

# CIRRUS AND WATER VAPOR FROM MODIS

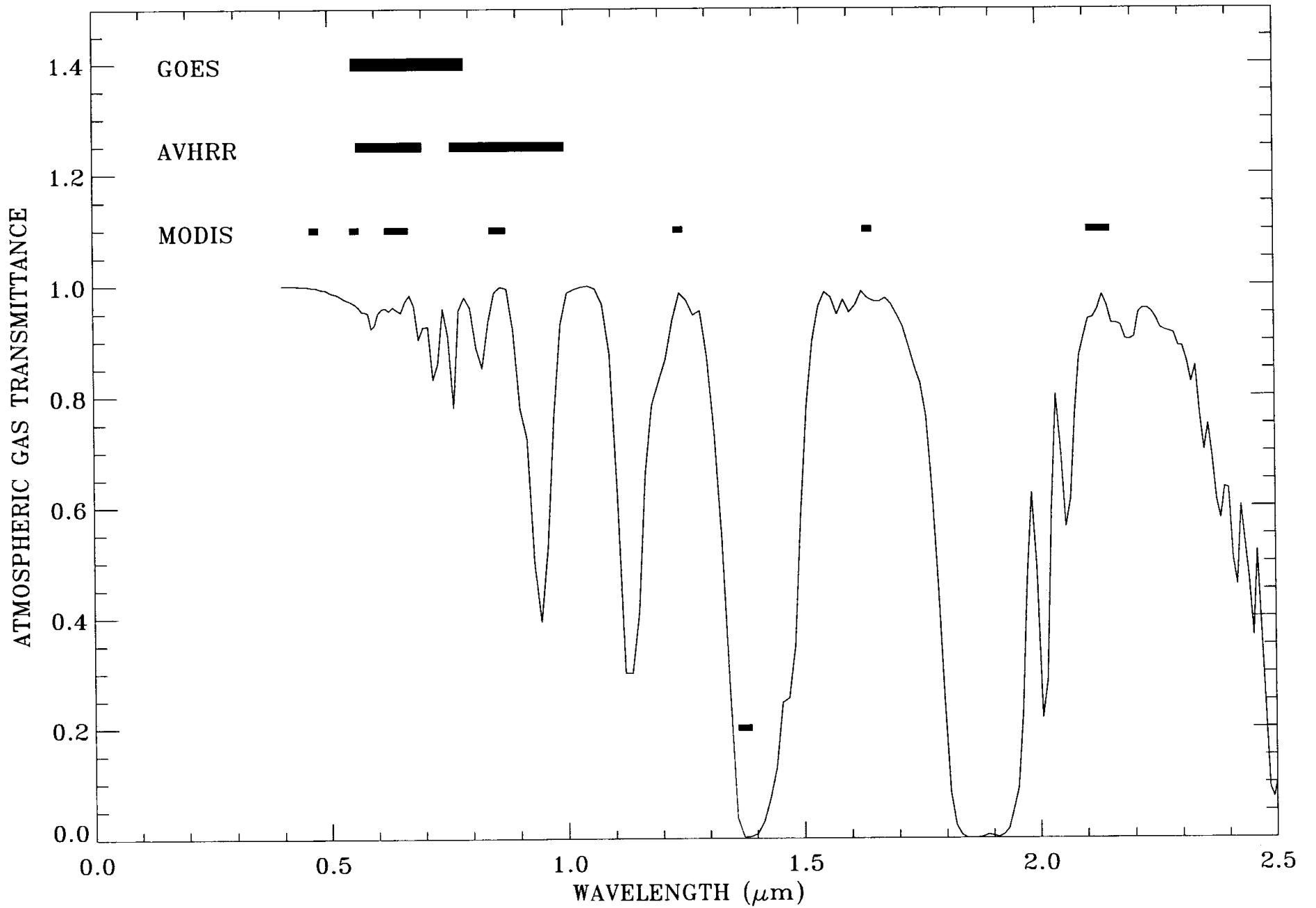
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# OUTLINE

- CIRRUS
  - Brief history on the 1.375-micron MODIS channel for cirrus detection
  - Sample results from MODIS observations
- Water Vapor
  - MODIS near-IR water vapor channels and retrieving techniques
  - Sample results
- Discussions
  - Cross-talking problems with the 1.375-micron cirrus channel
  - Saturation of land channels over bright clouds
  - Saturation of ocean color channels under hazy conditions
- Summary



CLOUD IMAGE OVER GULF OF MEXICO (12/5/91)  
(0.58  $\mu\text{m}$ , B17, RUN: 03, SEG: 04)



(CSES/U. OF COLORADO)

CLOUD IMAGE OVER GULF OF MEXICO (12/5/91)  
(1.35  $\mu\text{m}$ , B108, RUN: 03, SEG: 04)



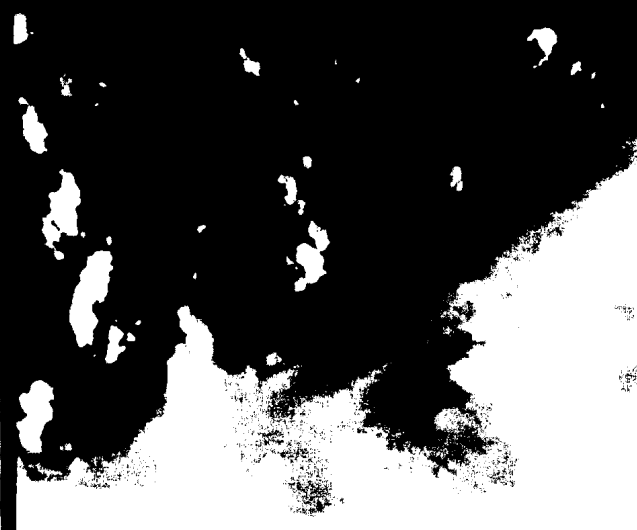
(CSES/U. OF COLORADO)

CLOUD IMAGE OVER GULF OF MEXICO (12/5/91)  
(1.38  $\mu\text{m}$ , B111, RUN: 03, SEG: 04)



(CSES/U. OF COLORADO)

CLOUD IMAGE OVER GULF OF MEXICO (12/5/91)  
(1.50  $\mu\text{m}$ , B123, RUN: 03, SEG: 04)



(CSES/U. OF COLORADO)

CLOUD IMAGE OVER COFFEYVILLE, KS (12/5/91)  
(0.56  $\mu\text{m}$ , B17, RUN: 10, SEGS: 09 & 10)



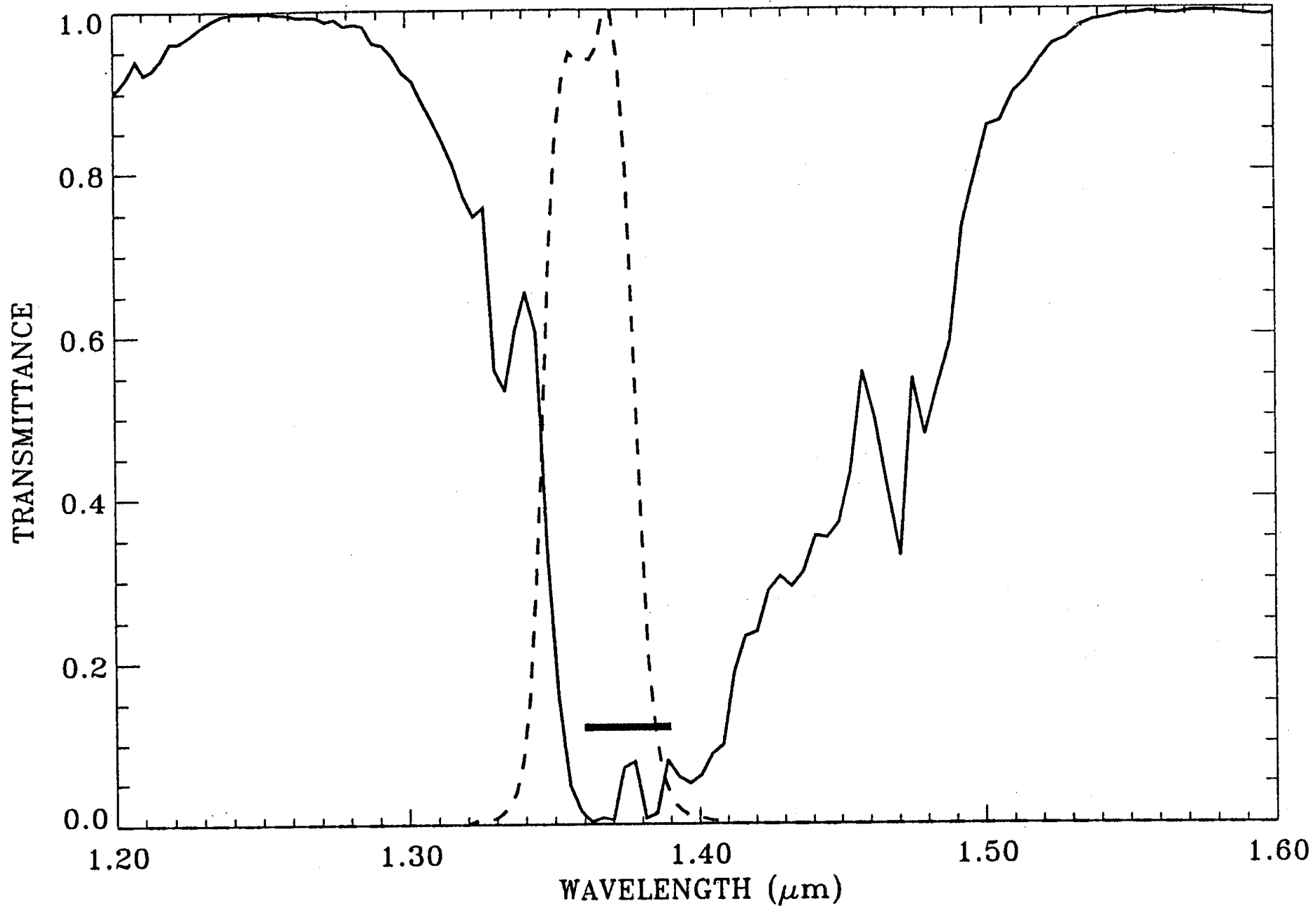
CLOUD IMAGE OVER COFFEYVILLE, KS (12/5/91)  
(1.25  $\mu\text{m}$ , B9B, RUN: 10, SEGS: 09 & 10)



