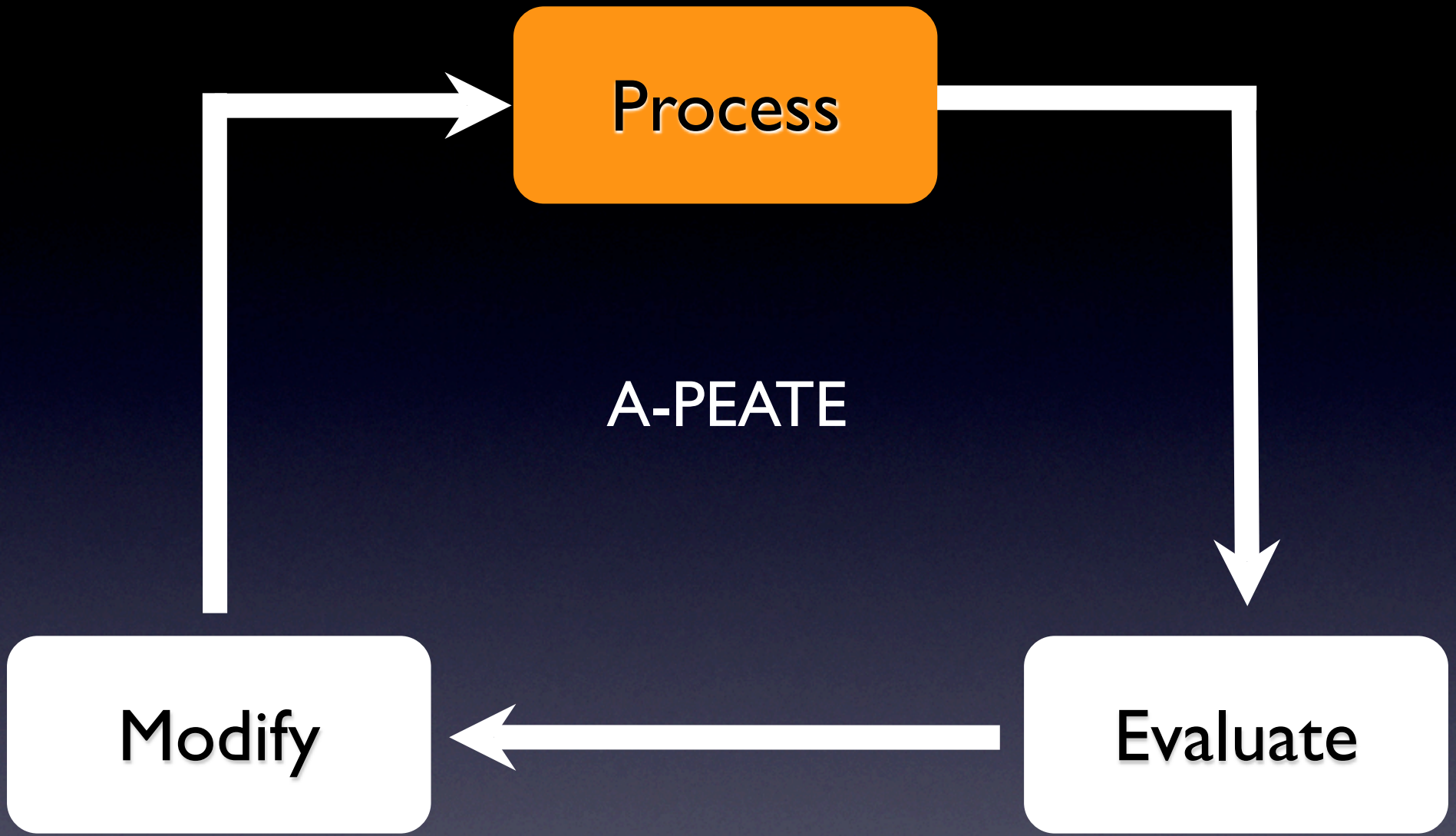
The University of Wisconsin Atmospheric PEATE

# Investigation of MODIS Cloud Retrievals Using CALIOP

Robert E. Holz, Steven A. Ackerman, Richard Frey, Steve Dutcher,
F.W Nagle, Liam Gumley, and Paul Menzel
Univ. of Wisconsin at Madison

