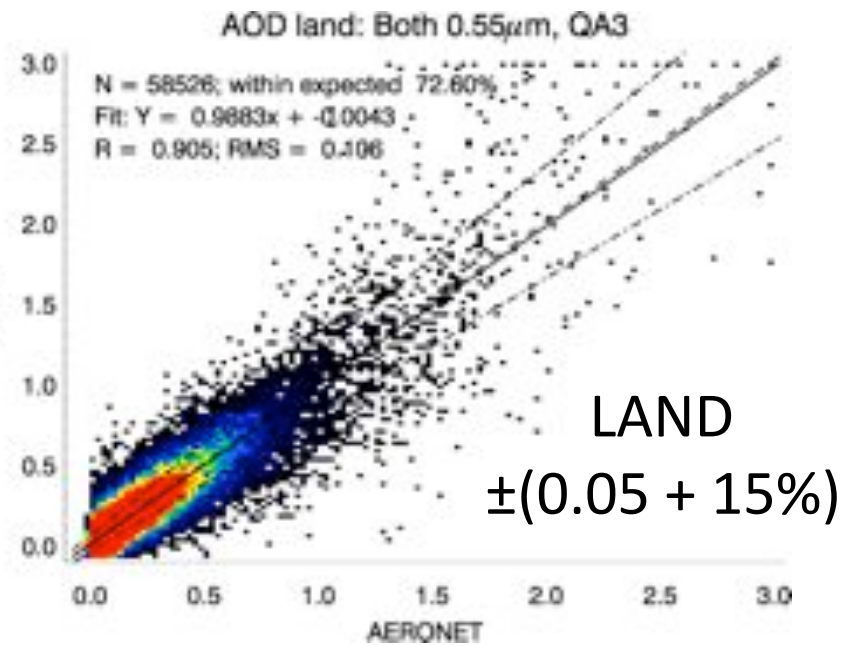
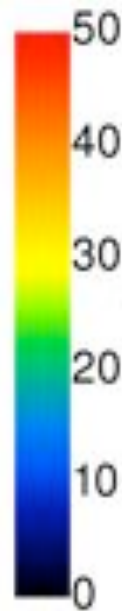
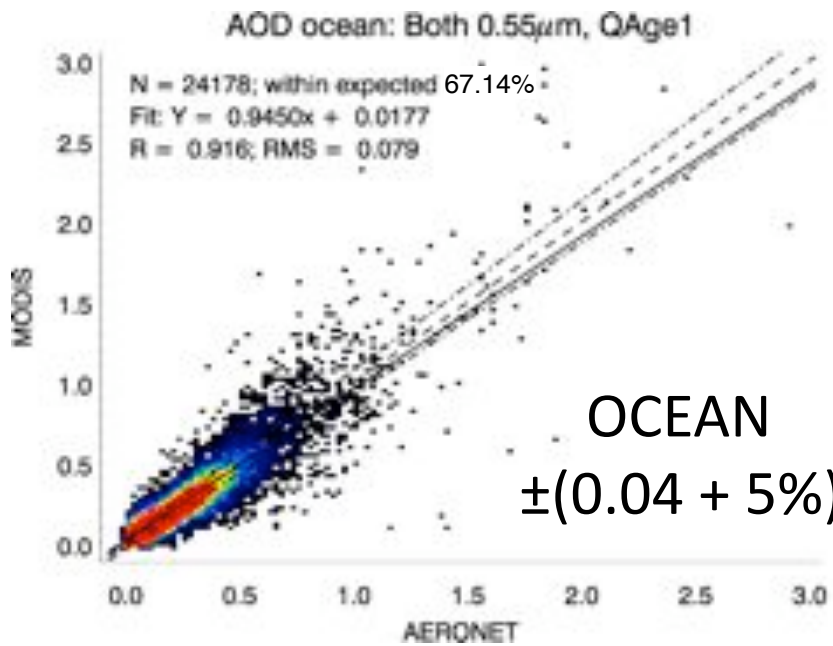


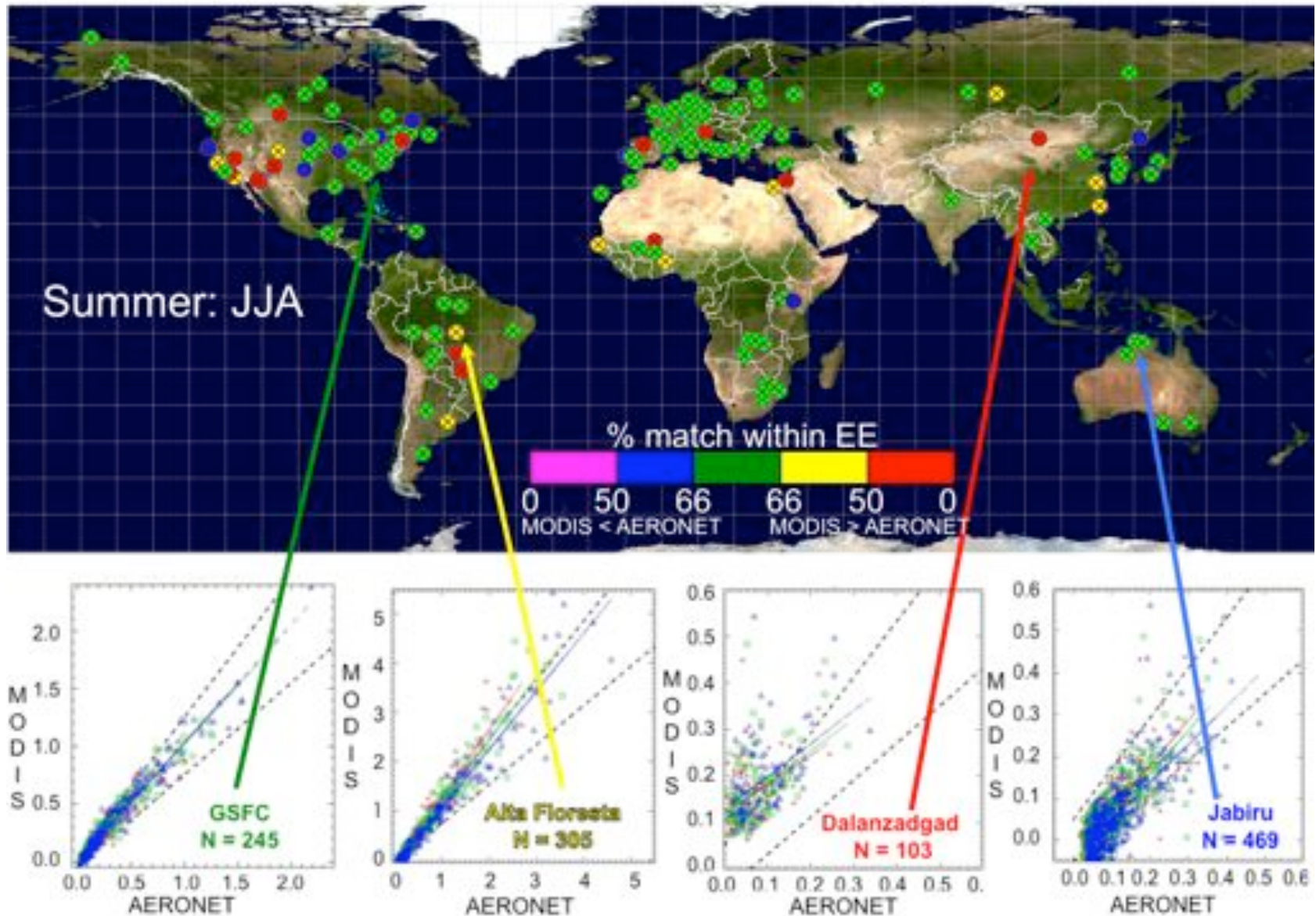
# Version 6 Dark Target MODIS Aerosol (MOD04)

