STATUS OF MODIS NEAR-IR WATER VAPOR ALGORITHM AND THIN CIRRUS REFLECTANCE ALGORITHM
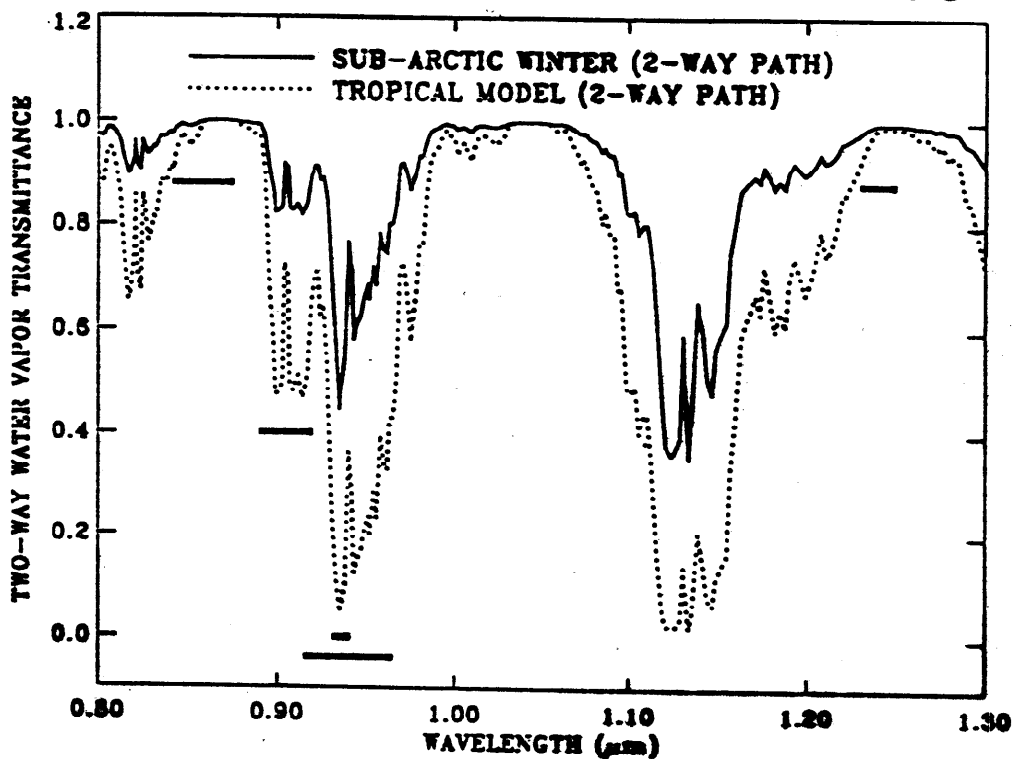
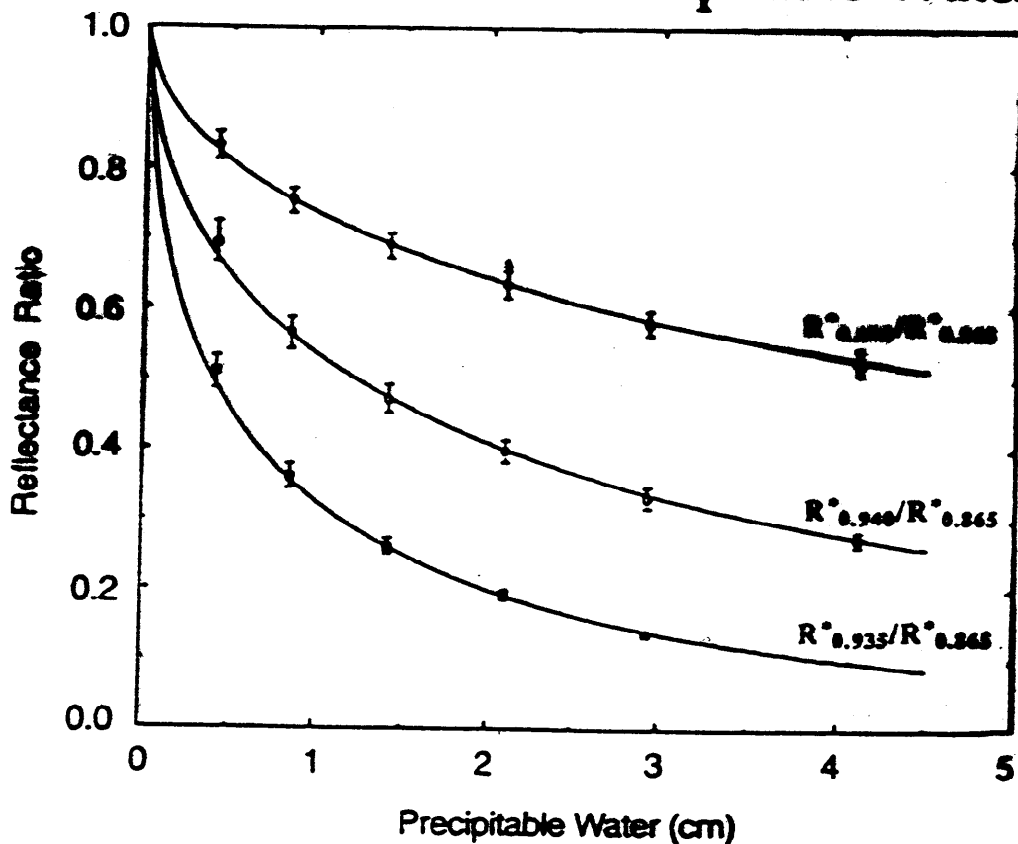Bo-Cai Gao, Ping Yang, and Yoram J. Kaufman

OUTLINE

- Water Vapor (near-IR)

  - MODIS near-IR water vapor channels and retrieving techniques
  - Improvement to the previous version of the algorithm
  - Sample regional and global water vapor images

- CIRRUS

  - Illustration of the 1.375-micron MODIS channel, and detection of high clouds with this channel
  - Improvement to the previous version of cirrus detection algorithm
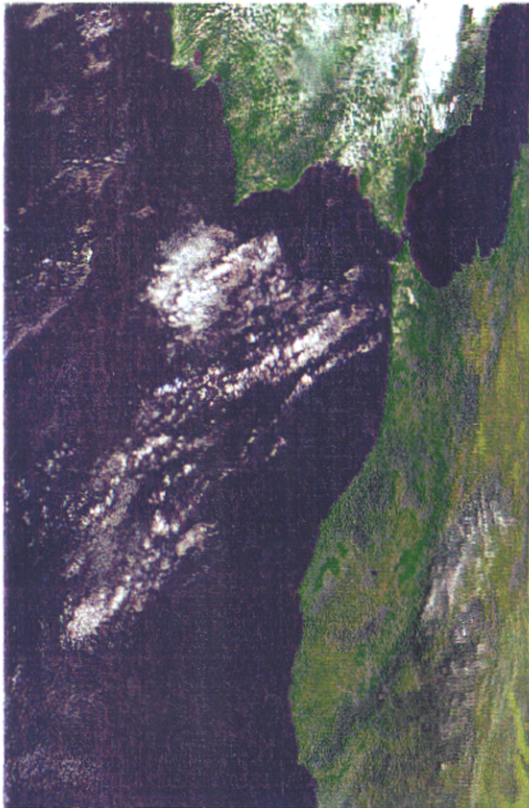 - Sample regional and global high cloud images