Mark Vaughan and Ralph Kuehn
NASA Langley

Steven Platnick and Gala Wind
NASA Goddard

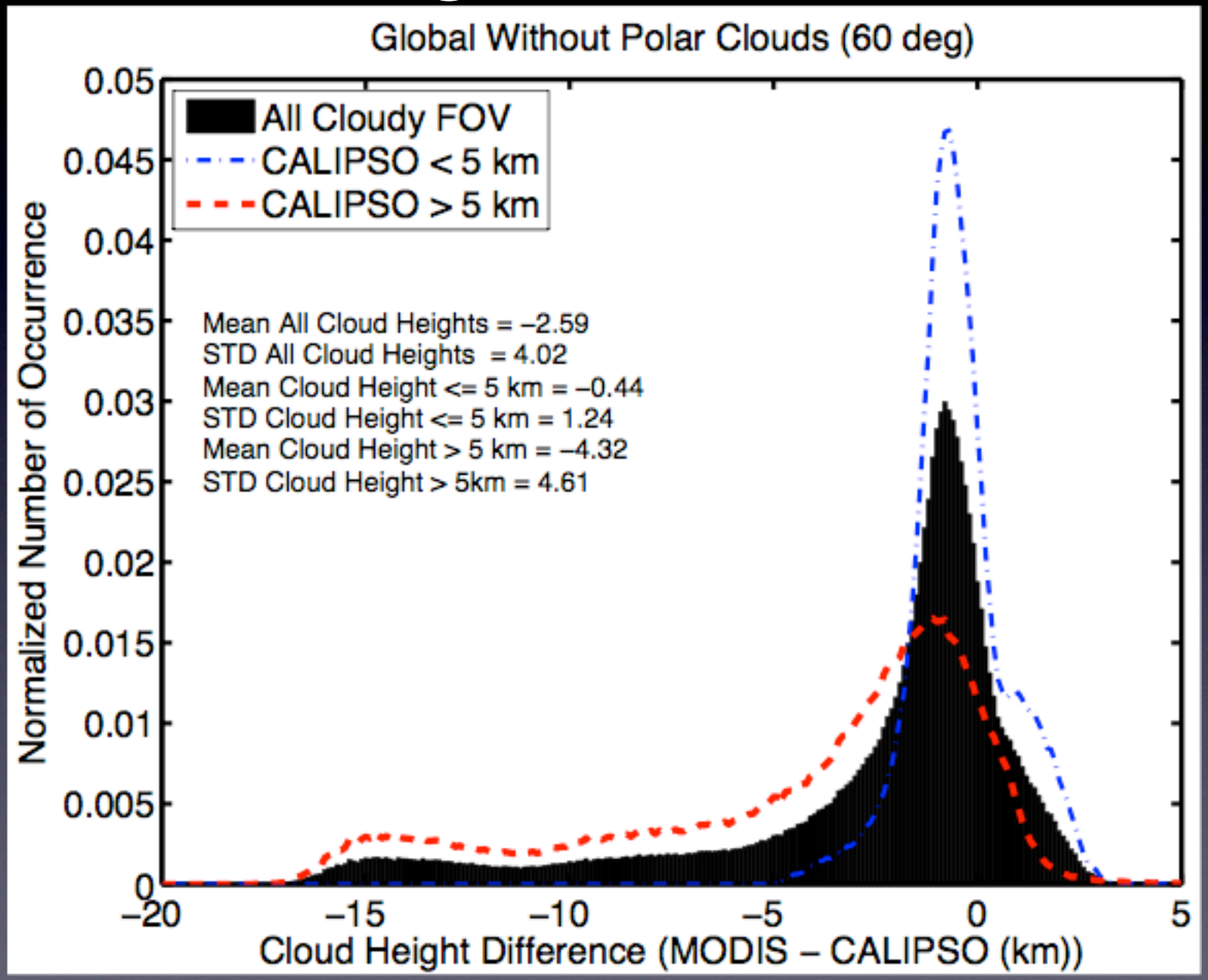

Process
A-PEATE
Modify
Evaluate

# Cloud Top Height Differences August 2006

Process

Modify

Evaluate



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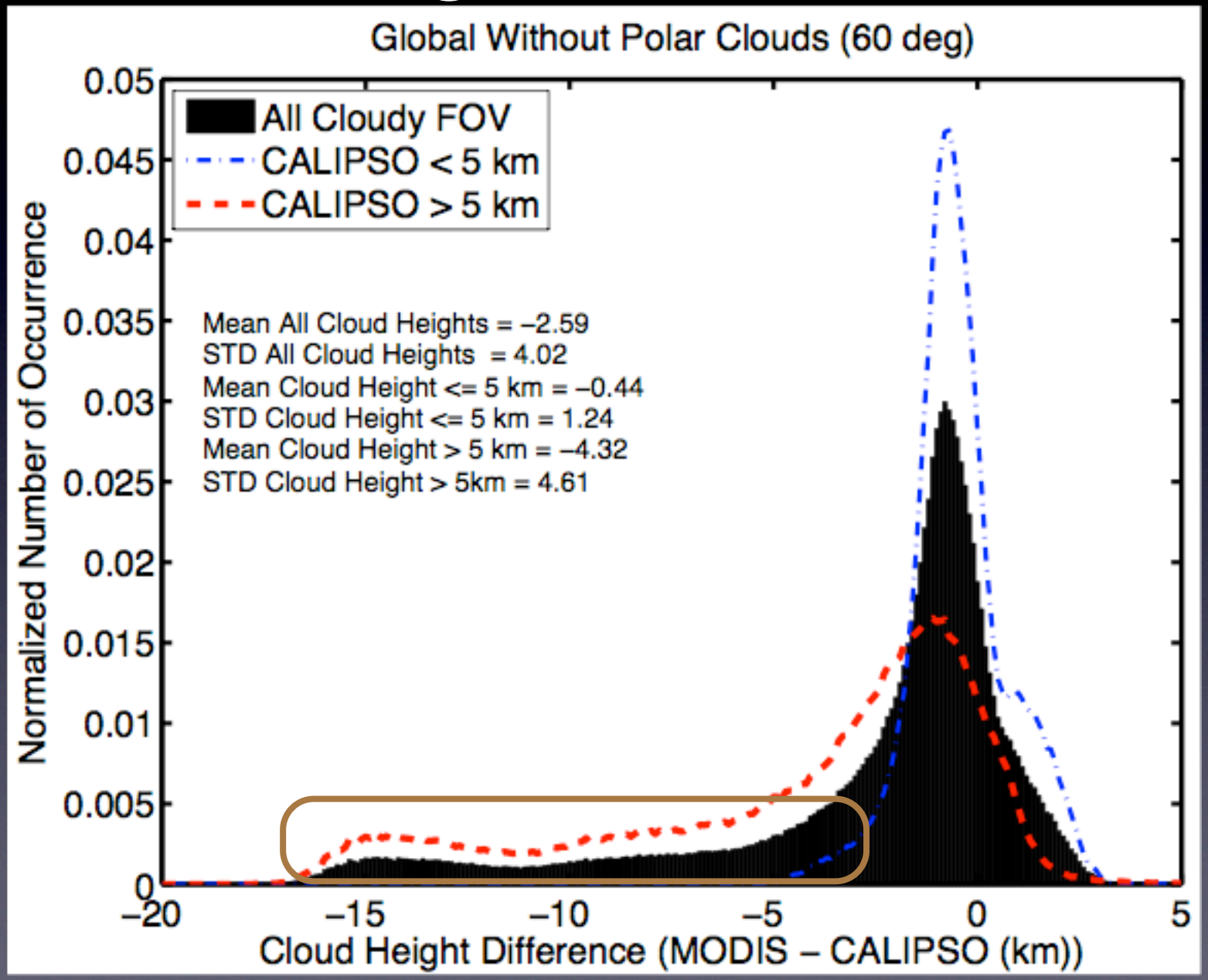
Modify

Evaluate



# Cloud Top Height Differences August 2006

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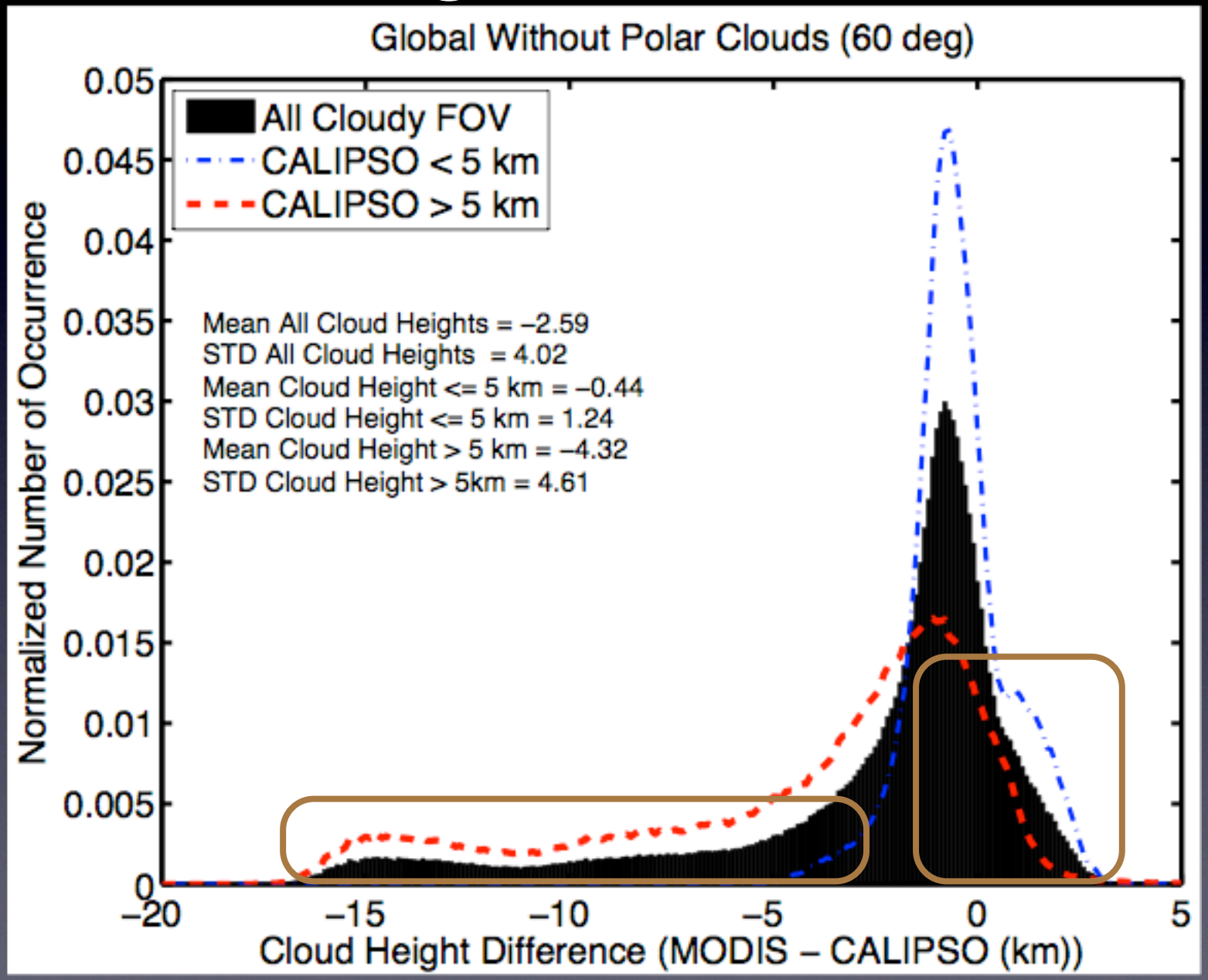
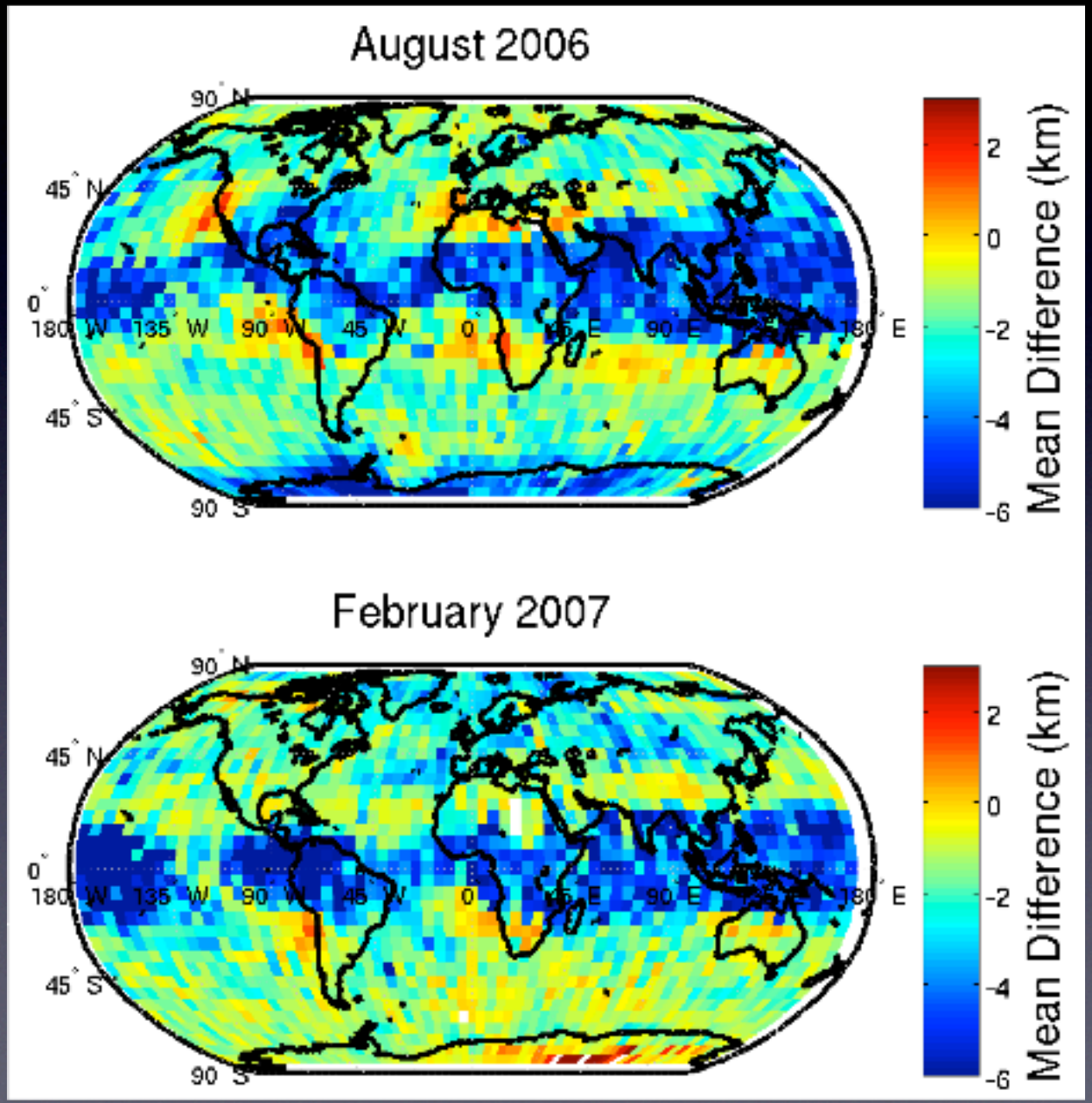
Evaluate



