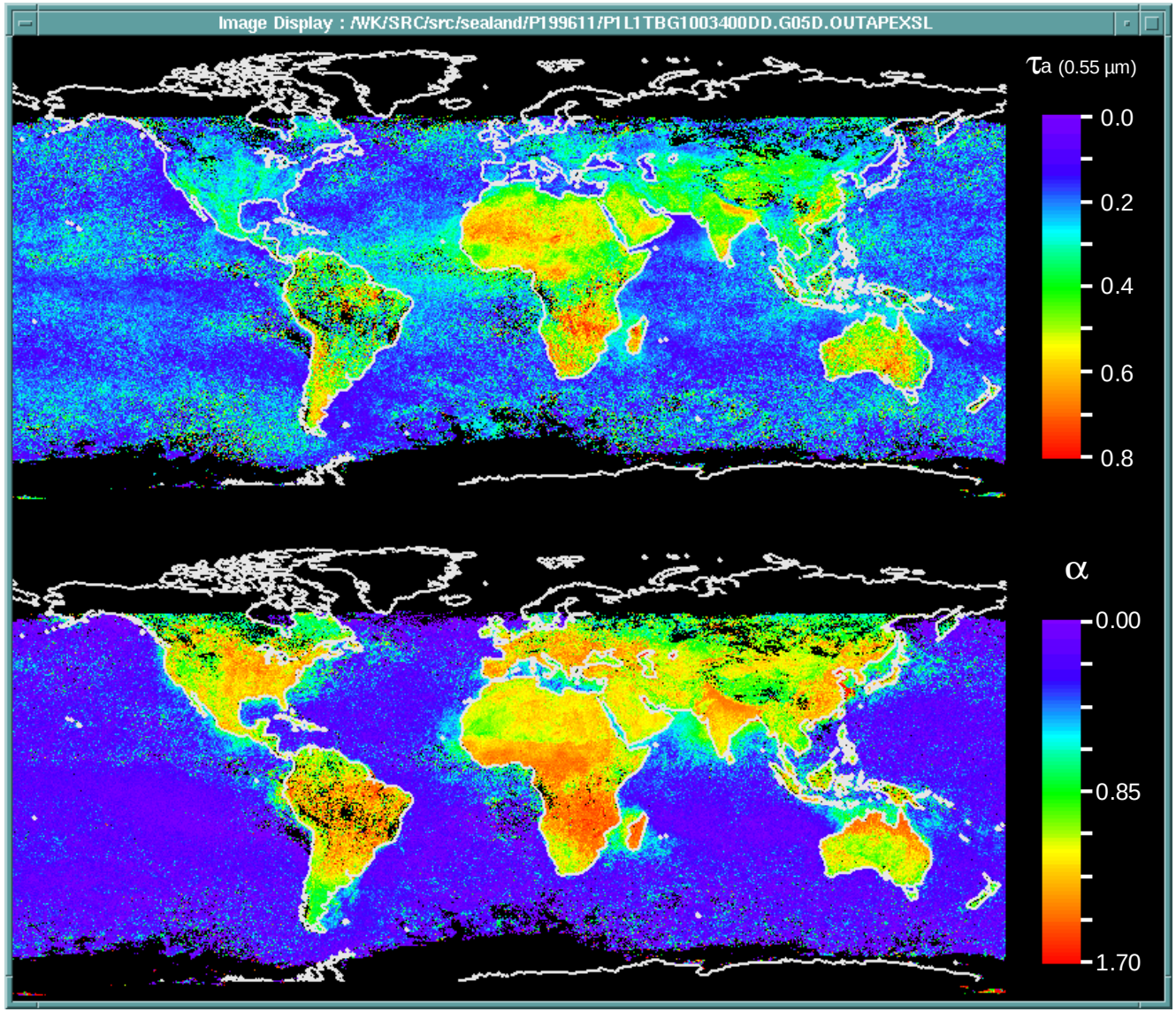


Land	Ocean
polarized radiance	radiance & polarization degree
⇩	⇩
optical thickness (τ) Ångström exponent (α)	optical thickness (τ) Ångström exponent (α) refractive index (m)

