Collection 6 Cloud Mask (MOD35)
Status and Recent Analysis

Richard Frey, Brent Maddux, and Steve Ackerman
MODIS Science Team Meeting
May 18, 2011

Status:

Collection 6 cloud mask has been delivered

Original delivery August 2010 (Low Earth Orbiter Cloud Algorithm Testbed)

- LEOCAT installed
- Problems found with 1.38 μm land test thresholds and 7.2-11 μm polar day test; TPW info from ancillary data too coarse spatially

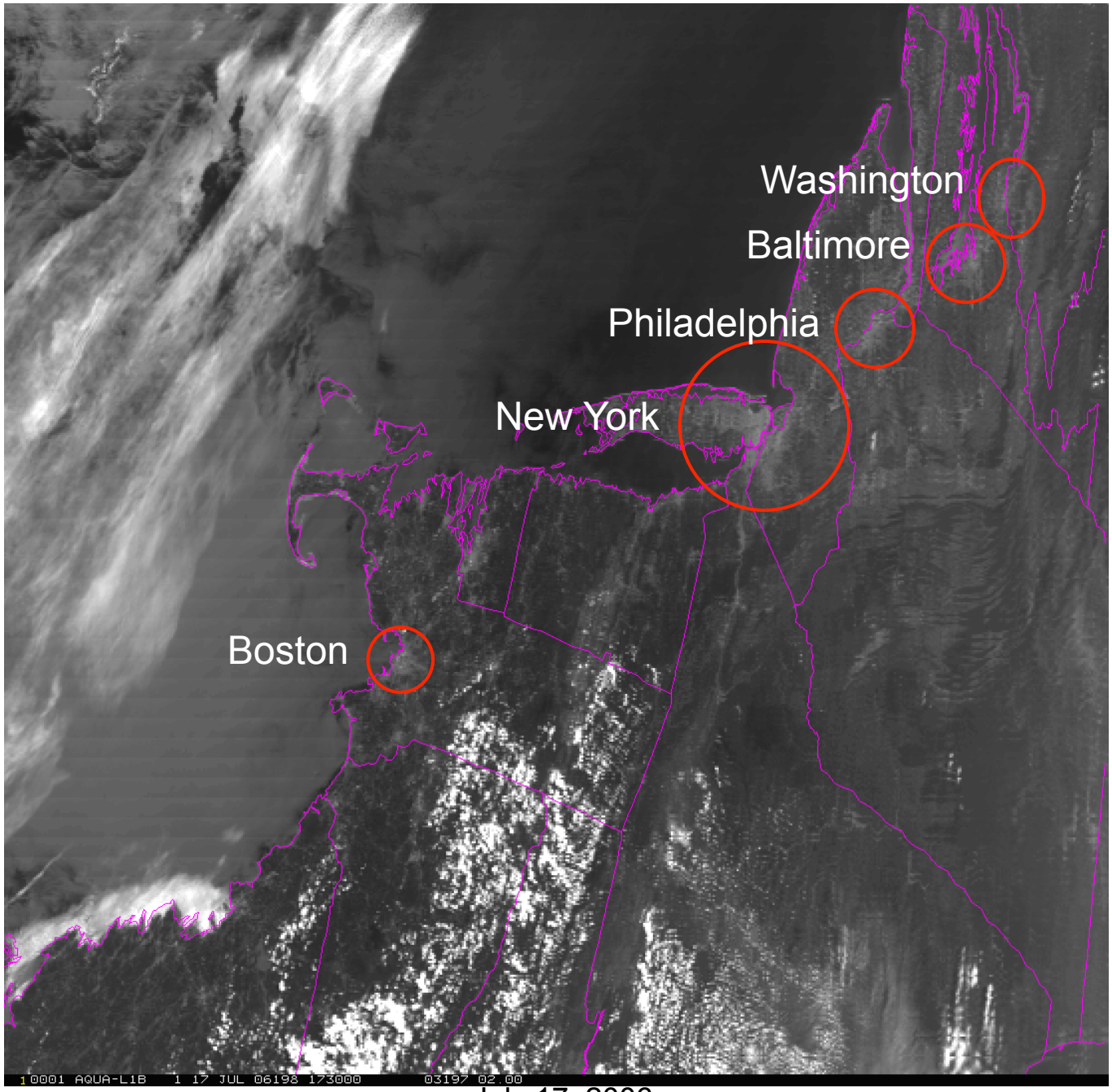
2nd delivery October 2010

- Problem discovered when false sea ice in ancillary data led to undetected clouds

3rd delivery November 2010

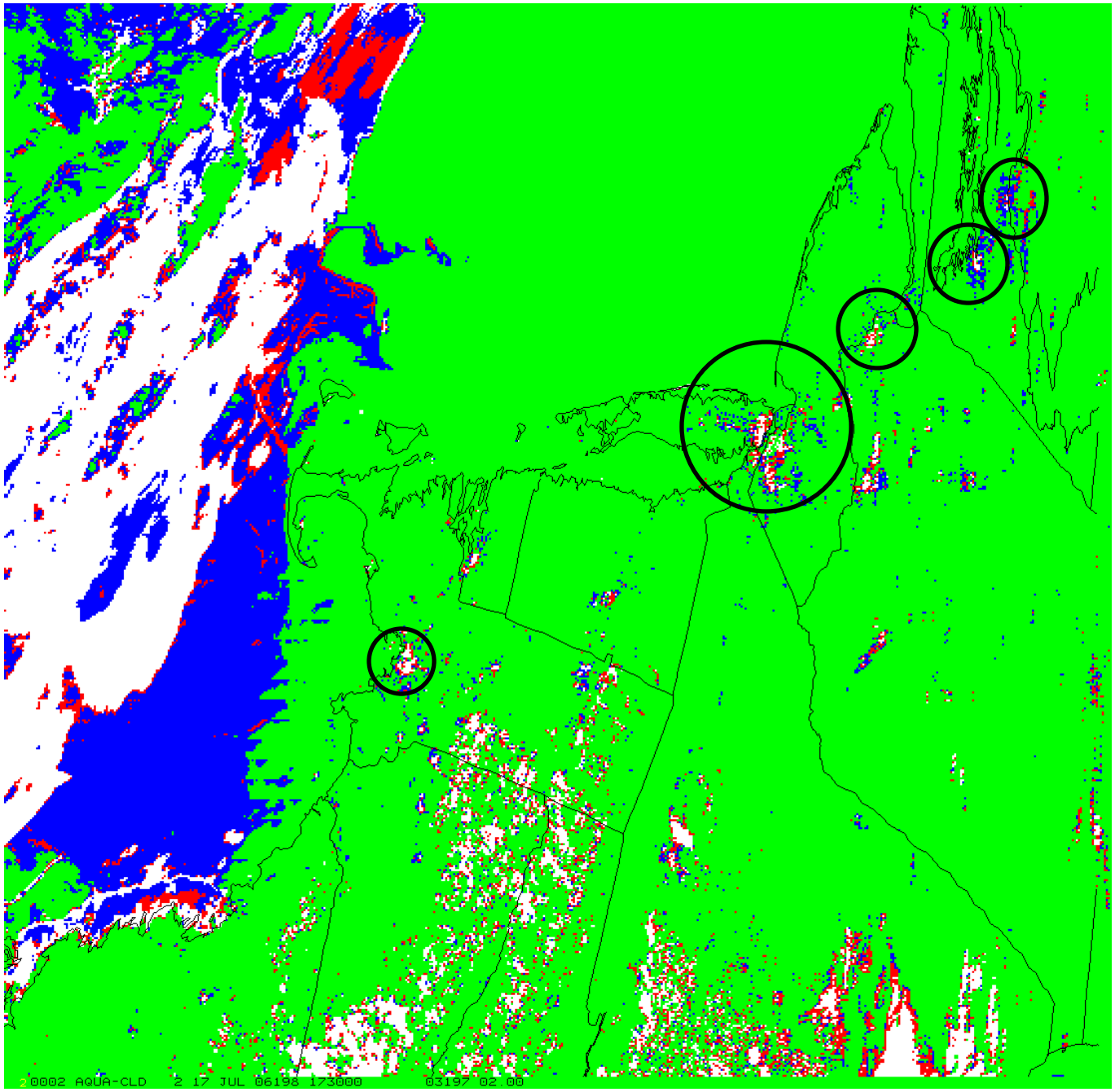
- Ok so far … may need threshold tweaks for use with Collection 6 L1b