# MODIS - CALIOP




Process

Modify

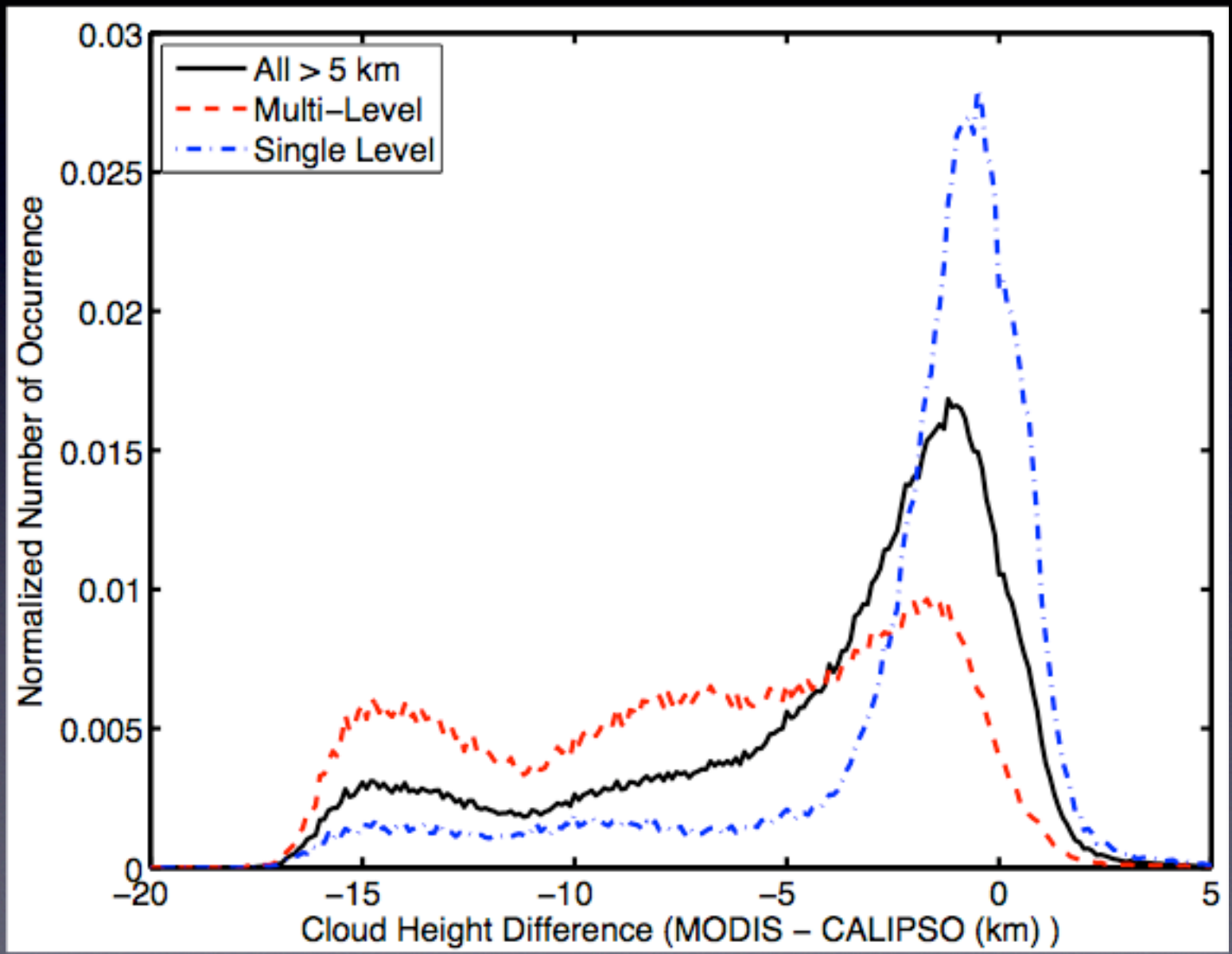
Evaluate

# Mult-Level?

Process

Modify

Evaluate

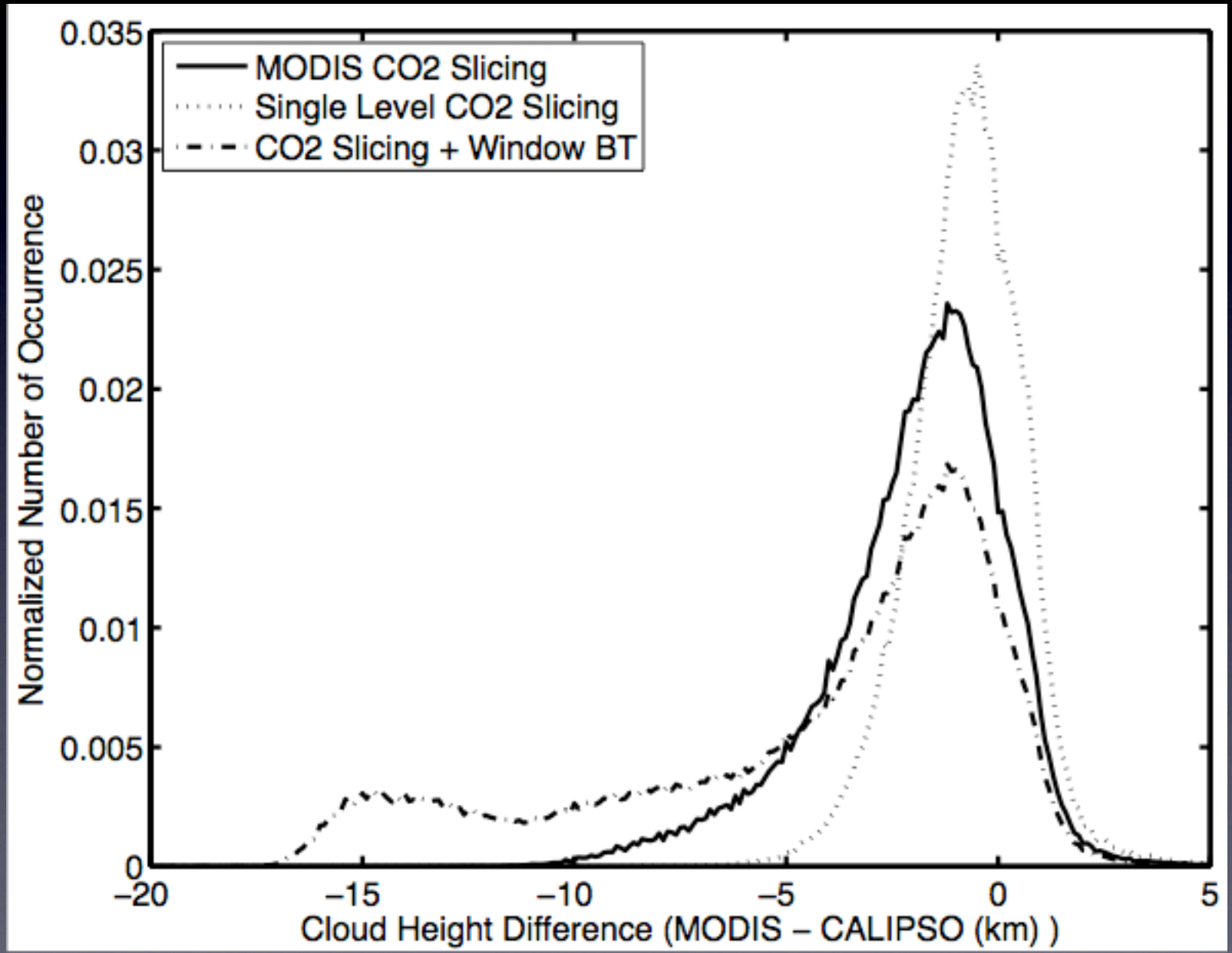


# CO2 Slicing?

Process

Modify

Evaluate



# Modify MODIS

Process

Modify

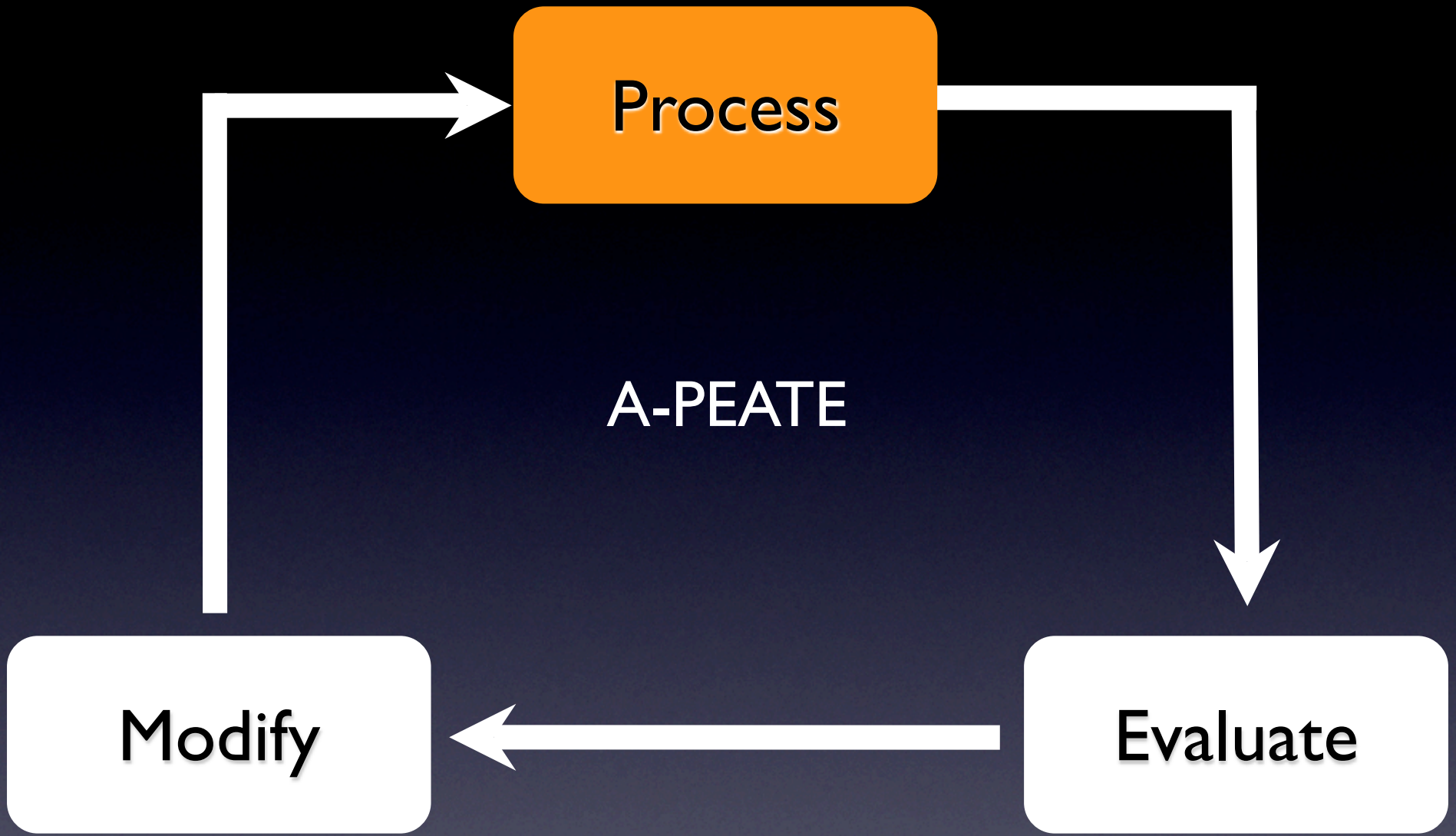
Evaluate

Test 1: Allow tropopause level to be the cloud height solution when no intersection is found between LHS and RHS of CO2-slicing equation; lower and upper bounds are window channel solution and tropopause, respectively.

Test 2: Perform selection of final result by "top-down" method; 36/35, 35/34, 34/33 in that order.

Test 3: Lower "noise" limits; clear vs. cloudy radiances required to be < a limit set for each of bands 33-36; do not use a band if the clear vs. cloudy difference is less than the limit. This has large impact on the number of 5x5s processed by the CO2-slicing algorithm as opposed to simple IR window channel technique.