CLOUD IMAGE OVER COFFEYVILLE, KS (12/5/91)  
(1.37  $\mu\text{m}$ , B110, RUN: 10, SEGS: 09 & 10)

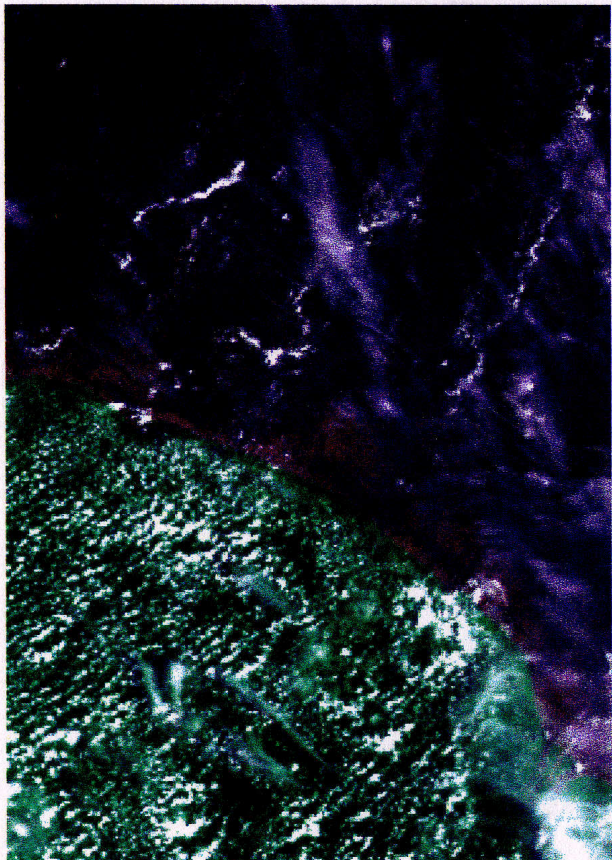


Solid: VAPOR TRANSM.; Dash: New Filter; Bar: Specification

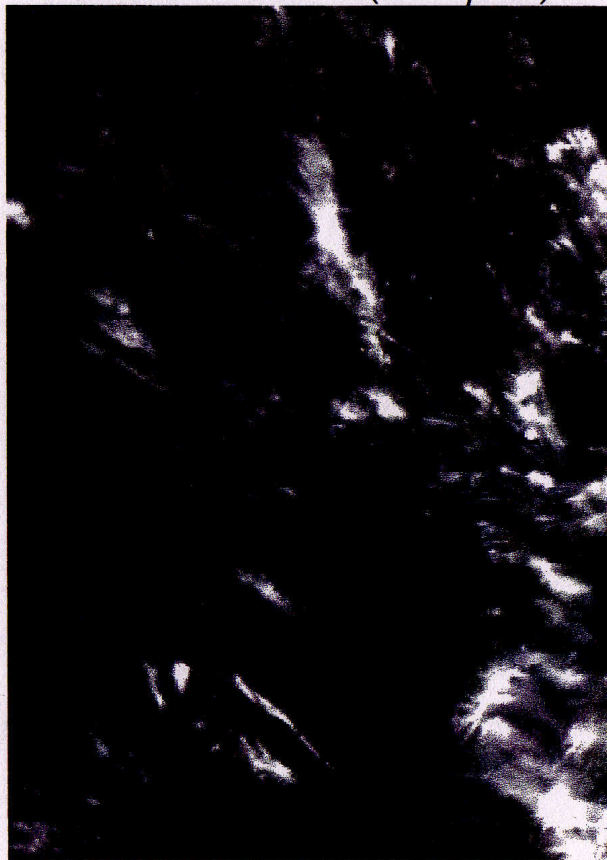


MODIS DATA, SOUTH AMERICA , 2/28/2000 at 14:50

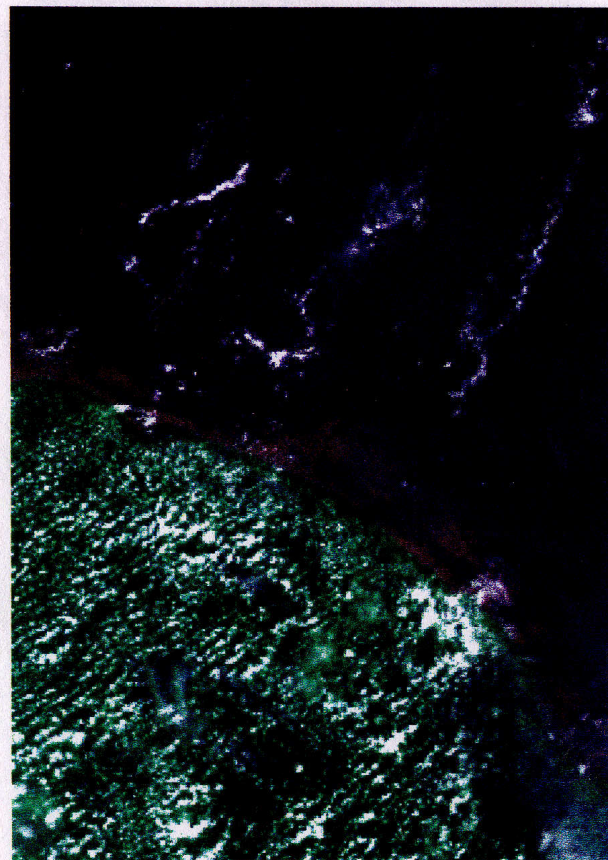
UNCORRECTED IMAGE



CIRRUS IMAGE (1.38 $\mu$ m)



CIRRUS-CORRECTED IMAGE

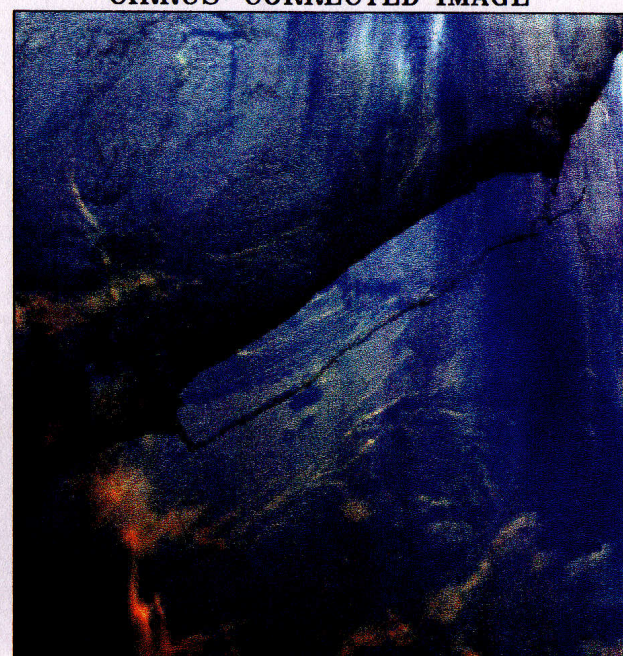
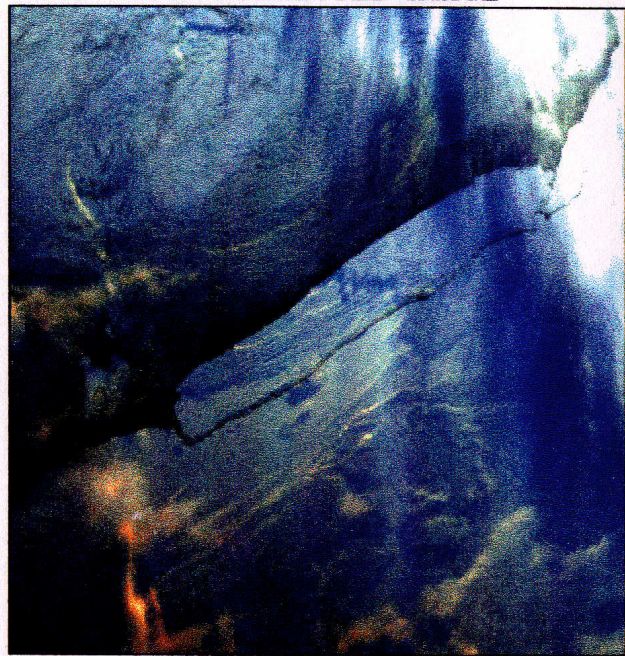


MODIS DATA, Antarctica, March 28, 2000 at 18:45

UN-CORRECTED IMAGE

CIRRUS IMAGE (1.38  $\mu\text{m}$ )