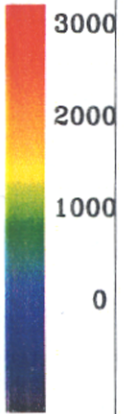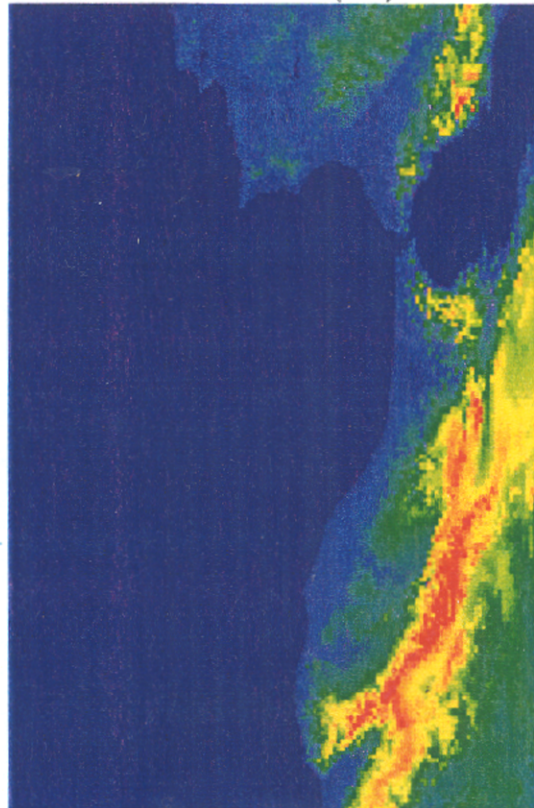- Discussions and Summary

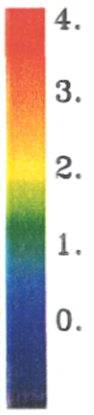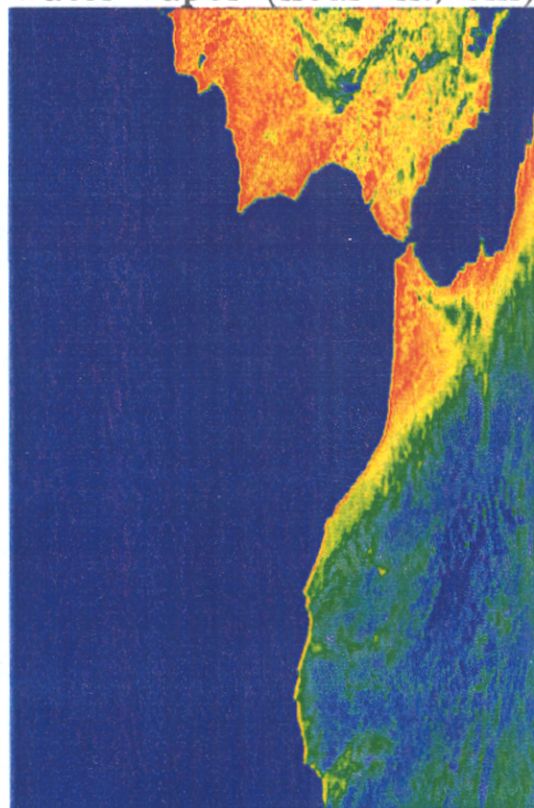# Positions of Five MODIS Channels

Channel Ratio VS Precipitable Water

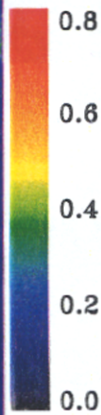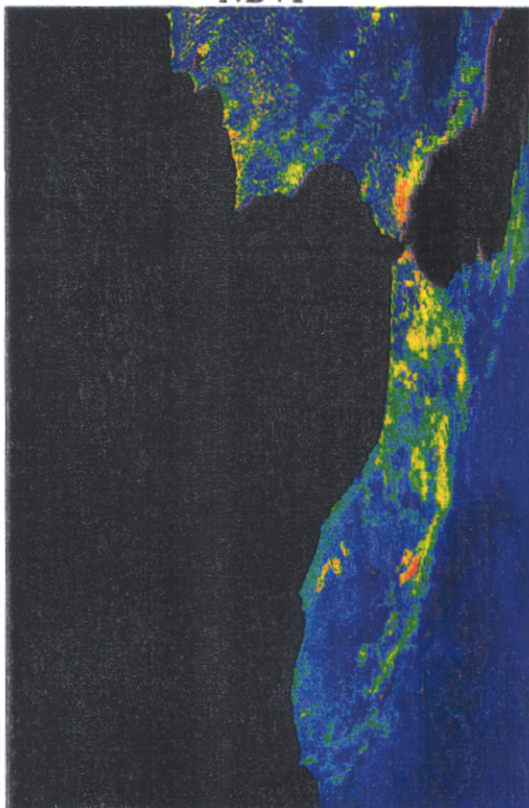# MOROCCO,SPAIN (MODIS,04/12/00,110.1200)

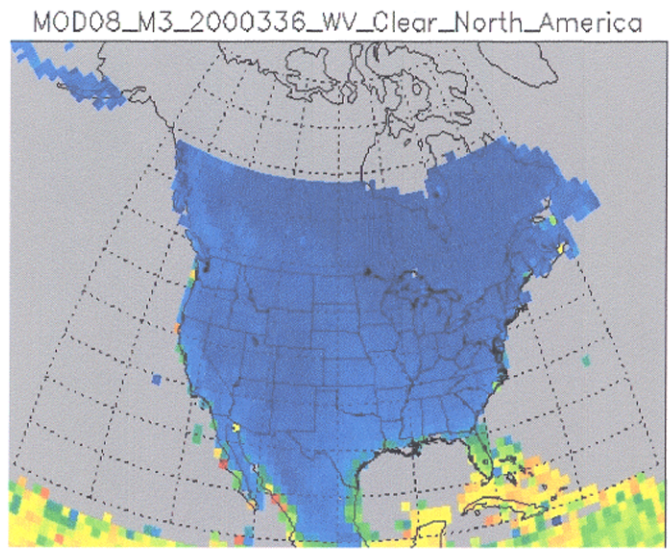R:0.66,G:0.86,B:0.46μm

Elevation (m)

NDVI

Water Vapor (near-IR, cm)

The improvement to the near-IR Water Vapor Algorithm

- Last year, we reported that our retrieved water vapor values from MODIS near-IR channels were ~**20%** or larger than expected. Possible problems might be due to errors in water vapor line parameters compiled on HITRAN96.

- In early spring of 2001, HITRAN2000 (Larry Rothman) became available. The 0.94-μm water vapor band intensity increased by about 20%.