Test 4: Adjust input climatological ozone profile between 10 and 100 hPa according to values in the GDAS data set.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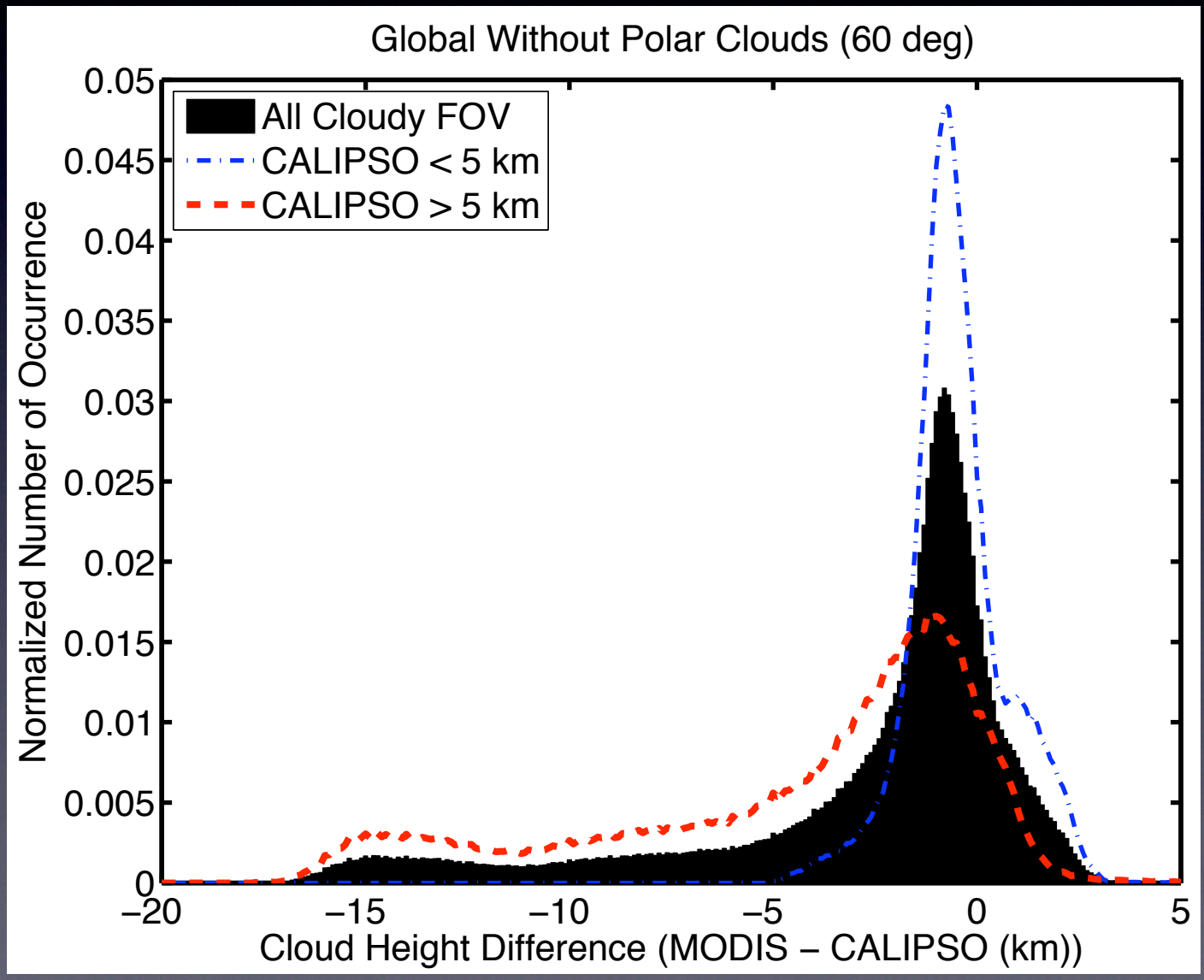
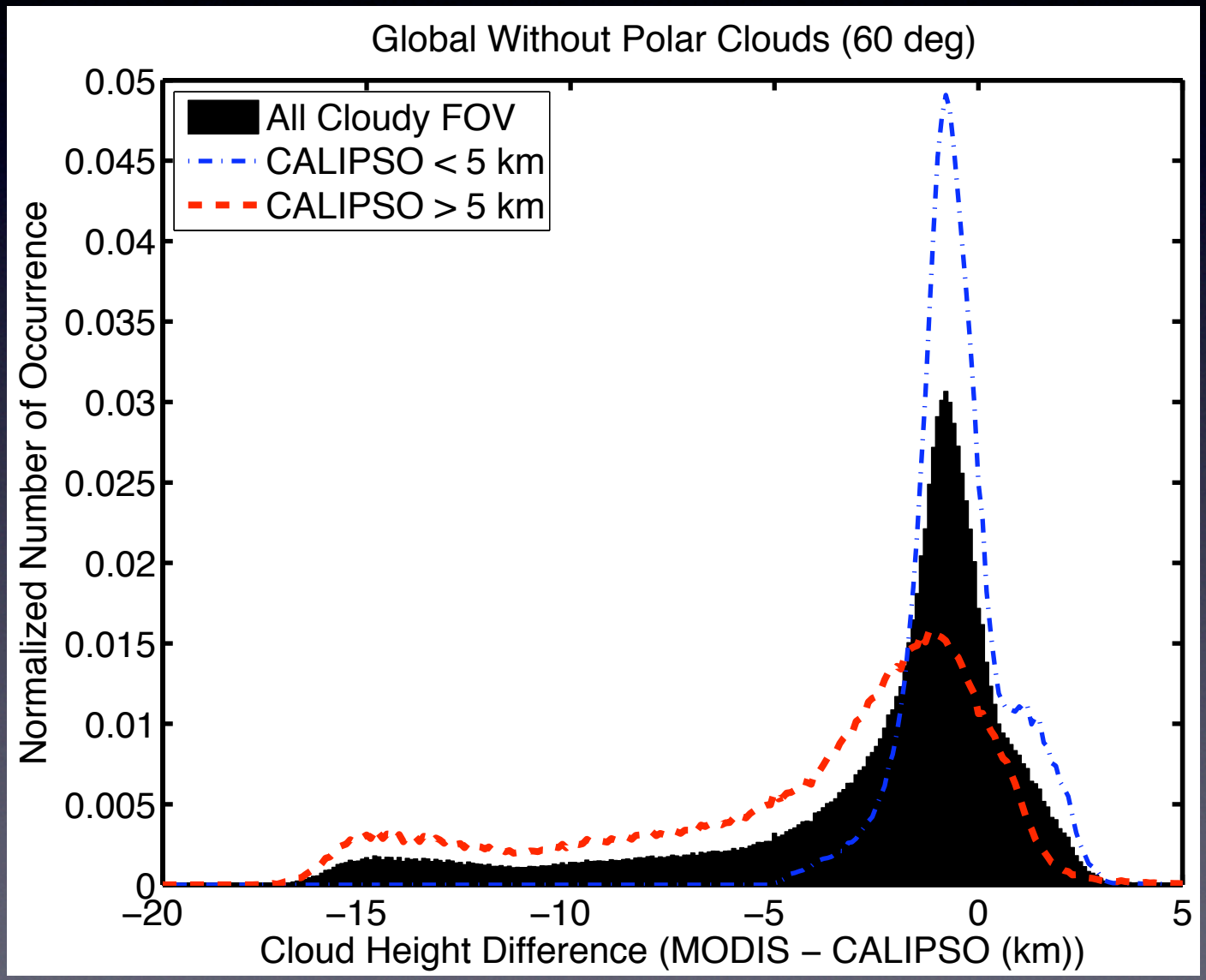
# DAAC V5


Global Without Polar Clouds (60 deg)
All Cloudy FOV
CALIPSO < 5 km
CALIPSO > 5 km
Normalized Number of Occurrence
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
−20
−15
−10
−5
0
5
Cloud Height Difference (MODIS – CALIPSO (km))

Test 1: Allow tropopause level to be the cloud height solution when no intersection is found between LHS and RHS of CO2-slicing equation; lower and upper bounds are window channel solution and tropopause, respectively.