Shana Mattoo   Science Systems and Applications/NASAGSFC  
Rob Levy        Science Systems and Applications/NASAGSFC  
Rich Kleidman   Science Systems and Applications/NASAGSFC  
Lorraine Remer   NASA Goddard Space Flight Center

# C005 validation



# Systematic Evaluation of C005



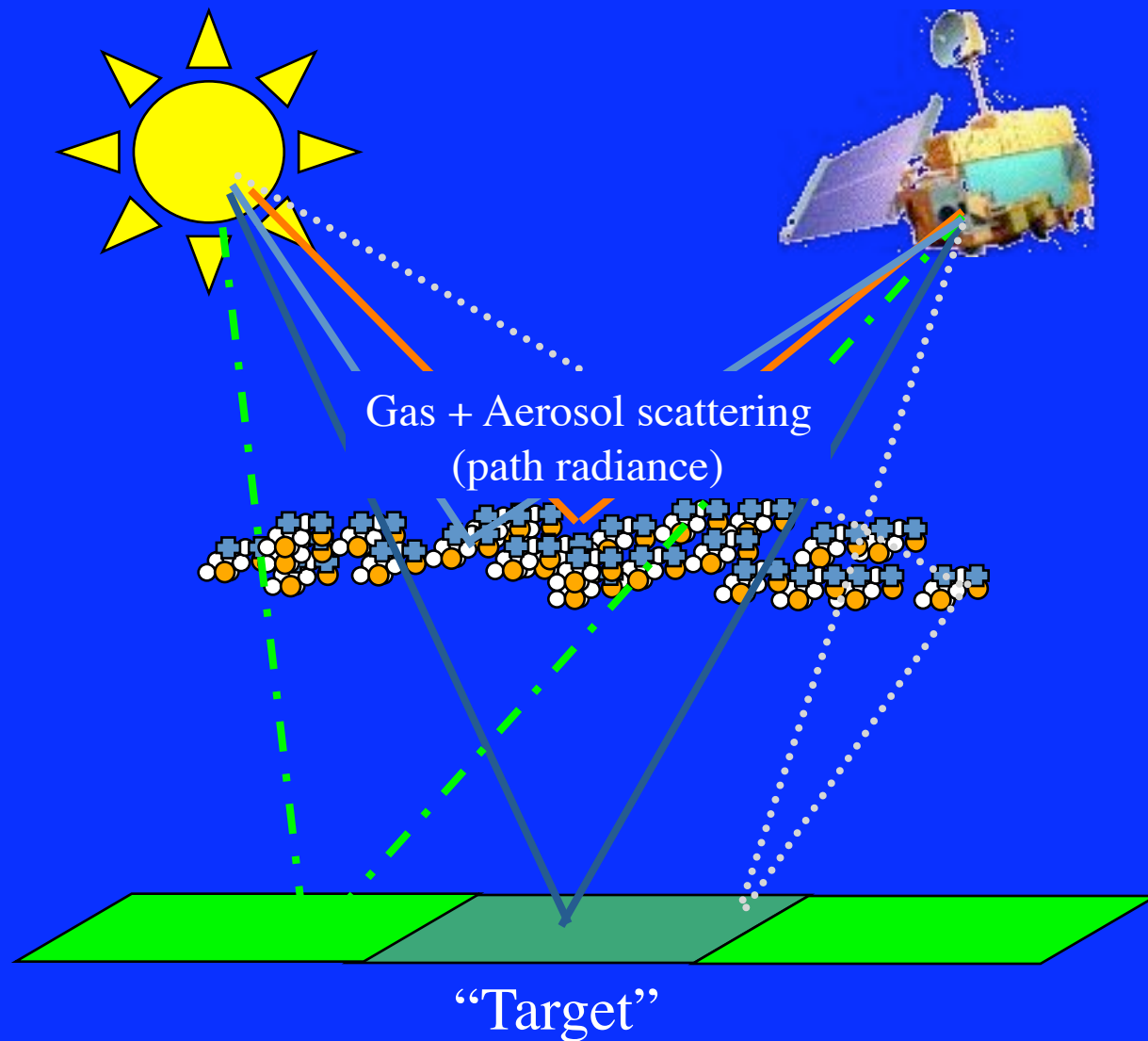
Some of the errors in the “global” products are systematic

# Changes for C006

- Revised assumptions for existing algorithms
- New diagnostic SDSs
- New SDSs (new parameters)
- Joint Dark Target / Deep Blue?
- Deleted SDSs
- Propagation to L3
- Urban-scale 3 x 3 km retrieval

# The Satellite Signal is complicated

and some assumptions will be updated for C006

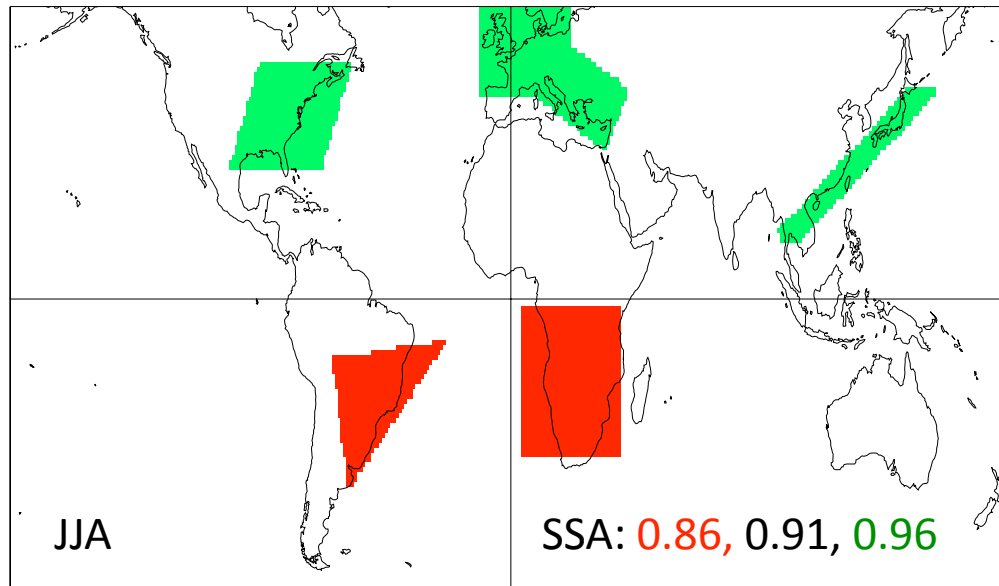


Based on systematic evaluation of C005 products, there will be “tweaks” in assumptions for:

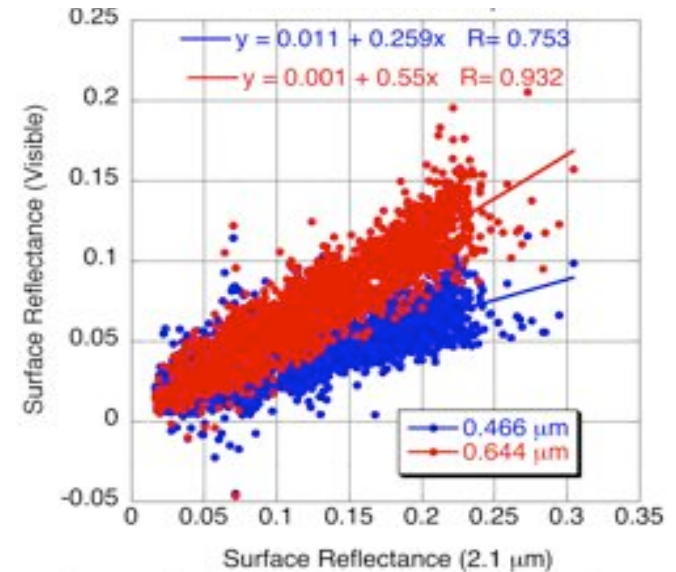
- Surface Properties
- Aerosol physics: size, optical properties
- Look up tables

# Changes in over land algorithm

C005: Aerosol type assignments



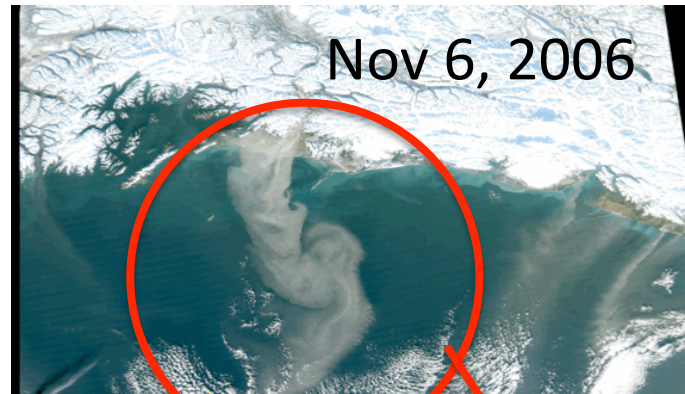
Surface Assumptions



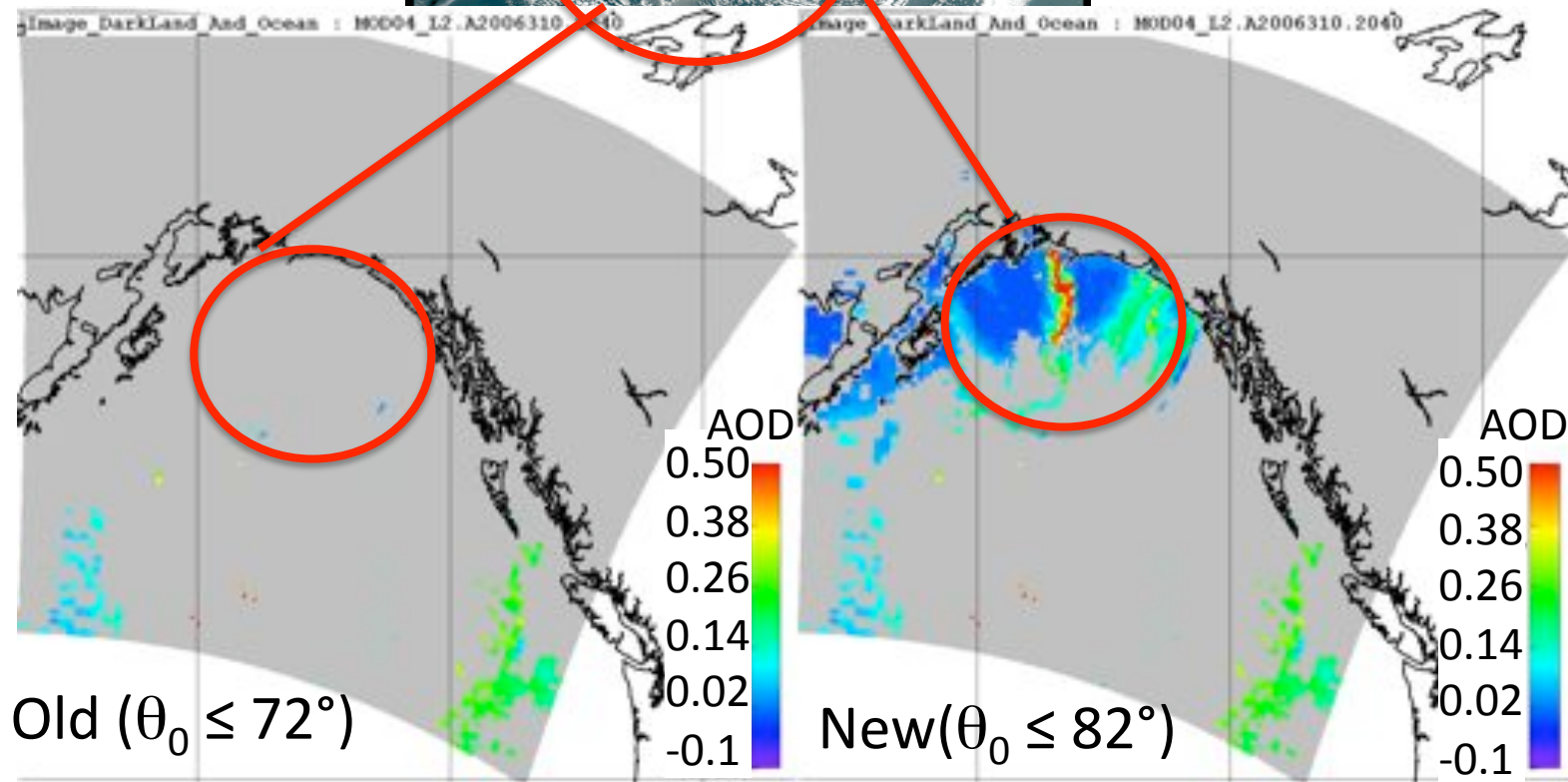
- We have 4 additional years of AERONET and MODIS data to identify systematic errors due to fixed assumptions in C005
- New assumptions will be tested