- In May of 2001, we generated new lookup tables using HITRAN2000 + lbl codes (Ridgway, Heidinger) for the MODIS near-IR water vapor algorithm.
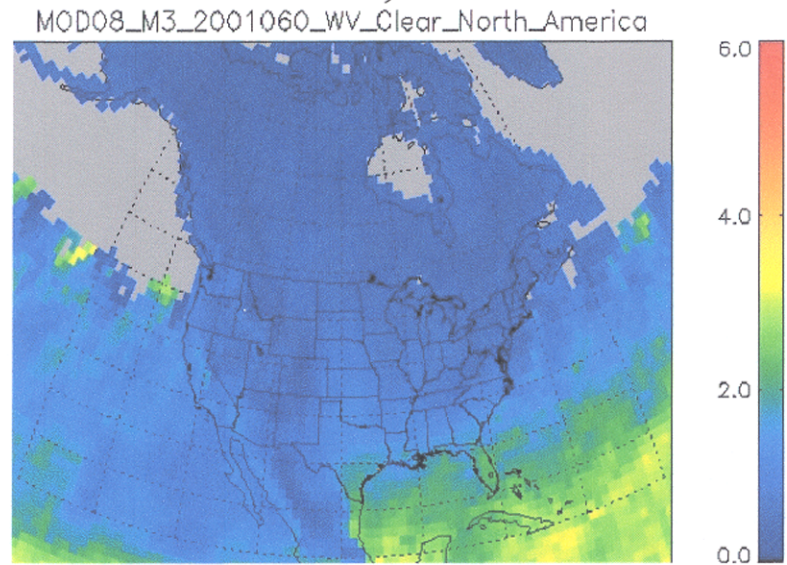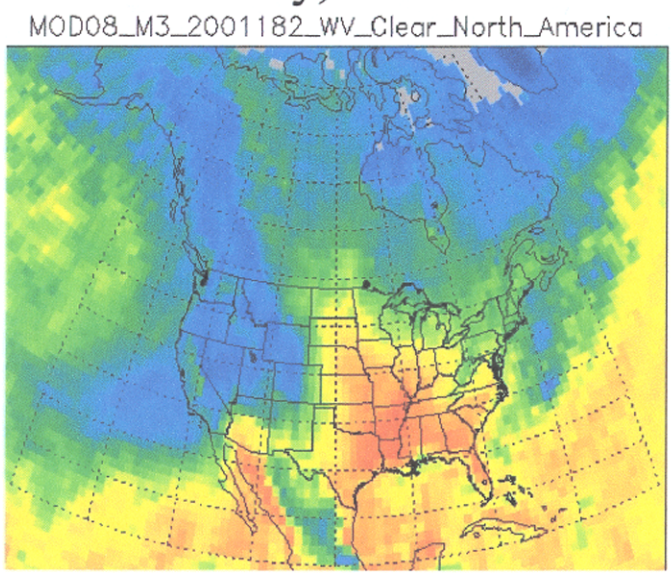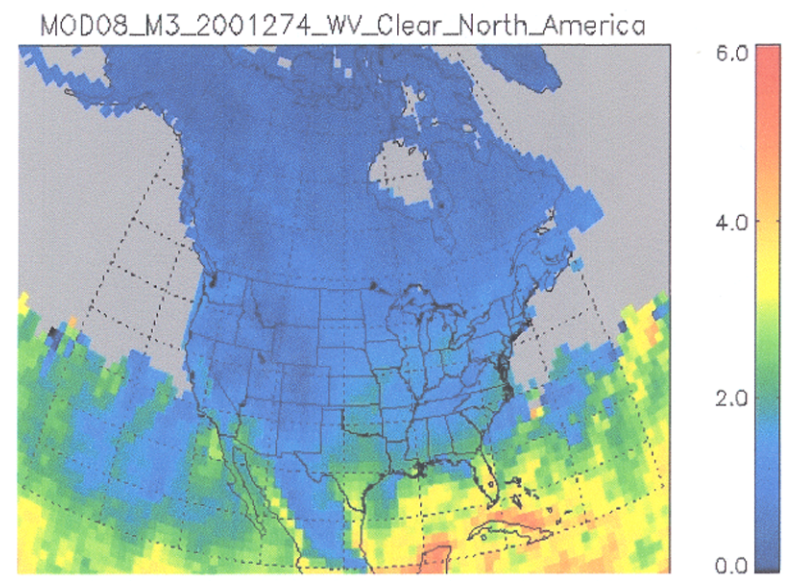
Water Vapor (North America, near-IR)

December, 2000

MOD08_M3_2000336_WV_Clear_North_America

March, 2001

MOD08_M3_2001060_WV_Clear_North_America

July, 2001

MOD08_M3_2001182_WV_Clear_North_America

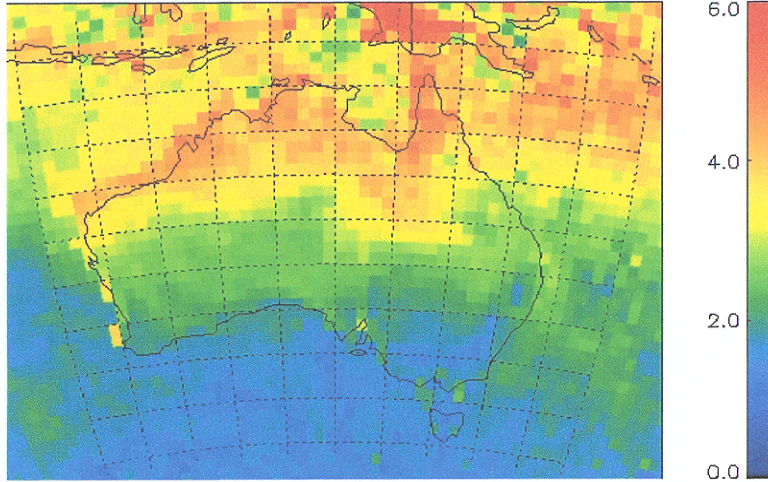## October, 2001

MOD08_M3_2001274_WV_Clear_North_America
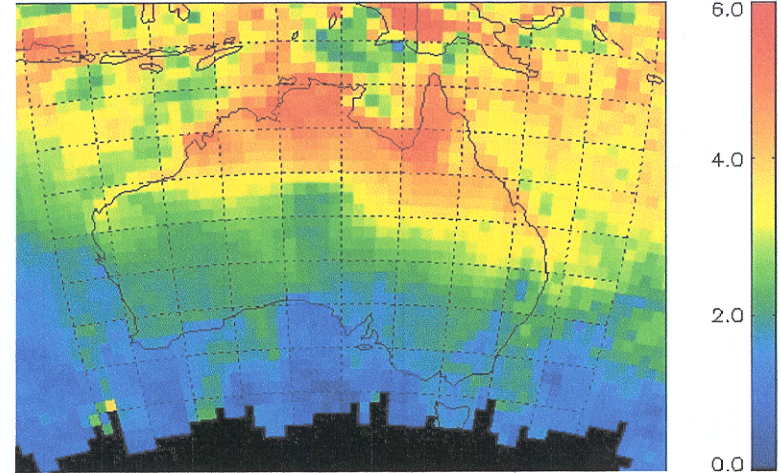
Water Vapor (Australia, near-IR)