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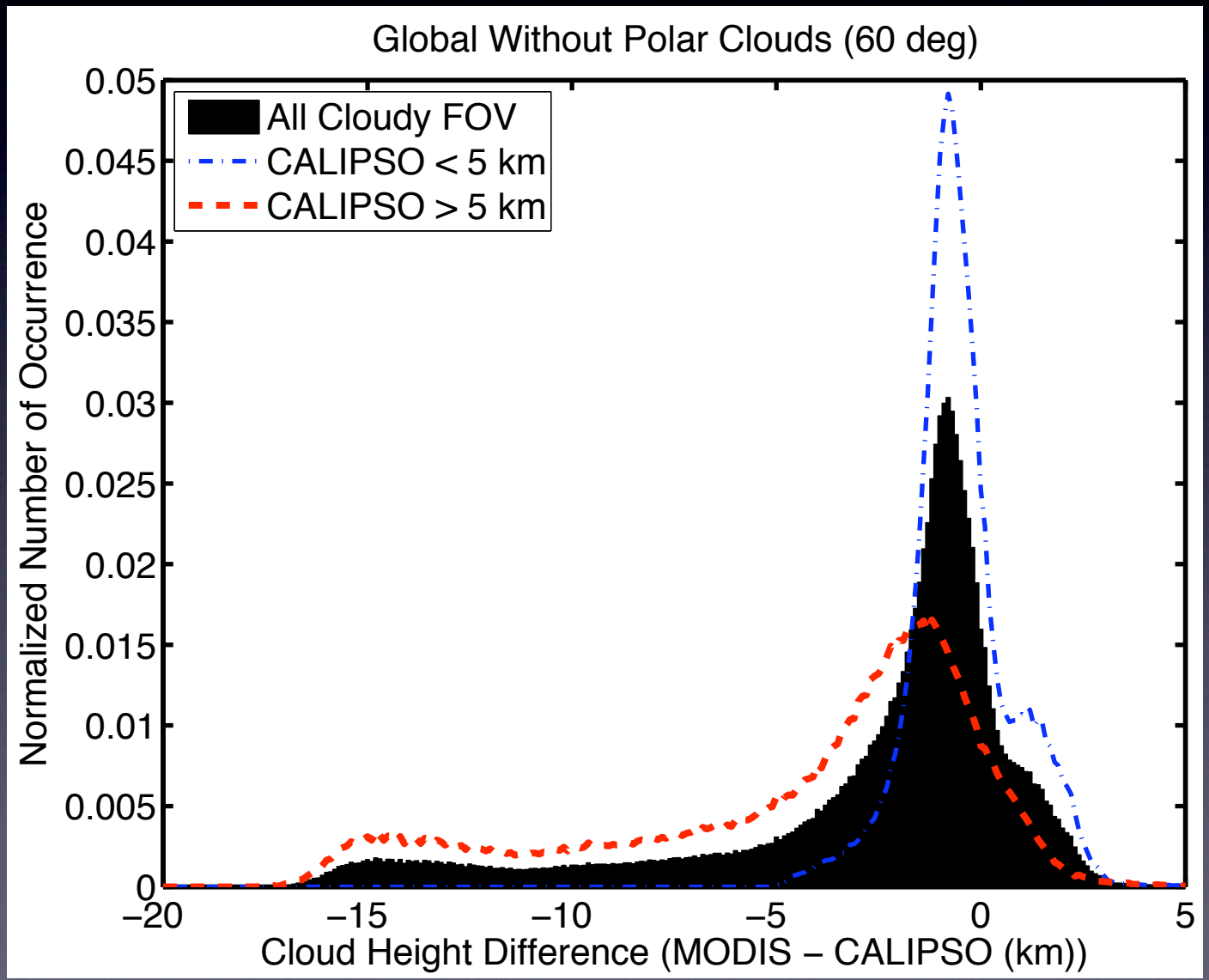

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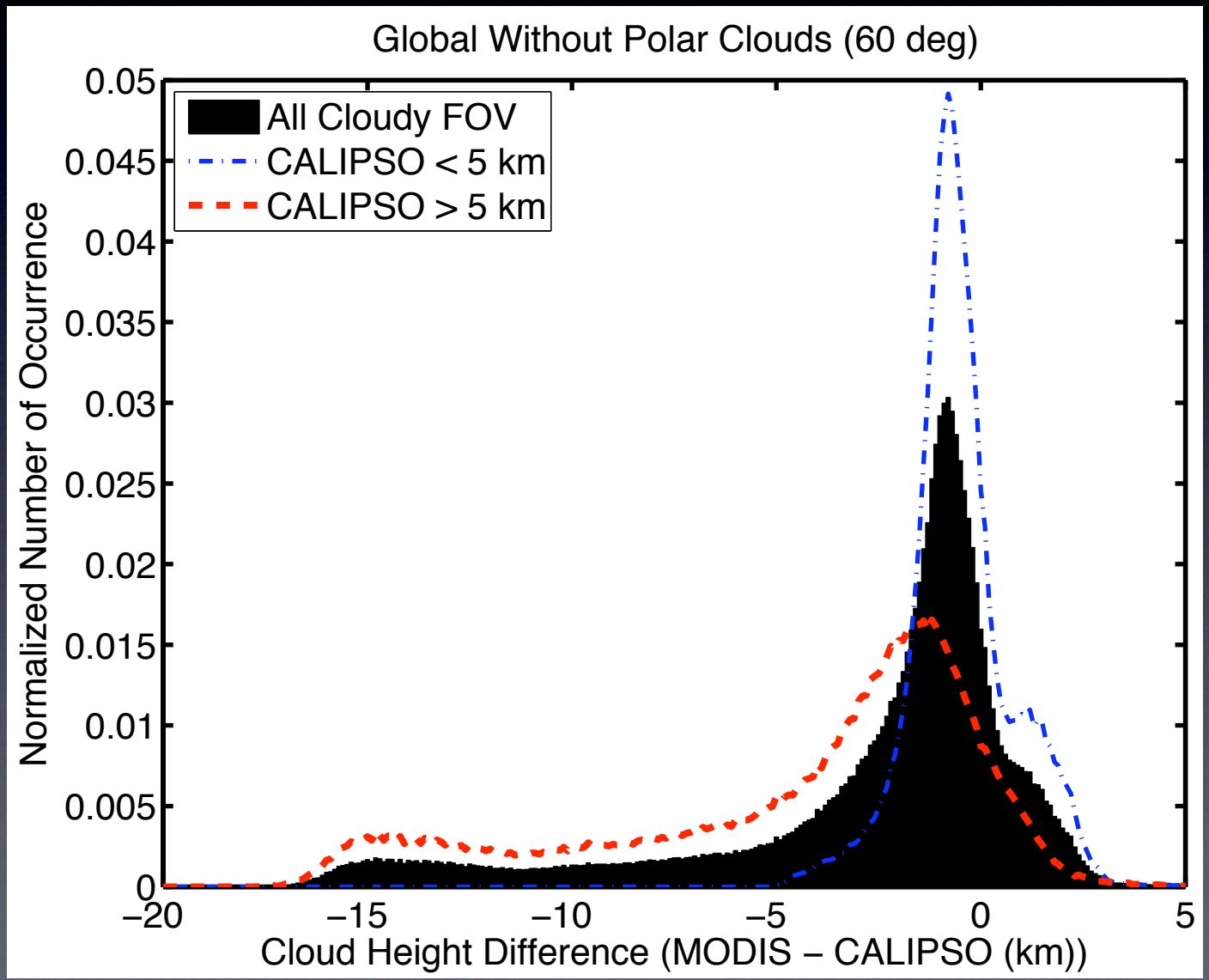