# Increasing MODIS coverage in high latitudes

Dust event  
Copper River  
Gulf of Alaska



Relaxing “valid” threshold  
for solar zenith angle  
increases coverage  
QA confidence still under  
evaluation



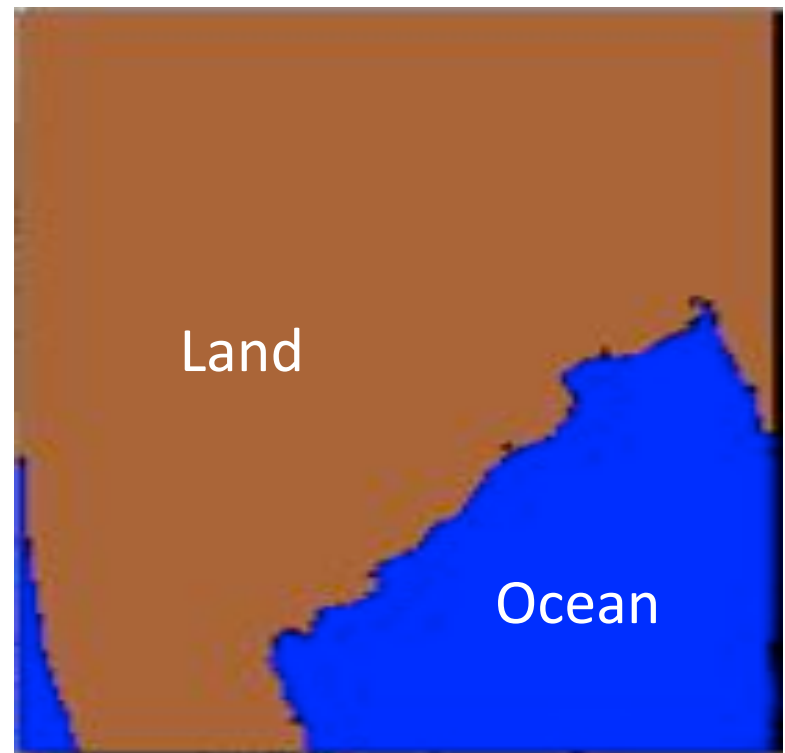
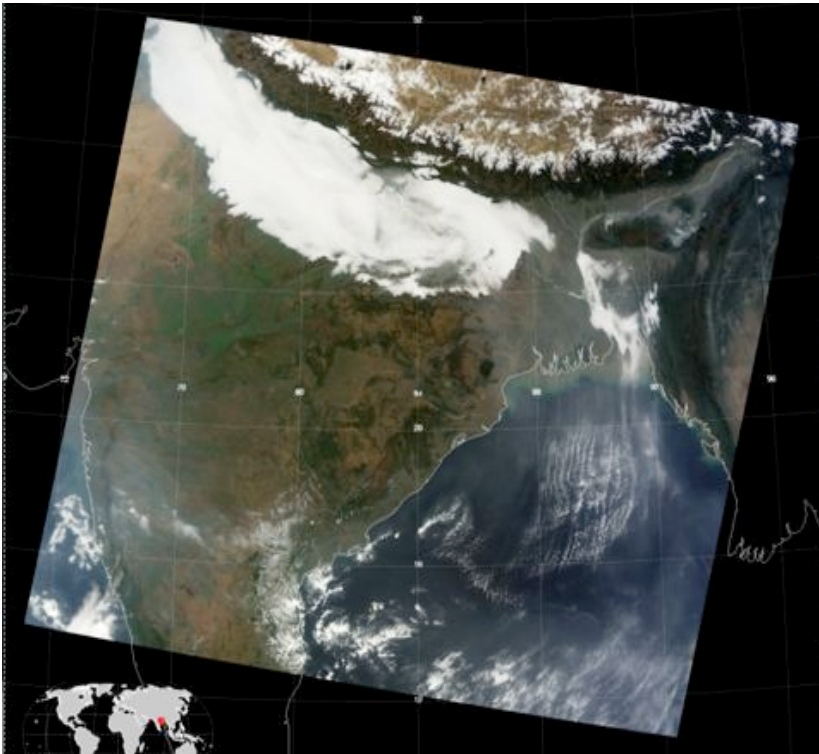
# New “diagnostic” SDSs

- Data users have difficulty “decoding” byte and bit flags for Quality Assurance
- So do we...



# Land or Ocean retrieval attempted?

- “Land\_Sea\_Flag” (10 × 10 km)
- Based on Land Sea Flag from Wisconsin (MOD35)
- 0 = “ocean”; 1 = “land/desert”, Fill = “coastal/other”



Example granule from India: Jan 2, 2010: 0500 UTC

# What is the confidence in the product?



- “Land\_Sea\_Quality\_Flag”
- 10 × 10 km
- Based on Land & Ocean retrieval’s QA bits