MODIS Band 1 Reflectance

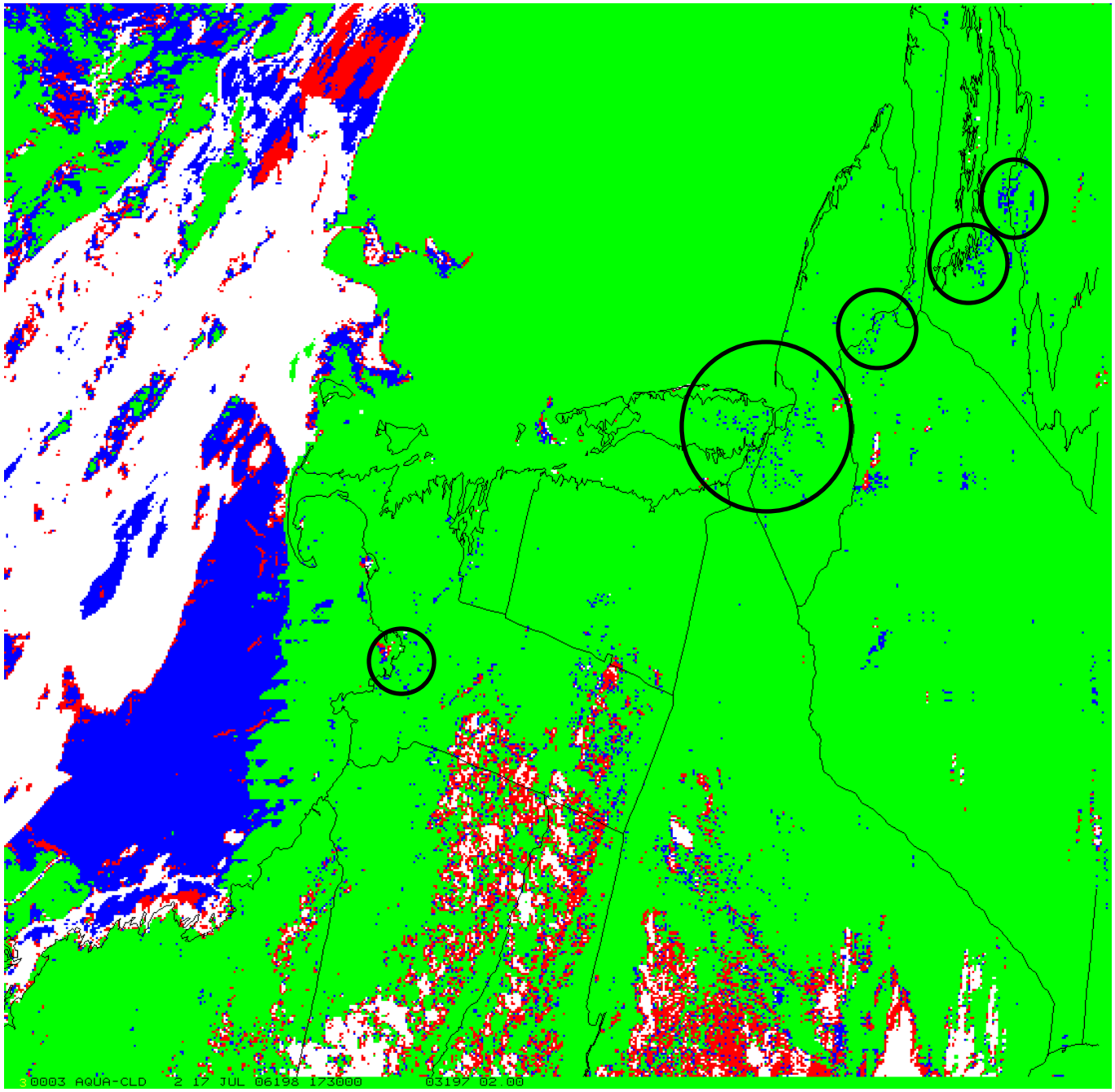


July 17, 2006

Collection 5 MODIS Cloud Mask (MOD35)



Collection 6 MODIS Cloud Mask (MOD35)