November in 1996

τa
0.55 µm

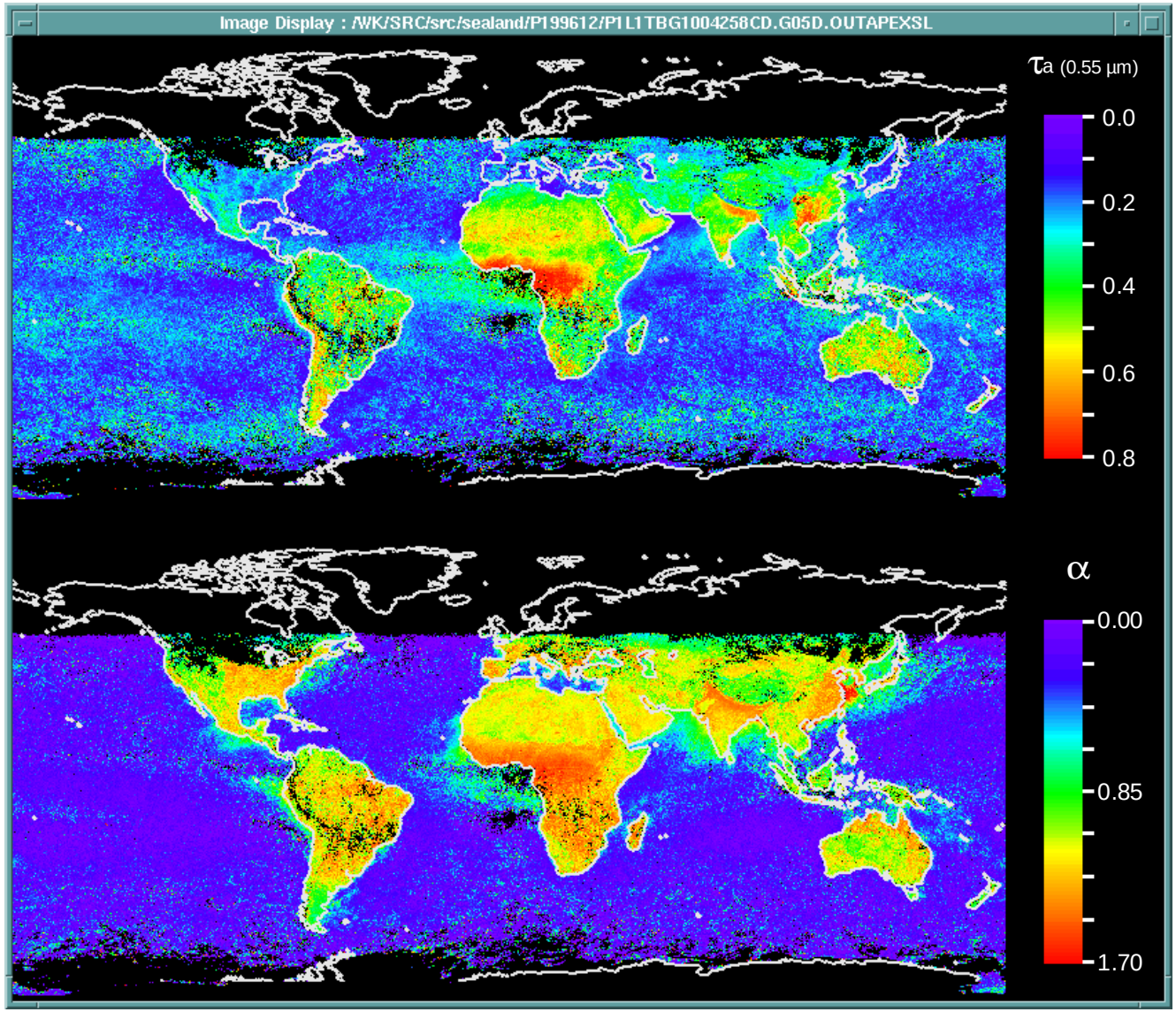
α



December in 1996

τ_a
0.55 µm

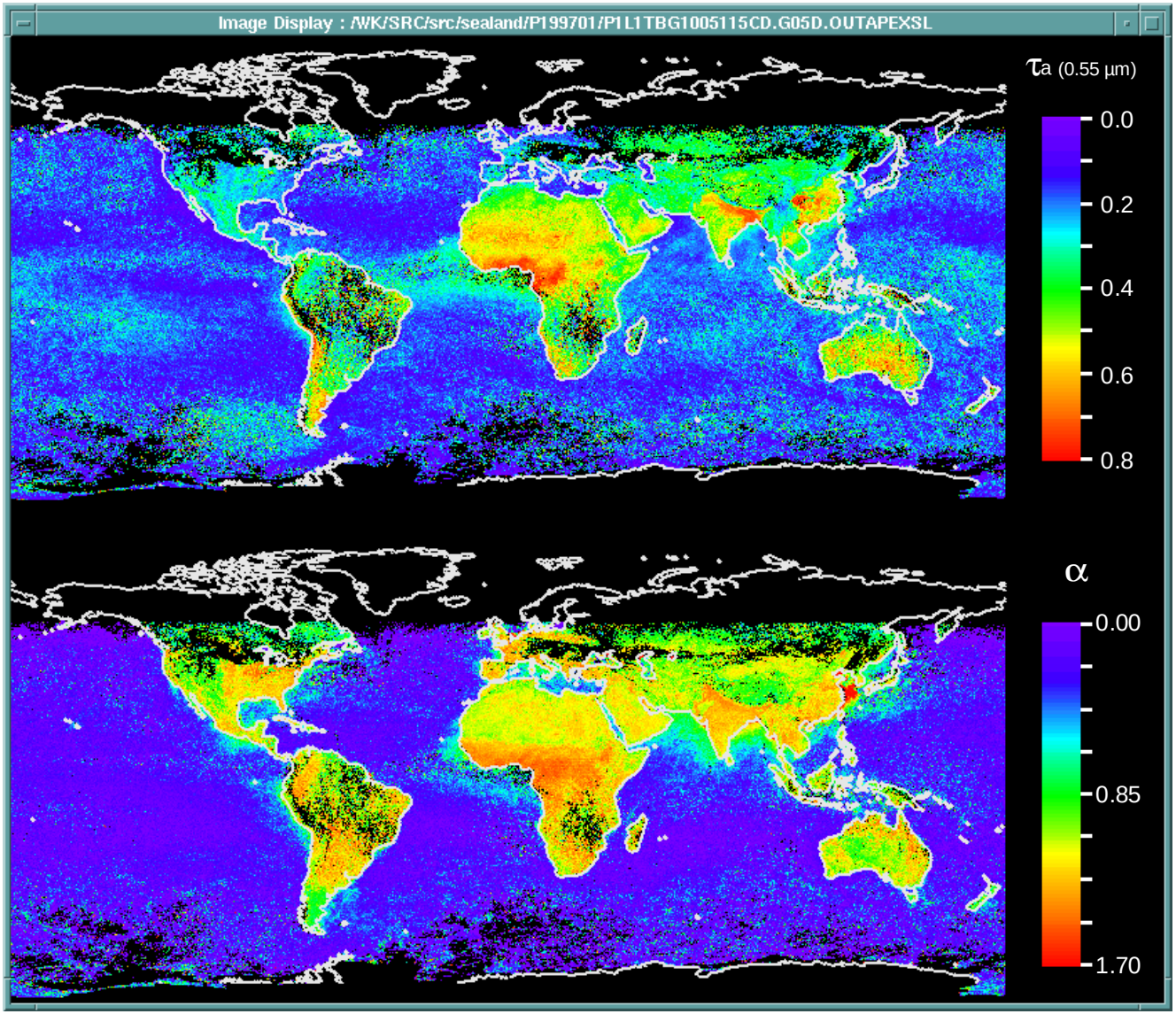
α



January in 1997

τa
0.55 µm

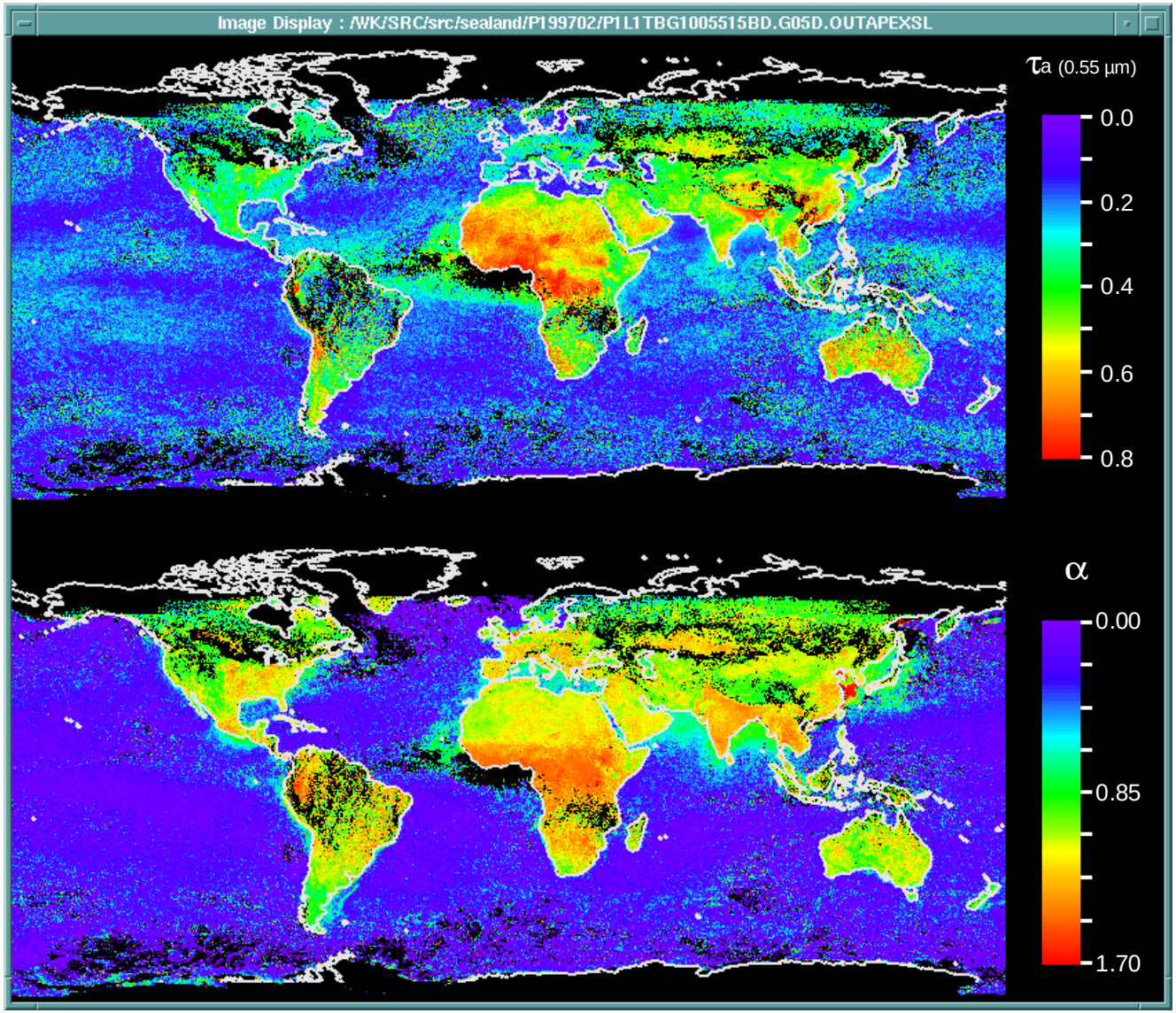
α



February in 1997

τ_a
0.55 µm

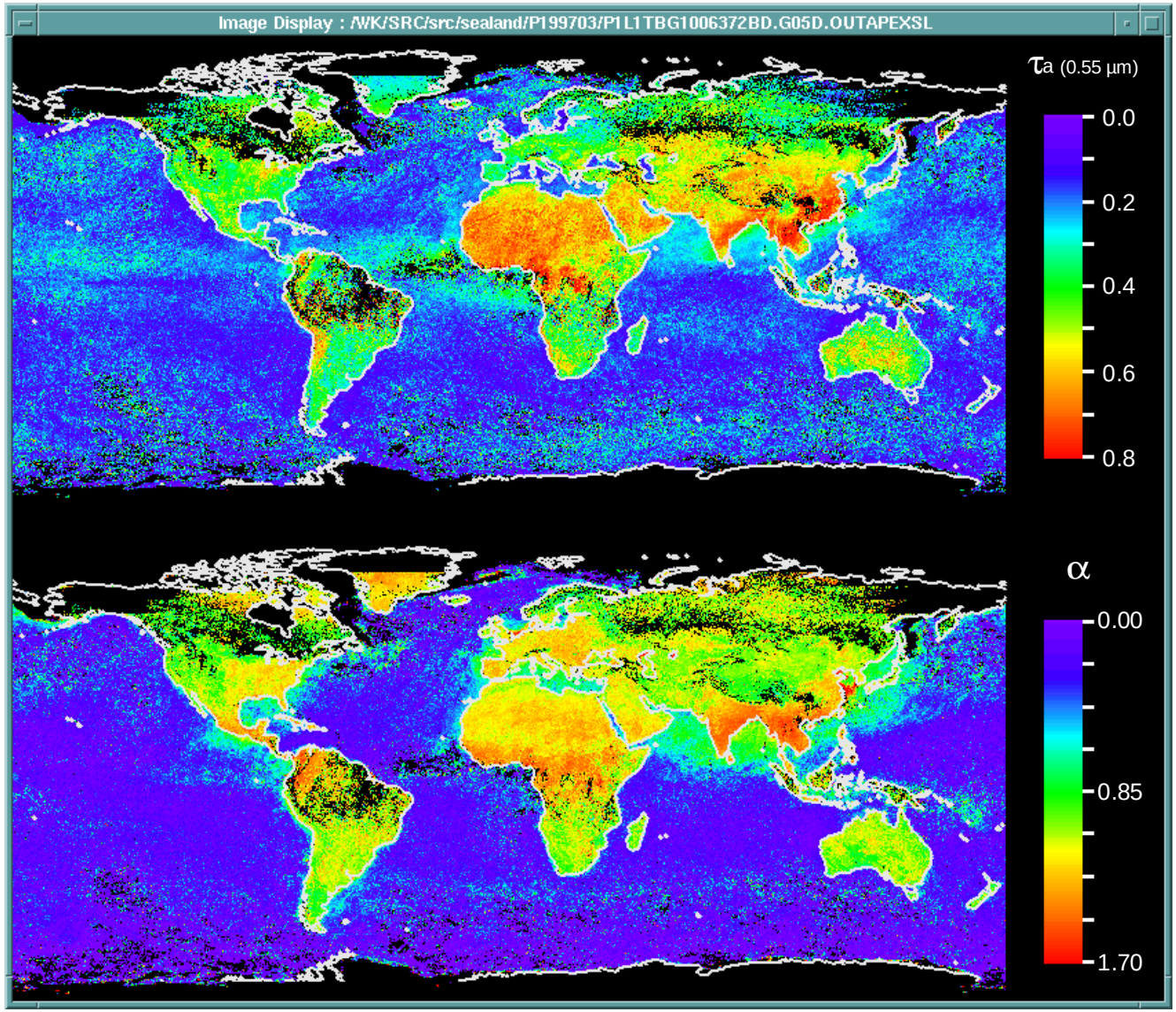
α



March in 1997

τa
0.55 µm

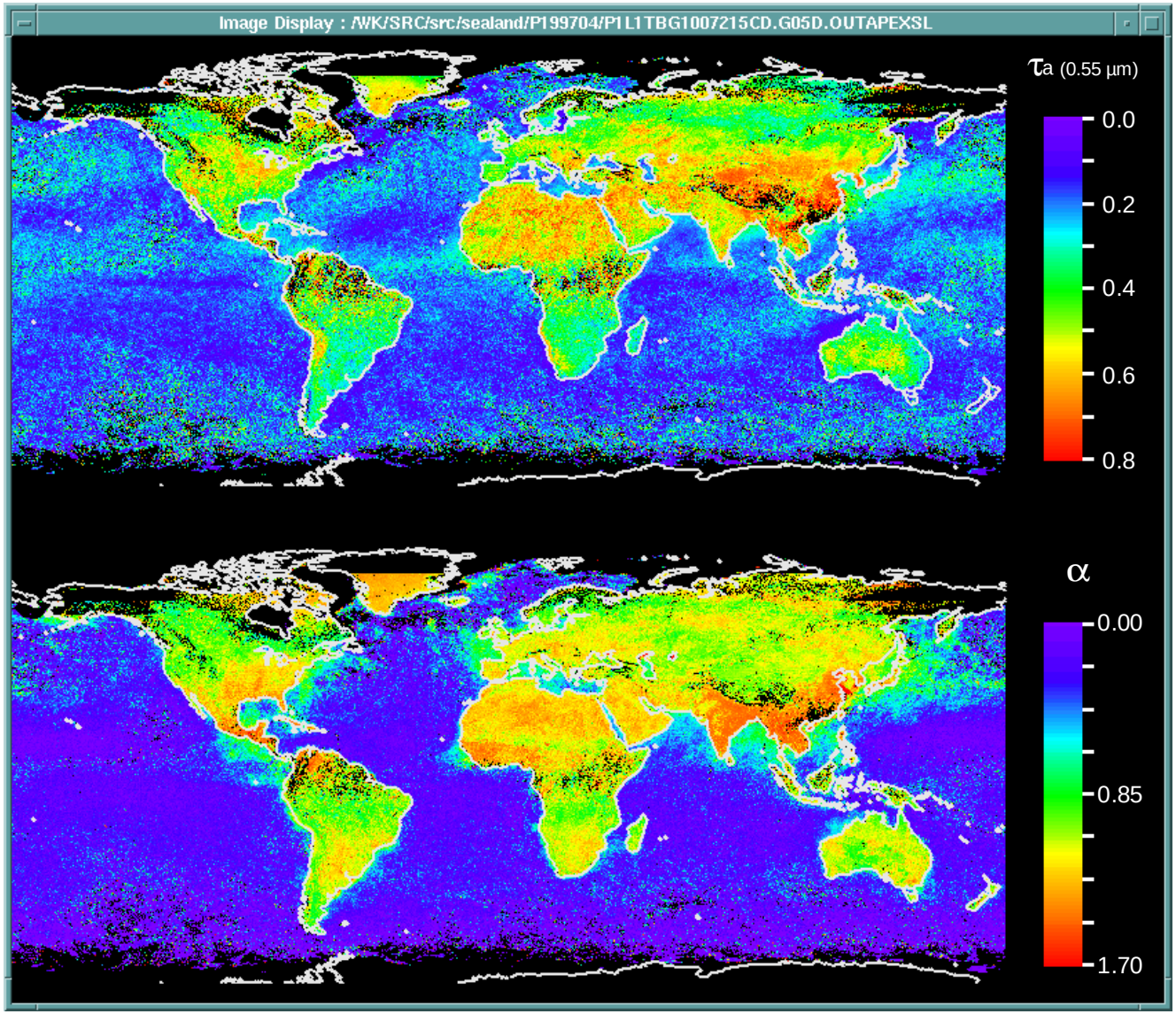
α



April in 1997

τ_a
0.55 µm

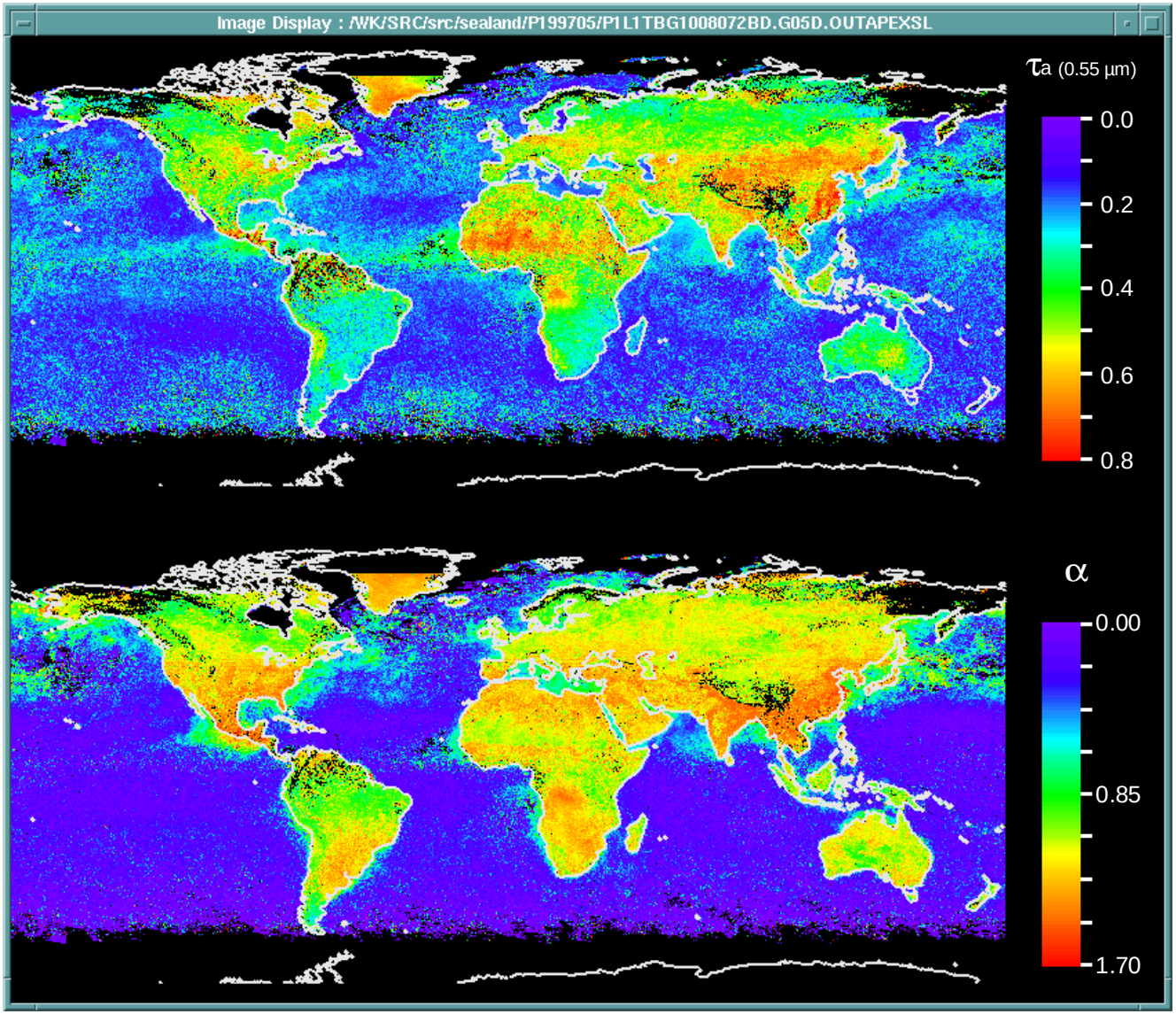
α



May in 1997

τa
0.55 µm

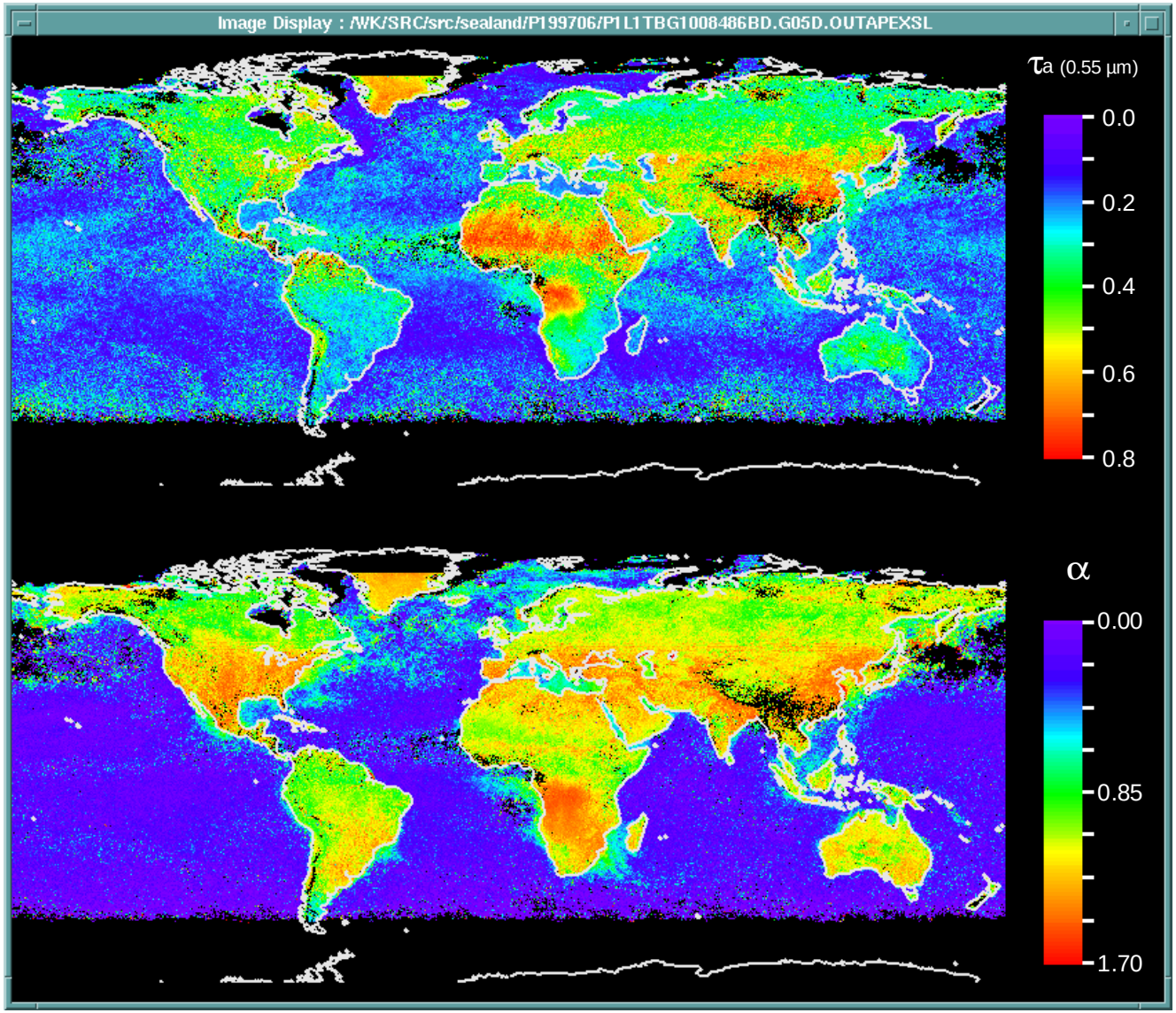
α



June in 1997

τ_a
0.55 µm