CIRRUS-CORRECTED IMAGE

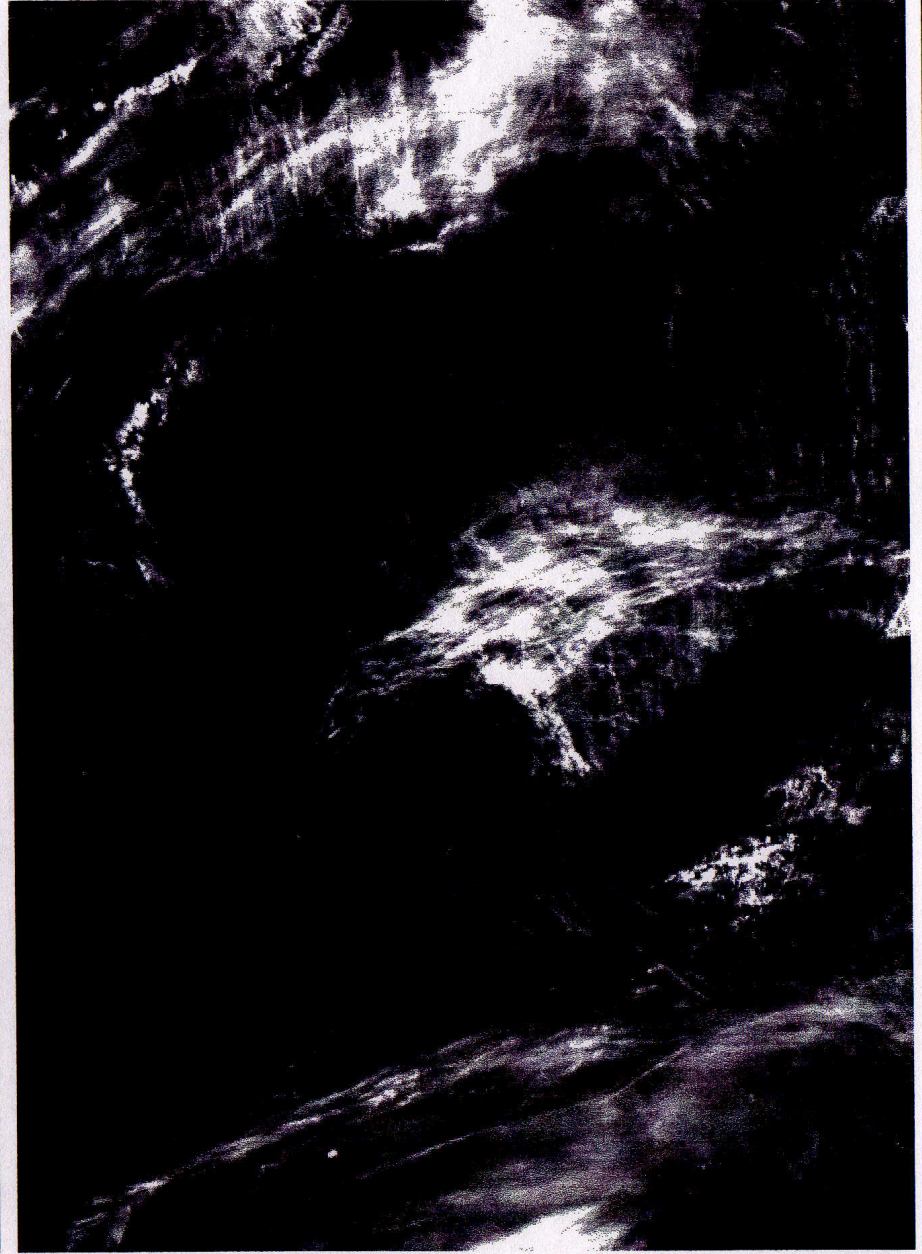
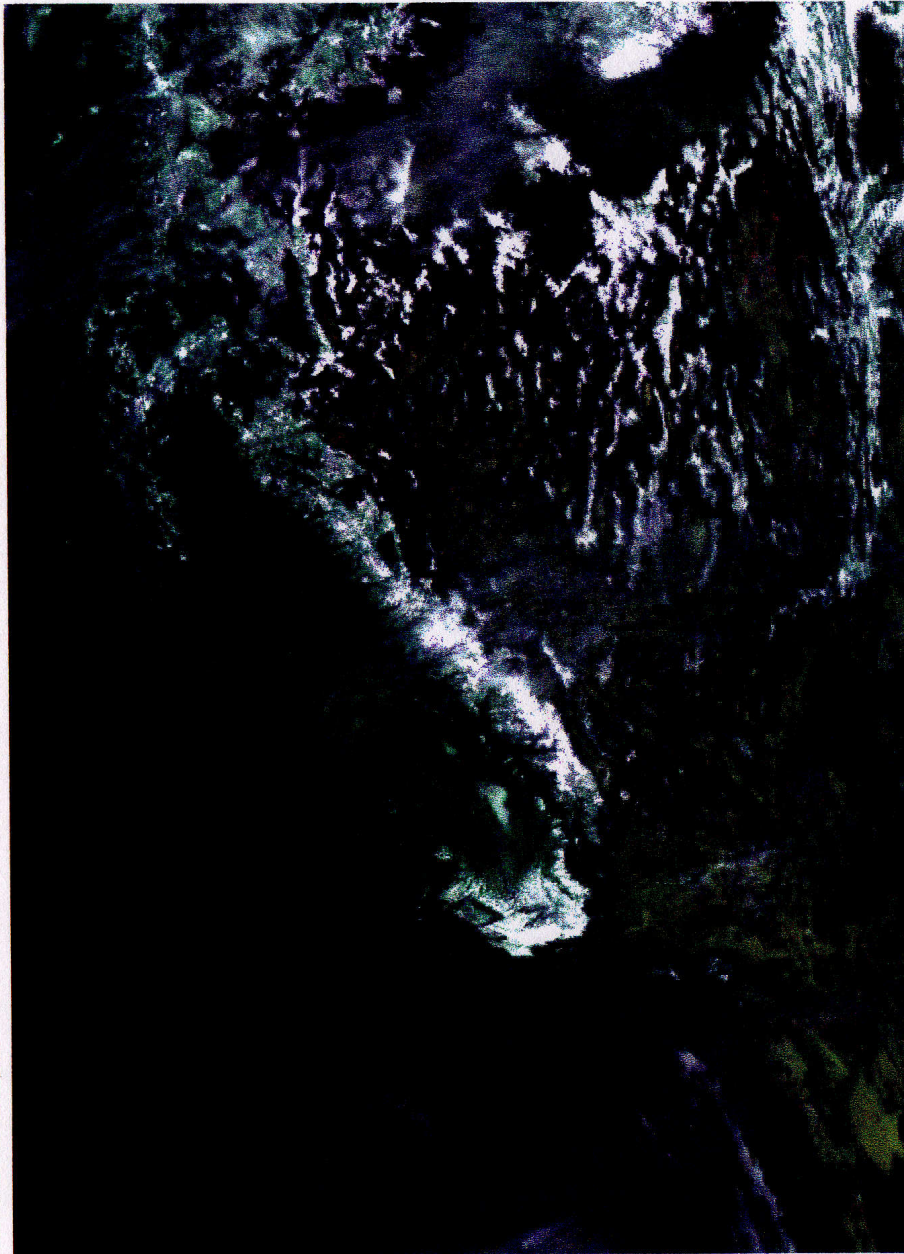




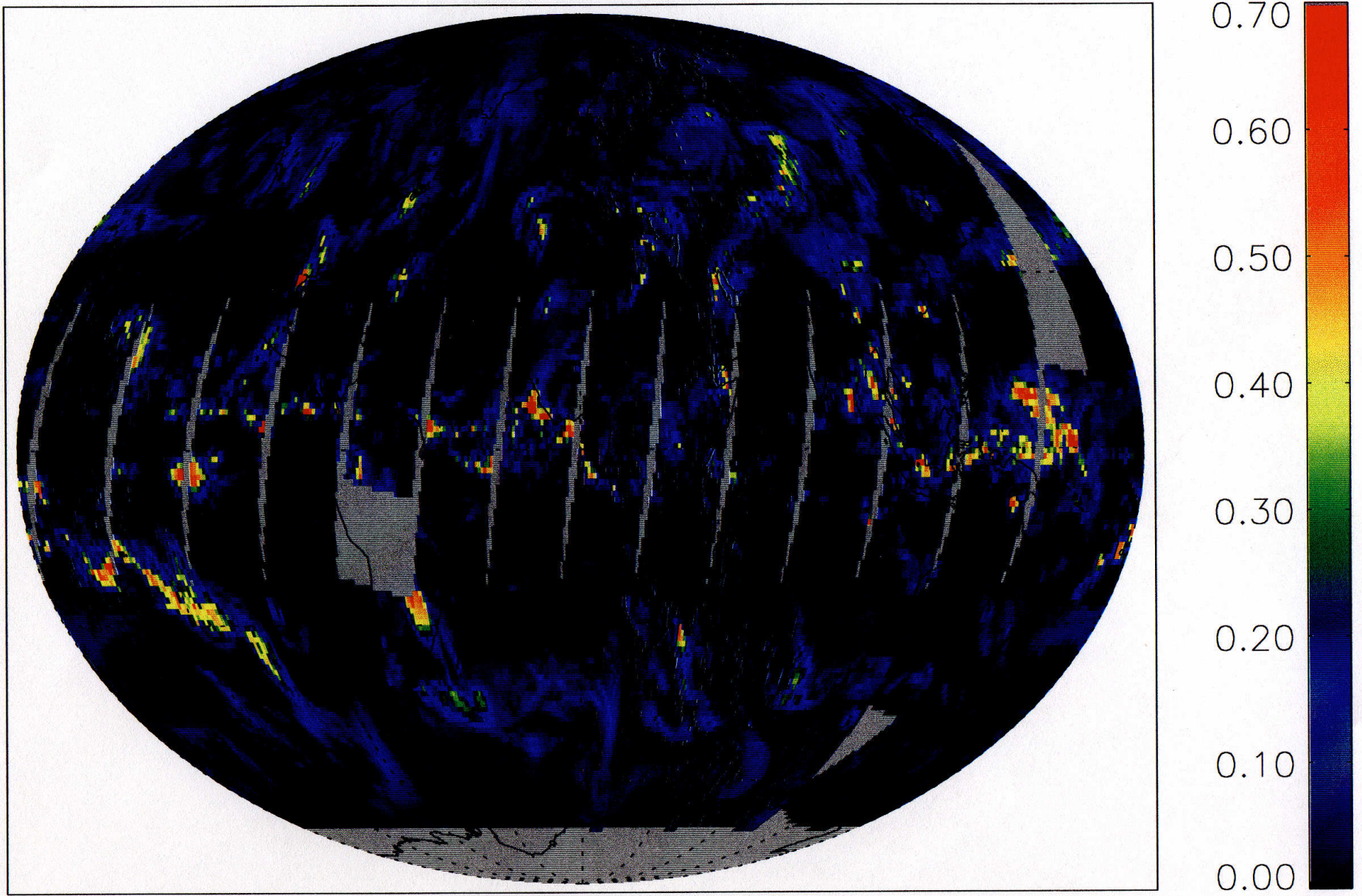
MODIS DATA (072.1910)