-9999: Fill

0: Poor

1: Marginal

2: Good

3: Very Good

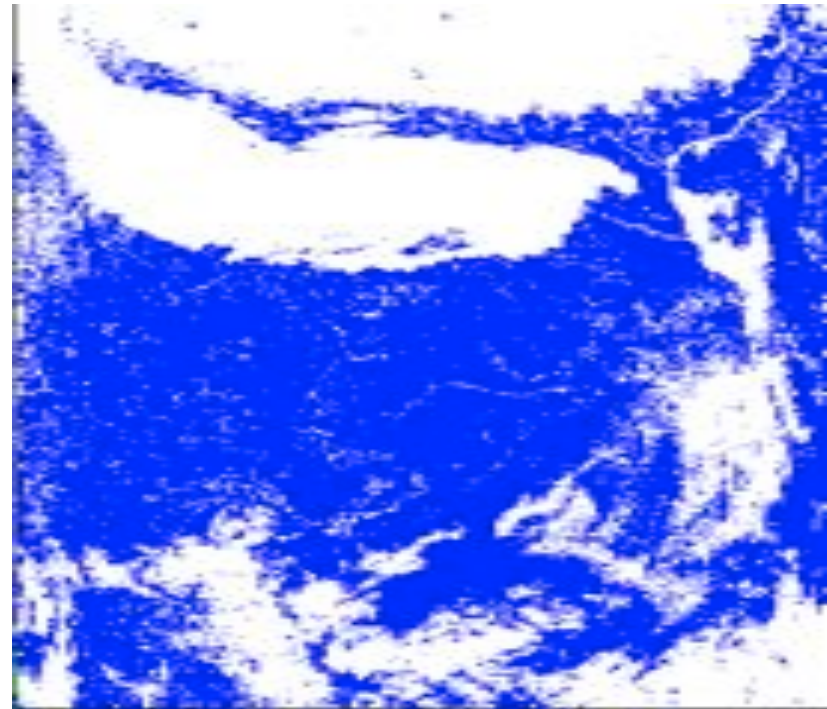
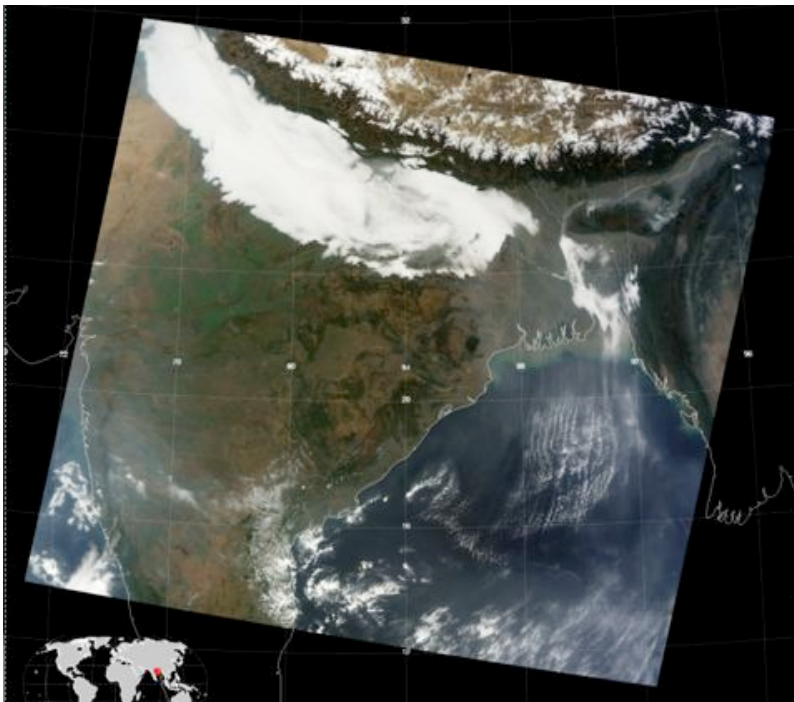
# New SDSs

## Aerosol/Cloud Boundaries

- Old paradigm: Retrieve aerosol properties in cloud free fields
- New paradigm: Retrieve aerosol properties in aerosol/cloud fields
- Determine “aerosol” cloud fraction
- Determine statistics of cloud-free region (e.g. “distance to the nearest cloud”)

# “Aerosol” Cloud Mask

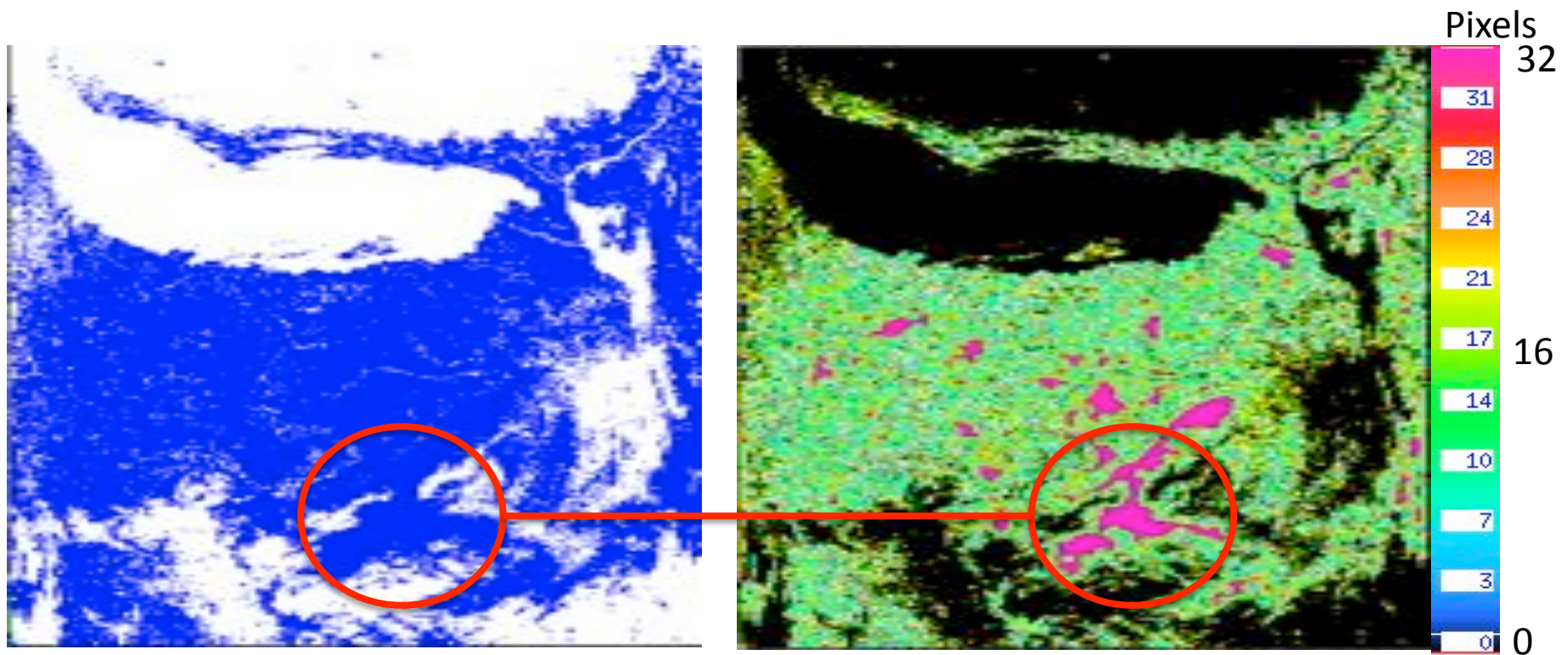
- “Aerosol\_Cldmask\_Land\_Ocean”
- 500 meter resolution (note high resolution but bit type)
- Based on combination of visible, near-IR, IR, spatial variability & other tests, different over land versus ocean
- NOT Wisconsin (MOD35) Cloud Mask!
- It will not be propagated to Level 3!