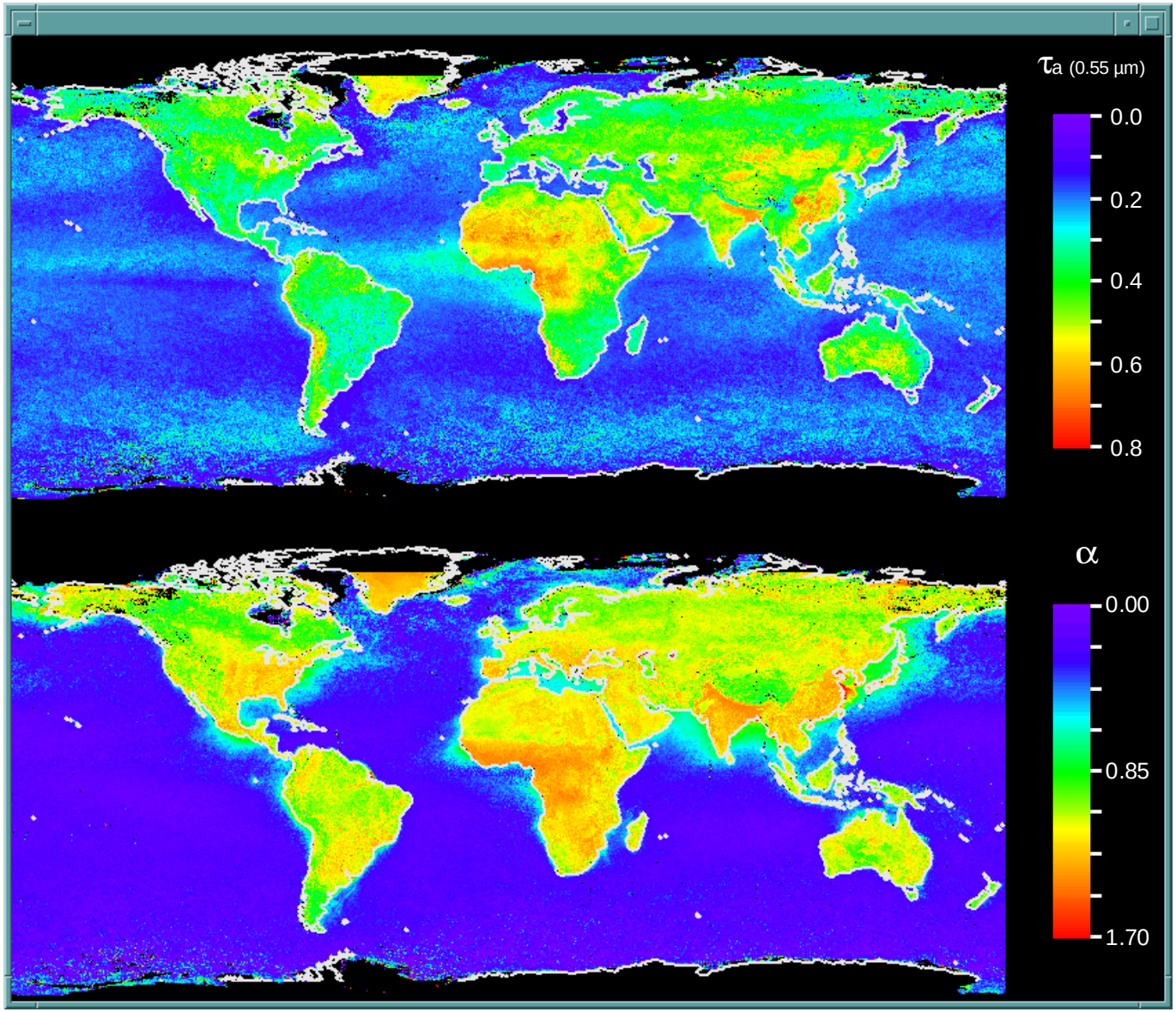
α



Averaged values over 8-months from November in 1996 to June in 1997

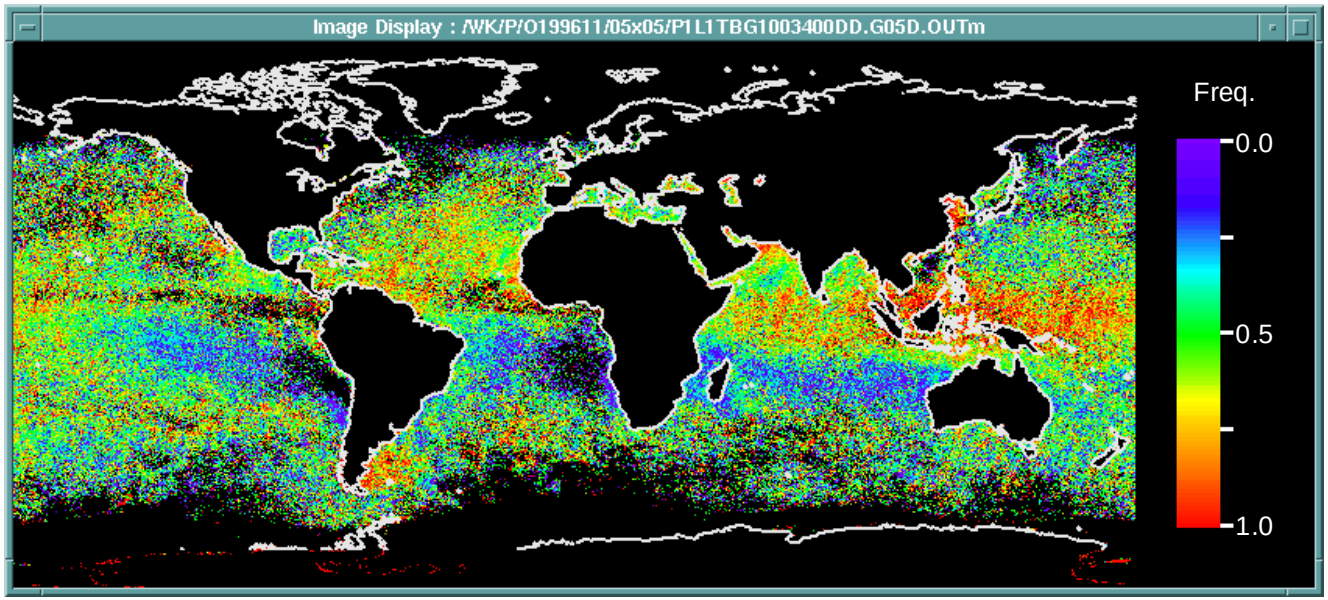
τ_a
0.55 μm

α



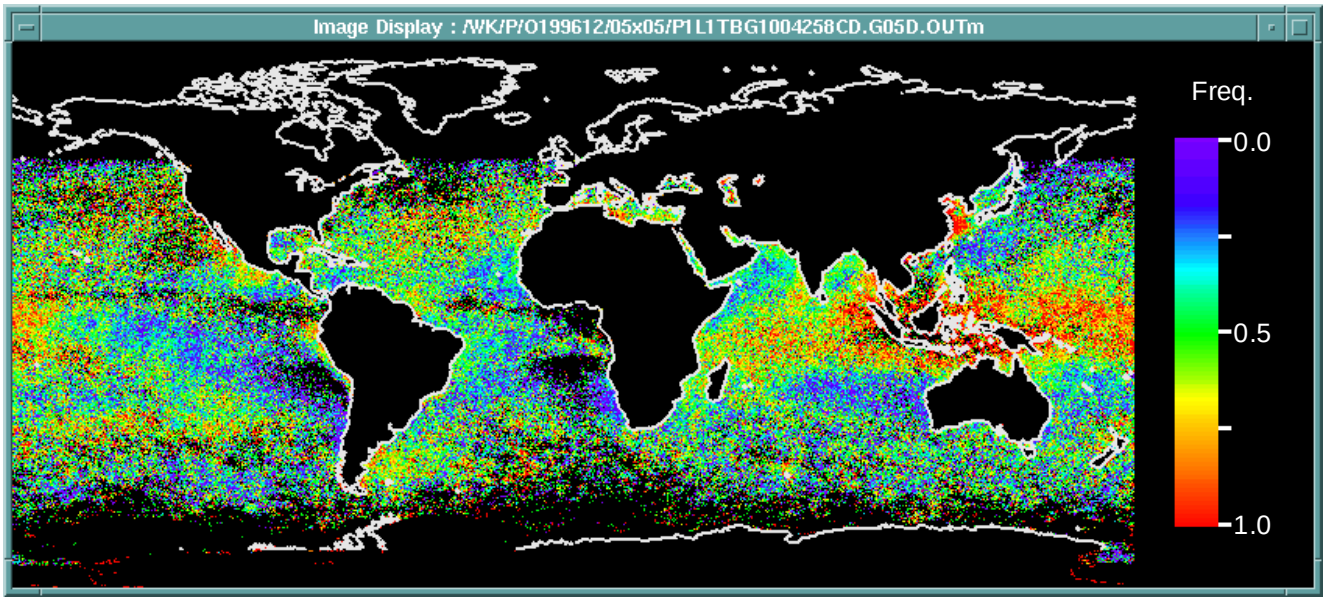
Distribution of aerosol composition in Nov. 1996

Frequency of absorbing particles with m=1.5-0.01i



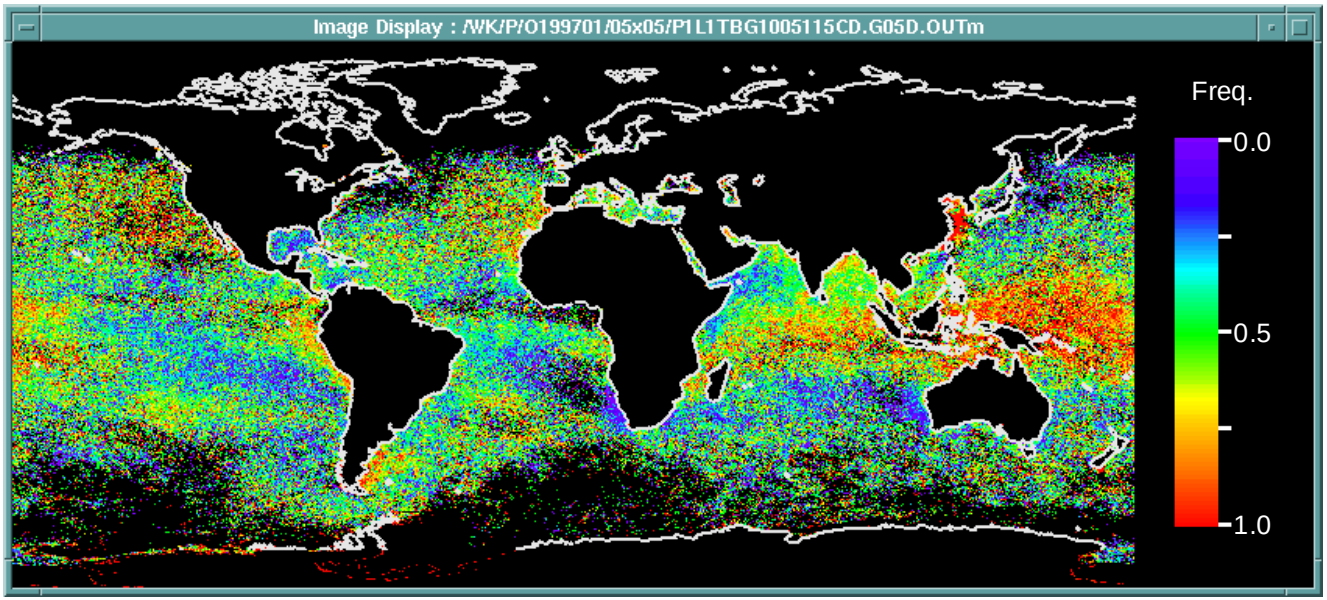
Distribution of aerosol composition in Dec. 1996

Frequency of absorbing particles with m=1.5-0.01i



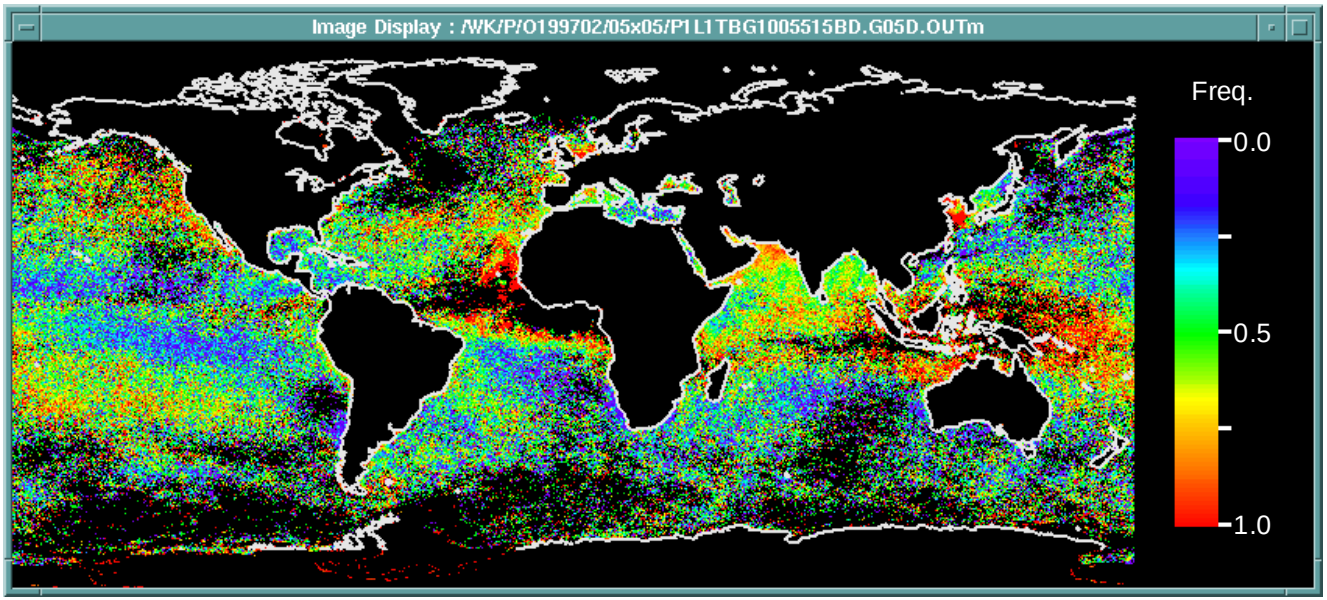
Distribution of aerosol composition in Jan. 1997