Month/Scene Type	Hit Rate / HK SS
Aug 2006 60S-60N day land (non-arid)	88.46 / 78.15
Aug 2006 60S-60N day desert	89.14 / 65.40
Aug 2006 60S-60N night land (non-arid)	91.12 / 81.78
Aug 2006 60S-60N night desert	88.36 / 69.76
Nov 2006 60S-60N day land (non-arid)	87.51 / 73.26
Nov 2006 60S-60N day desert	86.29 / 69.09
Nov 2006 60S-60N night land (non-arid)	88.48 / 72.38
Nov 2006 60S-60N night desert	83.74 / 66.26
Feb 2007 60S-60N day land (non-arid)	86.14 / 69.40
Feb 2007 60S-60N day desert	85.20 / 69.59
Feb 2007 60S-60N night land (non-arid)	87.35 / 72.36
Feb 2007 60S-60N night desert	81.72 / 62.90
May 2007 60S-60N day land (non-arid)	87.57 / 76.89
May 2007 60S-60N day desert	87.53 / 66.70
May 2007 60S-60N night land (non-arid)	89.67 / 77.89
May 2007 60S-60N night desert	86.45 / 67.50

Global to Large Region Cloud Amount Analysis

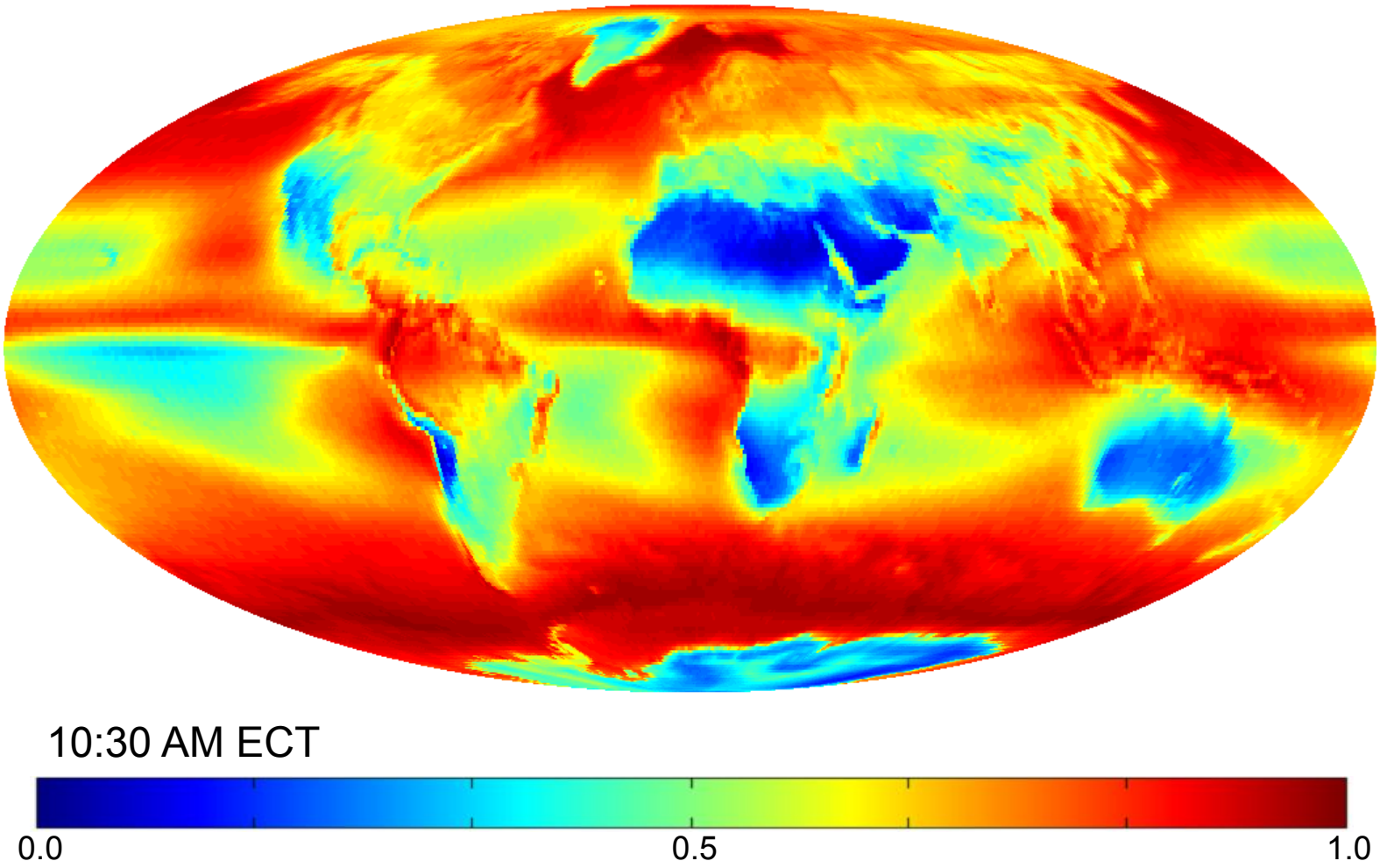
- uses Collection 5 MODIS Level 3 Data
  monthly/daily means at 1-degree resolution
  ten years of Terra, eight years of Aqua

- do cloud amount data show expected seasonal variations on a year-by-year basis (show temporal consistency)?