Blue Clear , White Clouds

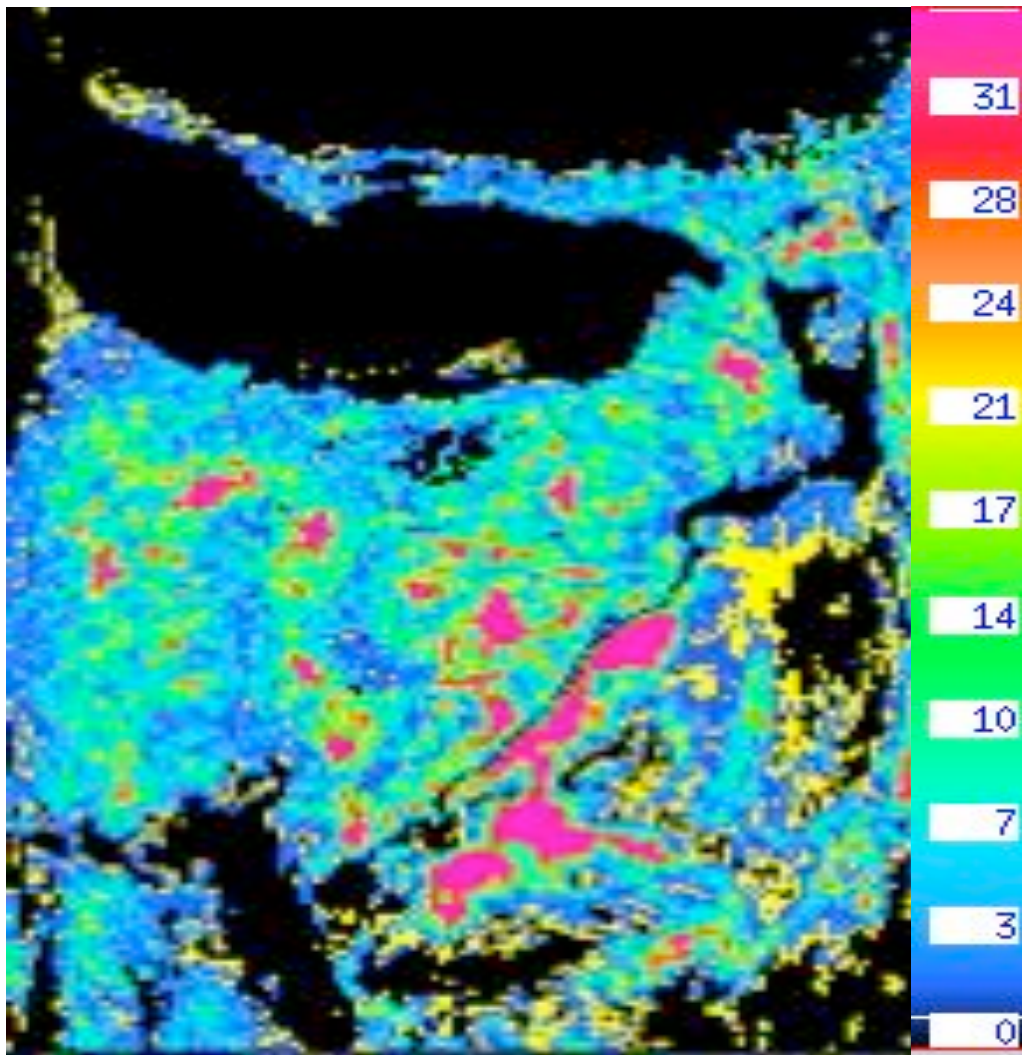
# What is the distance to the nearest cloud?

- “Cloud\_Distance\_Land\_Ocean”
- 500 meter resolution
- Distance (pixels) to the nearest cloud from EVERY pixel!
- Helps identify cloud and scene “type”



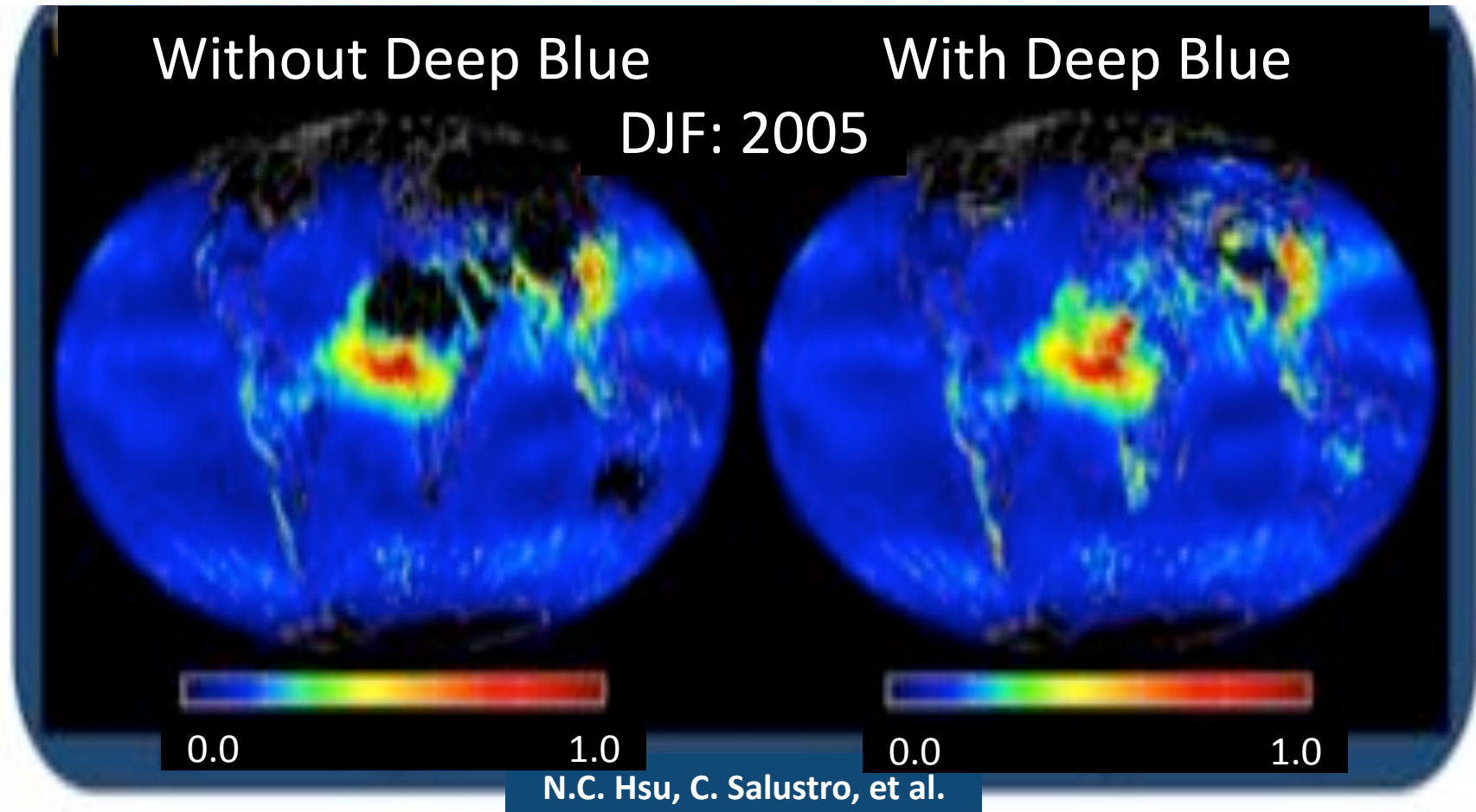
# What is “average” cloud distance?