Frequency of absorbing particles with m=1.5-0.01i



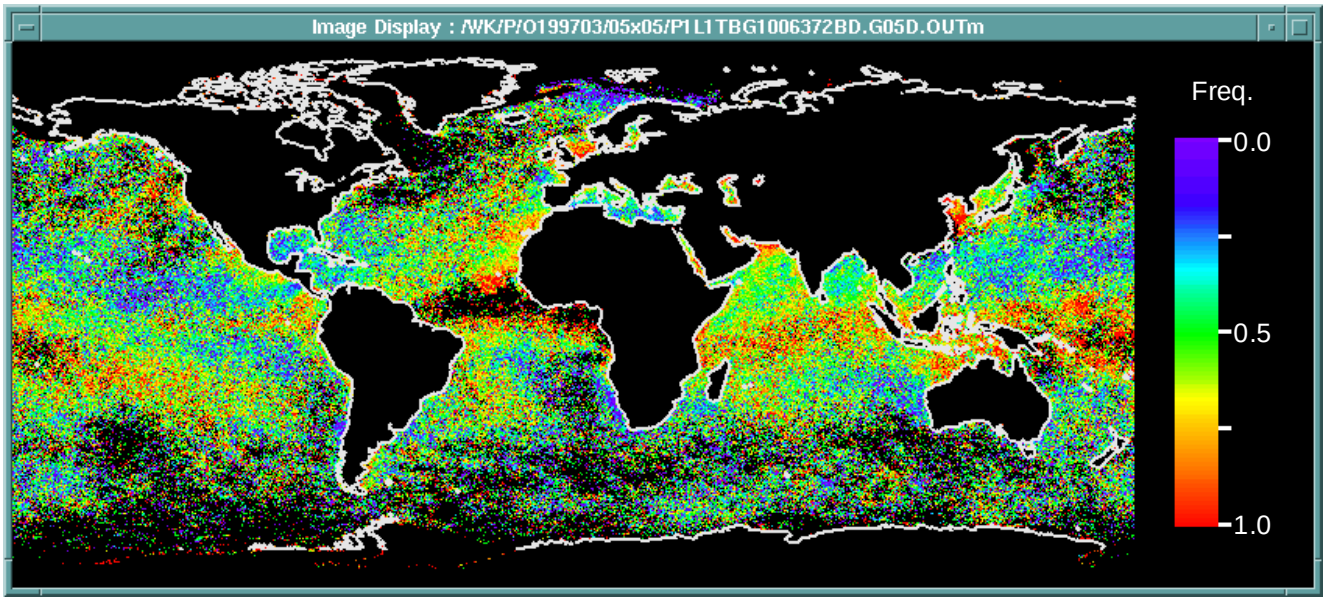
Distribution of aerosol composition in Feb. 1997

Frequency of absorbing particles with m=1.5-0.01i



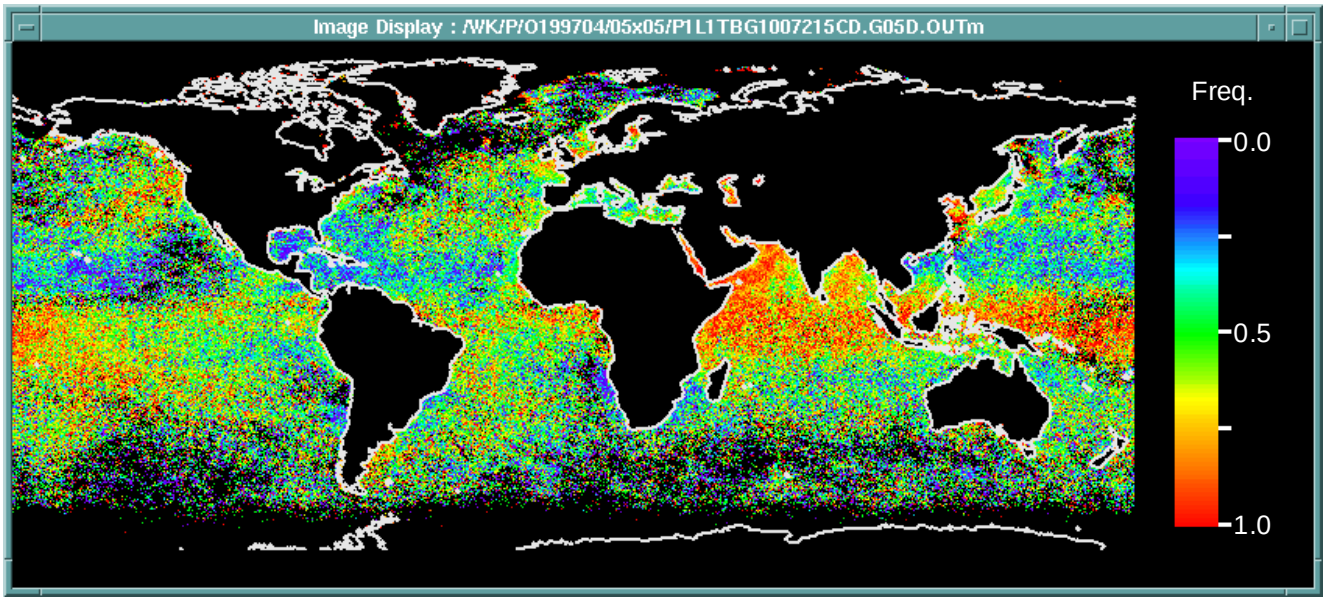
Distribution of aerosol composition in Mar. 1997

Frequency of absorbing particles with m=1.5-0.01i



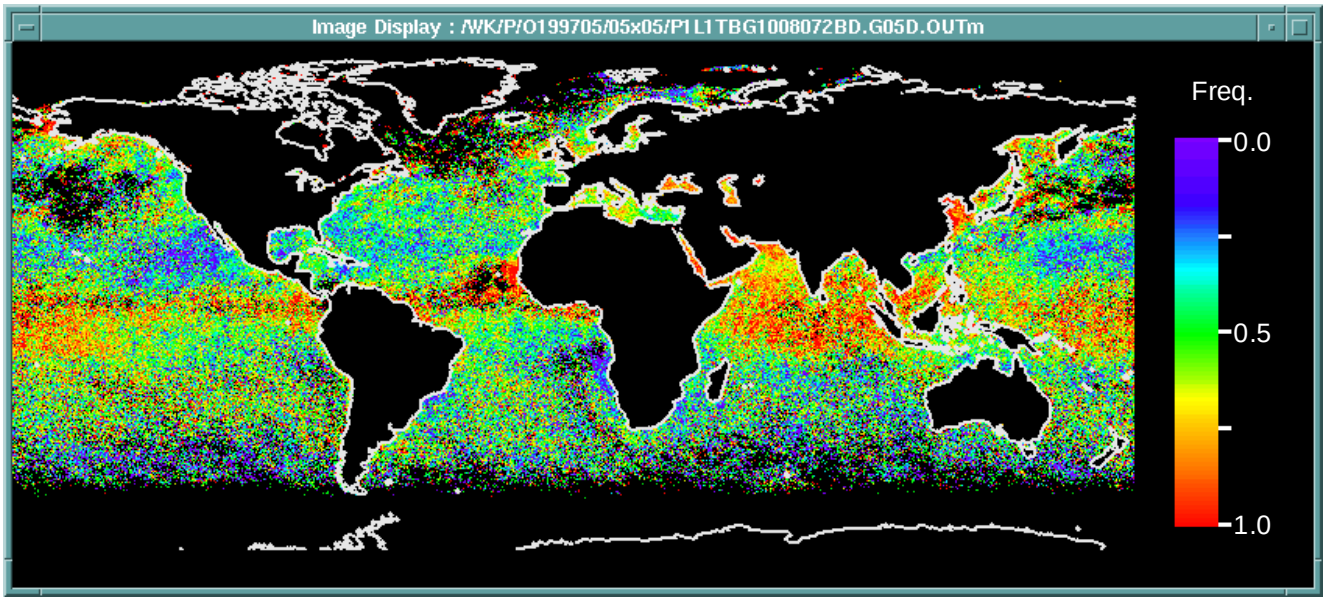
Distribution of aerosol composition in Apr. 1997

Frequency of absorbing particles with m=1.5-0.01i



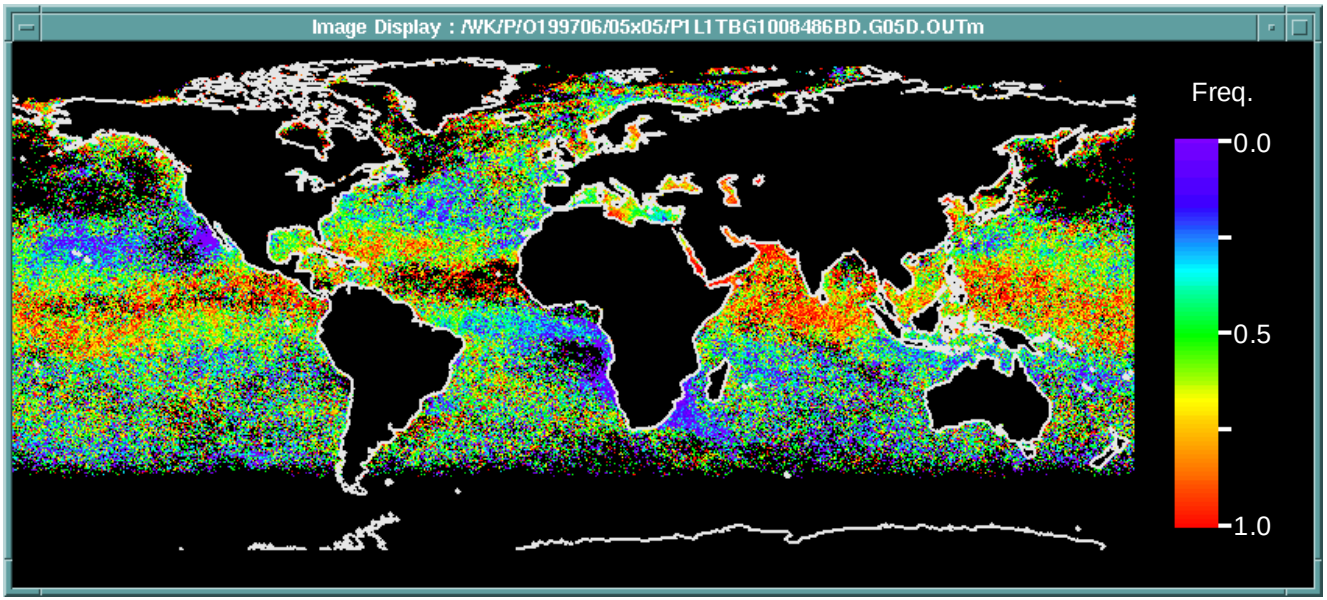
Distribution of aerosol composition in May. 1997

Frequency of absorbing particles with m=1.5-0.01i



Distribution of aerosol composition in Jun. 1997

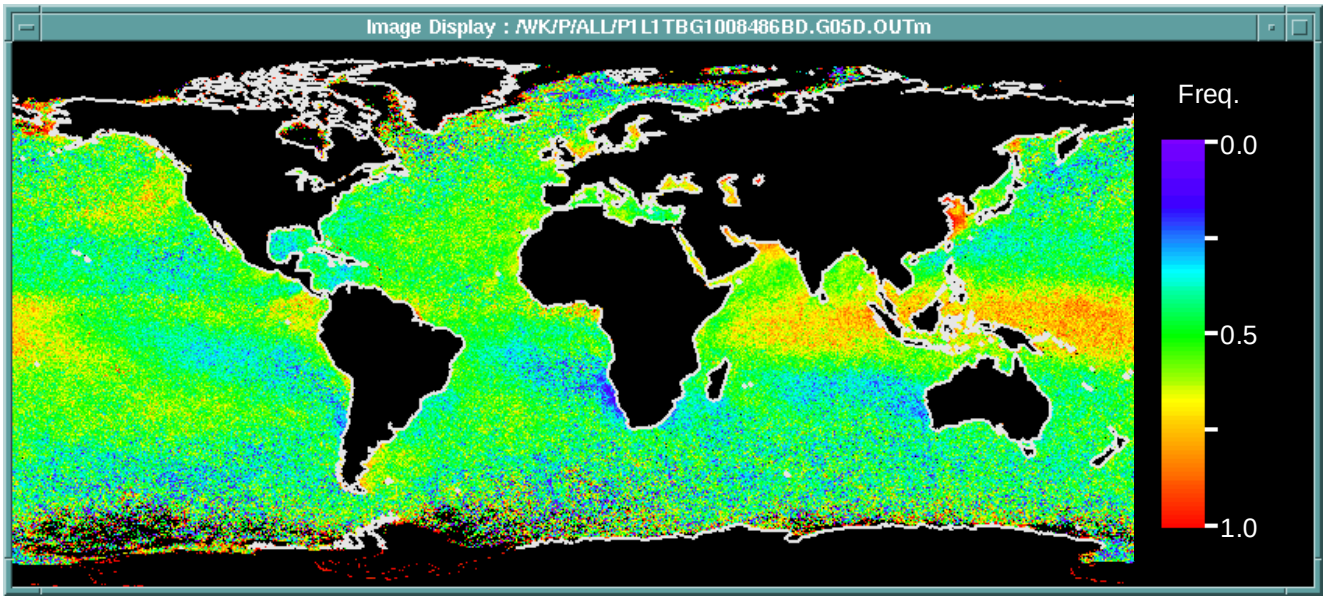
Frequency of absorbing particles with m=1.5-0.01i



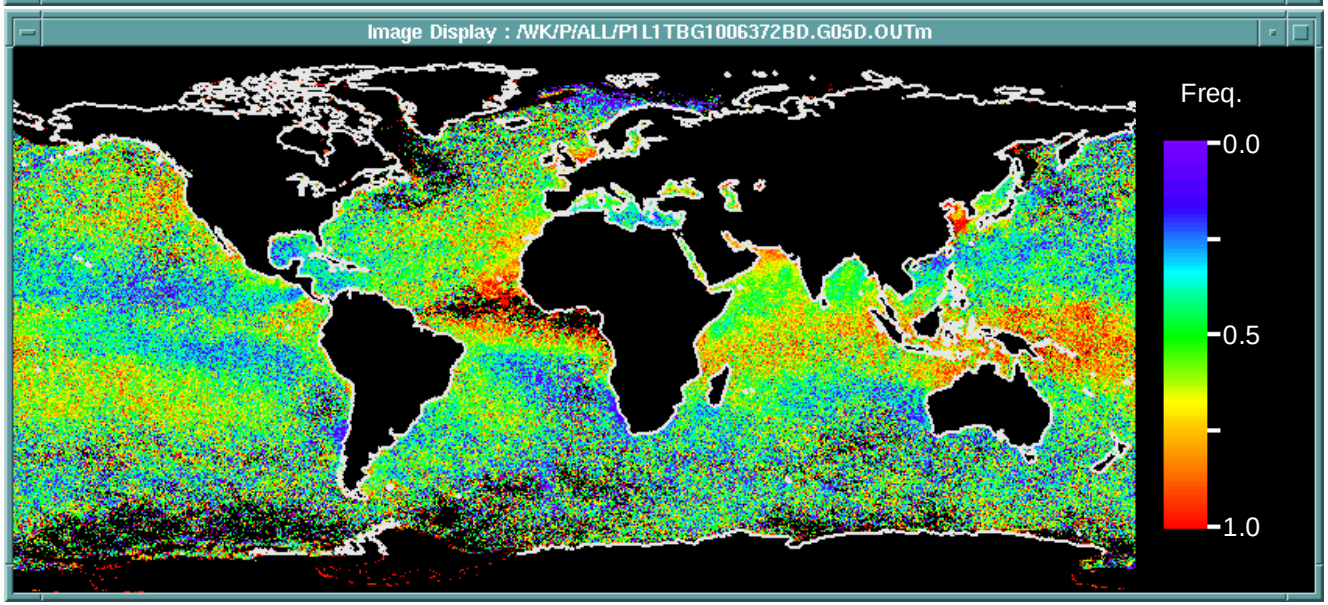
Aerosol composition in annual / Saharan dust season