R:0.66,G:0.86,B:0.46 $\mu\text{m}$

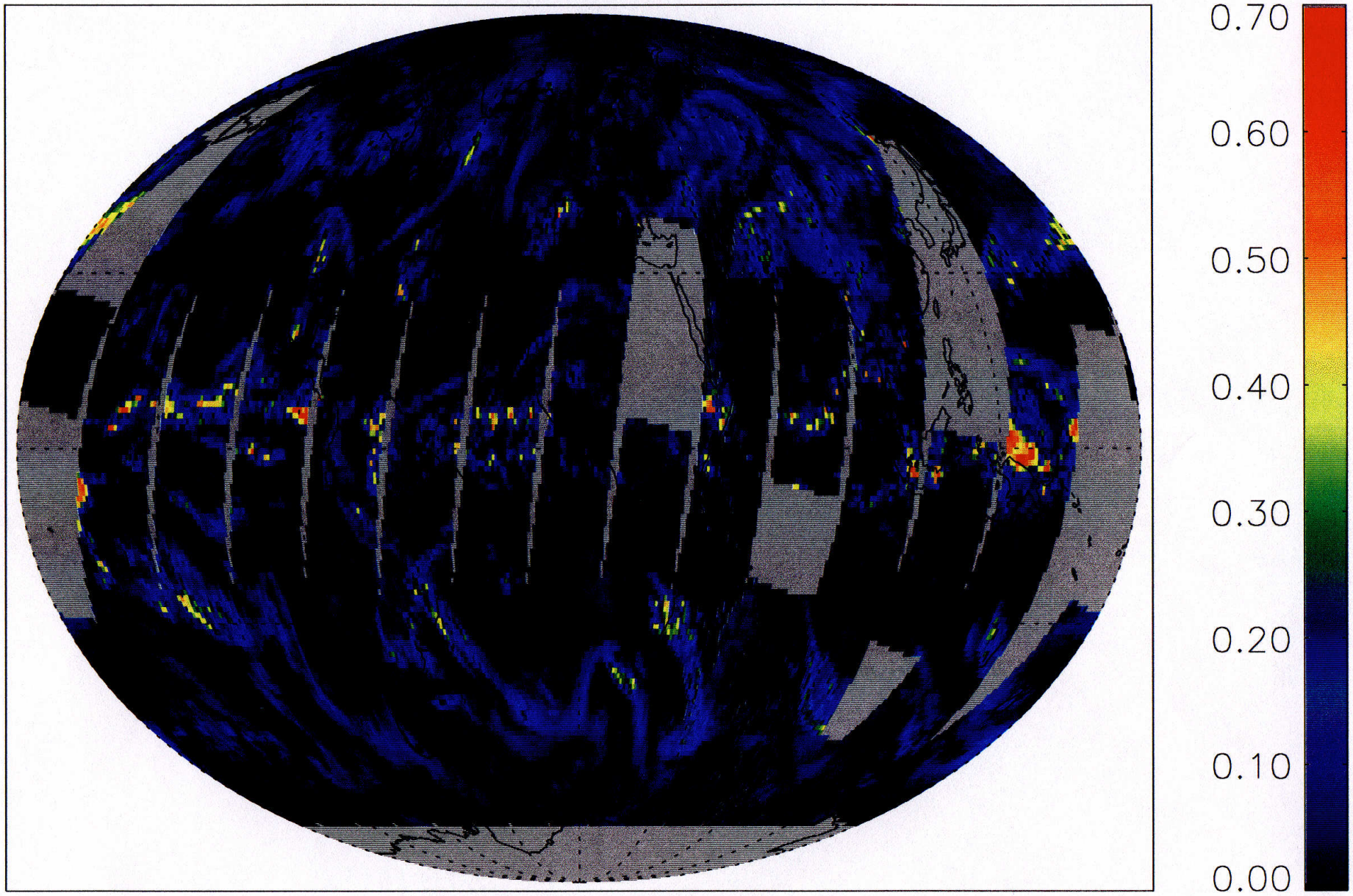
1.38 $\mu\text{m}$  IMAGE (Refl. 0 - 0.1)