“Average\_Cloud\_Distance\_Land\_Ocean”



- 10 x 10 km resolution
- Based on statistics of 500 m resolution
- Easy diagnostic of cloud distance tied to aerosol retrieval

# Joint dark target/deep blue?



- 10 x 10 km resolution
- Need to find optimized weighting for marginal surfaces where both algorithms retrieve
- Still under development

# Deleted SDSs

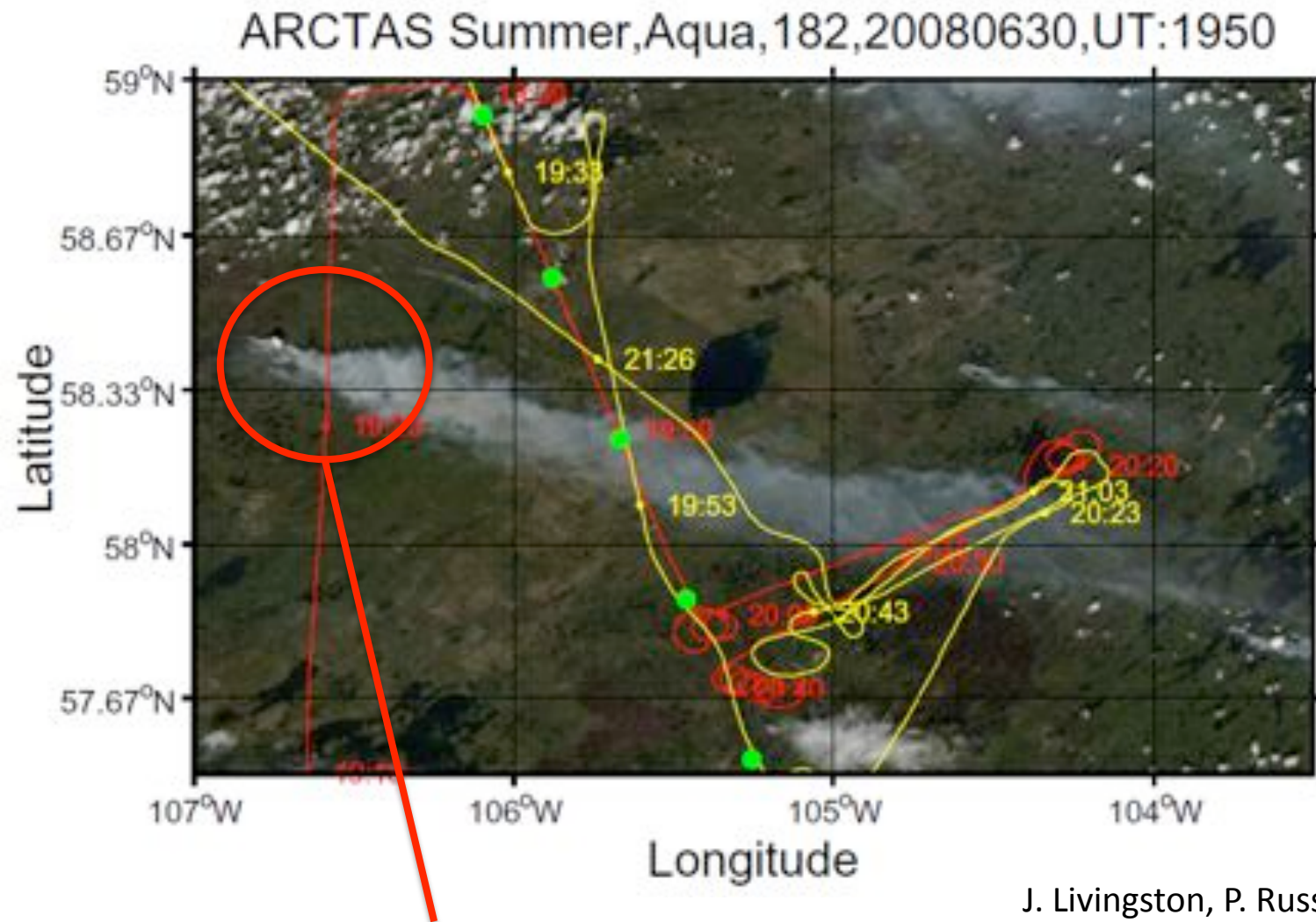
## **C) Deleted SDSs:**

Based on validation studies of C005 products, the following derived aerosol size parameters have little or no quantitative scientific use, and will be deleted from L2 (and L3) processing:

- Angstrom\_Exponent\_Land,
- Optical\_Depth\_Small\_Land,
- Mean\_Reflectance\_Land\_All,
- Standard\_Deviation\_Reflectance\_Land\_All,
- Path\_Radiance\_Land,
- Error\_Path\_Radiance\_Land,
- Critical\_Reflectance\_Land,
- Error\_Critical\_Reflectance\_Land,
- QualityWeight\_Path\_Radiance\_Land,
- QualityWeight\_Critical\_Reflectance\_Land