Frequency of absorbing particles with m=1.5-0.01i

annual

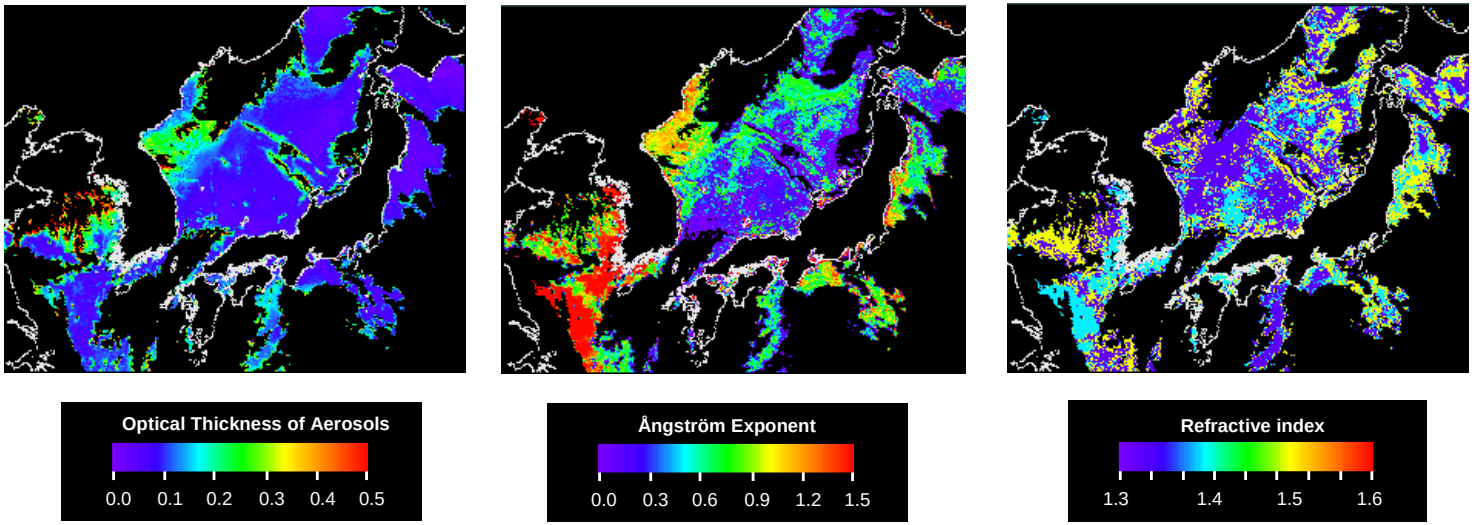


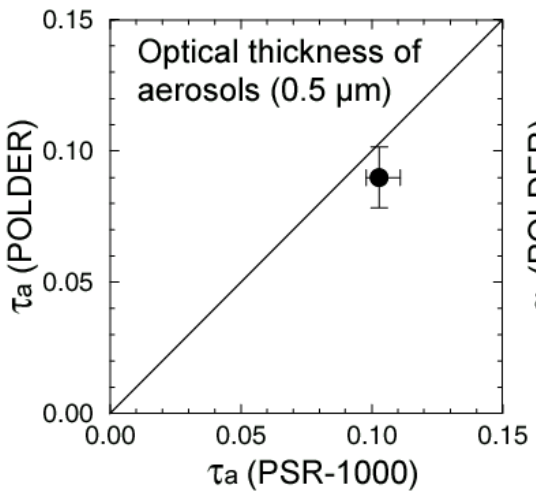
Saharan Dust Season (Feb, Mar)

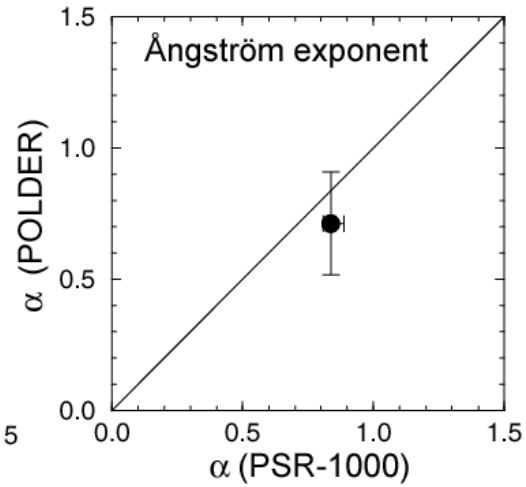


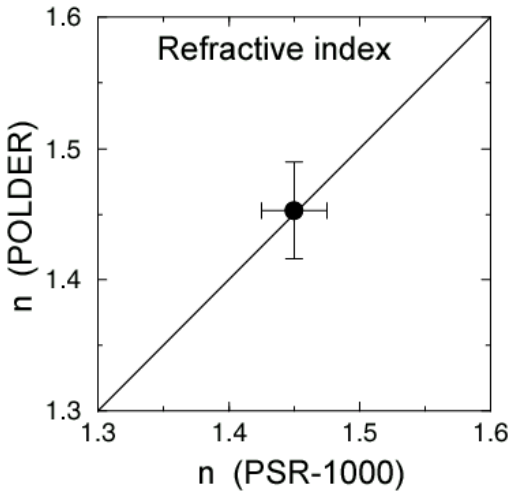
Validation of POLDER (on March 18,'97) with truth data

τa (0.5 μm) α m

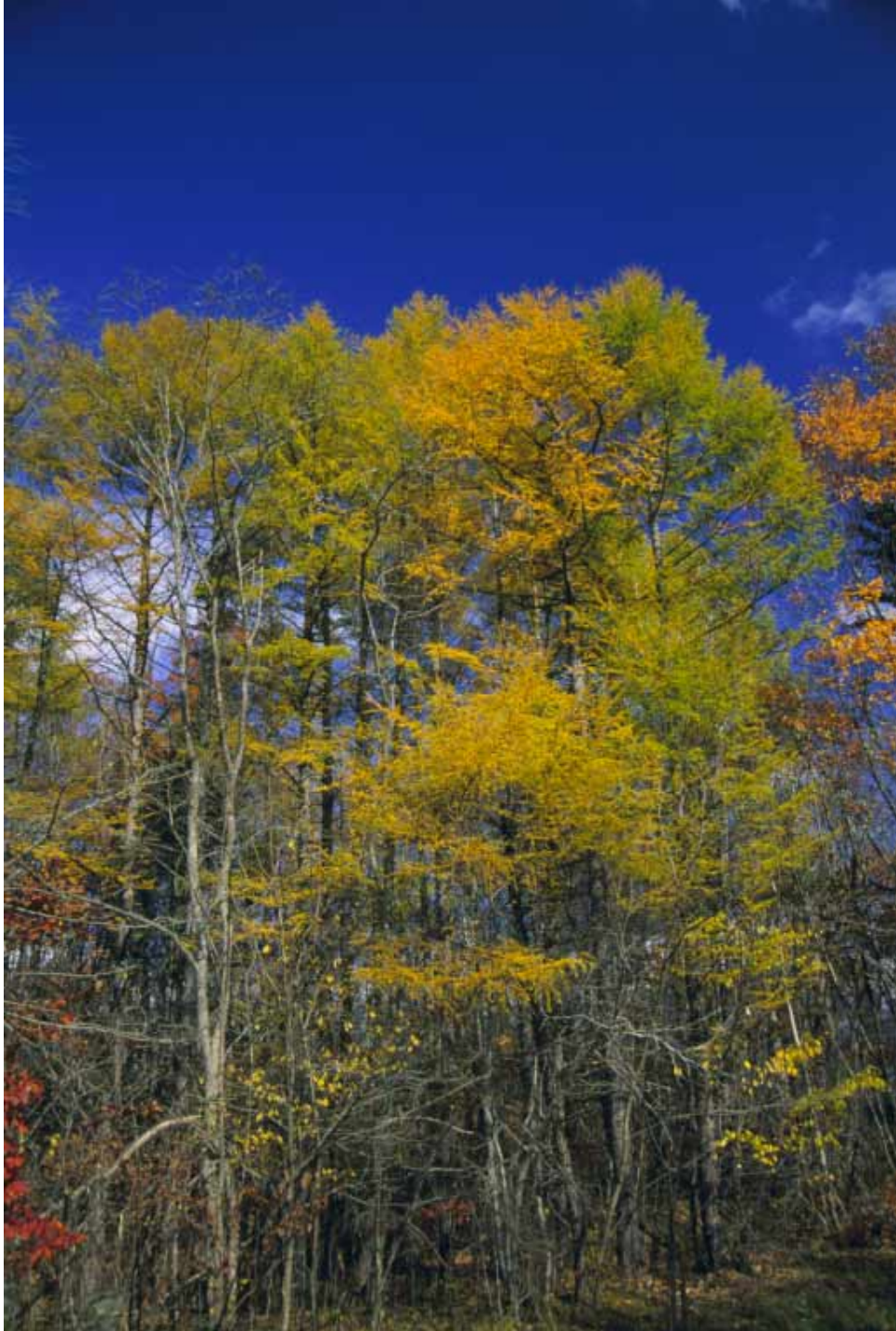








Ground polarimetry
in 2001



Ground polarimetry in 2001

Dec/'00 Mar/'01 Jun Sep Dec

APEX-E1

Hawaii / Seto-Inland

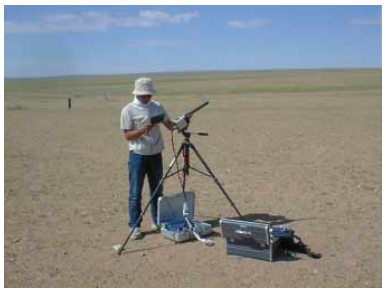
APEX-E2

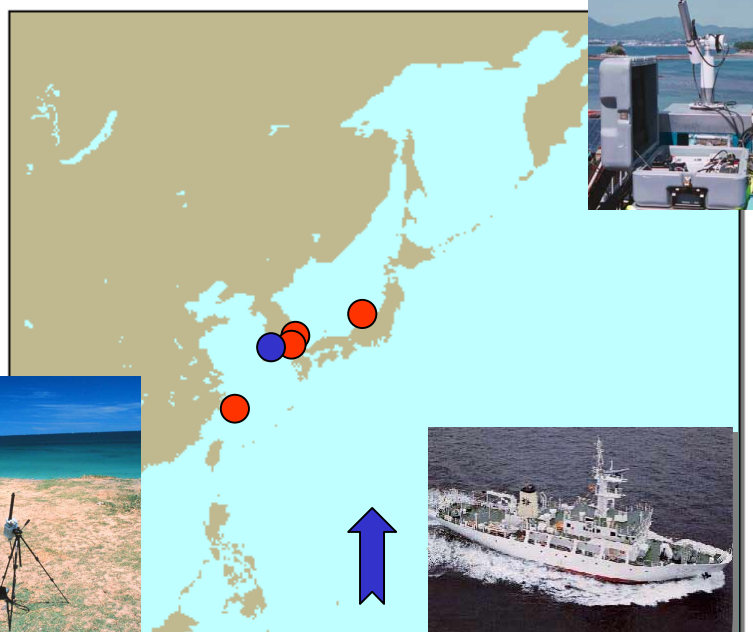
Noto (NASA/Cimel)

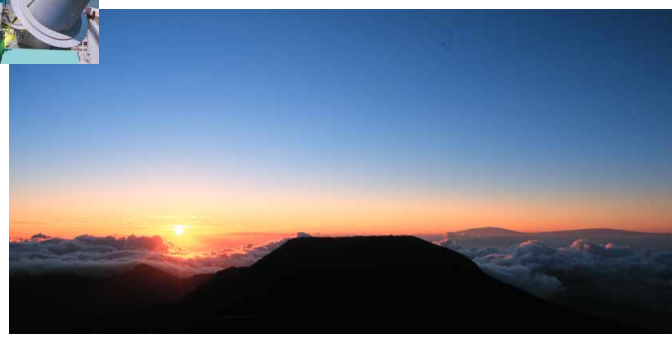
Mongol

Mirai

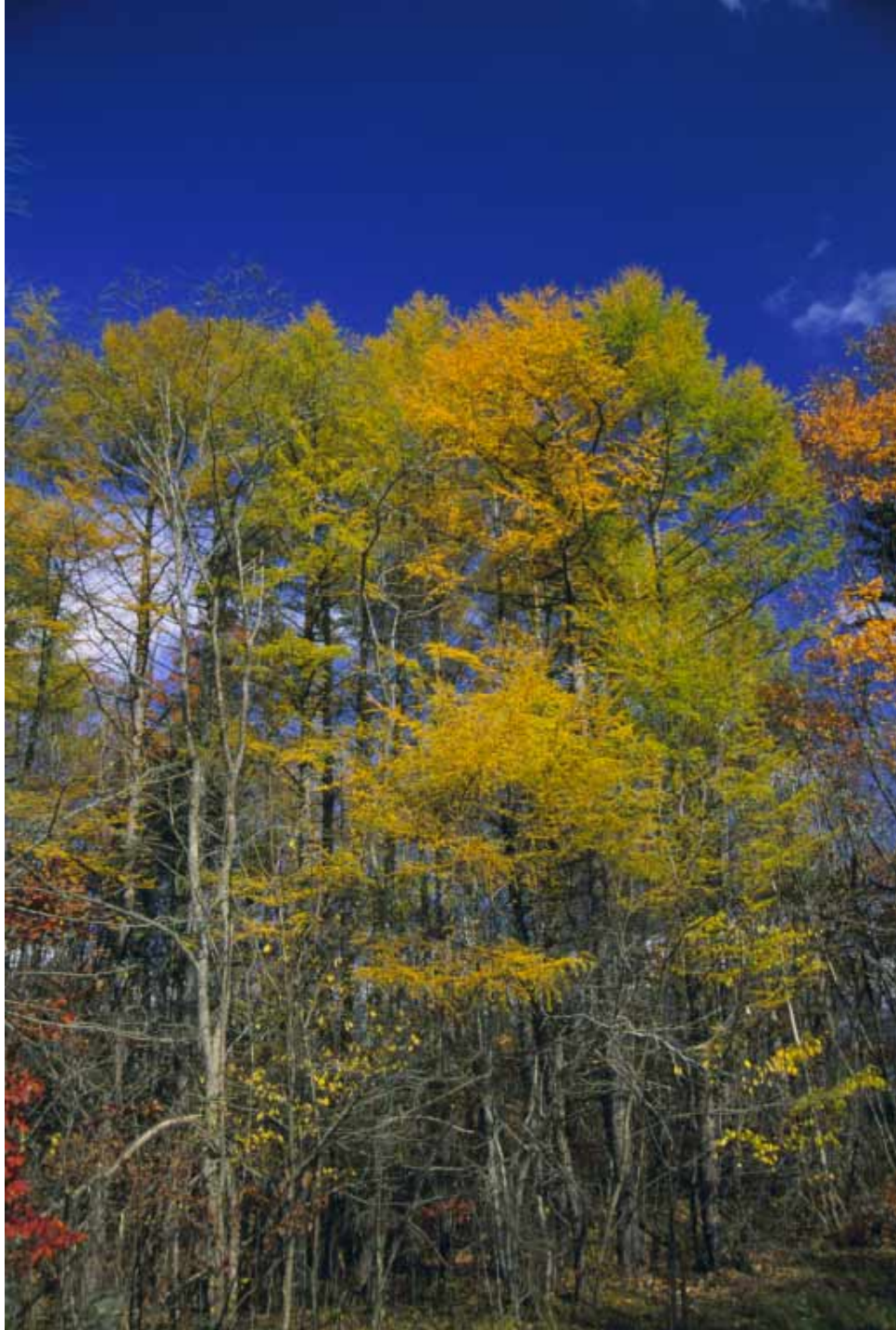
Higashi-Osaka (PSR-1000), Shirahama(NASA/Cimel)