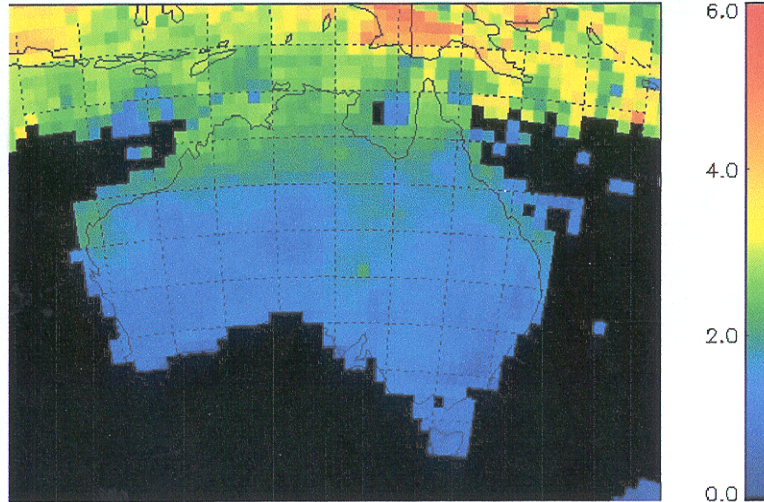## December, 2000

MOD08_M3_2000336_WV_Clear_Australia

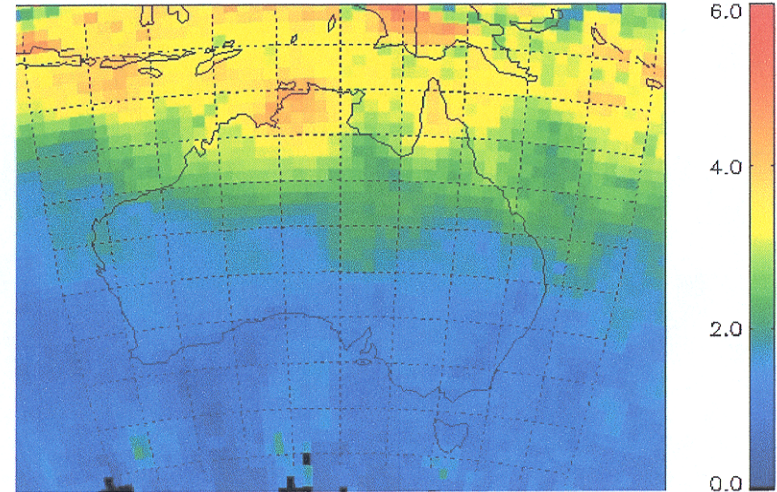## March, 2001

MOD08_M3_2001060_WV_Clear_Australia

July, 2001

MOD08_M3_2001182_WV_Clear_Australia

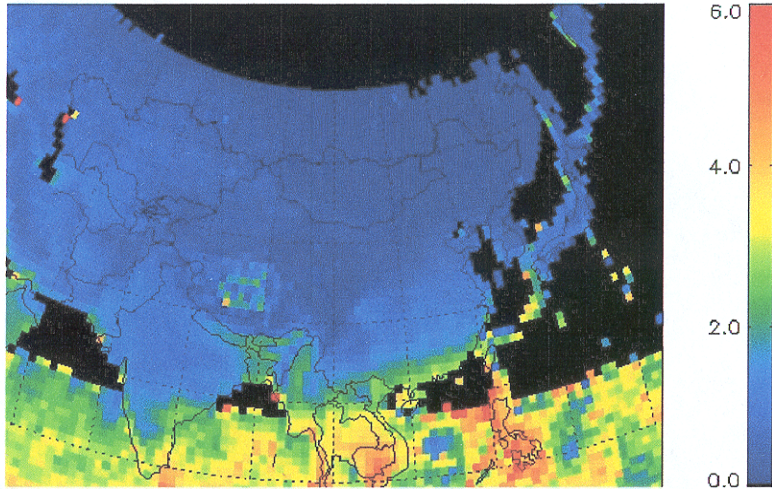

October, 2001

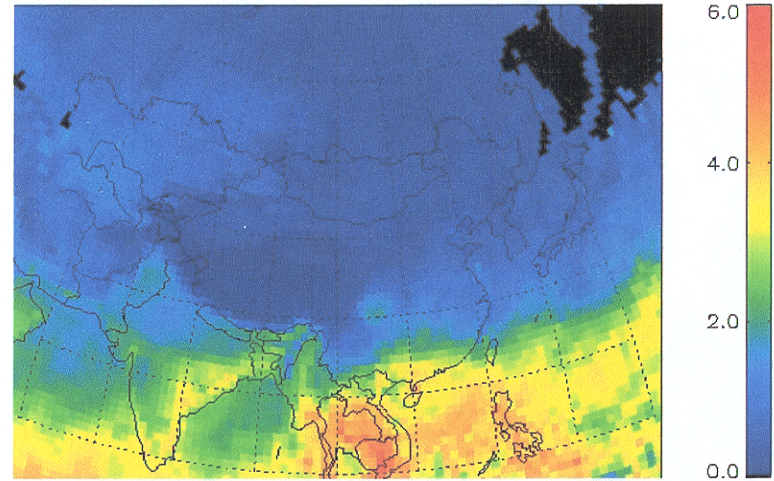MOD08_M3_2001274_WV_Clear_Australia

Water Vapor (Asia, near-IR)
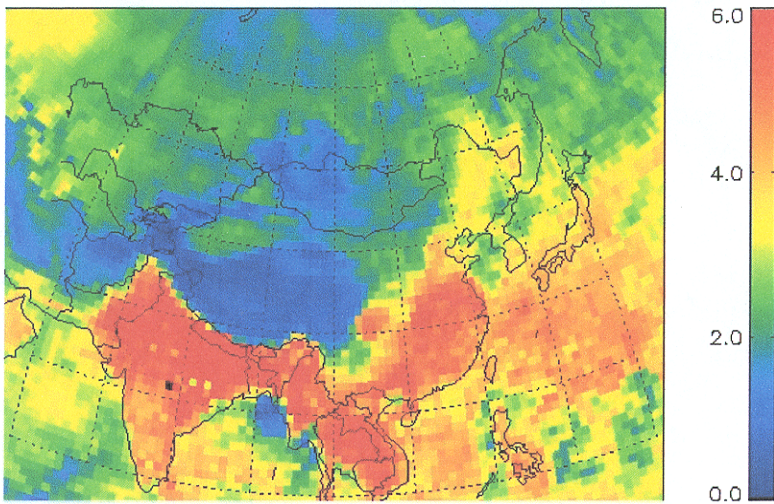
December, 2000