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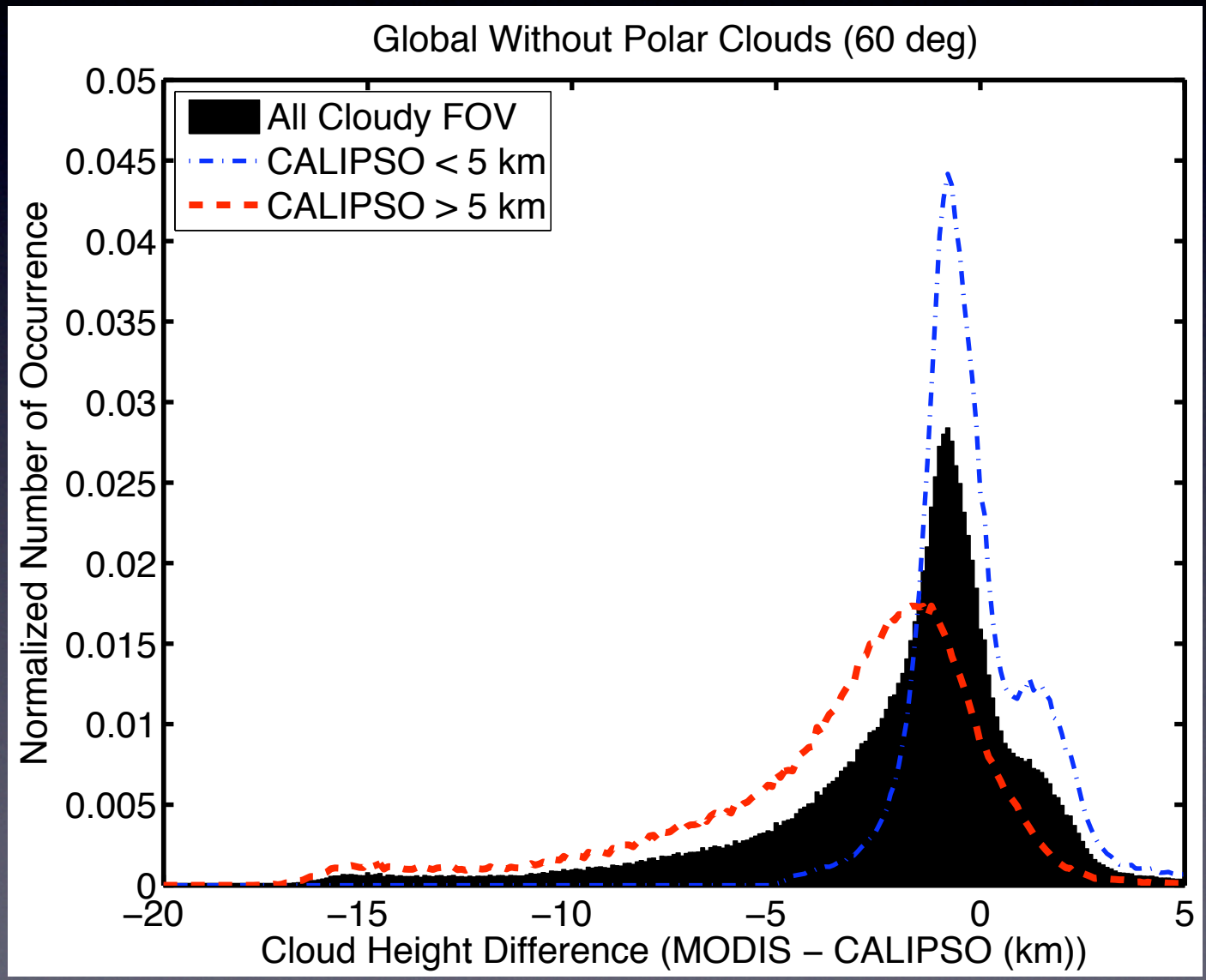
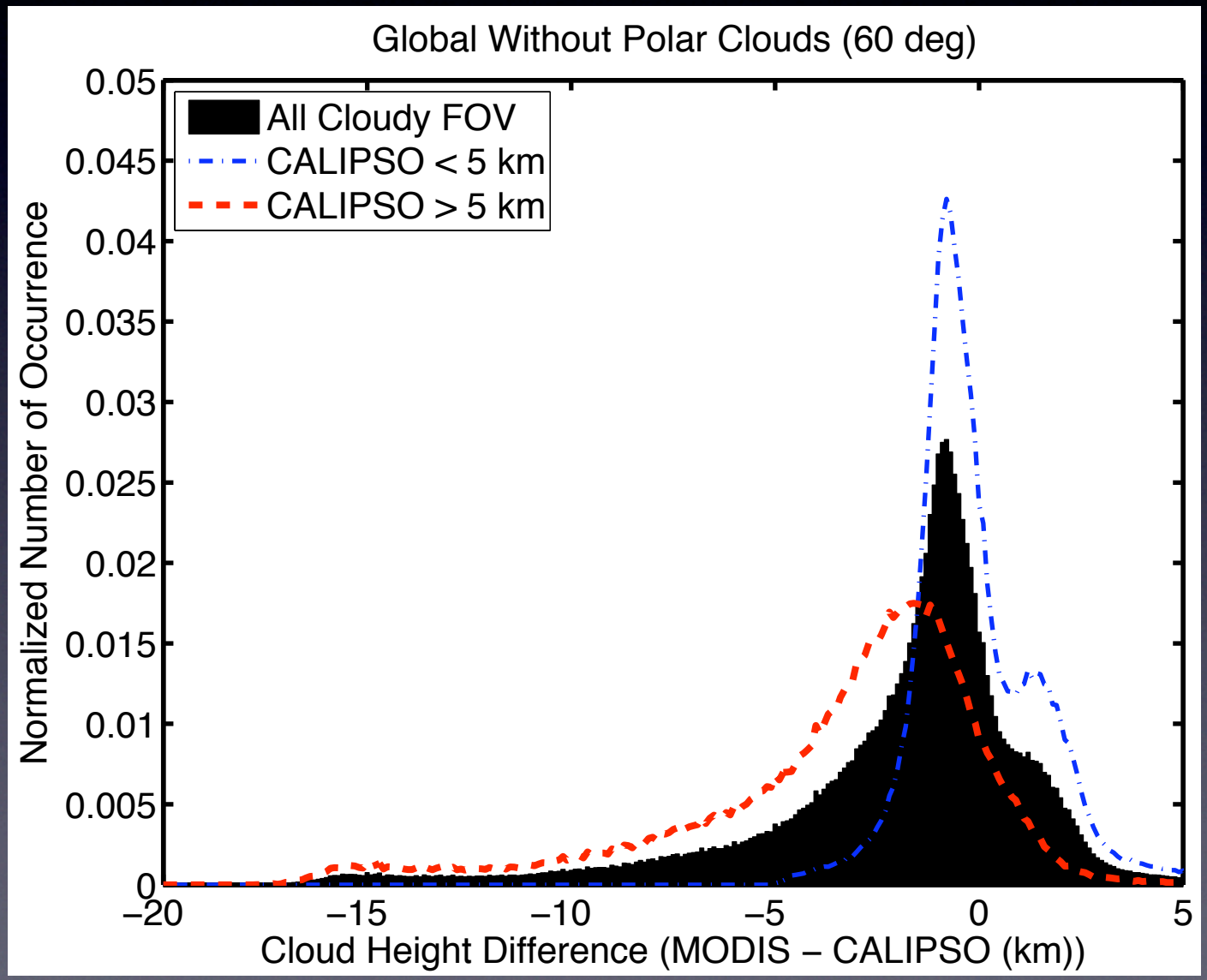


Test 4: Adjust input climatological ozone profile between 10 and 100 hPa according to values in the GDAS data set.



# MODIS - CALIOP

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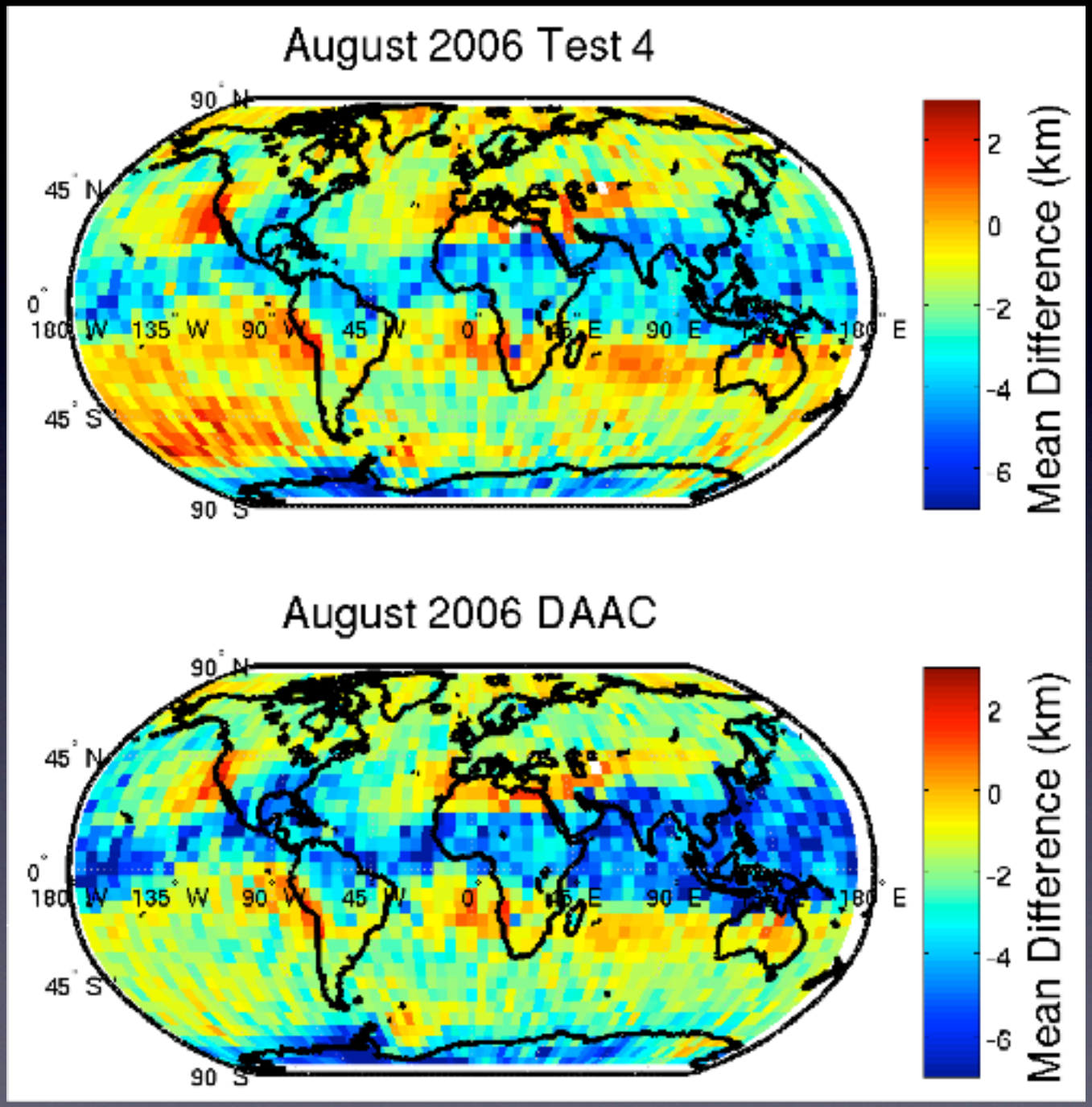
Modify