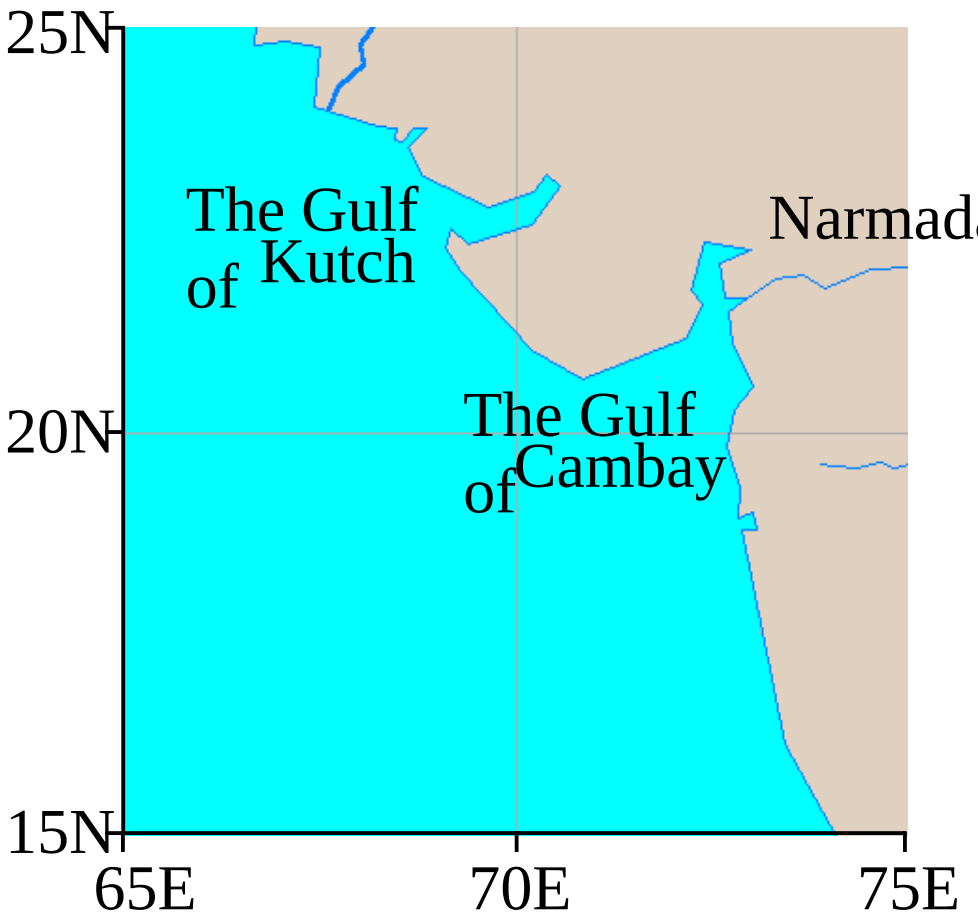


Correction of Soil-polluted water

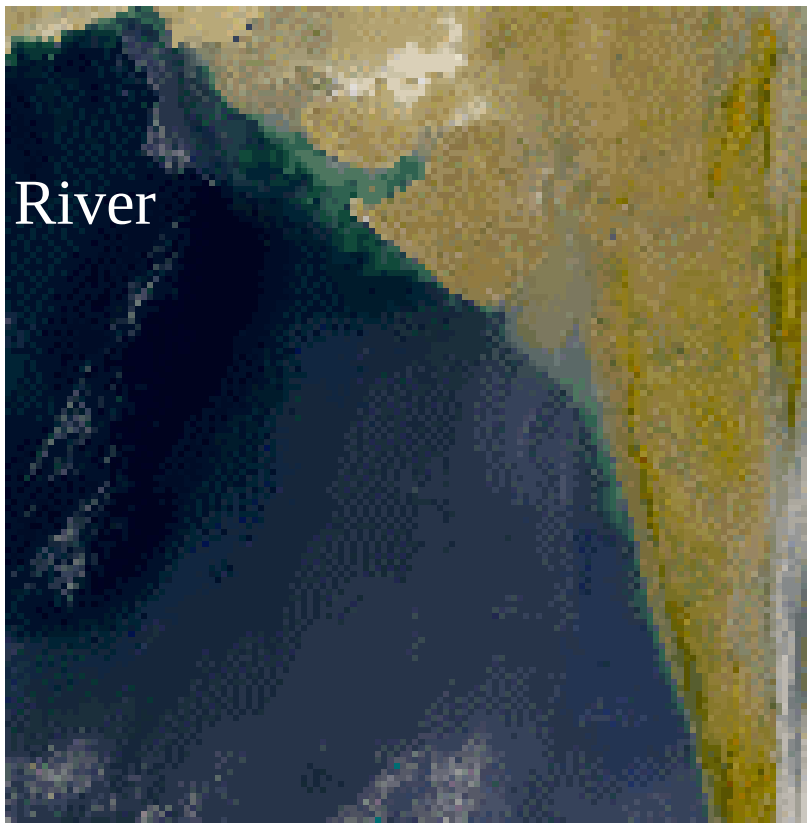


Case study for coastal zone in Western India

study area

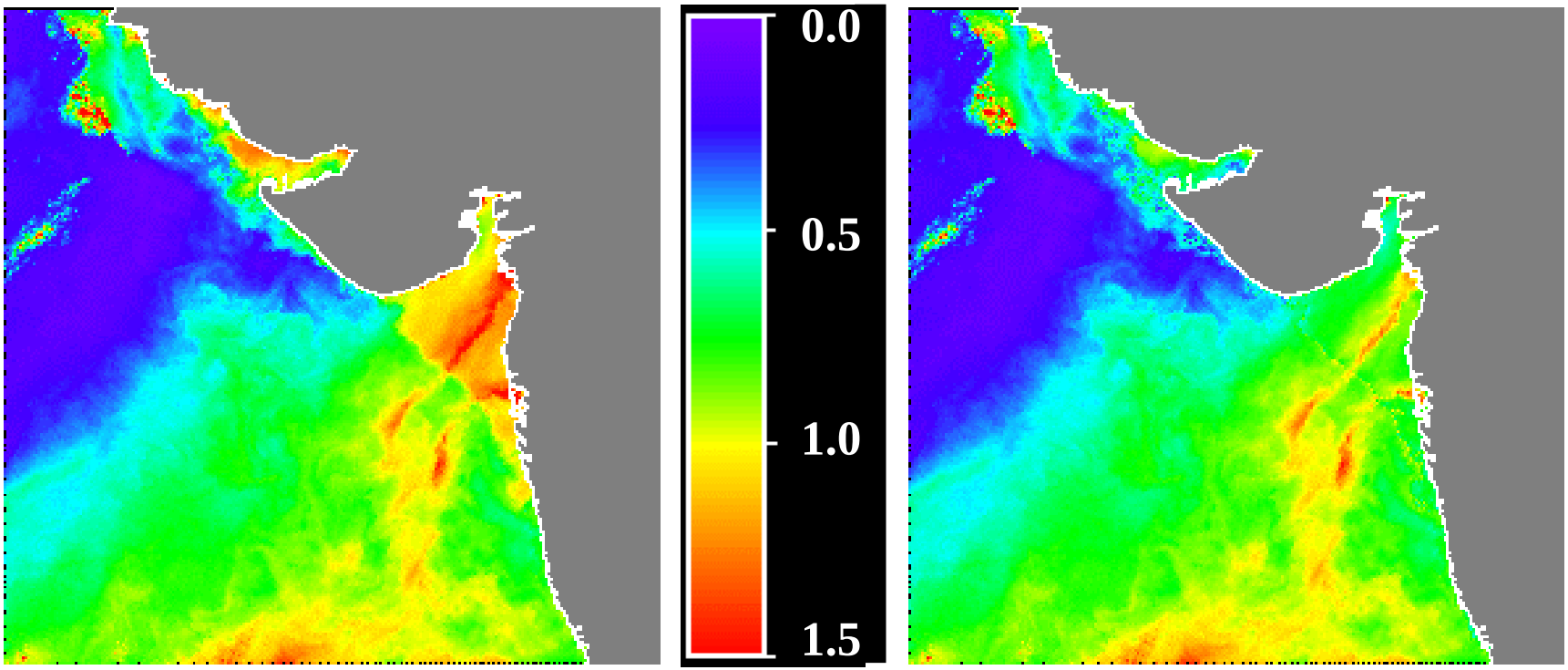


SeaWiFS composite Image on 24 Dec.'00

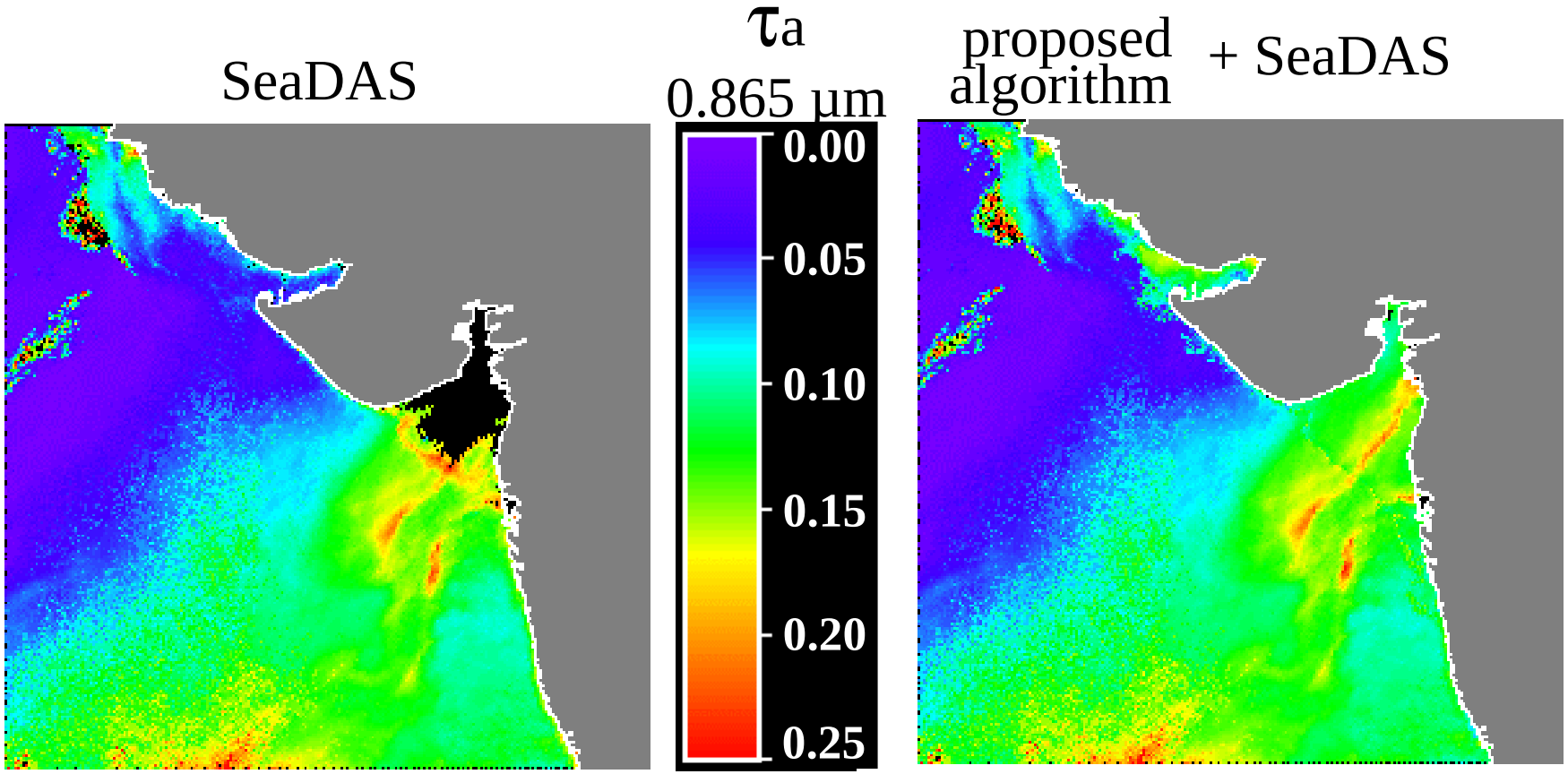


Radiance before/after the soil water correction

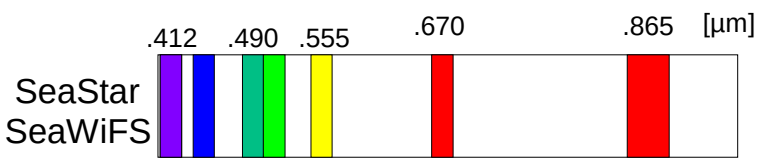
Before

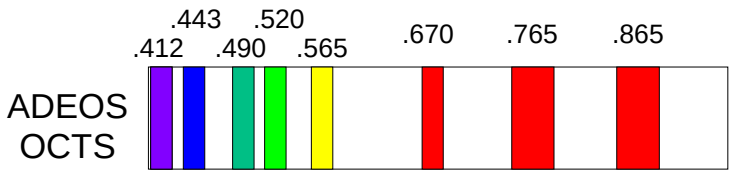


After



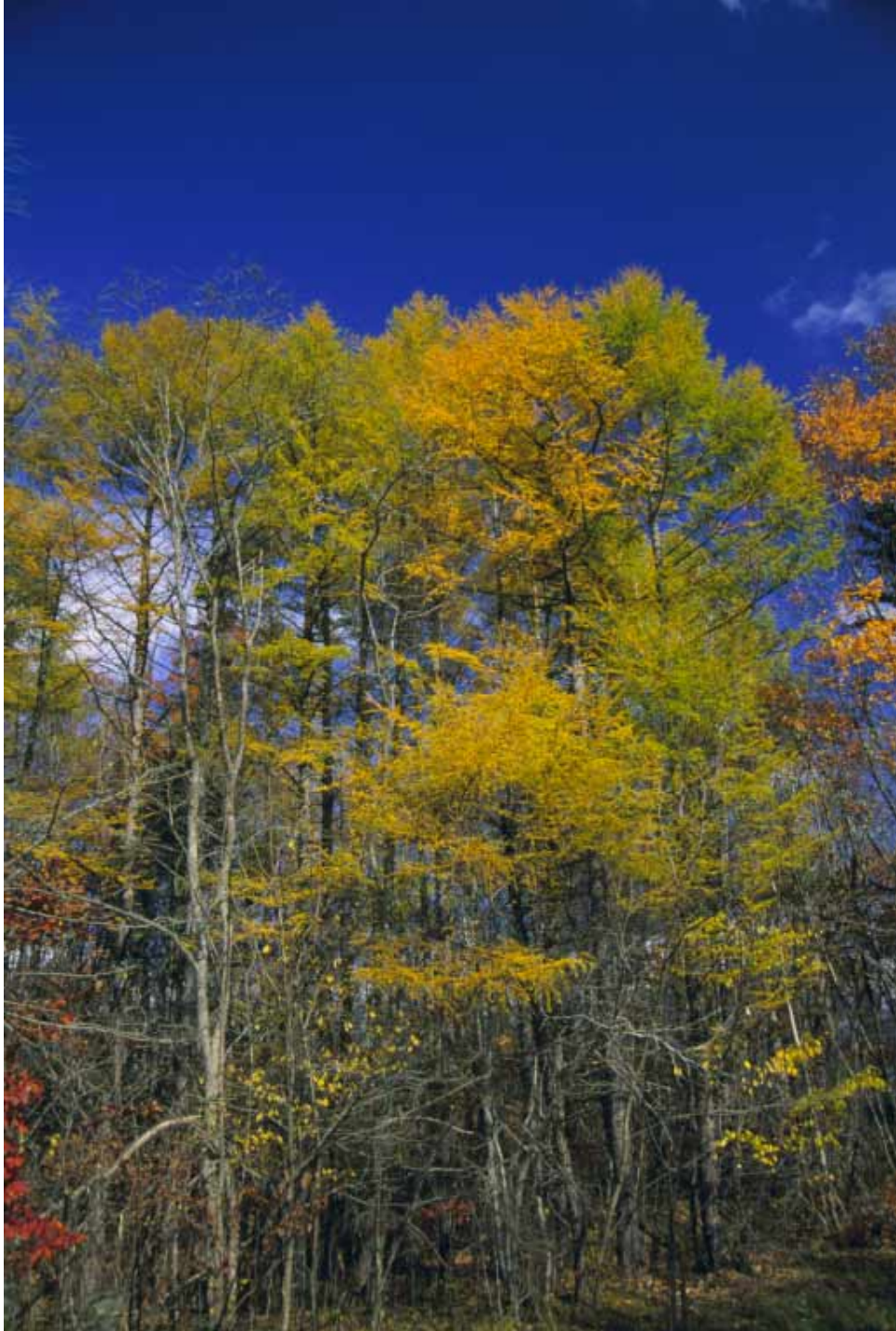
; preliminary results on retrieval of aerosol optical thickness over turbid water with soil particles using SeaWiFS visible data and SeaDAS code