MOD08_M3_2000336_WV_Clear_Asia
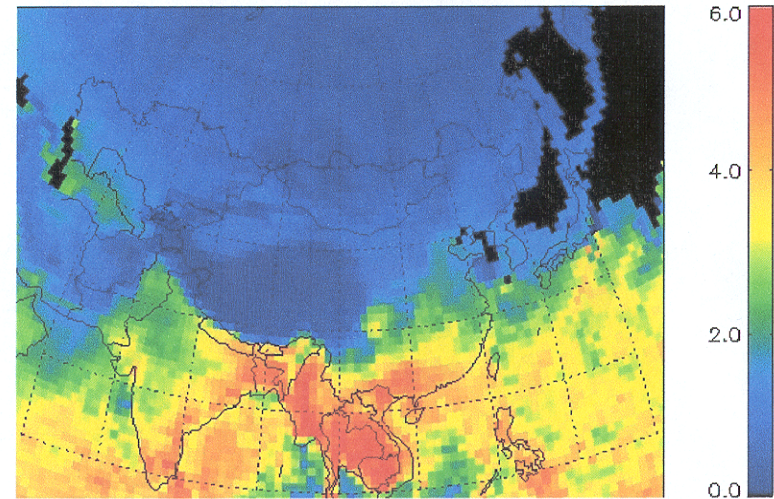

March, 2001

MOD08_M3_2001060_WV_Clear_Asia

July, 2001

MOD08_M3_2001182_WV_Clear_Asia

October, 2001

MOD08_M3_2001274_WV_Clear_Asia
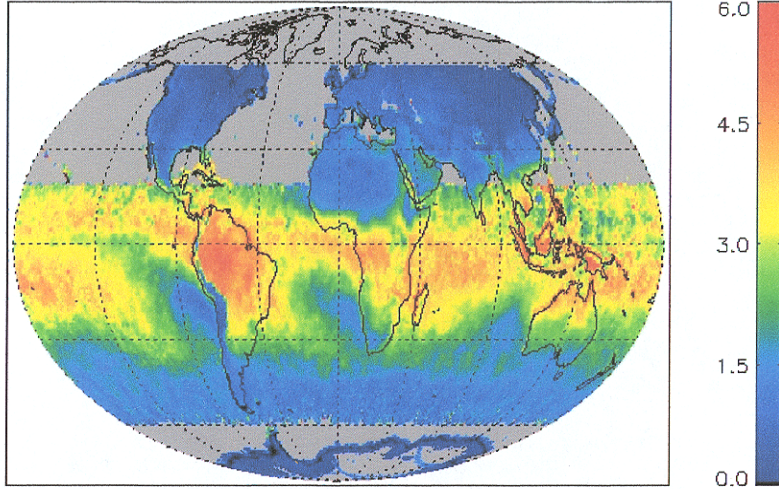
Water Vapor (Global, near-IR)
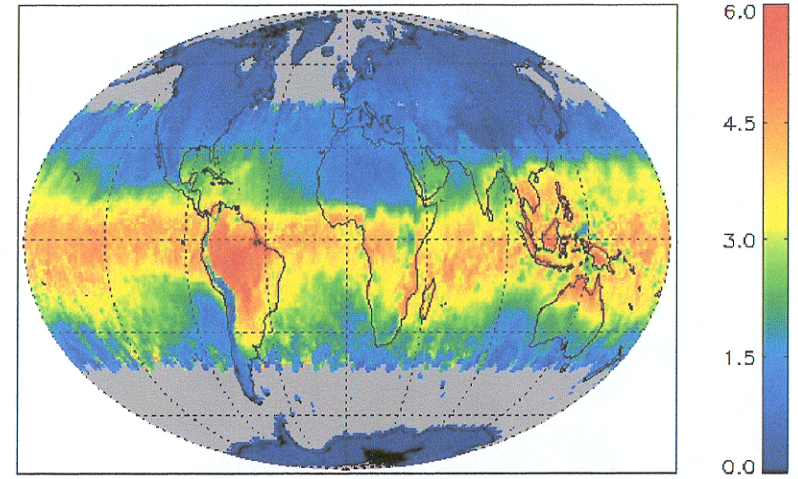
December, 2000

MOD08_M3_2000336_WV_Clear_Globe
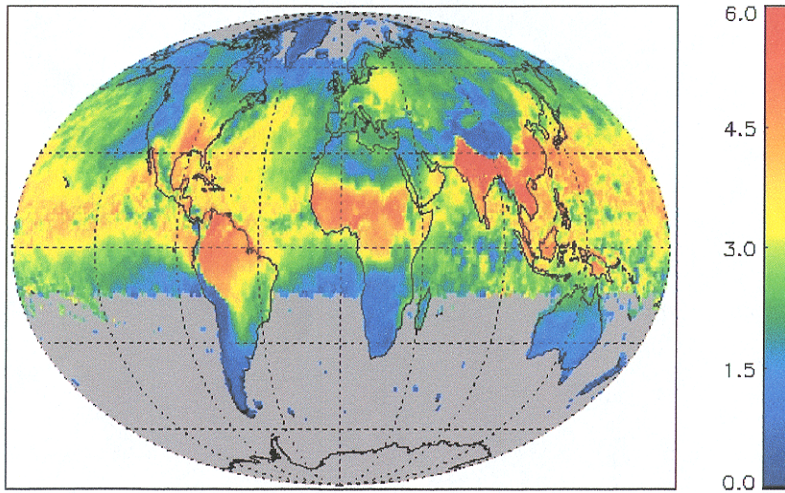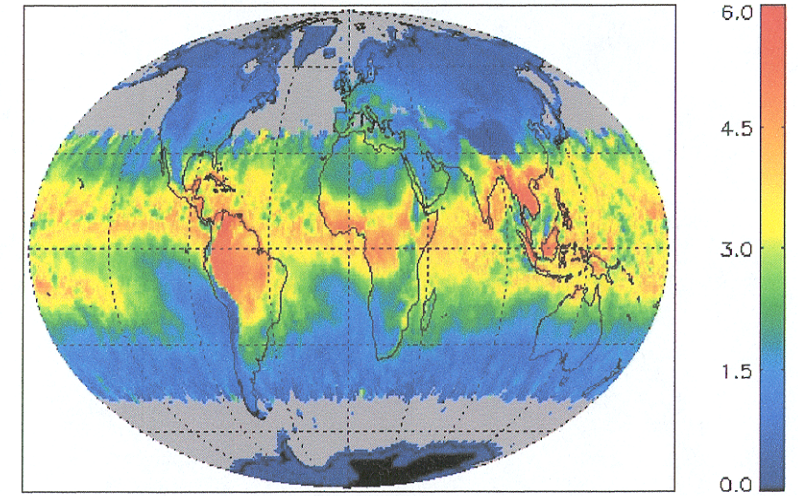
March, 2001