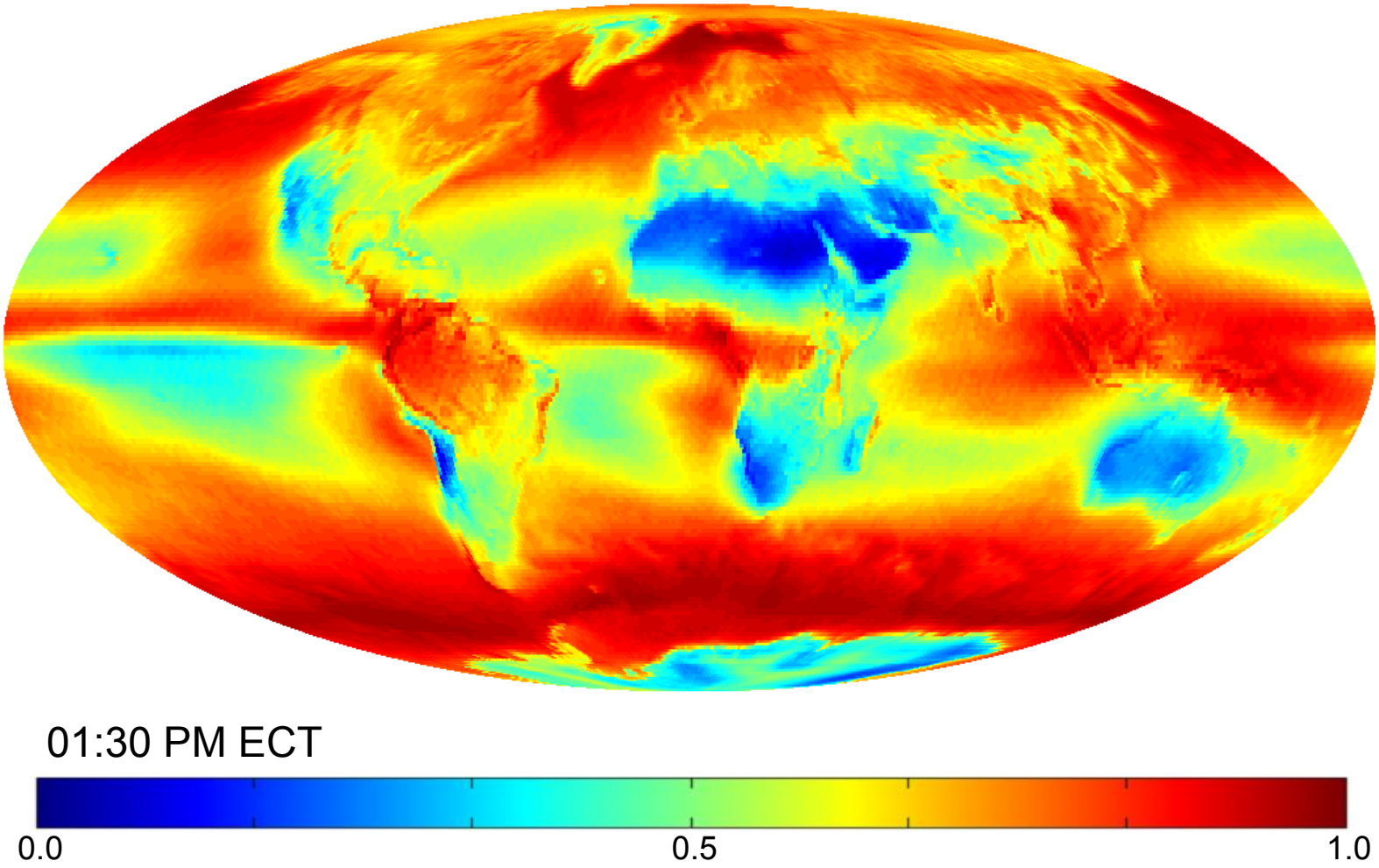
- are spatial patterns consistent with known atmospheric processes?

- how close are we to a cloud amount climatology baseline?
  in which regions can we establish “climate quality” credibility?