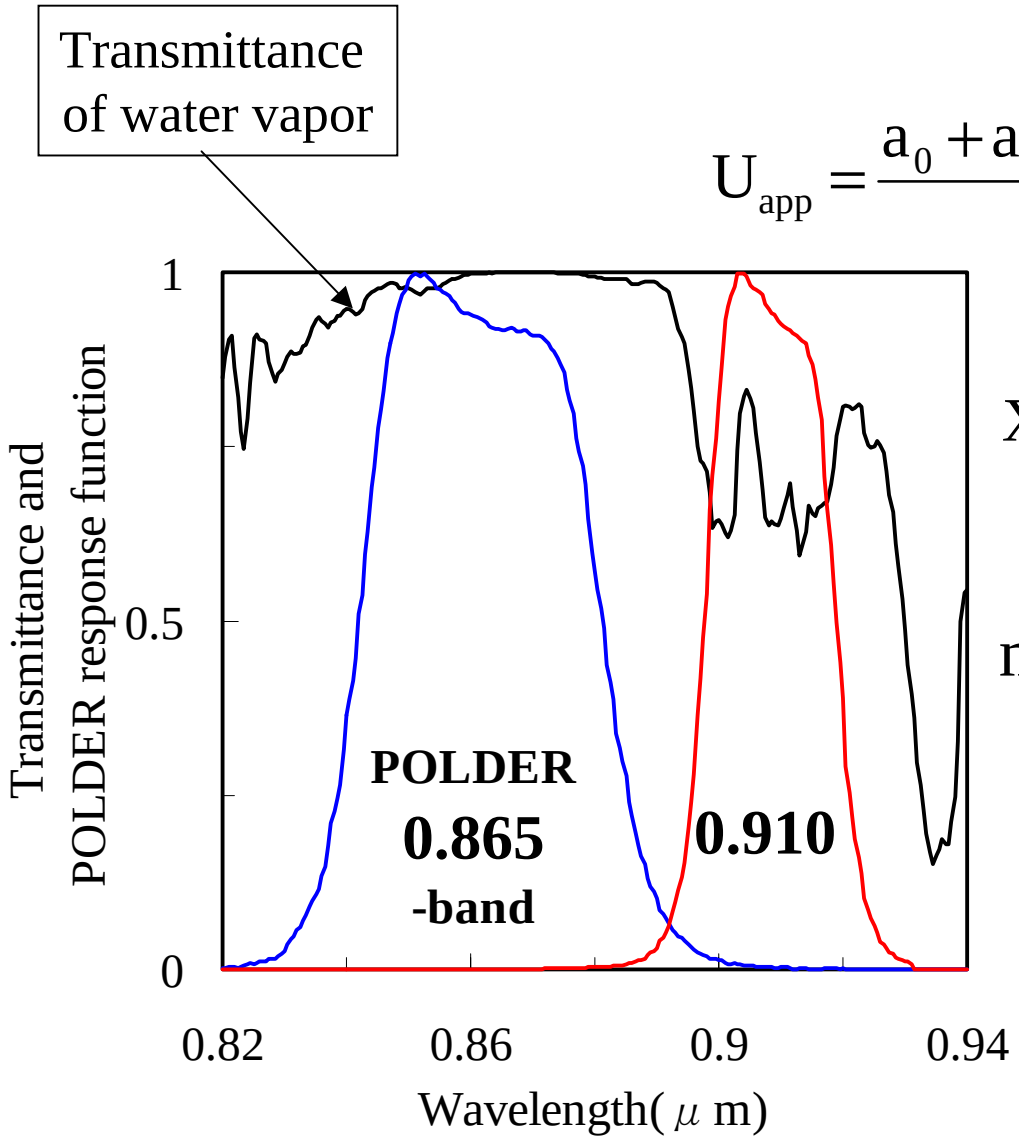
Water vapor

content of atmospheric water vapor retrieved from POLDER (0.865, 0.910 µm)



Water vapor content

over the land and sun-glint area over the ocean



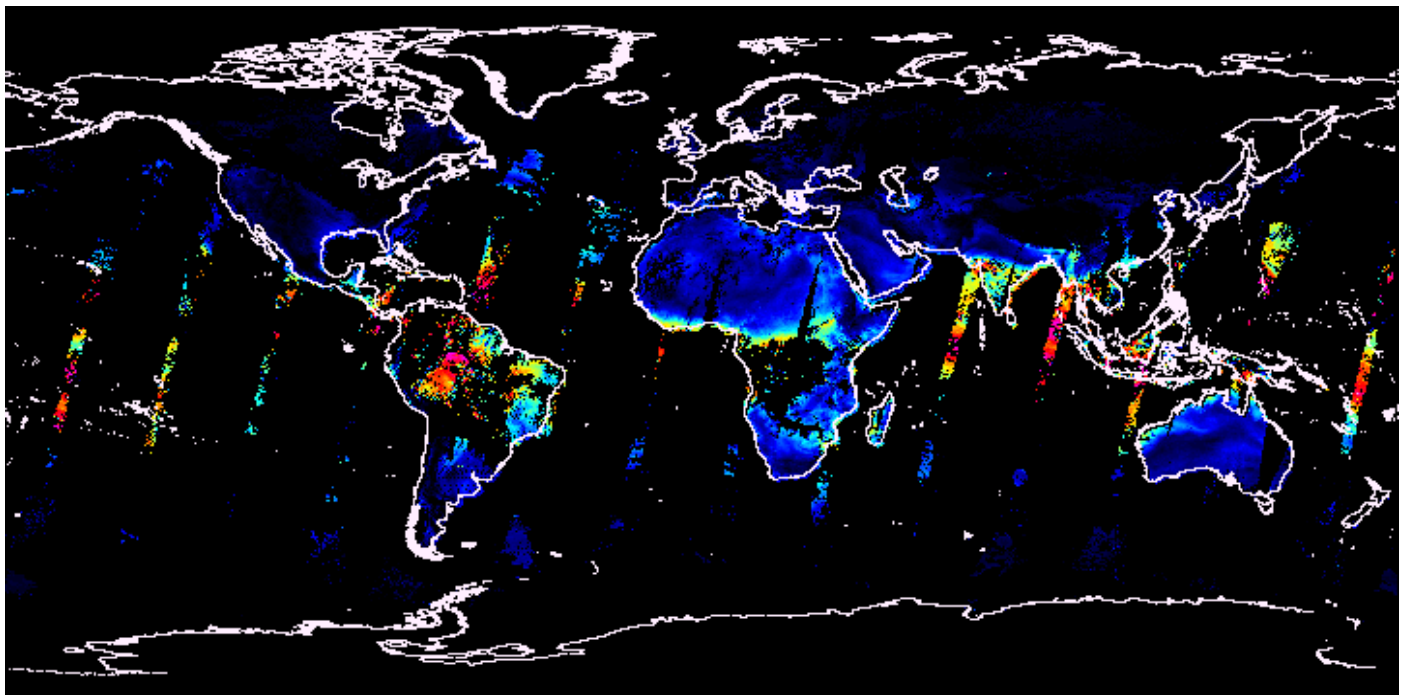
$$U_{app} = \frac{a_0 + a_1 \log(X) + a_2 [\log(X)]^2}{m P_{surf}} \quad \cdots\cdots (1)$$

$$X = \frac{R_{0.910}}{R_{0.865}} \quad \cdots\cdots (2)$$

$$m = \cos(\theta_s)^{-1} + \cos(\theta_v)^{-1} \quad \cdots\cdots (3)$$

ref. *IEEE Trans.*37,1613-,'99

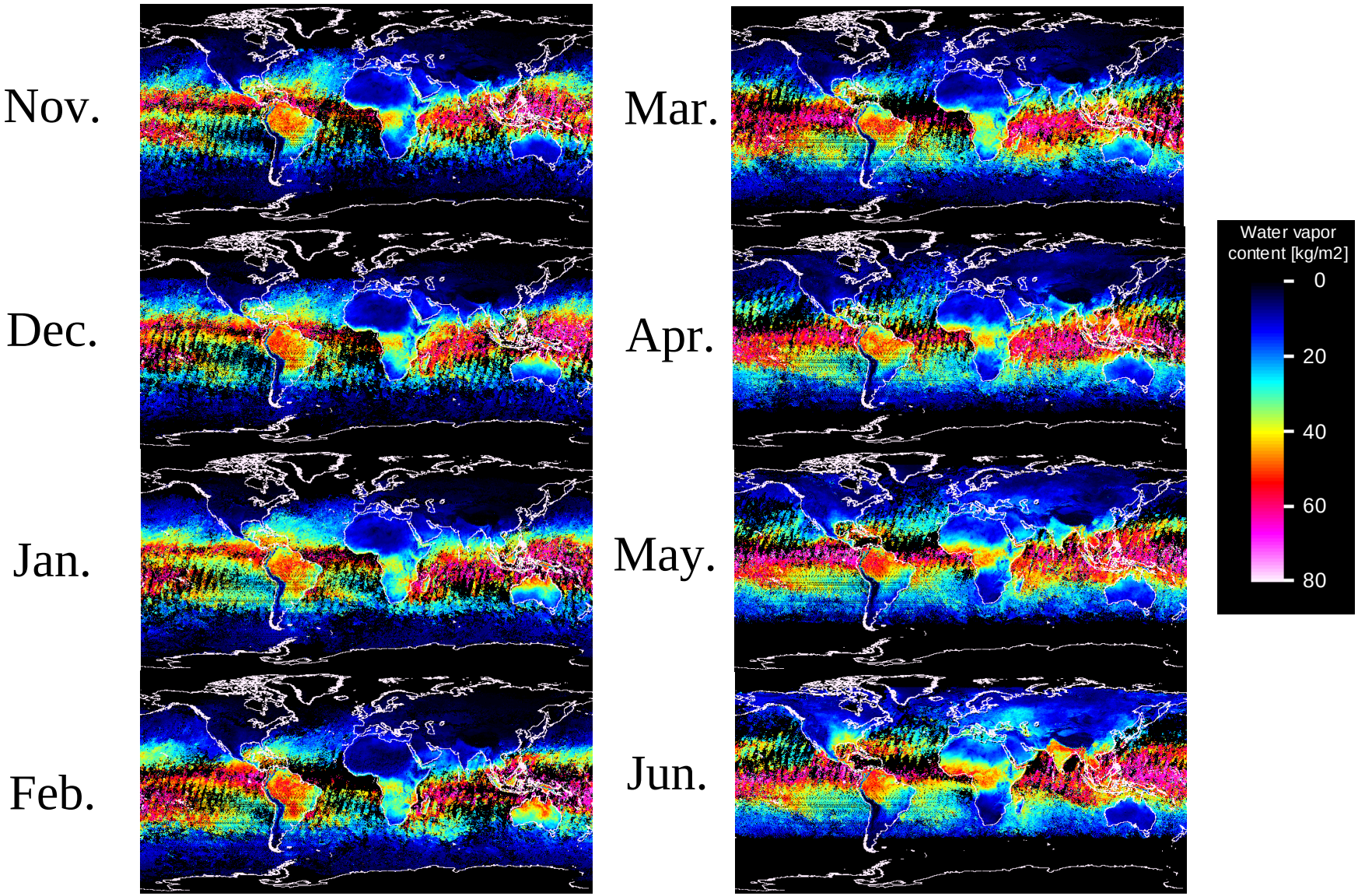
Daily distribution of water vapor content from POLDER data observed on November 10 in 1996



Water vapor content (kg/m^2)