Evaluate



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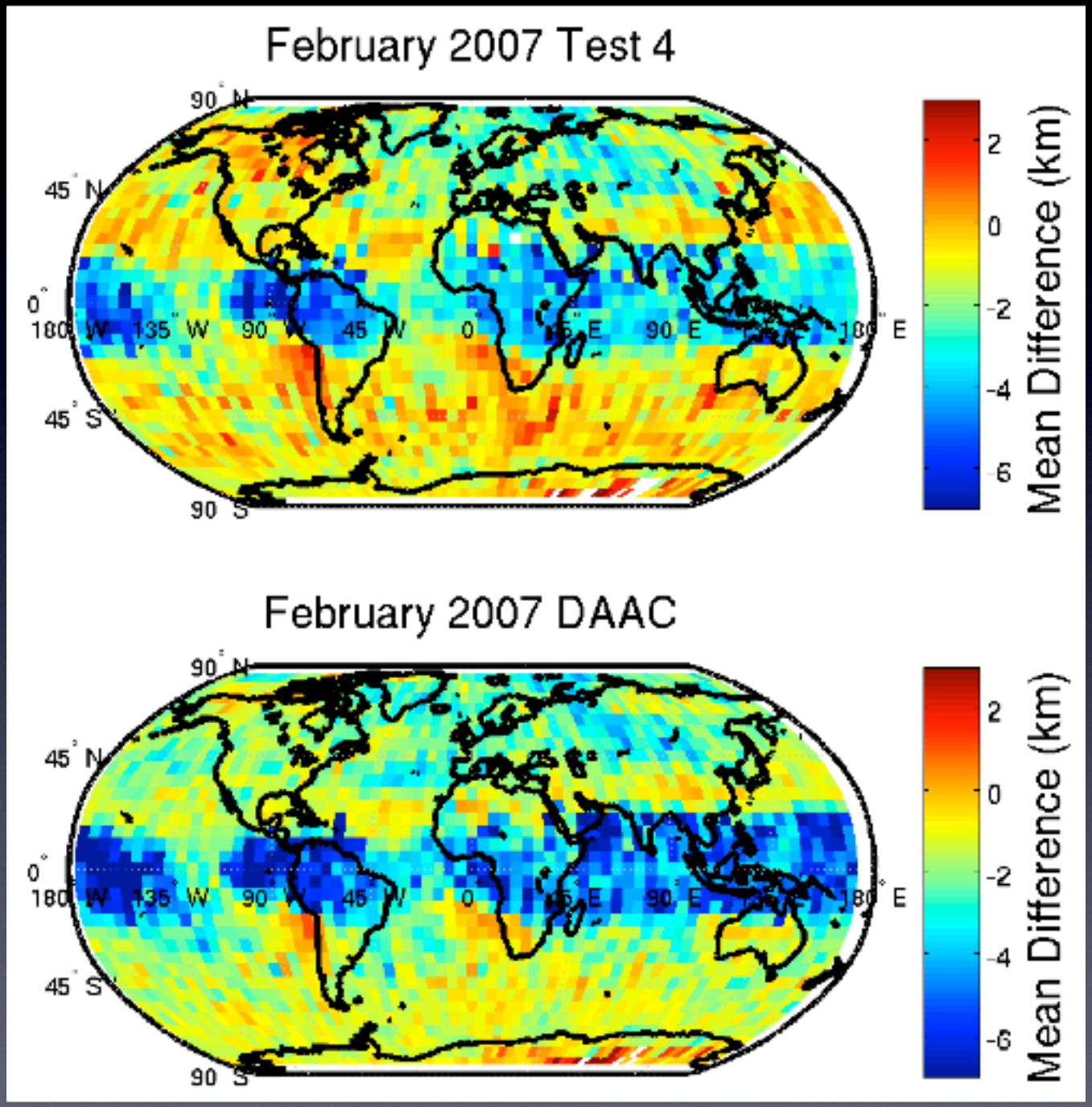
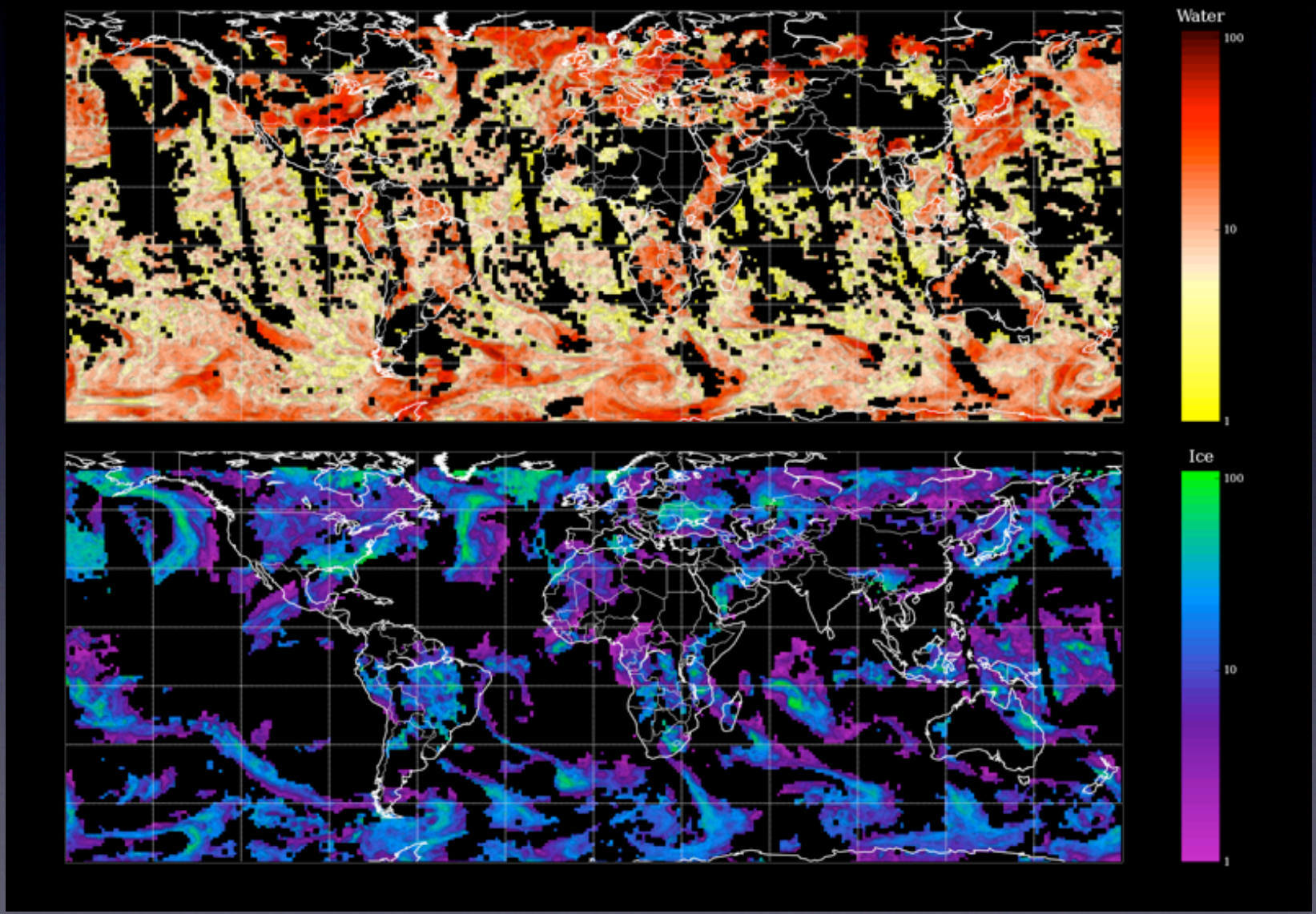


# Other Pending Tests

- Avoid CO2 slicing solutions for water clouds
- Avoid IRW solutions for ice or mixed phase clouds
- Restrict CO2 channel pair solutions to appropriate portion of troposphere (determined by weighting functions)
- Implement spectral shifts to b35 & b36 indicated by Tobin AIRS–MODIS intercomparisons