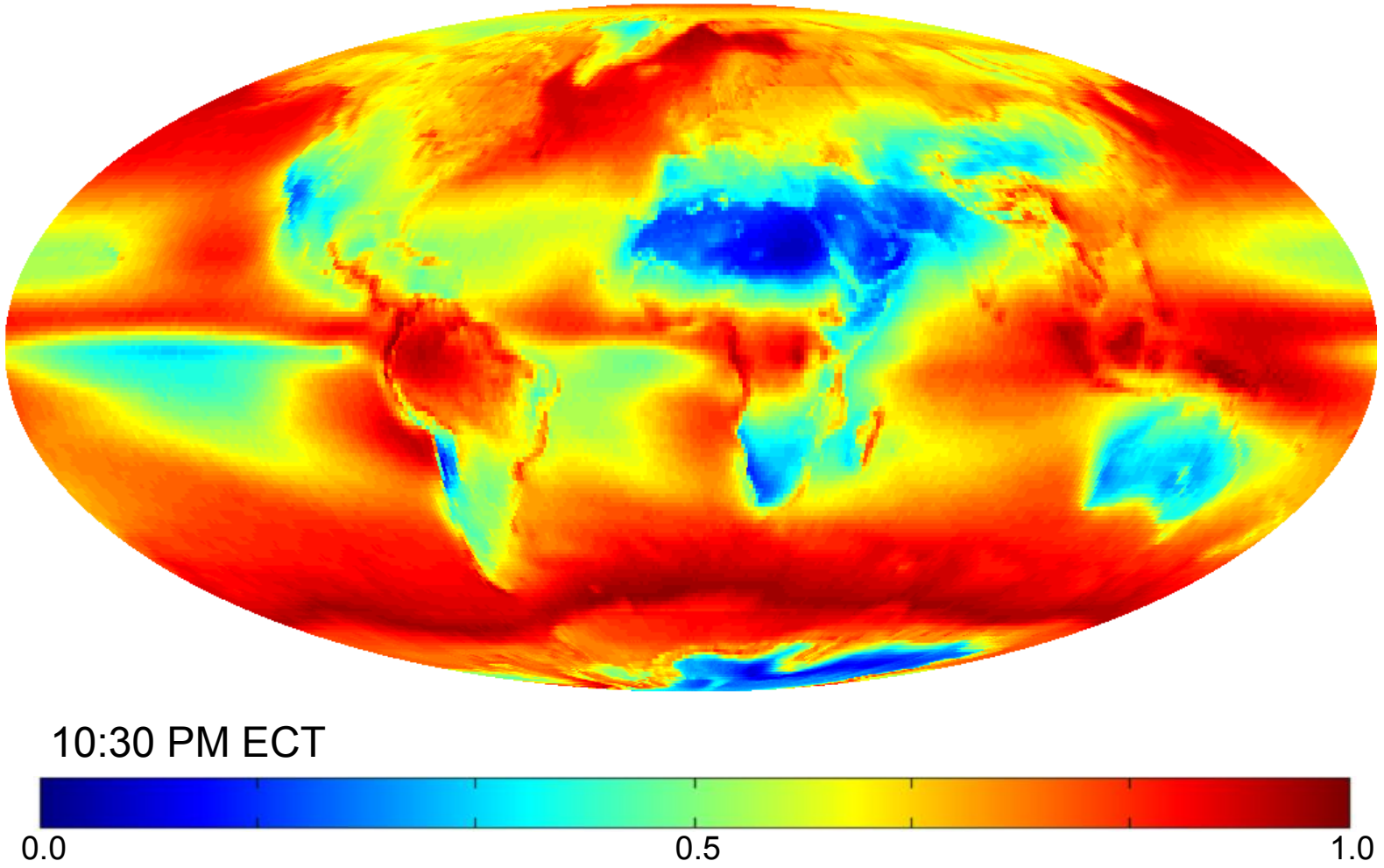
Ten Year Terra Daytime Cloud Fraction



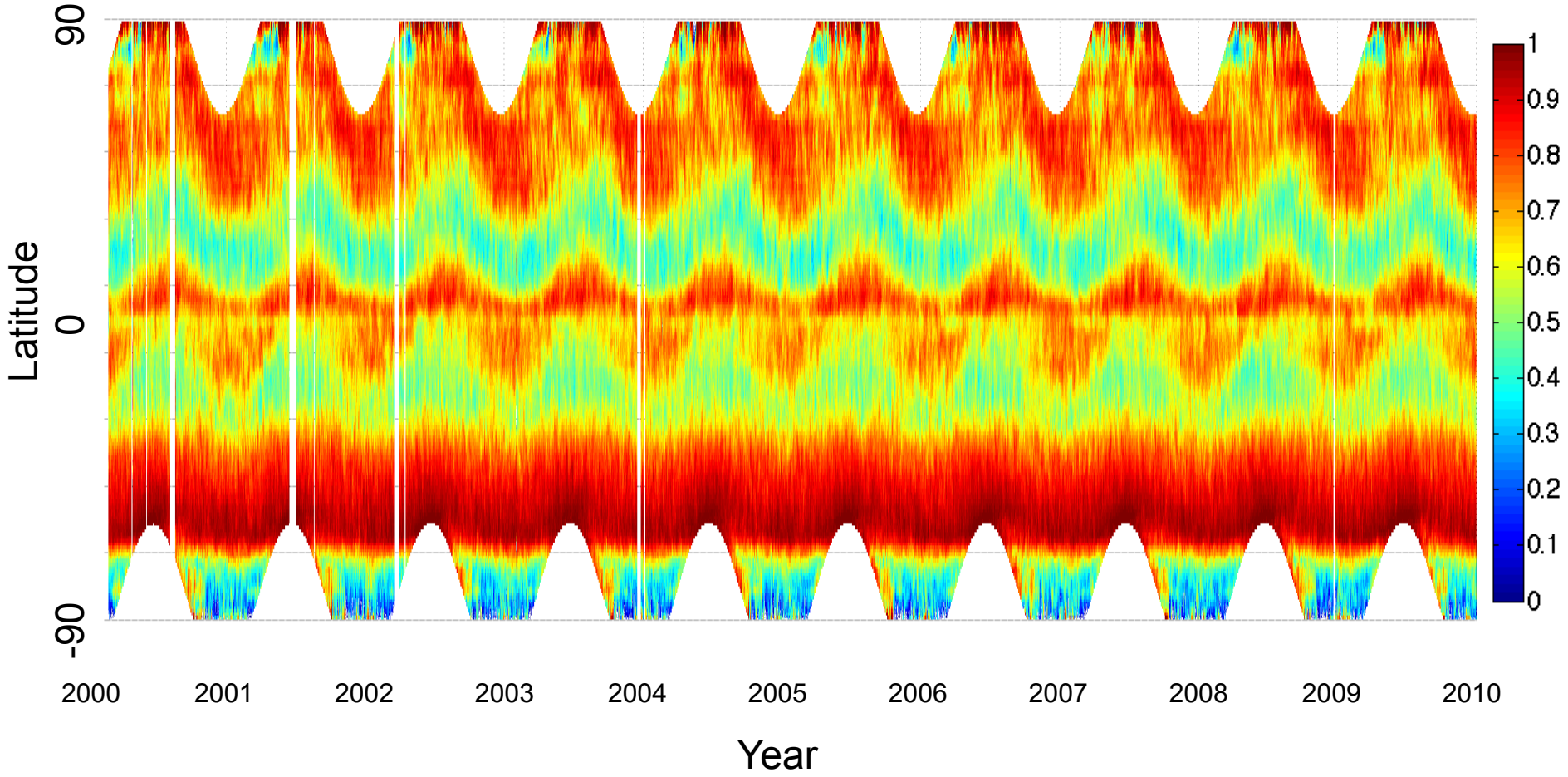
Eight Year Aqua Daytime Cloud Fraction



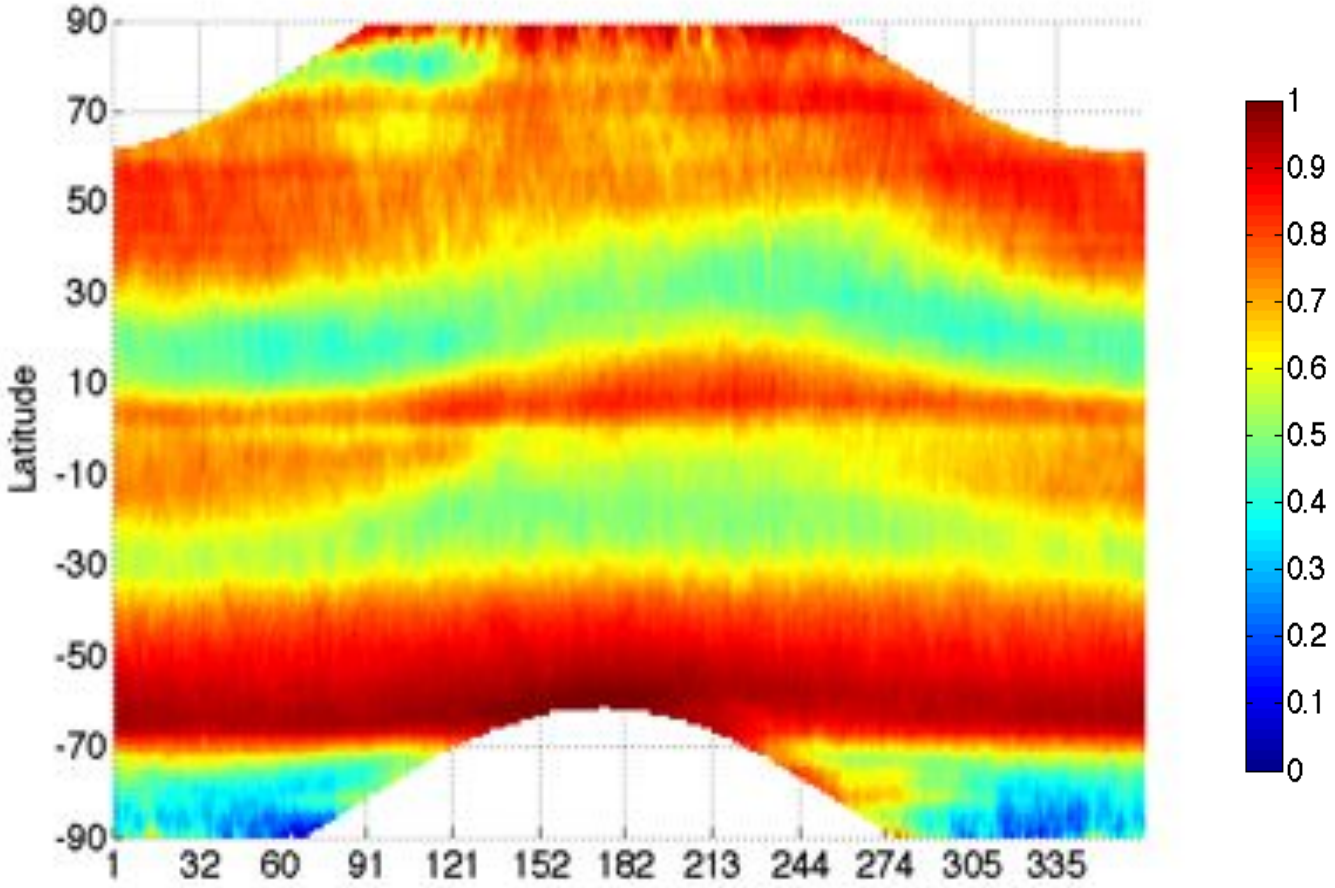
Ten Year Terra Nighttime Cloud Fraction



Daily Zonal Hovmoller: Terra Daytime Cloud Fraction

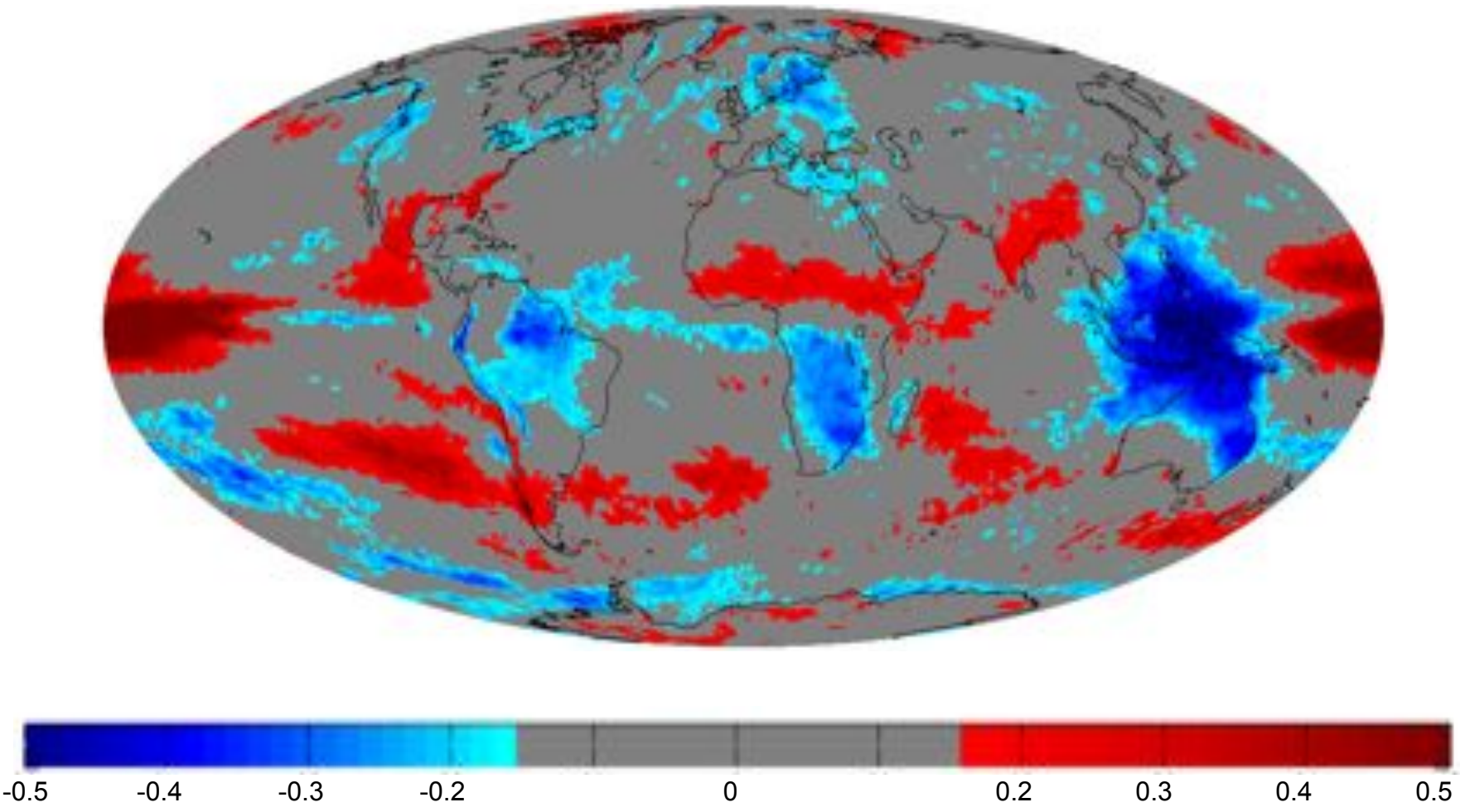