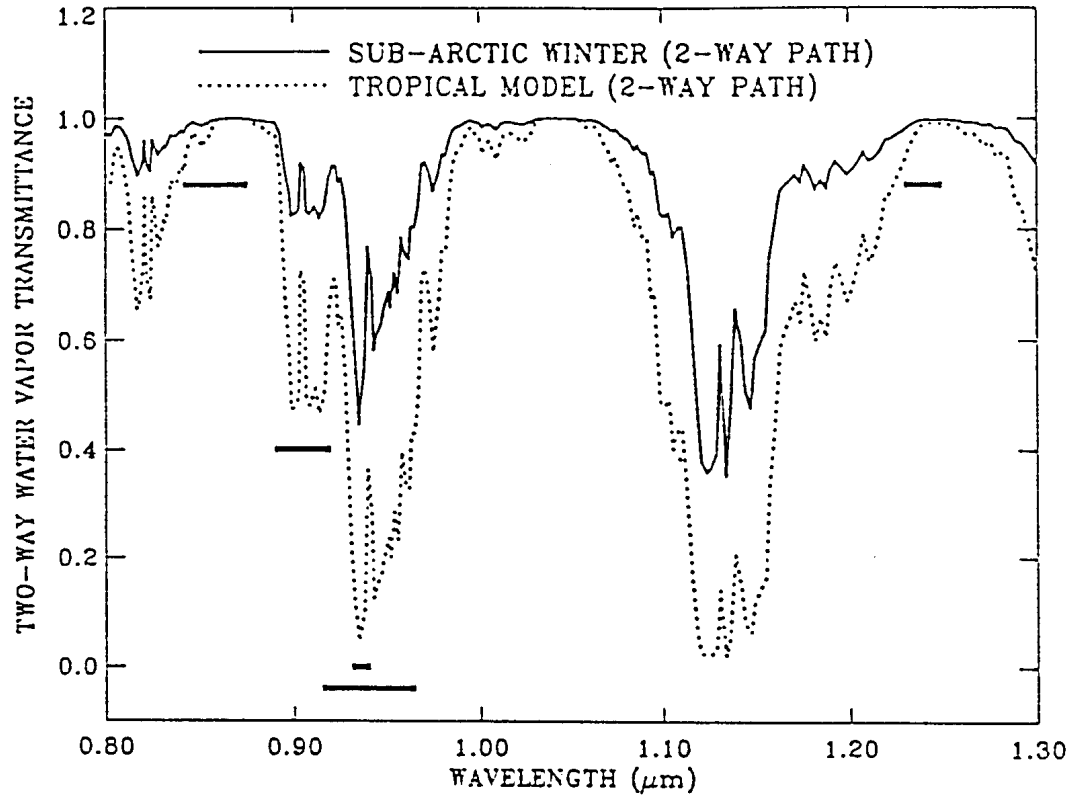
MOD08\_123\_Cirrus



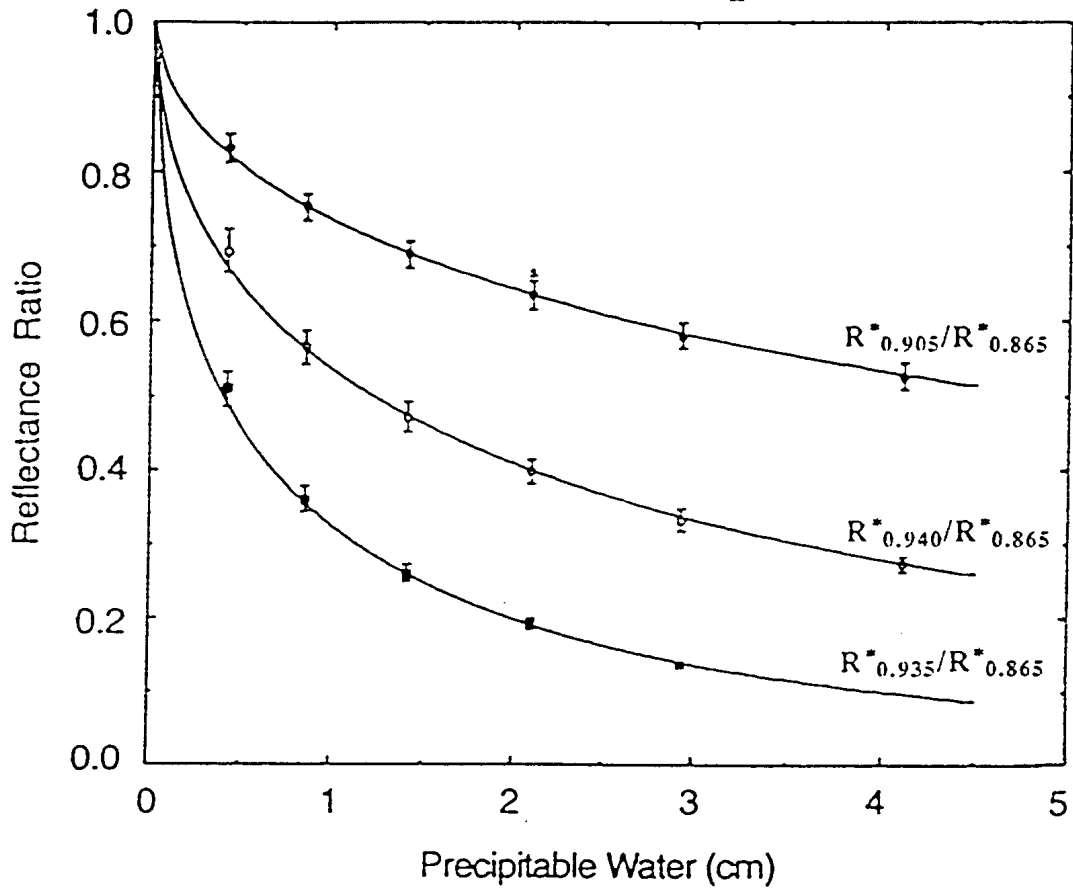
MOD08\_124\_Cirrus



## Positions of Five MODIS Channels



## Channel Ratio VS Precipitable Water



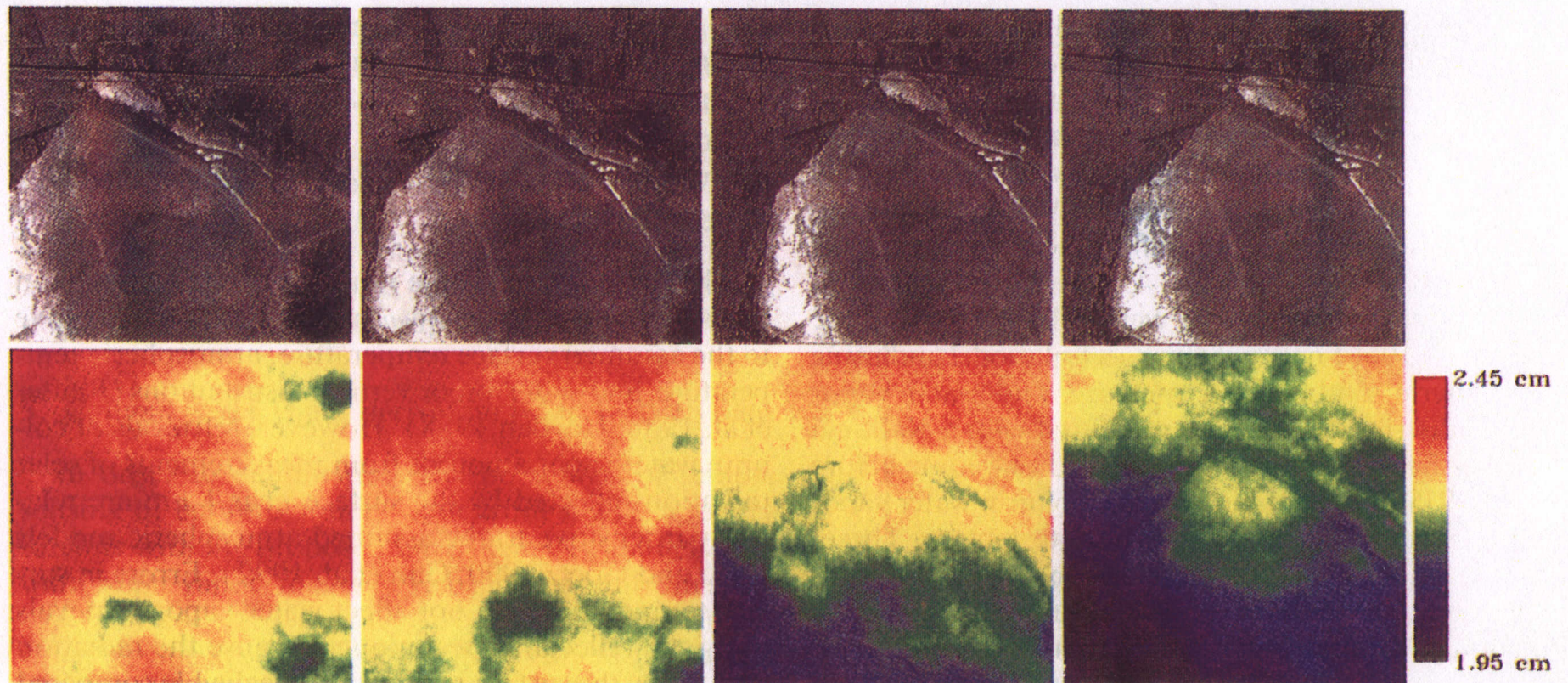
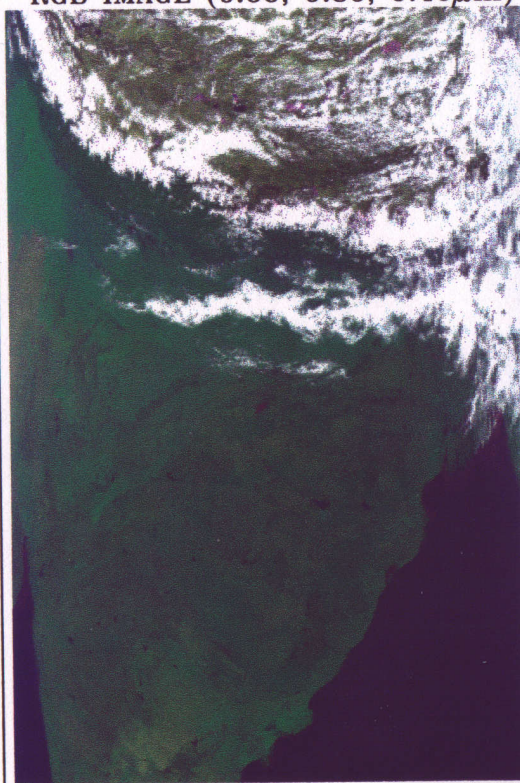


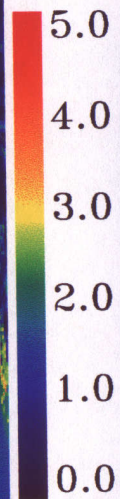
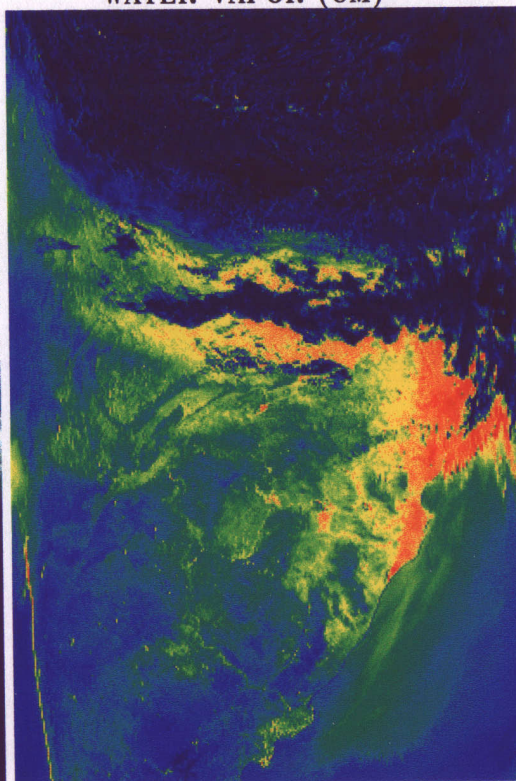
FIG. 9. Four  $0.865\text{-}\mu\text{m}$  AVIRIS images (upper row) over Rogers Dry Lake, California, and the corresponding four column water vapor images derived from the AVIRIS data. The four sets of AVIRIS data were measured at UTC time of 1852, 1903, 1916, and 1927 UTC 23 July 1990. The water vapor images are color coded so that blue corresponds to a column water vapor of 1.95 cm, and red 2.45 cm.

