Long Term Data Record Quality Assessment

Sadashiva Devadiga
January 18, 2007

Overview

- Post production QA
- Algorithm Testing
- LDOPE’s QA Services for LTDR
  - Global Browses
  - Time Series
  - Known Issues
- Future work

Post Production QA

- Data records are processed for one or more year using the revised version of the algorithm.
- Samples from the test are evaluated by the LDOPE staff
  - Check for intended performance
- Product issues are posted on the known issue page – accessible to science team only

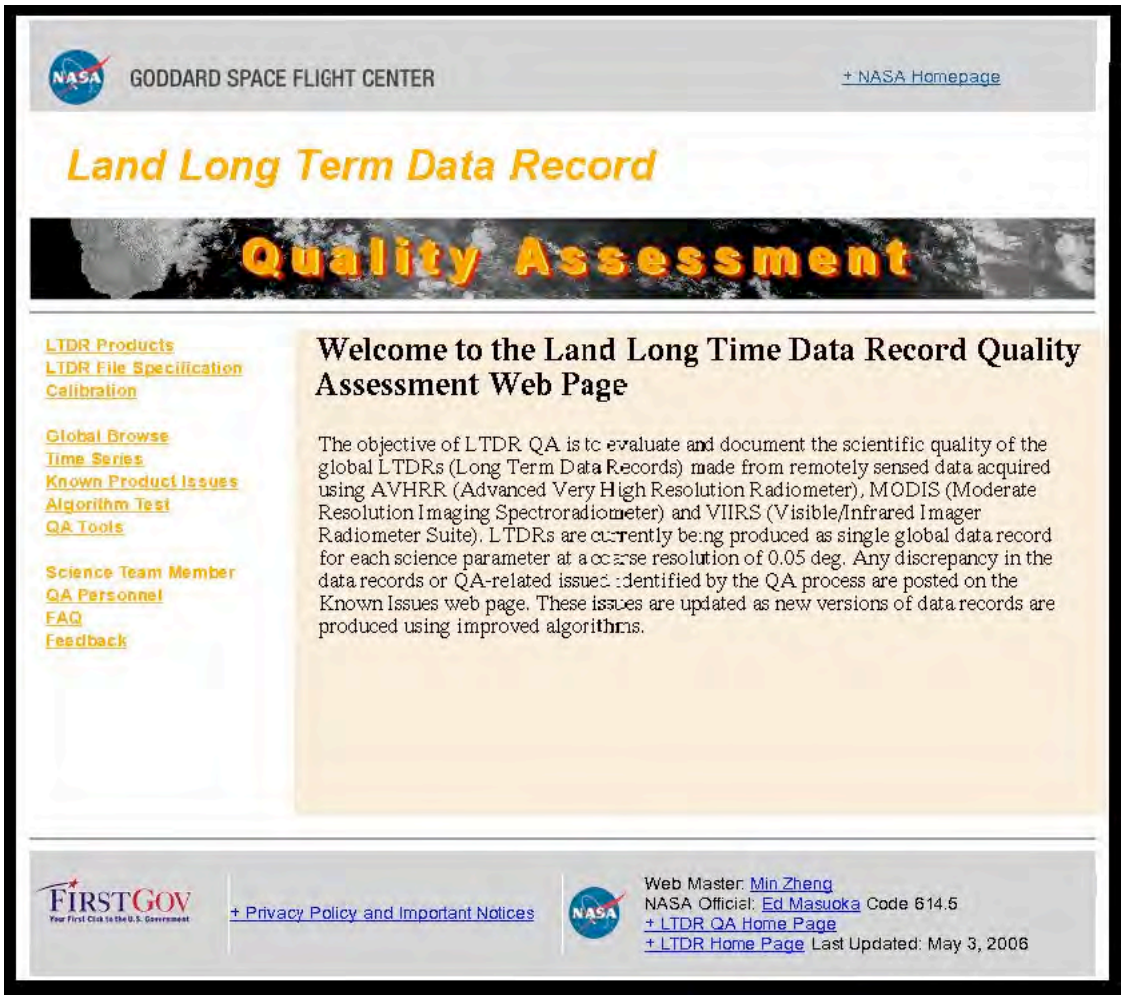
Algorithm Testing and QA

- Data records are reprocessed using the recent version of the science algorithm. Current verison is Beta version.
- Product samples are evaluated by the LDOPE staff
  - Compare with other datasets (PAL, GIMMS, MODIS)
  - Compare with the previous version of the LTDR
- Product issues are posted on the known issue page

LDOPE's QA Services for LTDR

- Global Browses
  - Beta version: Daily Band 1 surface reflectance and NDVI
  - Coming: RGB composite of band 1, 2, and 3
- Time Series
  - Time series of band 1 and band2 surface reflectance and VI
    - At aeronet sites
    - LDOPE golden tiles

LTDR QA Home Page



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Land Long Term Data Record

Quality Assessment

LTDR Products
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Science Team Member
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Welcome to the Land Long Time Data Record Quality Assessment Web Page

The objective of LTDR QA is to evaluate and document the scientific quality of the global LTDRs (Long Term Data Records) made from remotely sensed data acquired using AVHRR (Advanced Very High Resolution Radiometer), MODIS (Moderate Resolution Imaging Spectroradiometer) and VIIRS (Visible/Infrared Imager Radiometer Suite). LTDRs are currently being produced as single global data record for each science parameter at a coarse resolution of 0.05 deg. Any discrepancy in the data records or QA-related issues identified by the QA process are posted on the Known Issues web page. These issues are updated as new versions of data records are produced using improved algorithms.