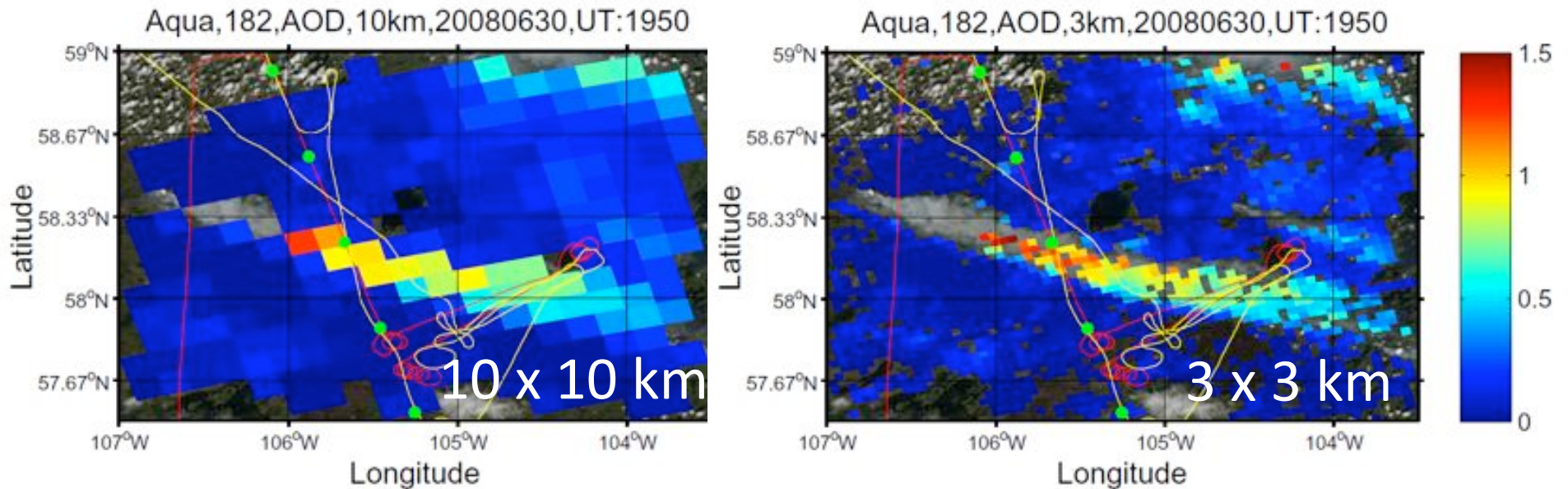


# 3 x 3 km aerosol retrieval for local studies



Point source smoke plume; circle approx. 25 km radius

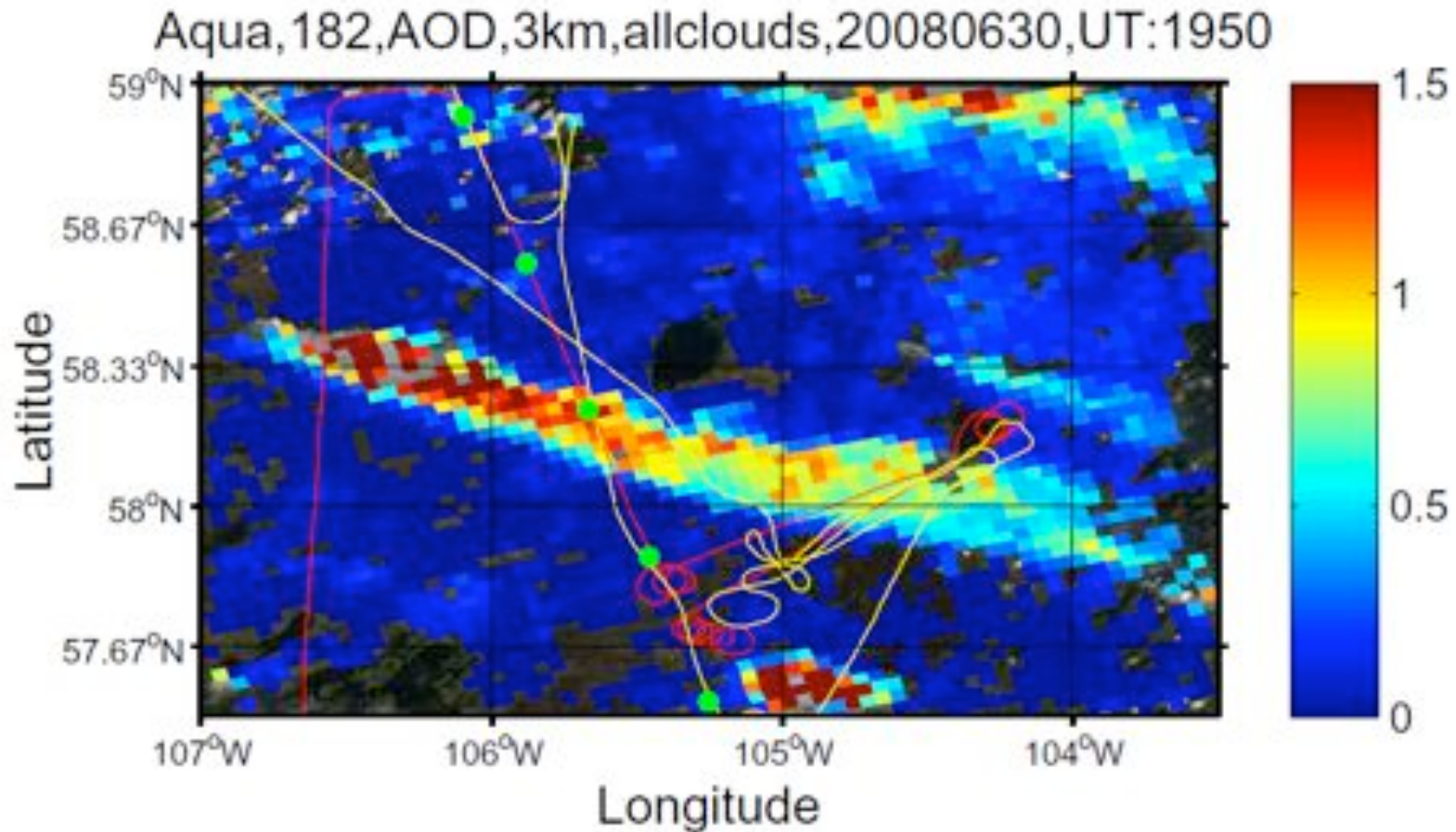
# 10 km (standard) versus 3 km



J. Livingston, P. Russell, et al.

- 3 x 3 km retrieves narrow plumes and spatial variability
- 3 x 3 km product introduces noise
- Aerosol retrieval technique and Lookup tables identical to 10 km version.
- Spatial variability and cloud masking similar to that of 10 x 10 km
- Reported SDSs will be a subset of those reported for 10 x 10 km
- 3 x 3 km product will NOT be aggregated into Level 3

# 3 km (less conservative around clouds)



- Less conservative cloud screening
- Plume is retrieved, although noisy

# Conclusion

- Based on our evaluation of C005 products, C006 10 x 10 km retrieval will have many improvements including:
  - Revised assumptions for existing algorithms
  - New diagnostic SDSs
  - New SDSs (new parameters)
  - Joint Dark Target / Deep Blue products
  - Deleted SDSs
  - Revised criteria for Level 3
- Local-scale 3 x 3 km retrieval as a separate product that uses most of 10 km assumptions