Terra Daytime Mean Cloud Fraction



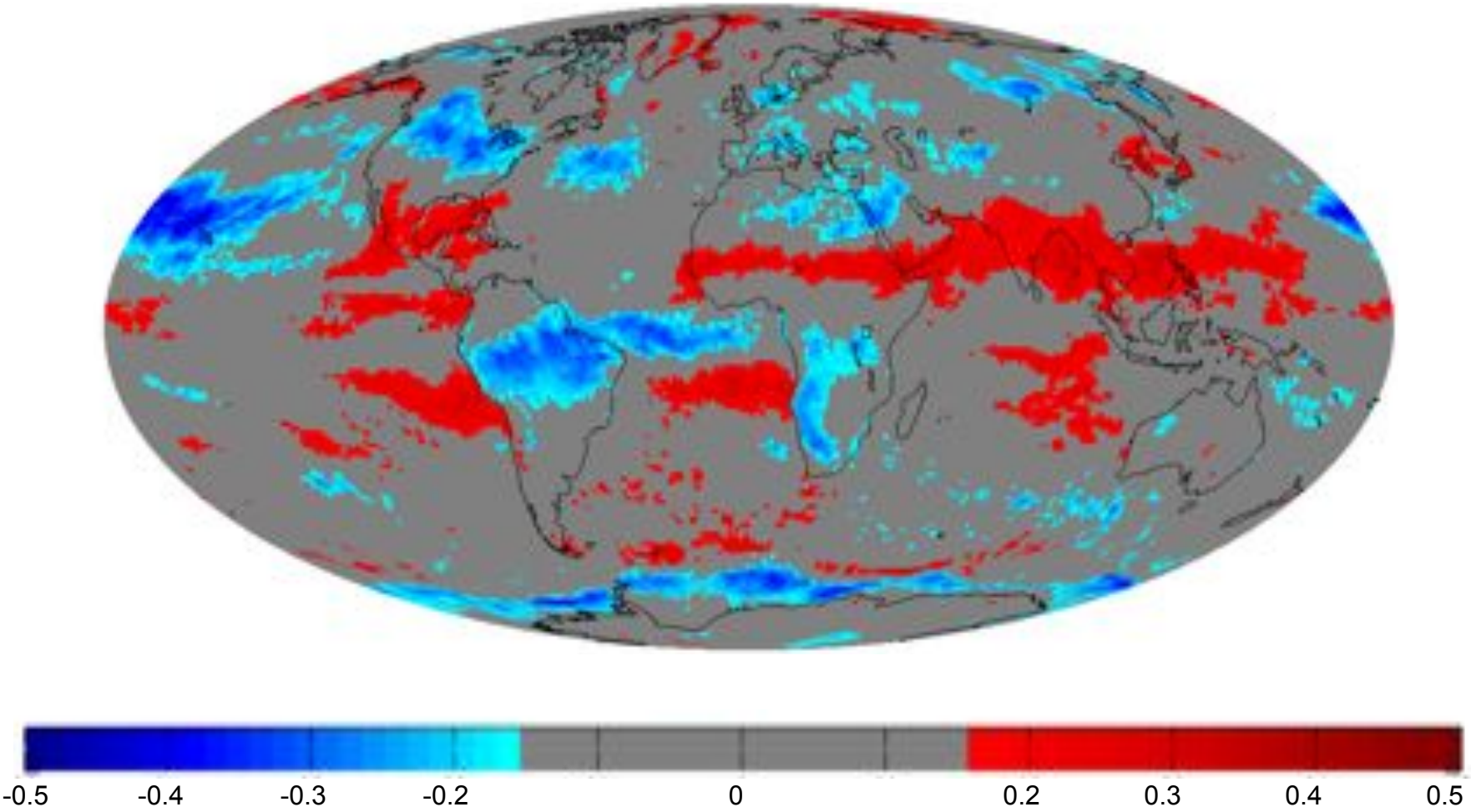
Day of Year

Correlation of ENSO and Terra Cloud Fraction



Correlation is significant >± .15 for a p-value of .05

Correlation of PNA and Terra Cloud Fraction



Correlation is significant >± .15 for a p-value of .05