MODIS DATA, TIBET & INDIA 3/2/2000 at 5:25 UTC

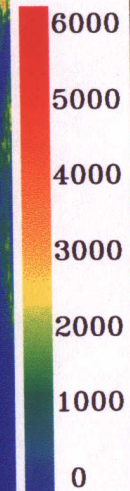
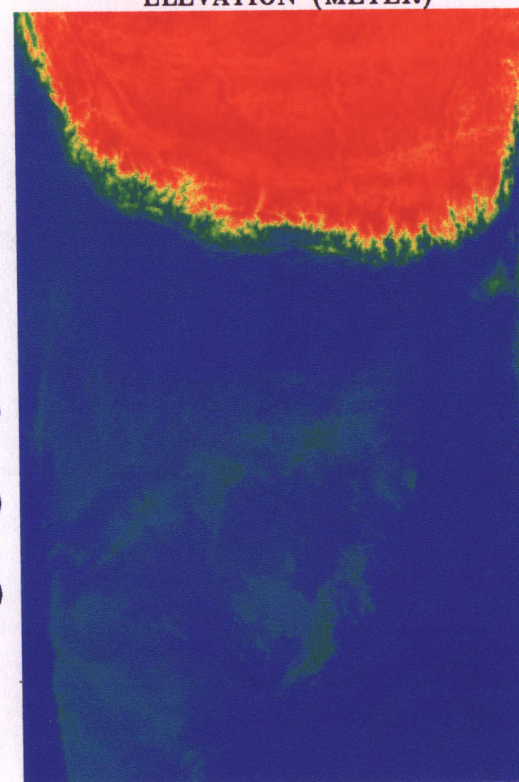
RGB IMAGE (0.66, 0.86, 0.46 $\mu\text{m}$ )



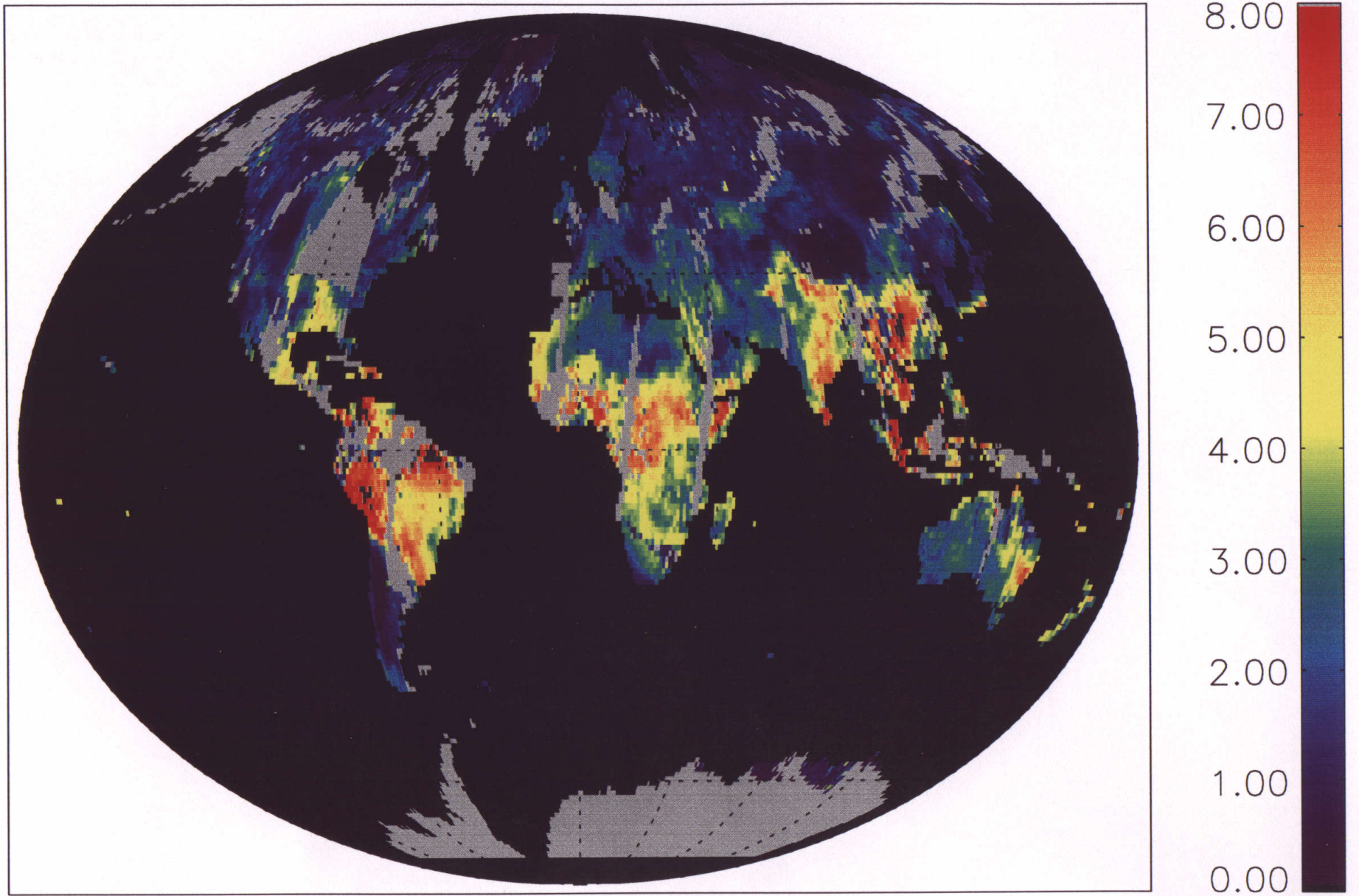
WATER VAPOR (CM)



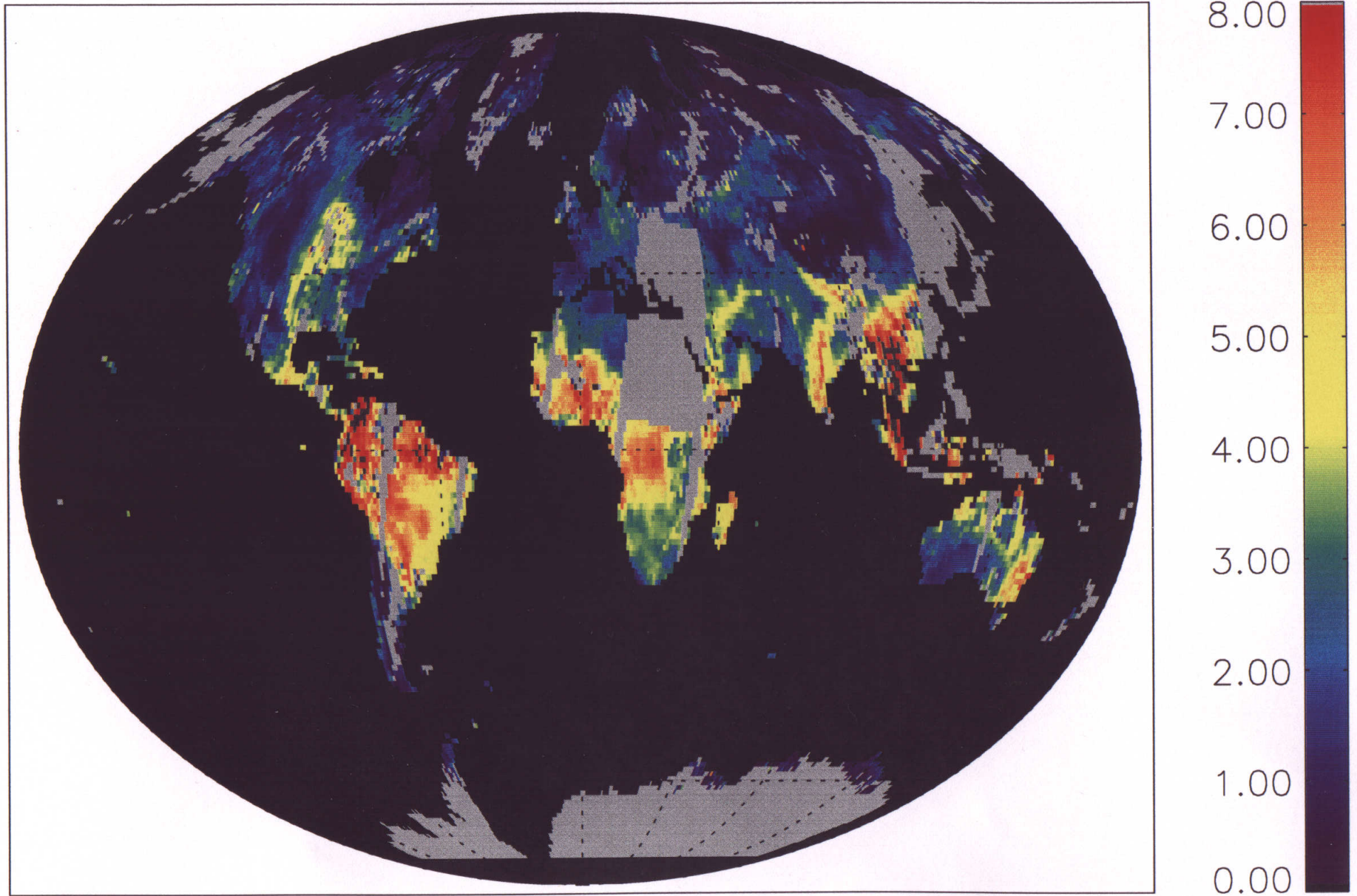
ELEVATION (METER)