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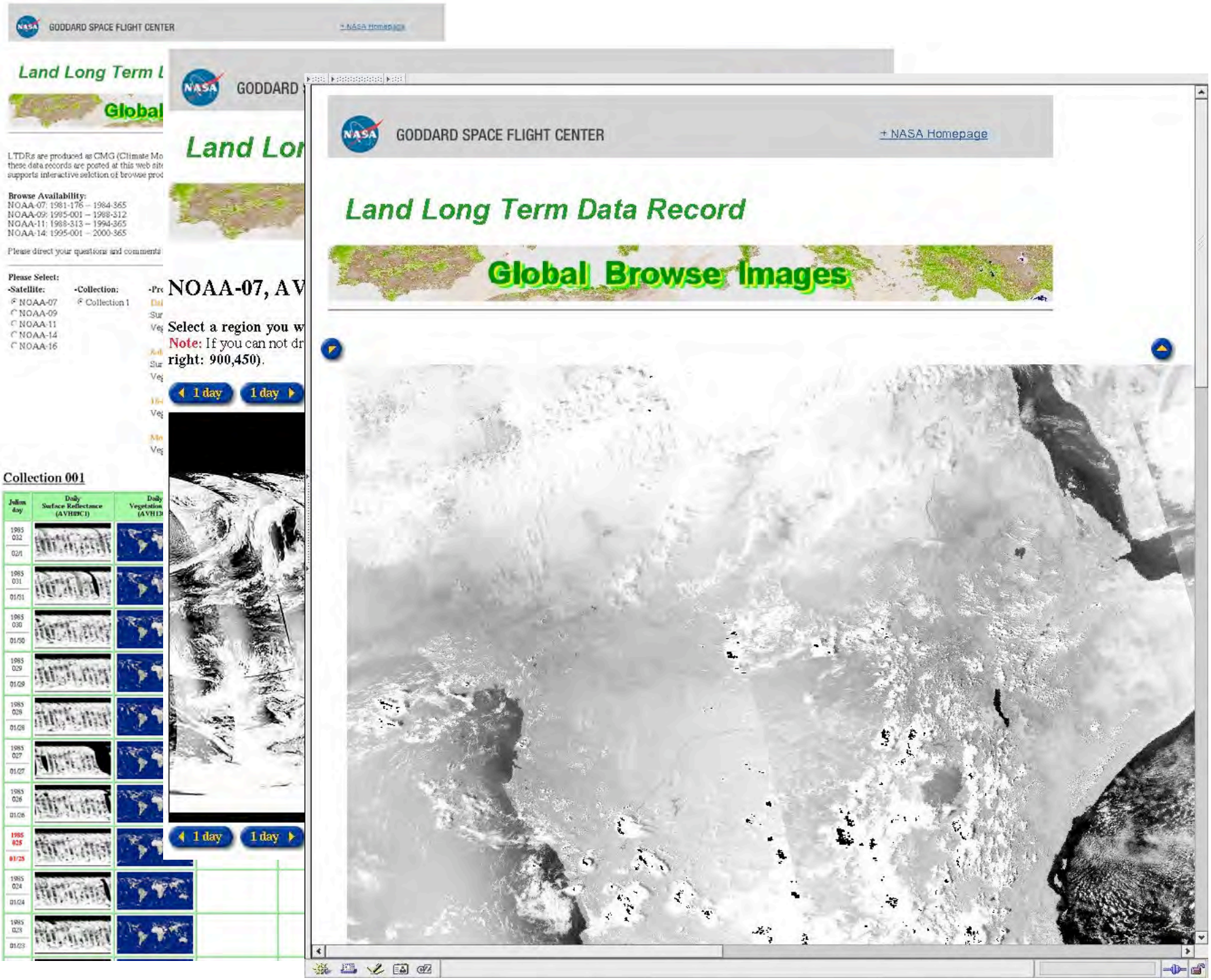
Web Master: Min Zheng
NASA Official: Ed Masuoka Code 614.5
+ LTDR QA Home Page
+ LTDR Home Page Last Updated: May 3, 2006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NOAA-14: 1995-001 – 2000-365
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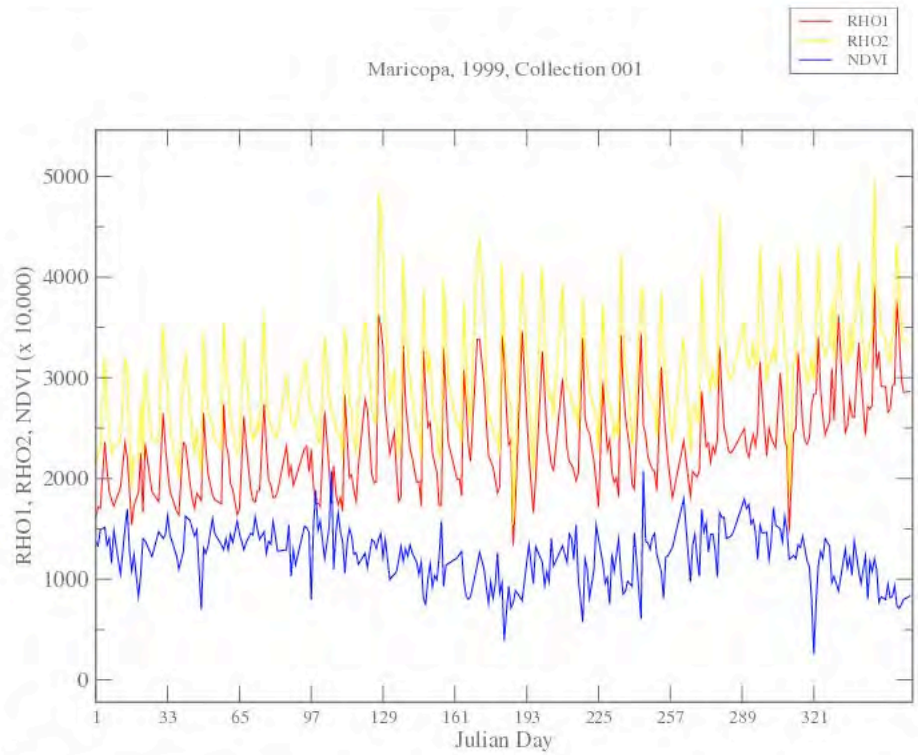
Land Long Term Data Record