Small Region to Local Cloud Amount Analysis – a Wisconsin Example

- demonstrate the value of high resolution gridding

-**create previously unavailable local cloud amount climatologies?

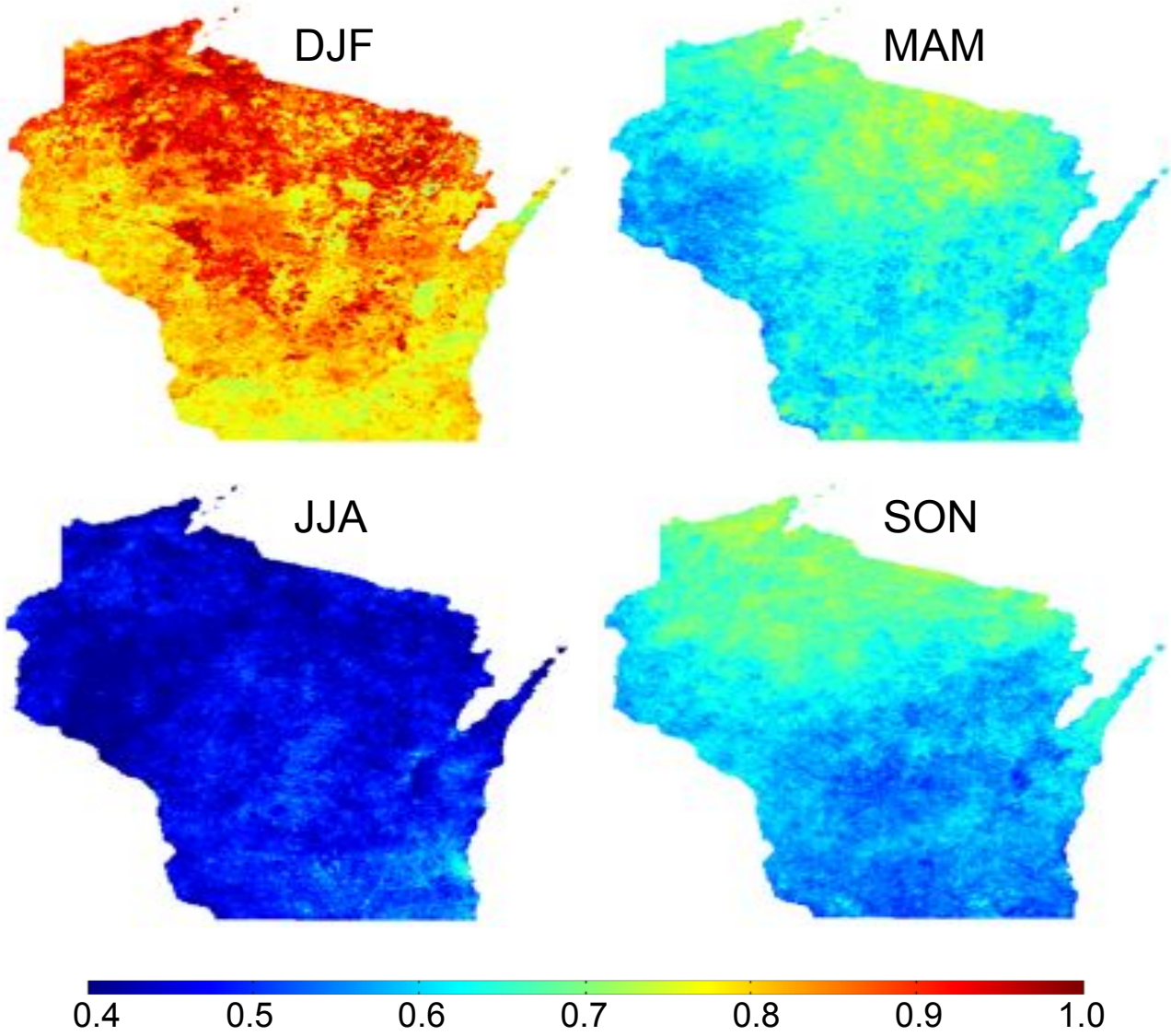
- study cloud processes and interactions with atmospheric phenomena at local scale, e.g. lake breeze, urban heat island, etc.