MOD08_M3_2001060_WV_Clear_Globe

July, 2001

MOD08_M3_2001182_WV_Clear_Globe

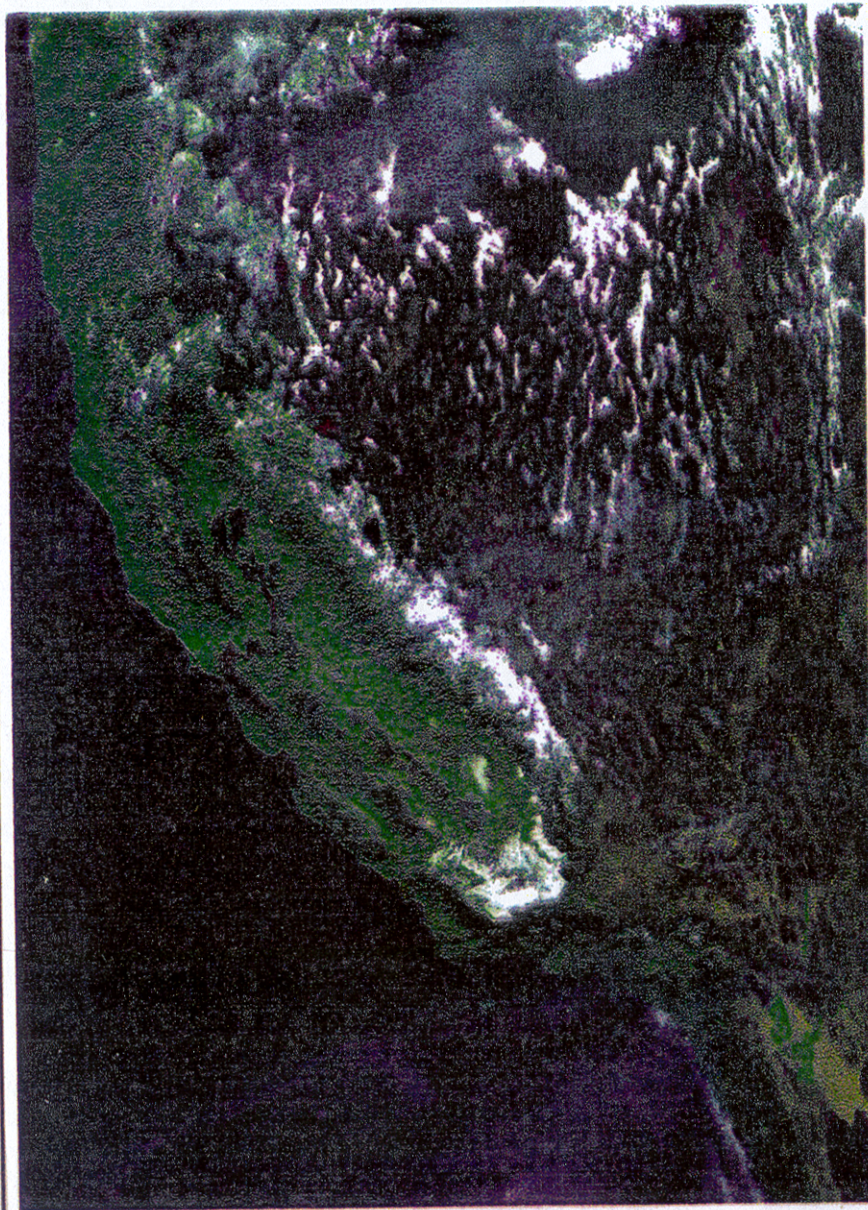## October, 2001

MOD08_M3_2001274_WV_Clear_Globe

Legend:
- —— THICK CIRRUS
- ⋯⋯ CLEAR LAND

Y-axis: TRANSMITTANCE (0.0, 0.2, 0.4, 0.6)

X-axis: WAVELENGTH (μm) (0.8, 1.0, 1.2, 1.4, 1.6)

MODIS DATA (072.1910)

R:0.66,G:0.86,B:0.46μm   1.38μm IMAGE (Refl. 0 – 0.1)

(a) RGB Composite   (b) 0.66−μm Image   (c) 1.38−μm Image

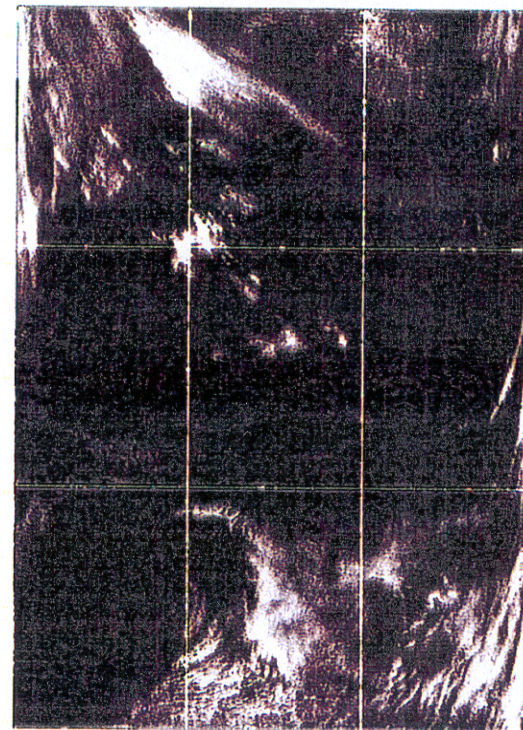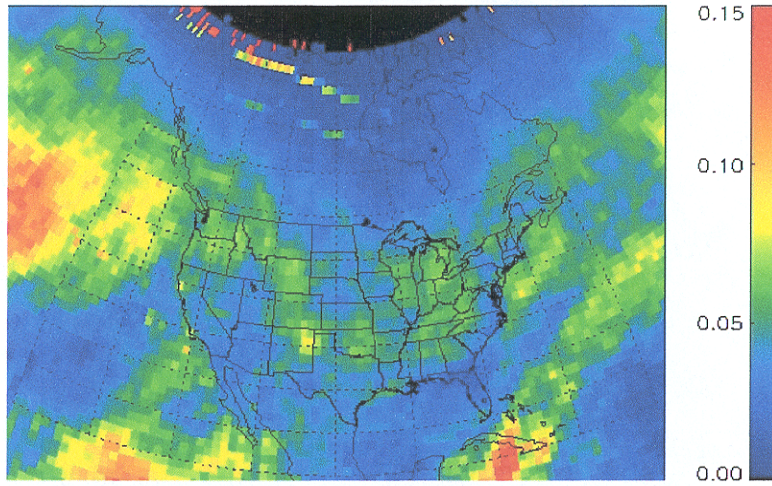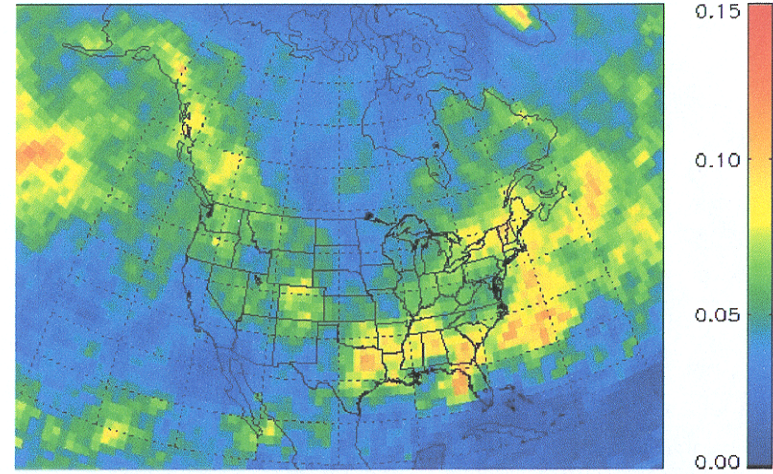