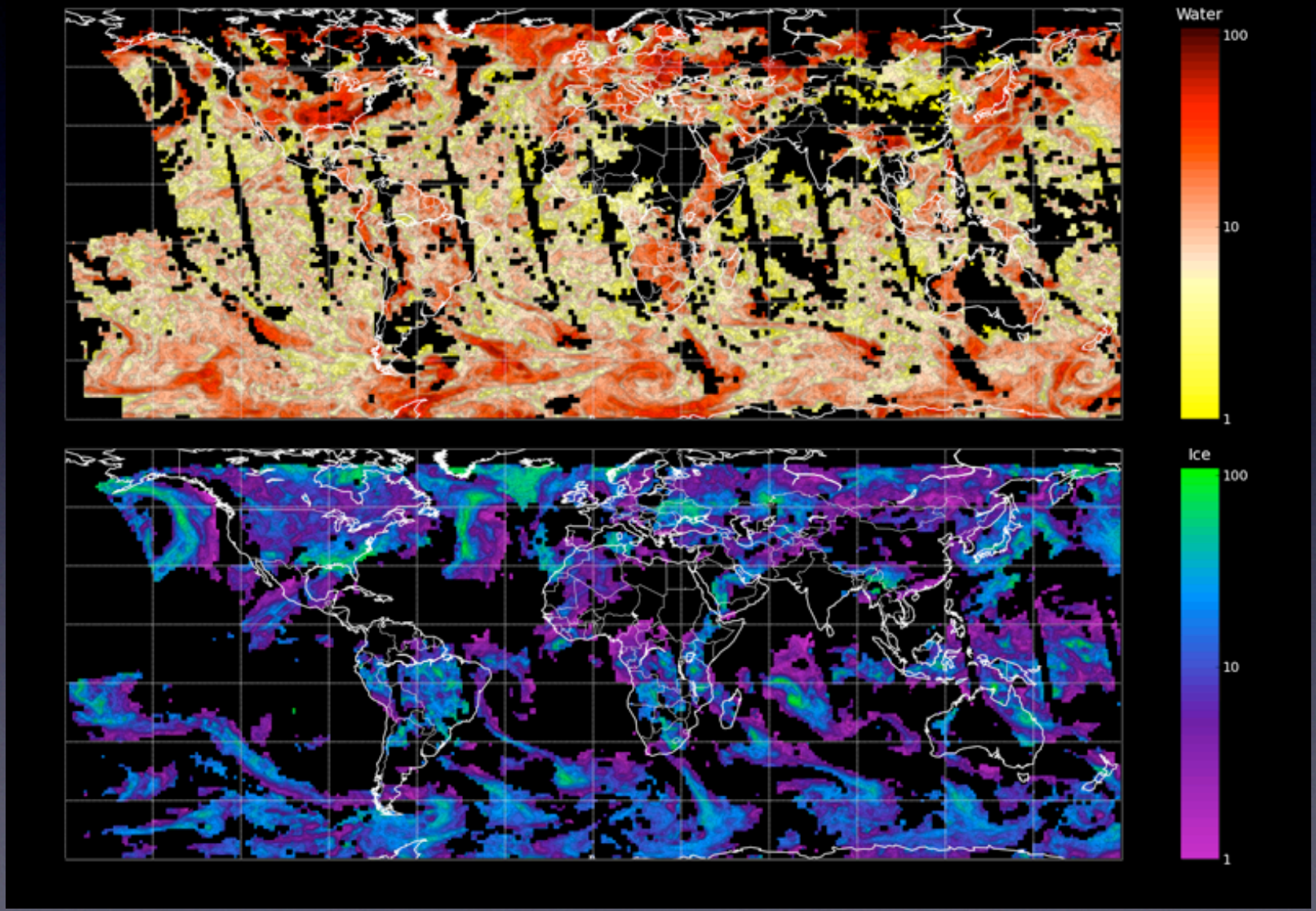
# A-PEATE Gridded OD

DAAC Version



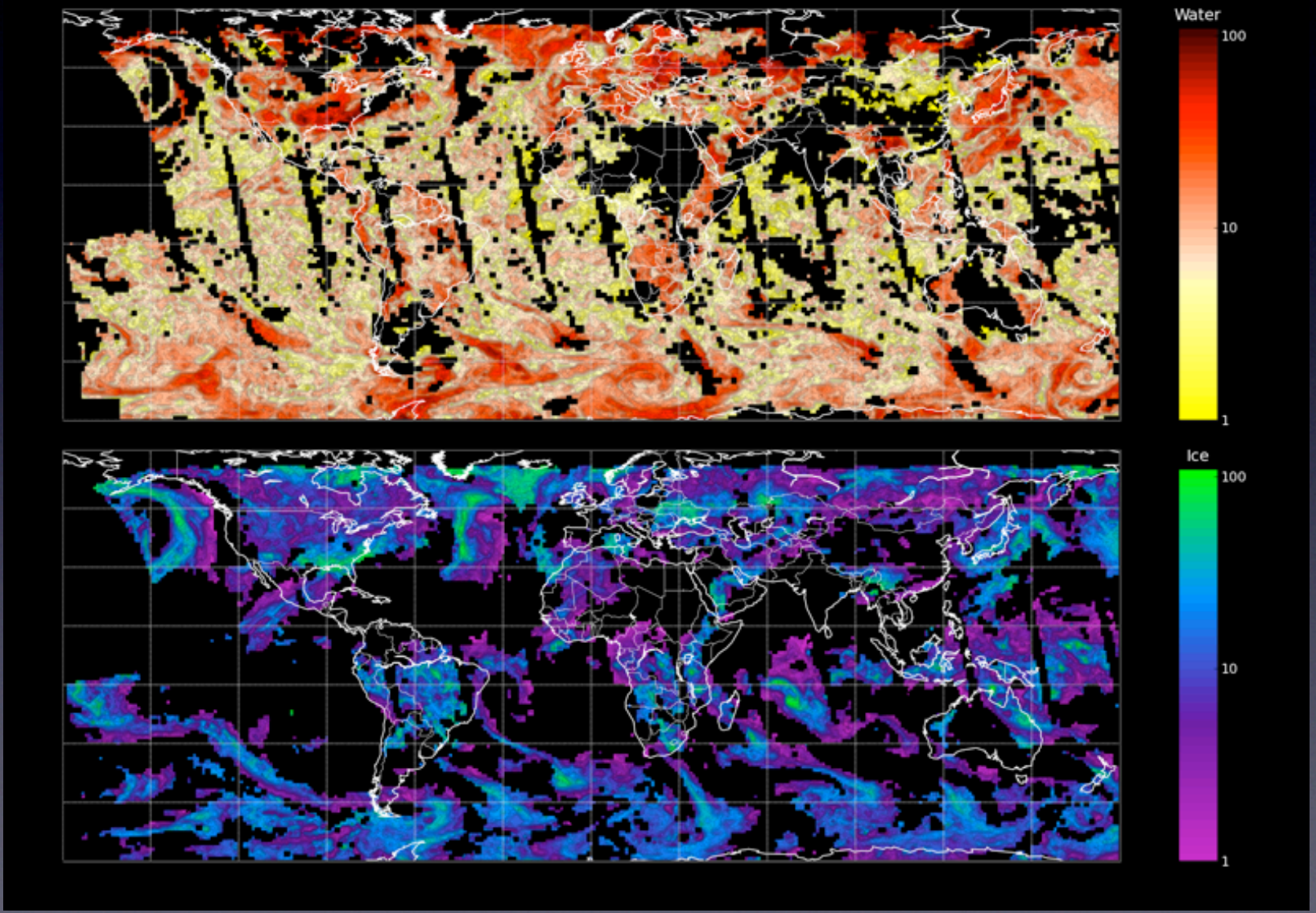
# A-PEATE Gridded OD

PEATE Version



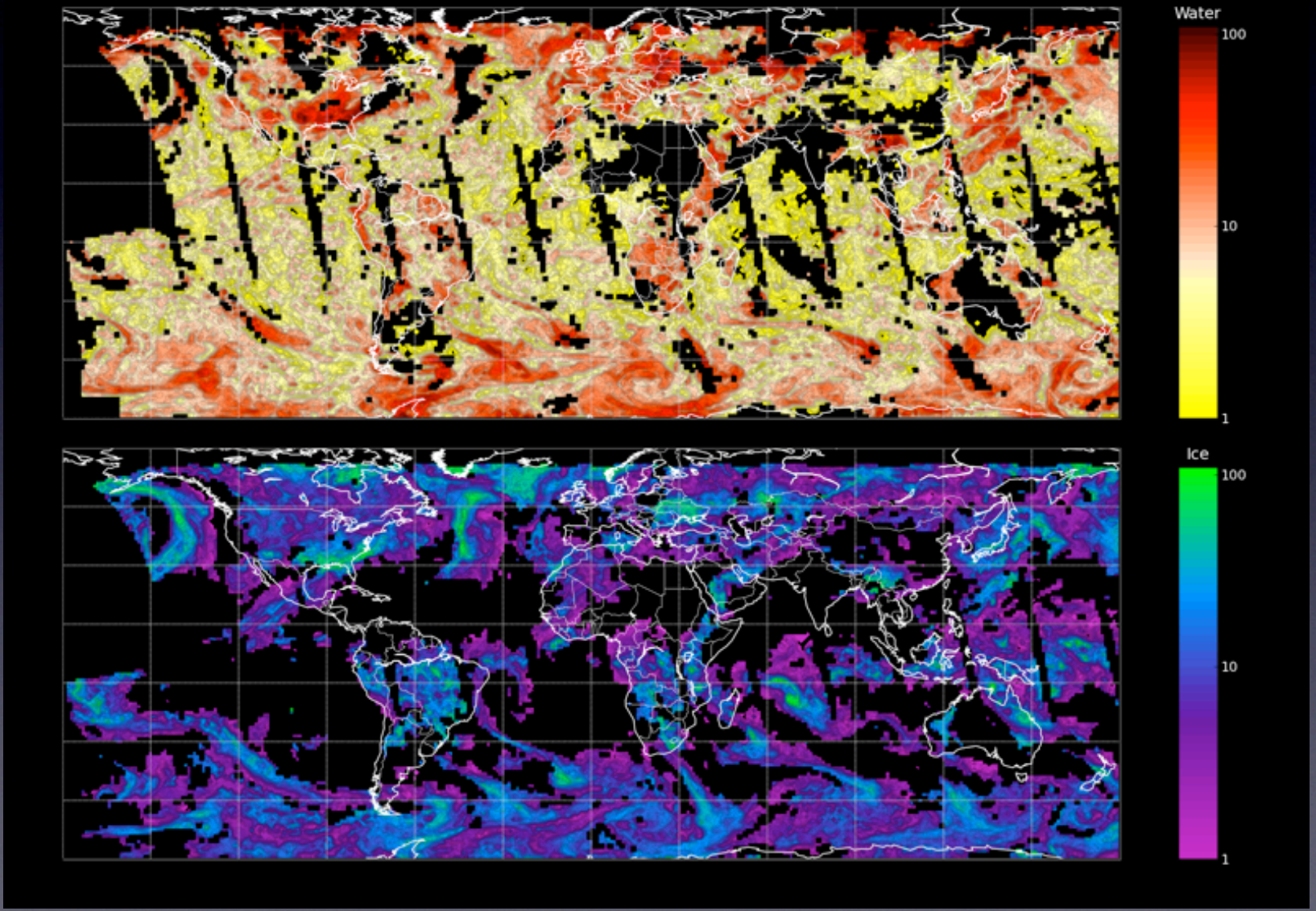
# Gridded DAAC vs Research

## DAAC



# Gridded DAAC vs Research

## Research



# Conclusions

- Significant CH differences exist for high clouds (>5 km) between CALIOP and MODIS
- The largest cloud height differences results from not using $CO_2$ slicing (>15 km)
- Modifications to the MODIS CH algorithms are in progress
- The A-PEATE has a prototype L3 aggregation system that compares closely to the DAAC version