-**analyze systematic biases due to surface type, ancillary data, etc.

For each granule that overlaps Wisconsin:

- place each 1-km pixel (C5 L2) to a fixed grid with resolution of about 1.2 km
  preserves the pixel level data at nearly the original full resolution
  results in minimal horizontal movement of pixels between grids

- gridding and averaging for Aqua and Terra independently
  this creates four “looks” at Wisconsin daily



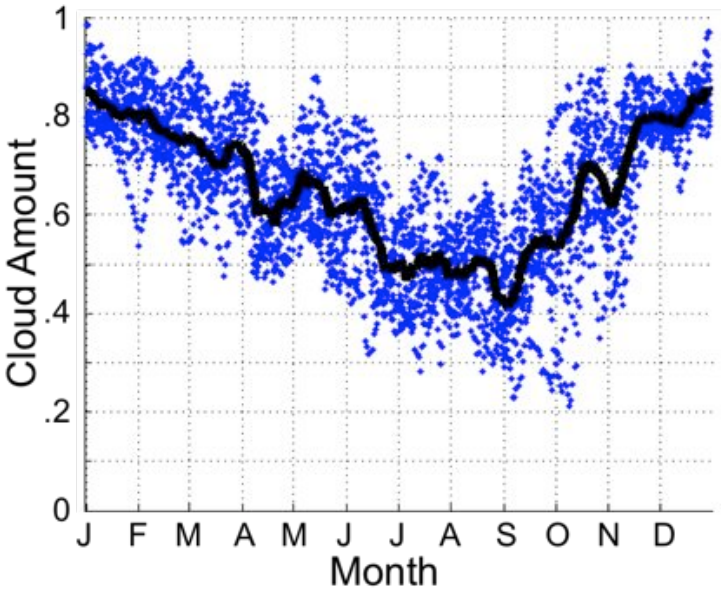
Wisconsin Seasonal Cloud Amounts
from Ten Years of Terra Data

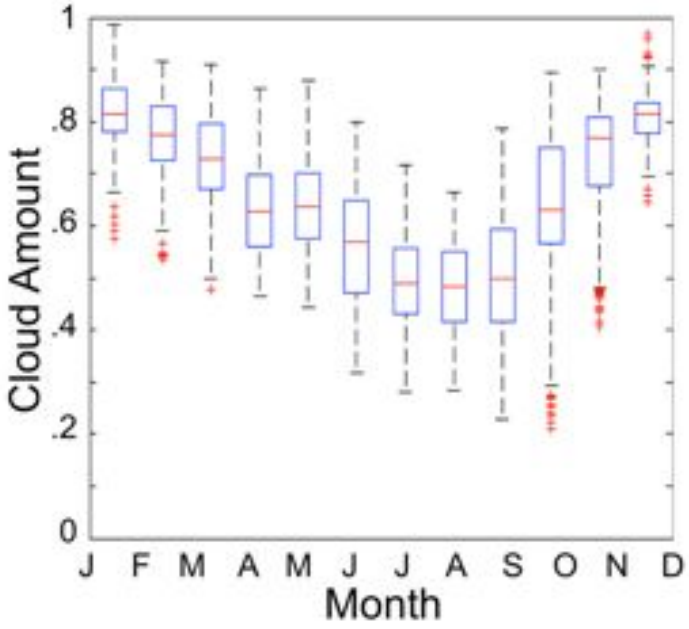
From 10-year
Terra Data Set

55.0 57.5 60.0 62.5 65.0 67.5 70.0 72.5

Wisconsin Annual Mean Cloud Amount

Wisconsin 10-Year Cloud Amount Variability



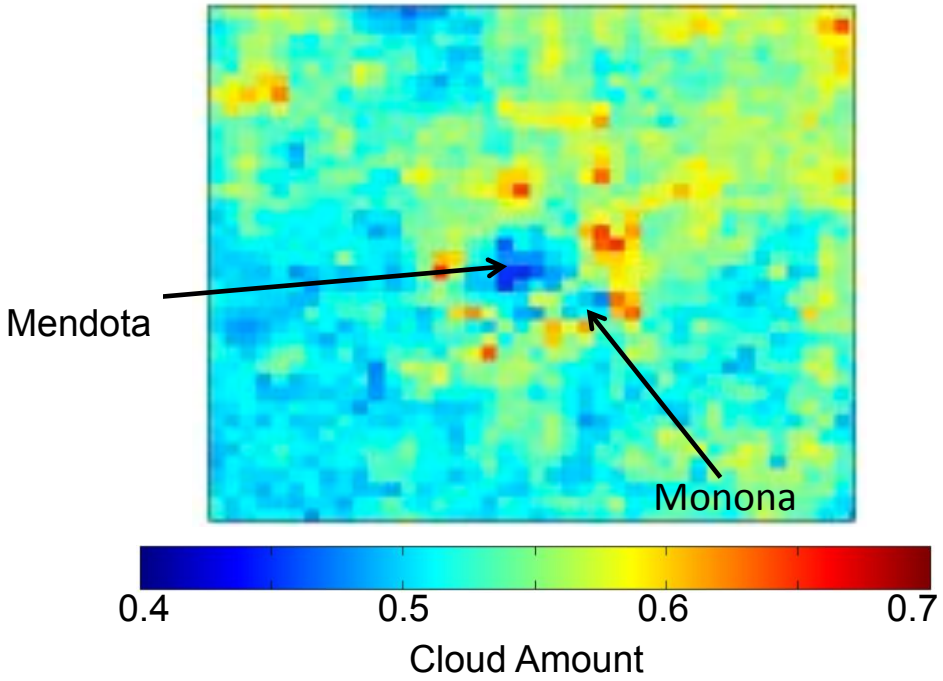


Terra daily mean cloud amounts plotted in blue dots for each day between 2001-2010

Fair weather cumulus over
southern Wisconsin

June 4, 2008 250 m Resolution

Mean Summer Cloud
Amount over Madison



Conclusions:

1) Collection 6 Cloud Mask (MOD35) is ready as far as we know.

2) Work by Brent Maddux shows that aggregated Collection 5 cloud mask data records atmospheric phenomena as reflected in cloud amounts at large, regional, and local scales.