Fig.7

High Cloud (North America)
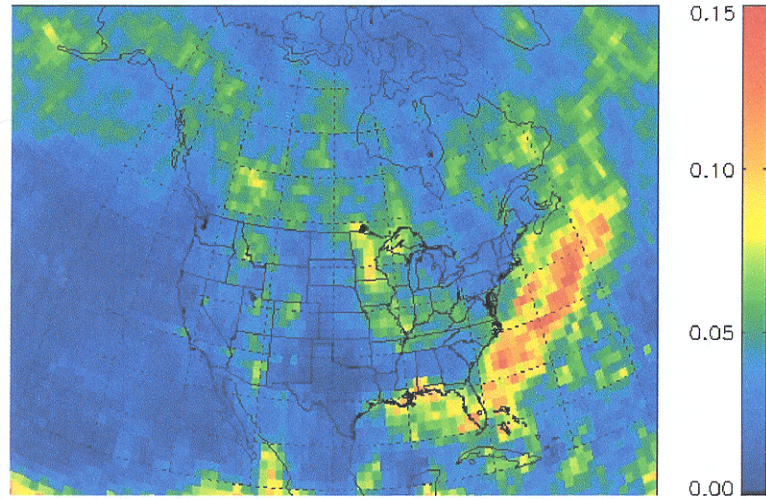
December, 2000

MOD08_M3_2000336_Cirrus_North_America

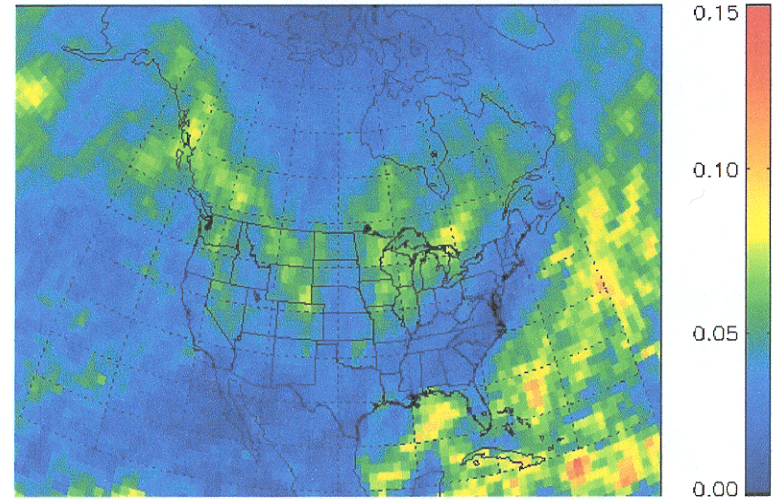## March, 2001

MOD08_M3_2001060_Cirrus_North_America

July, 2001

MOD08_M3_2001182_Cirrus_North_America

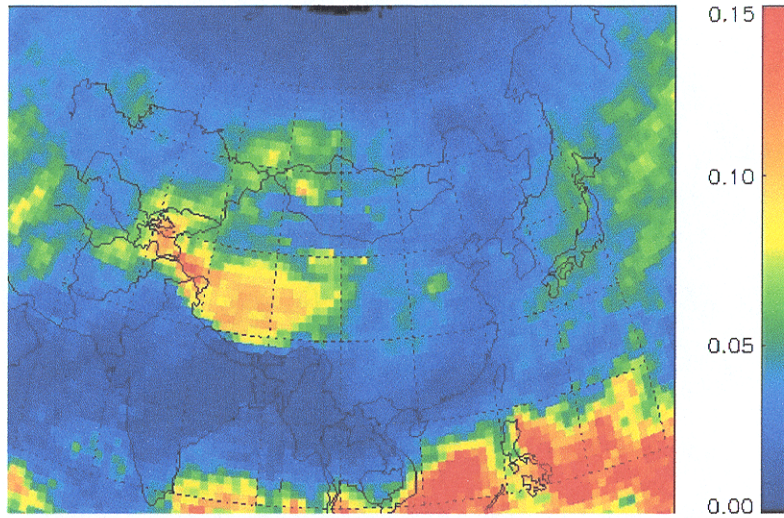## October, 2001

MOD08_M3_2001274_Cirrus_North_America

High Cloud (Asia)

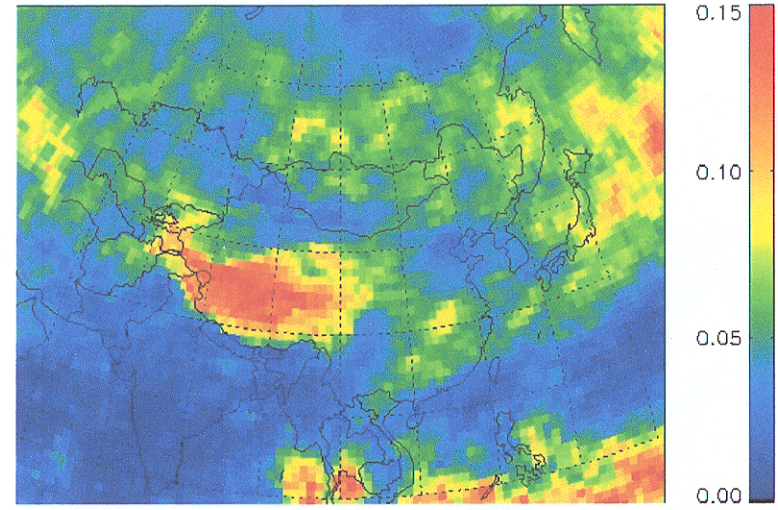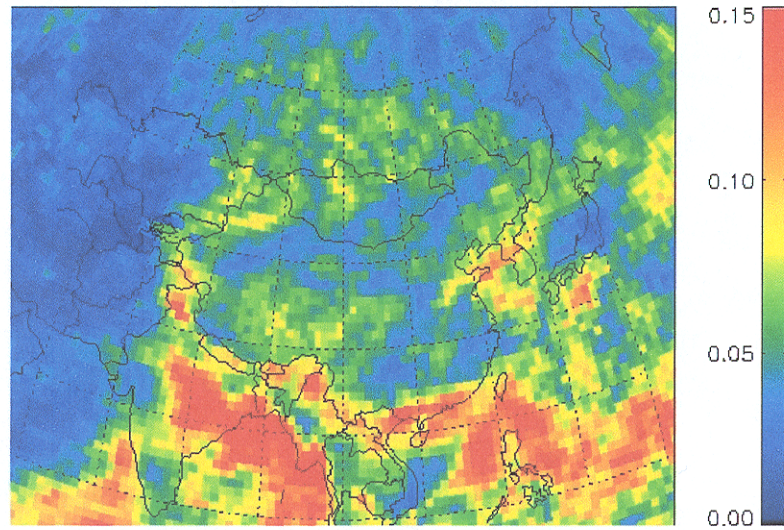## December, 2000