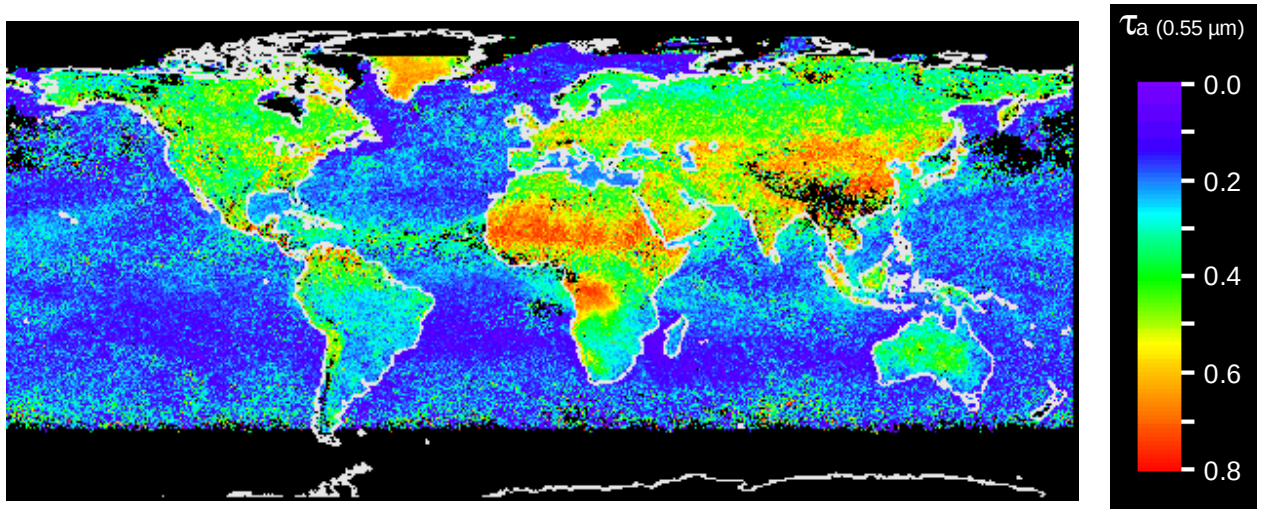
0 40 80

Monthly distribution of water vapor content from POLDER

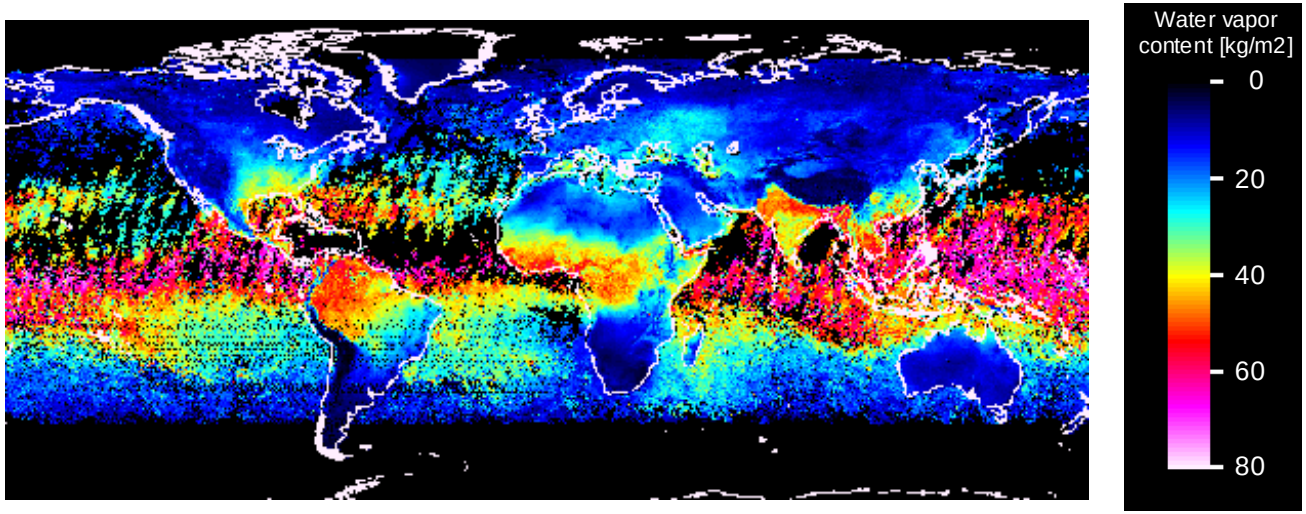


Aerosol loading and water vapor content in June, 1997

τ_a
0.55 µm



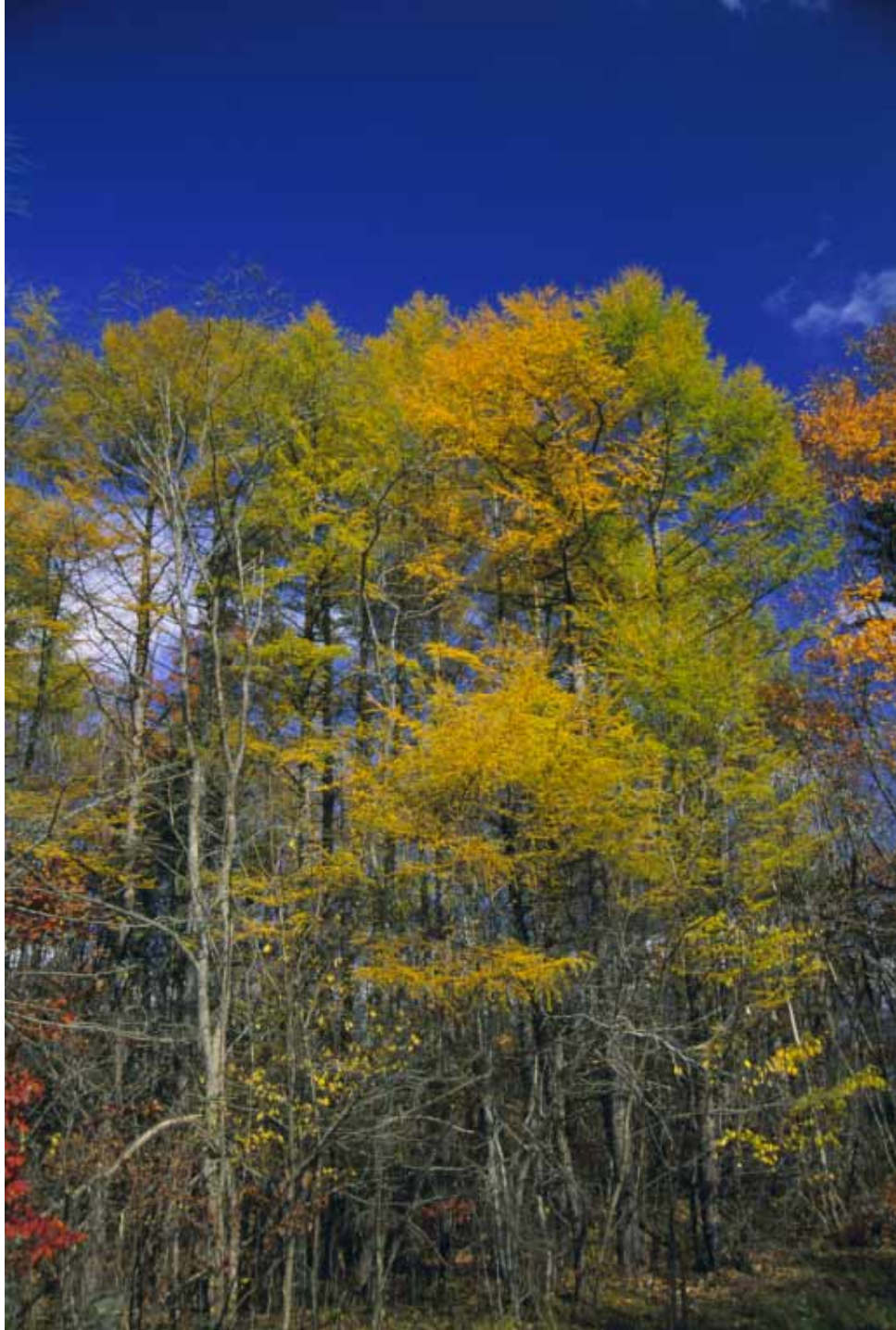
water vapor



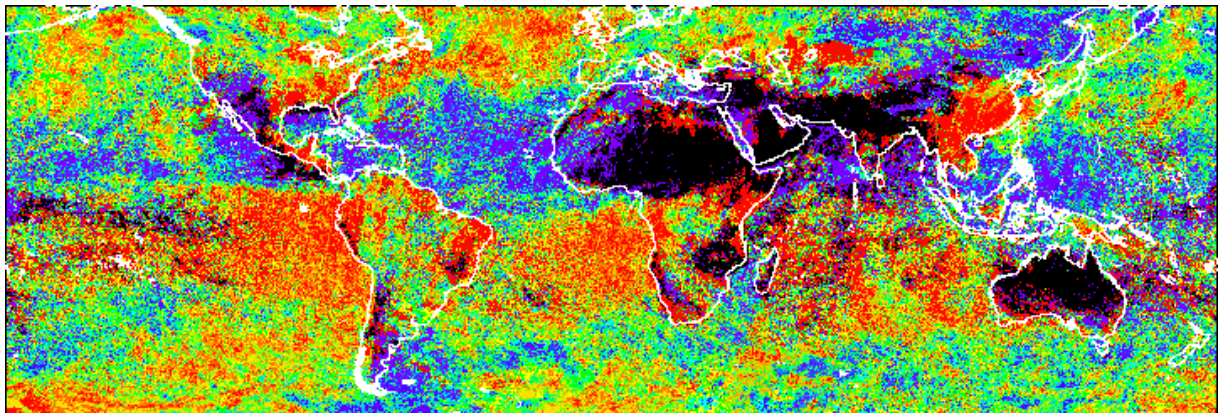
Cloud retrieval

- cloud coverage
- classification of water/ice phase
- size of water ptl.

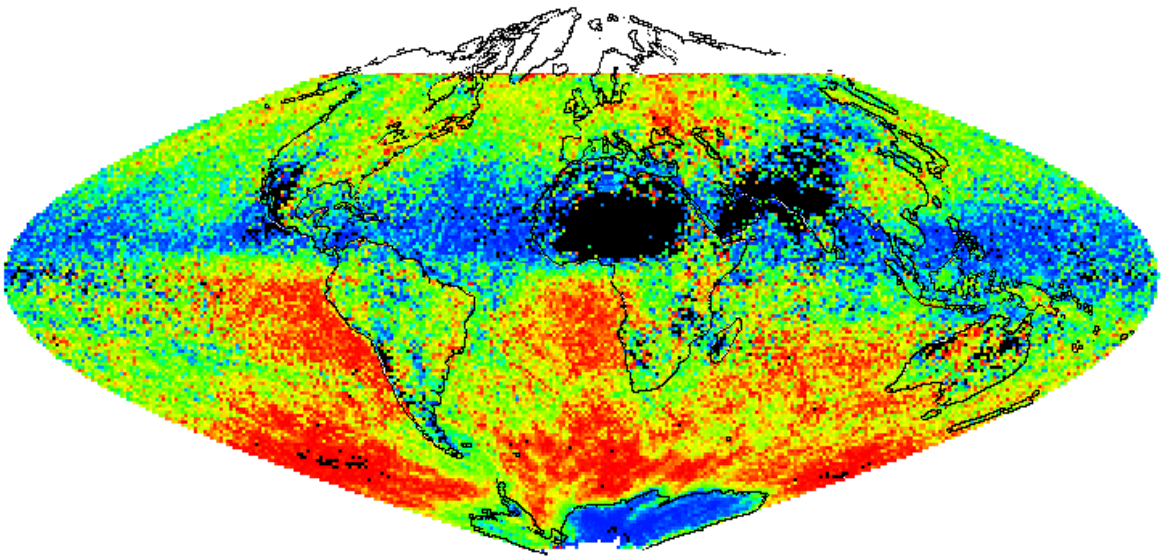
retrieved from POLDER(0.865μm)
& OCTS (8.53, 10.9, 12μm)



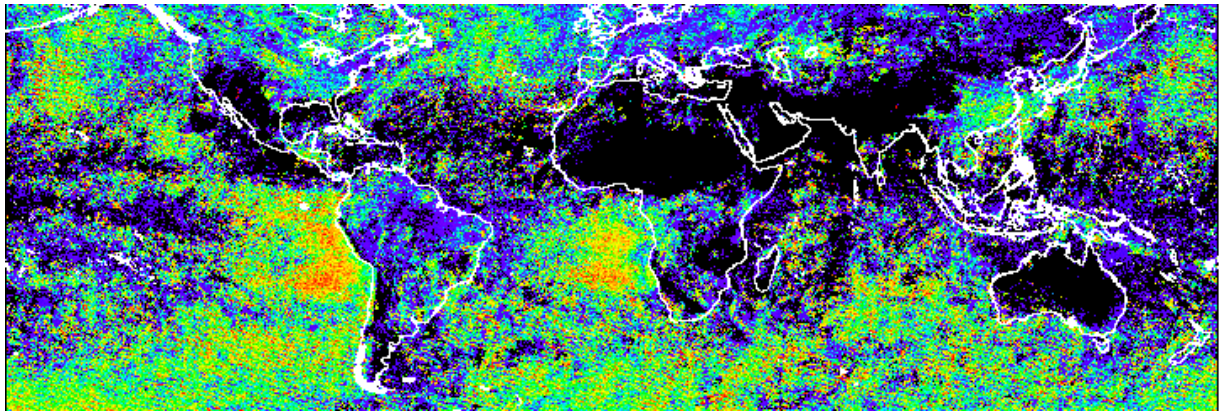
Global map of cloud phase (water/ice) frequency on 8 ～ 14 November in 1996



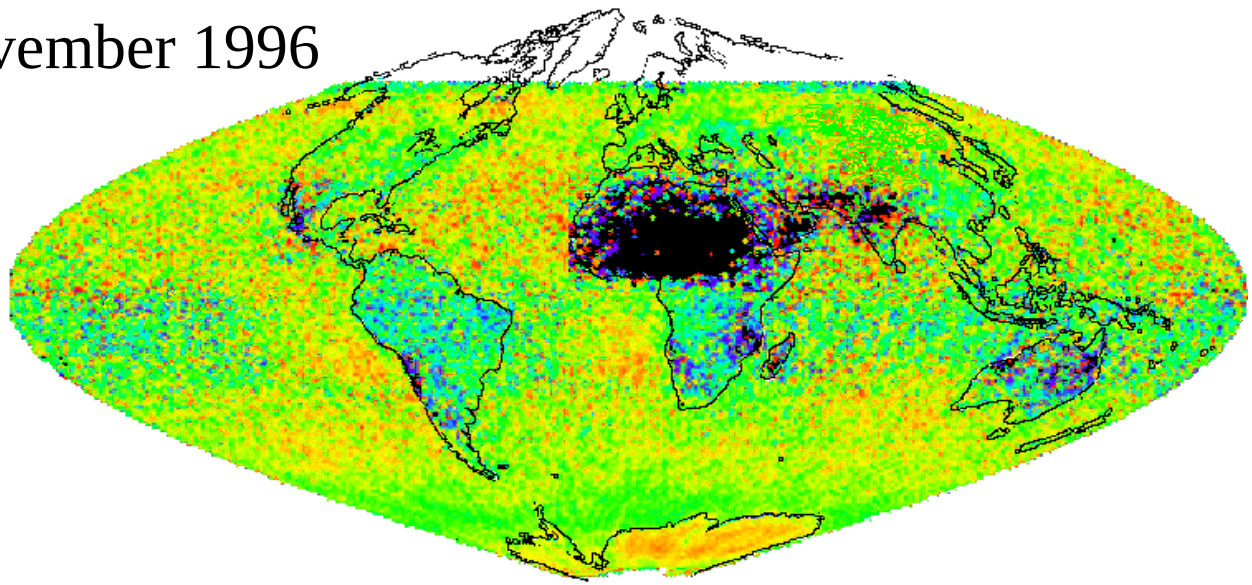
November 1996



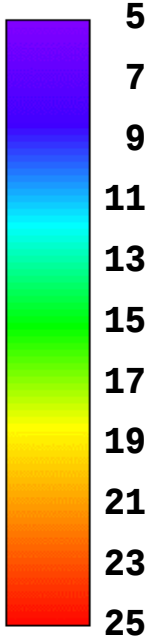
Size distribution of water particles on 8 ~ 14 November in 1996



November 1996



r_{eff} [μm]



Combination of POLDER and GLI on ADEOS-II is promising for

- ✌ retrieval of aerosols, cloud, and water vapor,
- ✌ improved atmospheric correction over the land, coastal zone, and ocean,

- ☐ polarization by non-spherical particles,
- ☐ polarization from realistic surface,
- ☐ aerosol- cloud interaction.