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A Detailed Study of Aerosol in the Vicinity of Clouds from MODIS, ASTER and CERES

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Executive Summarv

MODIS Cloud Mask and Selected Pixels



- 1. MODIS AOT increases near cloud edges.
- 2. Cloud-Rayleigh scattering above cloud still a major mechanism for 3D cloud adjacency effects at shorter wavelengths
- 3. The cloud radiative effects are pronounced within ~10 km to cloud edges. The effects still exist at a distance 30km from cloud edges for 0.47 micron.
- 4. MODIS selected pixels for aerosol retrieval appear not contaminated by clouds 5. CERES radiative forcing can be used for correcting cloud adjacency effects
- 6. AOT after the correction still show increases near cloud edges indicating other



MODIS, ASTER and CERES Obervations



MOD04 cloud mask is clearconservative. Compared to the ASTER image, no evident cloud contamination is found.

CERES Cloud Forcing and Correction of AOT



Radiative forcing is the driving force to enhance the clear sky reflectance. CERES cloud forcin is used for correcting AOT.



Left: Original MODIS AOT at 0.47µm. Right: Corrected AOT. A substantial correction up to 0.08 is made near cloud edges.



relatively less correction up to 0.02 is made near cloud edges.

Conclusion: CERES cloud forcing is very useful and practical for correcting MODIS AOT. Increase of AOT near cloud edges after the correction indicates other mechanisms.











Increase of AOT near cloud edges

CERES SW Flux (W/m^2)

-97.4 -97.2 -97.0 Longitude (degrees)

Increase of CERES flux near cloud

37.3

36.9

-97.6







-97.2

Cloud top ~5km

Average radius ~20µm -97.4 -97.2 -97.0

> -97.4 -97.2

70% in ice phase

Cloud Optical Thickness

April 30, 2006.

97.40 -97.20

370.24

343.79

317.35

90.90 264.46

> 238.01 11.57

> > 85 12

-96.8