MOD08_M3_2000336_Cirrus_Asia
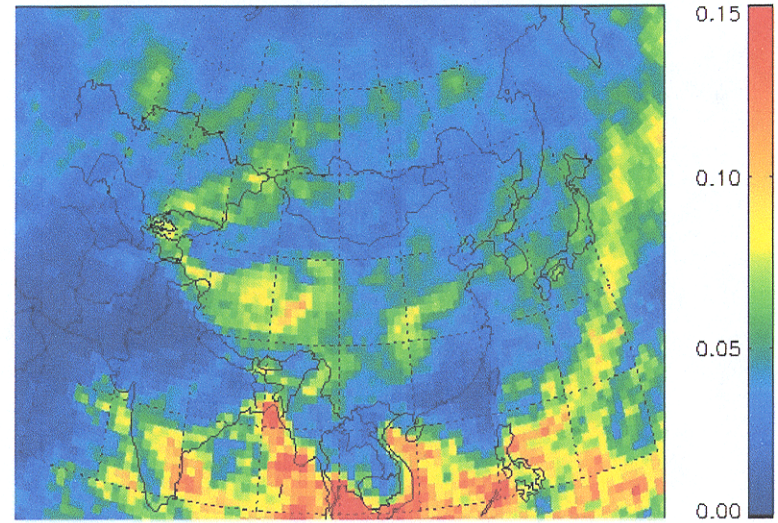

March, 2001

MOD08_M3_2001060_Cirrus_Asia

July, 2001

MOD08_M3_2001182_Cirrus_Asia
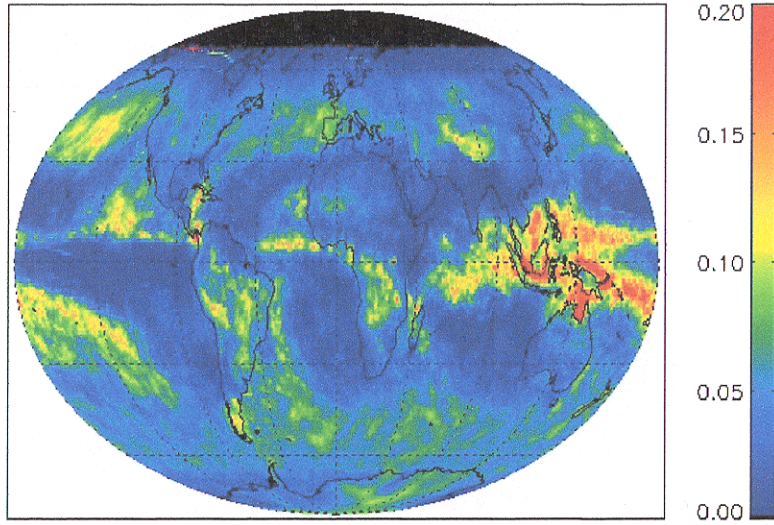

October, 2001

MOD08_M3_2001274_Cirrus_Asia

High Cloud (Global)

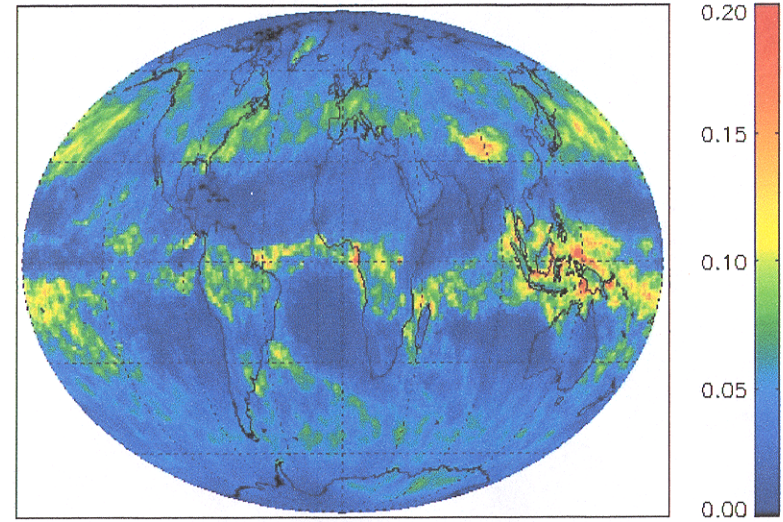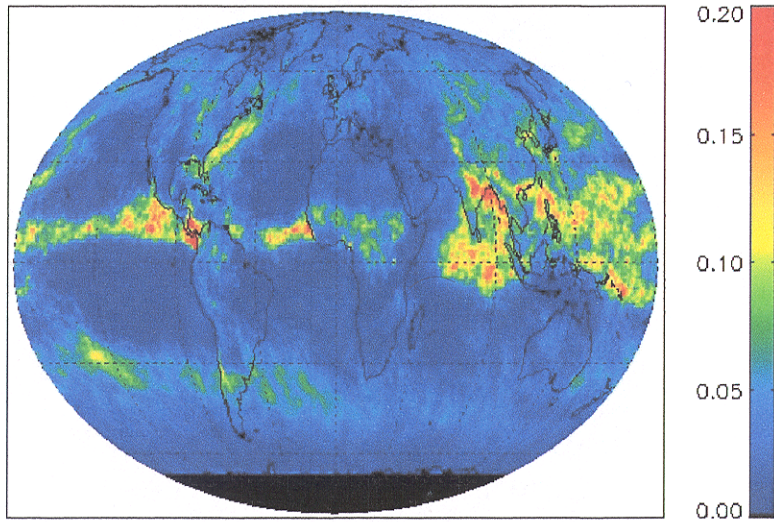## December, 2000

MOD08_M3_2000336_Cirrus_Globe
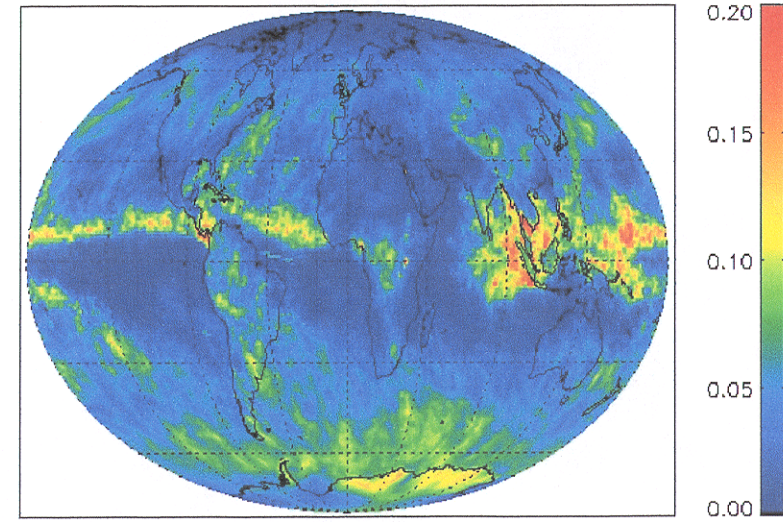
March, 2001

MOD08_M3_2001060_Cirrus_Globe

July, 2001

MOD08_M3_2001182_Cirrus_Globe

October, 2001

MOD08_M3_2001274_Cirrus_Globe

DISCUSSIONS & SUMMARY

- There are still cross-talking problems with the 1.38-micron MODIS channel. Bright stripes are often seen in 1.38-micron images. Improvement in radiometric calibration for this channel is still needed.

- Both the near-IR water vapor algorithm and cirrus detection algorithm are working reasonably well. The algorithms allow reliable observations of seasonal and global water vapor and high cloud variations. The data products from these algorithms will have important applications in many fields, including meteorology, hydrology, and climate studies.