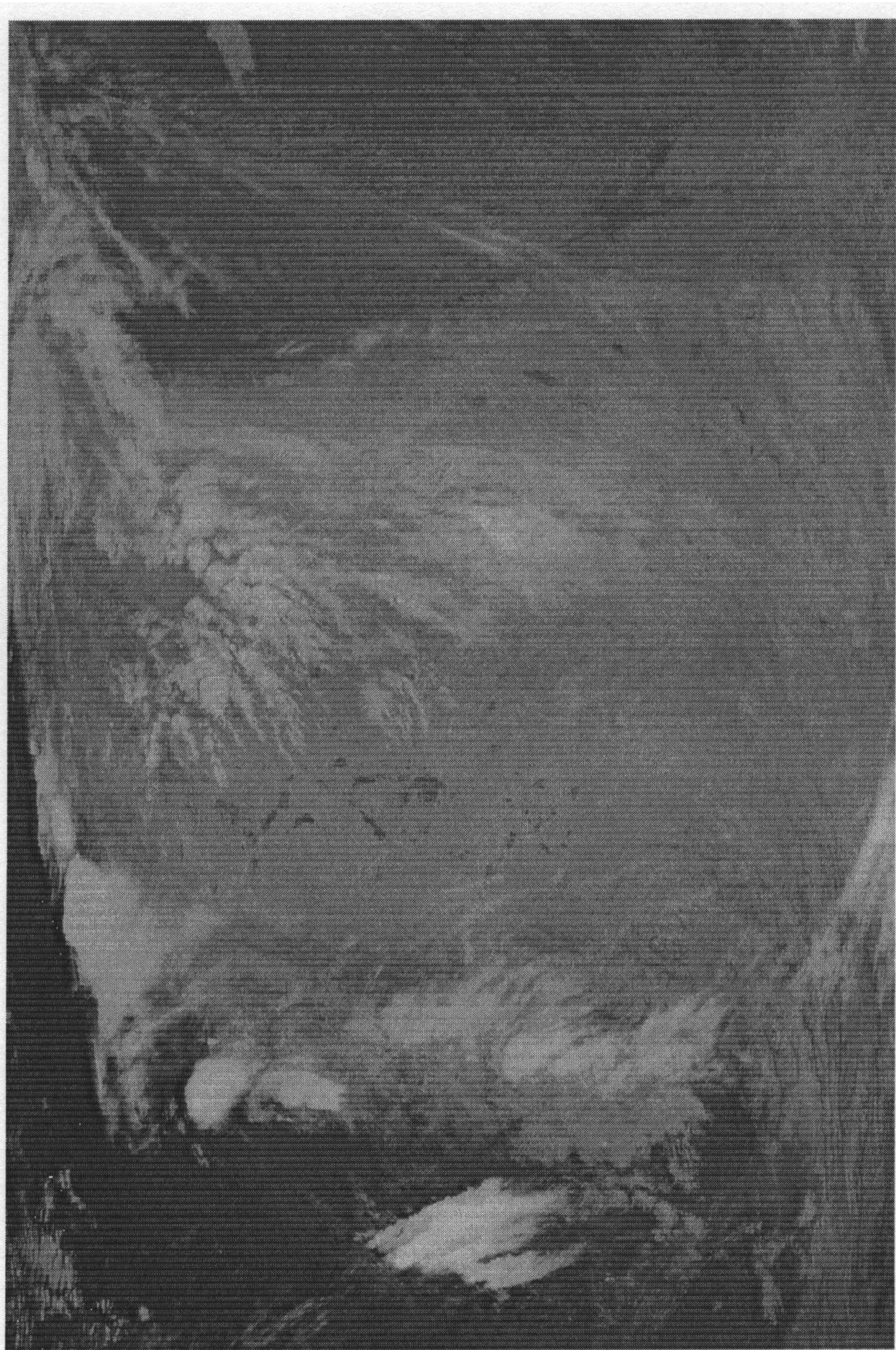
MOD08\_126\_WV\_Clear



MOD08\_124\_WV\_Clear

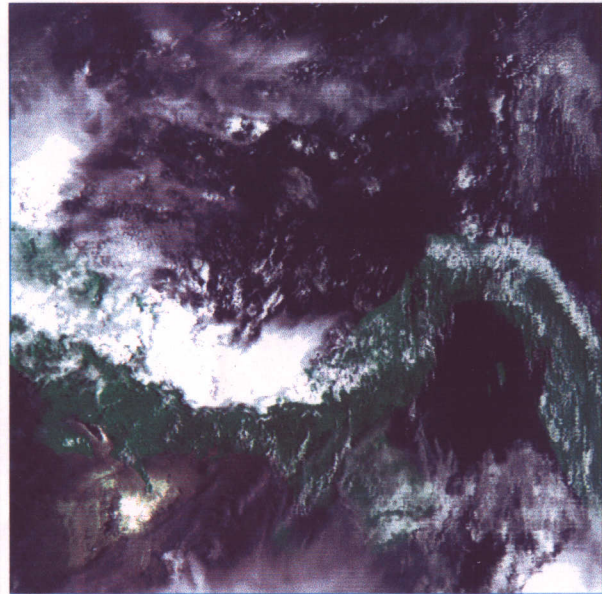




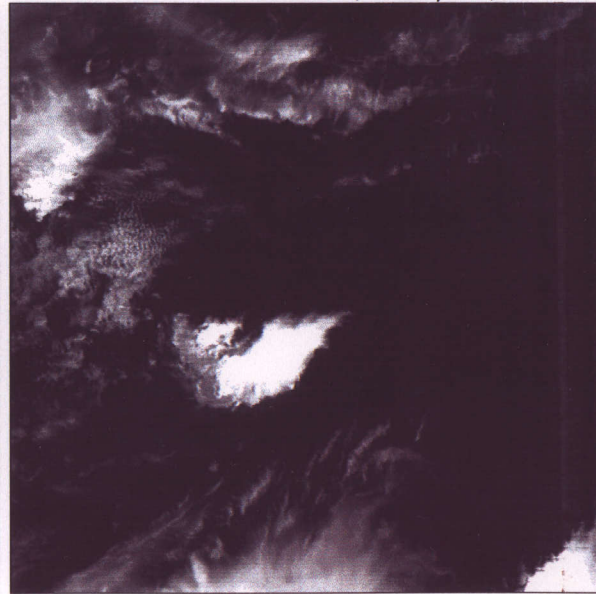


MODIS DATA, COSTA RICA, April 9, 2000 at 16:25

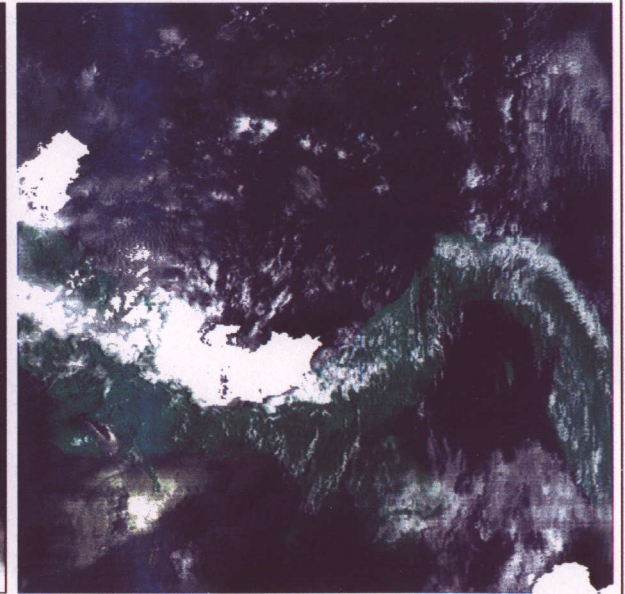
UN-CORRECTED IMAGE



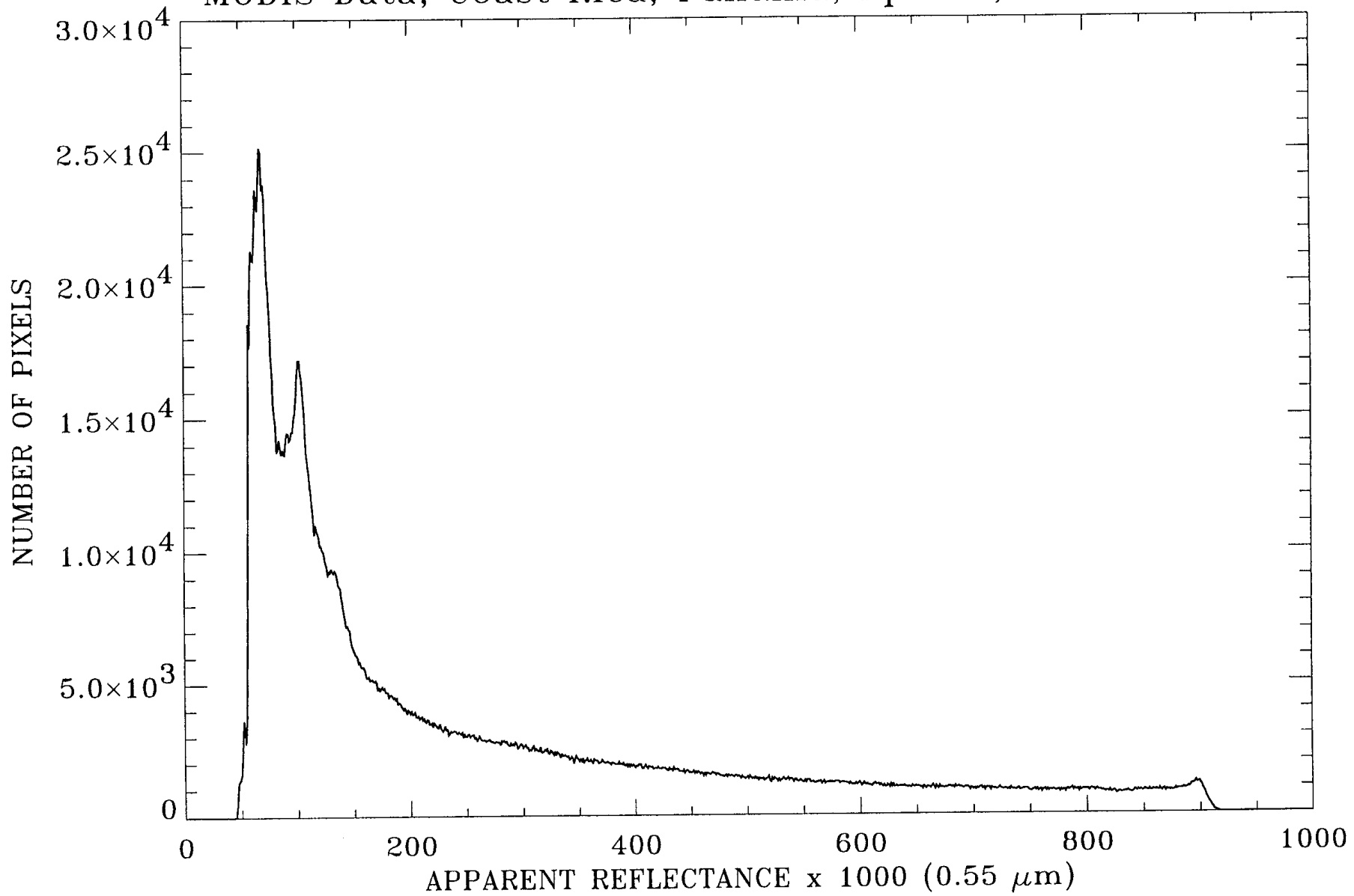
CIRRUS IMAGE (1.38  $\mu\text{m}$ )

