

CLOUD MASKING AND CLOUD PRODUCTS ROUNDTABLE

**EXPECTED PARTICIPANTS: ACKERMAN, HALL, WAN,
VERMOTE, BARKER, HUETE, BROWN, GORDON, KAUFMAN,
SCHAAF, BAUM**

**NOMINAL PURPOSE: DISCUSSION OF TESTS FOR ACCURACY
AND RESIDUALS, OPTICAL EFFECTS FOR EACH CLOUD FLAG,
INTEGRATION WITH OTHER PRODUCTS, 3-D CLOUDS, AND
SHADOWS**

POTENTIAL TOPICS:

- DEFINITION OF "CLOUD"**
- CLOUD MASK**
 - EXISTING TECHNIQUES FOR DETECTING CLOUDS**
 - HOW DO THESE TECHNIQUES APPLY FOR
VARIOUS DISCIPLINES/OTHER PRODUCTS?**
 - RECOMMENDED TECHNIQUES THAT TAKE
ADVANTAGE OF MODIS CAPABILITIES**
 - SPECTRAL TECHNIQUES**
 - SPATIAL TECHNIQUES**
 - NIGHTTIME**
 - DAYTIME**
 - OVER OCEAN**
 - OVER LAND**
 - HOW TO DETECT AND HANDLE SHADOWS**
 - NECESSARY ANCILLARY DATA**
 - QUALITY ASSURANCE/ACCURACY TESTS**
- CLOUD PROPERTIES PRODUCTS**
 - COVER**
 - OPTICAL DEPTH**
 - ETC.**
 - ACCURACY, ETC.**

RESPONSIBILITIES

- MODIS TEAM**
- TO AND WITH OTHER TEAMS; E.G., CERES, MISR, ASTER
MIMR, AIRS/AMSU**

Summary of Roundtable Discussions
(May 5, 1995)

Introduction: V. Salomonson

-went over the general content and the objectives of the roundtable.

Steve Ackerman (University of Wisconsin)

-using AVHRR LAC plus HIRS (infrared, but lacking in spatial resolution relative to MODIS)

-MAS (limited in coverage)

-Kaufman suggested the MAS helps in validation (high resolution attribute)

-J. Barker suggested that Landsat should be used. It, at least, offers high resolution views over many parts of the world. Barker will take the "lead" to explore and apply the virtues of Landsat for cloud masking work.

-Eric Vermote likes AVHRR for his studies because of the frequent temporal coverage and the similarity to MODIS in terms of spatial resolution.

-Cloud masks and their character depend upon the application.

-using reflectance (this implies that a "correction" to the radiances has been applied) is a helpful perspective.

Cloud Mask work and associated needs

-calibrated, navigated radiance data in 15 channels

-Ancillary data

-1 km land/water map (will come now from EDC). There is an issue about whether a 250m land/water map is needed.

-1km topography and ecosystems maps.

Reportedly J-P Muller will deliver the topography map soon. An AVHRR-based ecosystem map

from EDC may be available (contact T. Loveland at EDC)

- snow/ice map

 - cirrus clouds: CO2 channels (there are difficulties in polar regions associated with inversions.)

 - 1.38 micrometer channel use?

- cloud radiance composite maps

- the cloud mask will be implemented as a 32-bit word (S. Ackerman described the information that will be in each of the 32 bits)

 - the mask is a 1km mask. 250m data will be used as a consistency check in the 1km IFOV

 - there was quite a bit of discussion about developing cloud masks at the 250 and 500m resolutions and how to do this.

 - lots of "enhancements to the S. Ackerman, et al, work were discussed.

 - sun glitter areas use a nighttime approach

 - can shadow be determined at 250m? (Ron Welch is reportedly working on this). The whole issue surrounding cloud shadows is a "research area".

 - the approaches to get cloud height were discussed. Much of this involved using geometry to determine where the clouds were/are located. This is a "thread" problem in that it involves the cloud properties efforts and feedback loops.

"issue": "cloud shadow" parameter may require more than one bit, ultimately.

Conclusion: cloud shadow efforts should be done spectrally initially and then add spatial/geometric algorithms.

Overall conclusion: the 32-bit approach looks good and should be continued. Enhancements can be added as resources and time permit, but particularly post-launch when the full power and properties of MODIS become available.

-interactions with oceans and, particularly, SST are encouraged/sought.

-The data sets that are being used now by S. Ackerman, et al., are:

- HIRS/AVHRR cloud mask: (available on ftp or through SDST)

- first data set only over land

- AVHRR (LAC) data

- has 1 km resolution (algorithm doesn't work over snow)

- MAS/Gulf experiment/January 1995 (coming "on-line")

-Issues:

- (a). Land/sea flag: will use EDC product; ecosystem map will also come from EDC.

- (b). Confidence flag(s)

- (c). As users, how complex do you want the cloud mask to be?

-Kaufman suggests using SAGE data to help in distinguishing between stratospheric aerosols from cirrus at 1.38 μm . Distinguishing thin cirrus from aerosol is a research issue.

Crystal Schaaf (Phillips Lab-collaborator with A. Strahler)

- Knowledgeable use of cloud tests and confidence flags.

- cloud shadows (a subject of concern to the MODIS land group)

- land/water mask

- a major item/concern for the MODIS land group.

- 1 km land/water mask is available based on Digital Chart of the World (DCW)--circa 1991/it is static and does not show recent changes such as the change in extent of the Aral Sea.

- DCW-based mask can/will be enhanced with the World Vector Shoreline (WVS)--available by launch
 - digital topo data from J-P Muller must match.

- Post-launch note: there is a need for reflecting seasonal and manmade variations in the ecosystem maps. This probably can optimally be done or refinements provided through the MODIS land-cover product.

- all this assumes a 1km product. The use of 250m data is an issue that needs to be explored.

Eric Vermote

- Dr. Vermote will take the 32-bit/Wisconsin product at work to add refinements that address MODIS land group efforts. These include applying atmospheric correction to pixels that are clear, mixed, or shadowed (not applied to cloud covered pixels).

- cirrus effects is a separate issue that will involve the 1.38 μm band.

Bryan Baum (LaRC/CERES)

- this effort is presently driven by the need to have algorithms working in time for the TRMM launch (1997)

- at present they are using AVHRR (VIRS simulator) data

- the VIRS/AVHRR cloud mask is never saved. The saved product will be the MODIS responsibility in the EOS AM time frame. Sun glint remains a problem.

- using AVHRR data the CERES group are going global using AVHRR on NOAA-9.

- Cloud properties now being mapped globally/tested using AVHRR data include:

- cloud fraction

- cloud height

- optical depth
- effective droplet radius (water clouds)
- the AVHRR/VIRS data will be mapped within the CERES footprint to at least provide high and low clouds relative to the CERES point-spread function.

Adjournment: 10: 30 A.M.