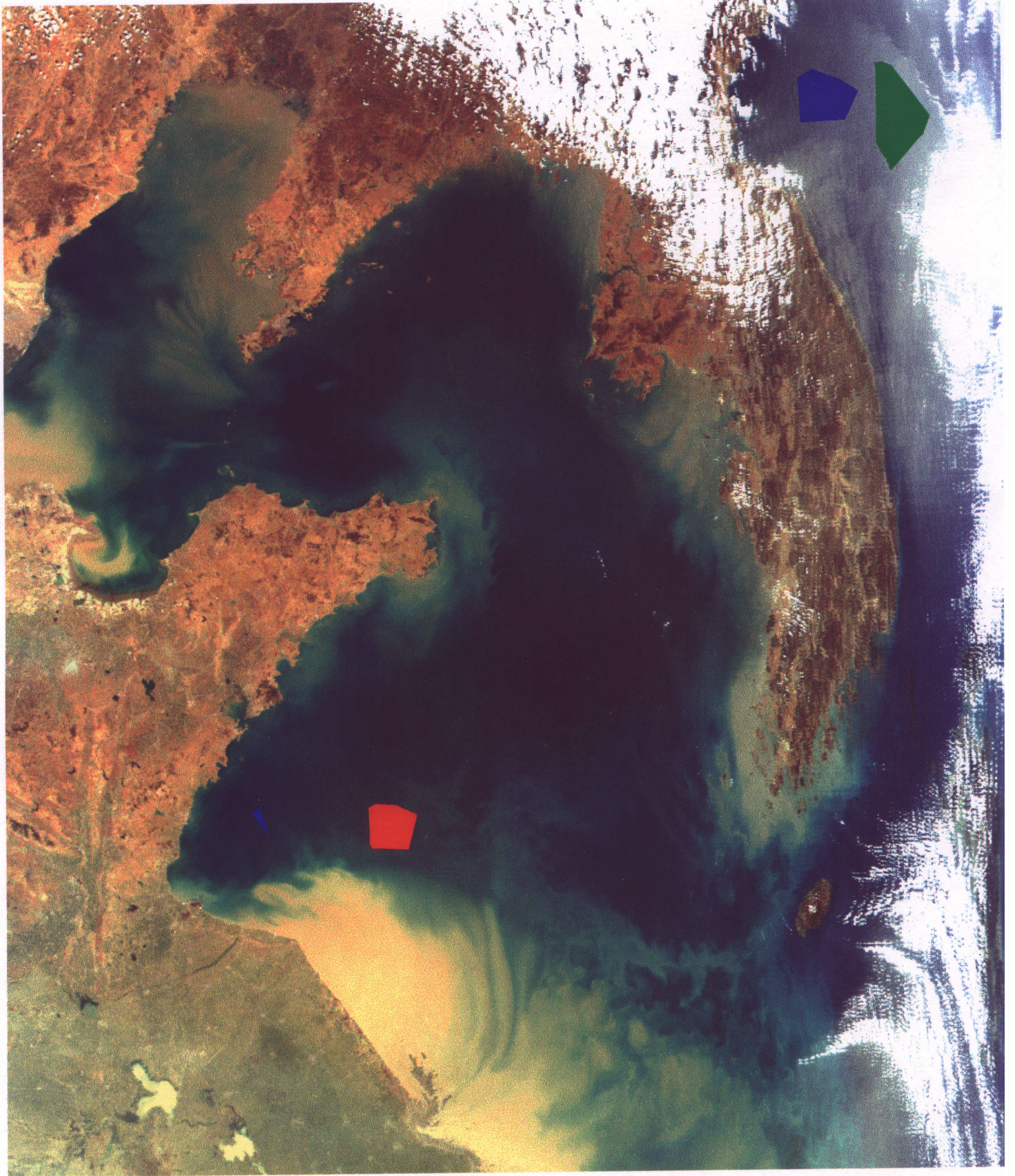


CIRRUS-CORRECTED IMAGE

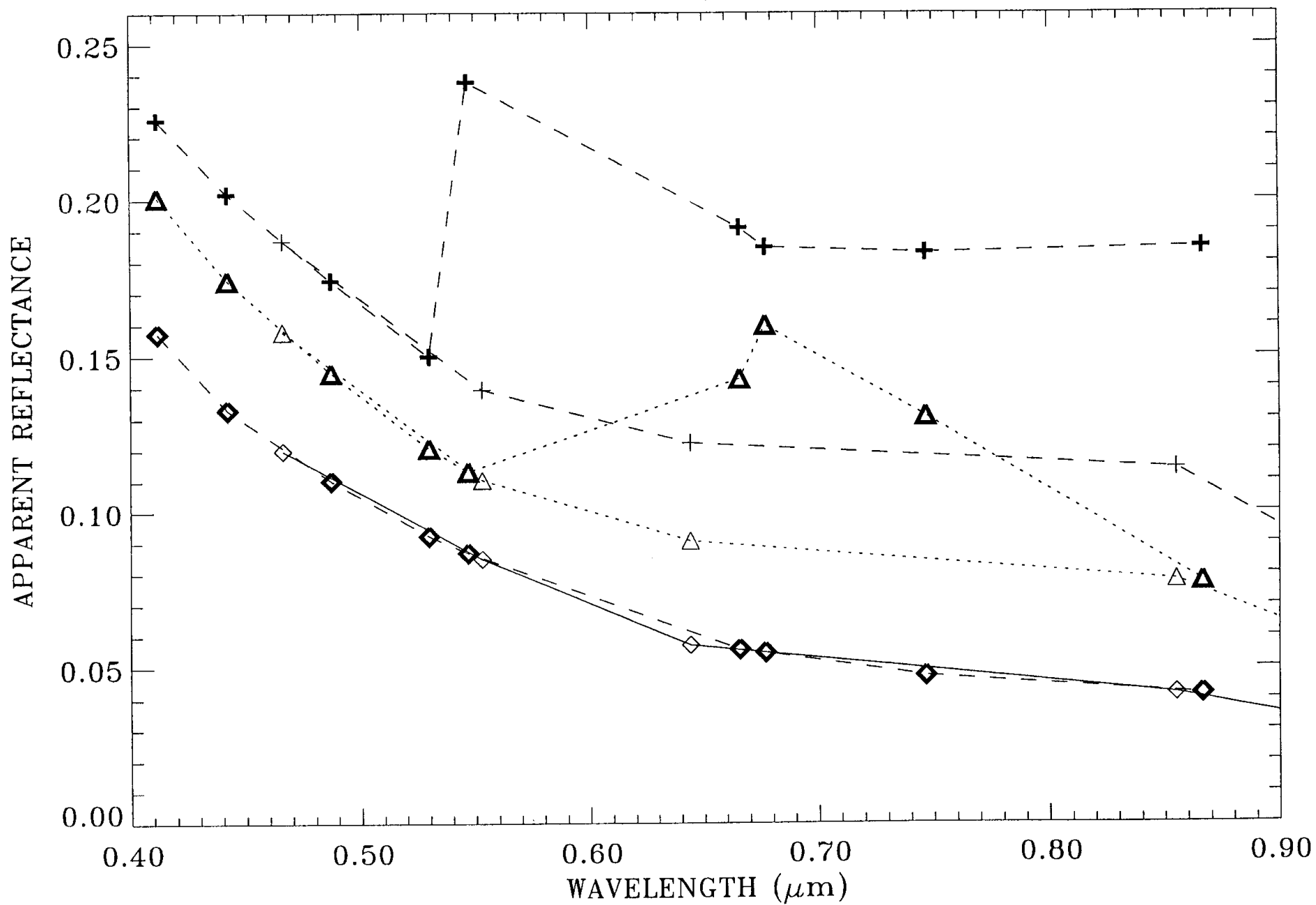


MODIS Data, Coast Rica, Panama, April 9, 2000 at 16:25





# A2000084.0305, China, Korea



## SUMMARY

- Based on our analysis of spectral imaging data collected by the NASA/JPL Airborne Visible Infrared Imaging Spectrometer (AVIRIS), the MODIS 1.375-micron cirrus-detecting channel and near-IR water vapor channels were selected.
- Our preliminary results obtained from MODIS data are quite encouraging. We can easily detect thin cirrus clouds and aircraft contrails from the 1.375- $\mu\text{m}$  image. The water vapor images derived from MODIS data are also quite reasonable. The cross-talking problem with the 1.38-micron channel will be investigated by the MODIS Calibration and Support Team (MCST).
- Over bright clouds, the MODIS land channels can saturate. The MODIS ocean color channels for atmospheric corrections are saturated under hazy atmospheric conditions. It would be worthwhile to consider setting the saturation levels of future ocean color sensors at higher radiances.