Time Series



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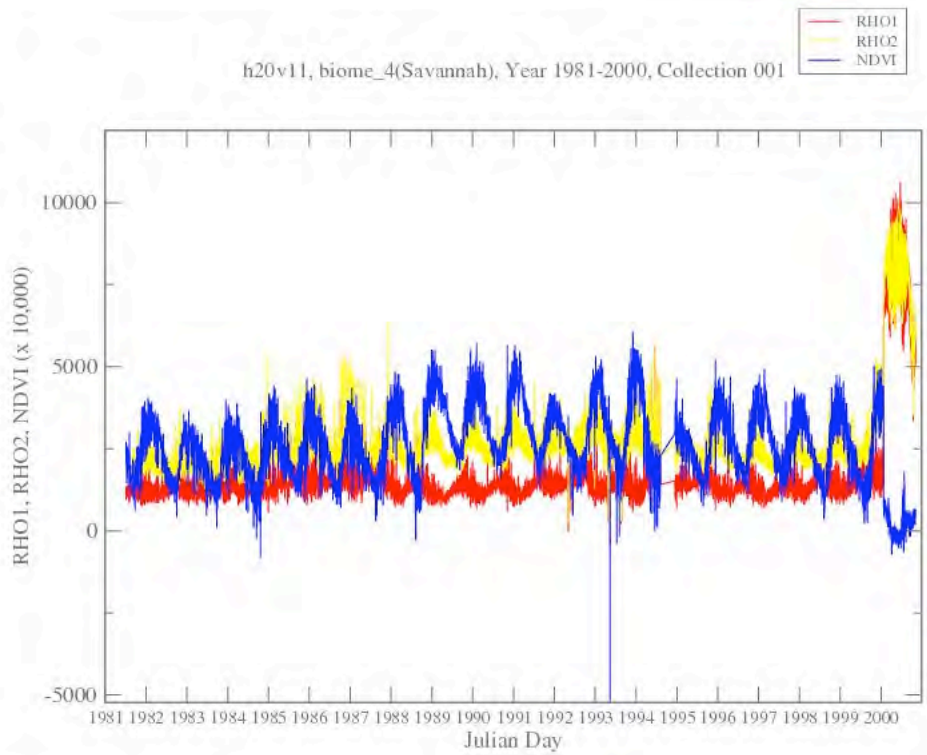
Land Long Term Data Record

Time Series



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A time series of summary statistics derived from locations is maintained and monitored by the LT internet. Time series statistics are extracted at al series are important because they capture algorit aerosol loading) and remote sensing (e.g. sun-sur they allow changes in the instrument characterist site (listed in aphabetical order) or tile and biom

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Summary

Color Key | Case pending | Case closed | Case reopened | QA note

Case number
CC_AVH09C1_0622
CC_AVH09C1_0619
CC_AVH09C1_0619
CC_AVH09C1_06138
CC_AVH09C1_06138
CC_AVH09C1_06111
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Last Updated: 08/14/

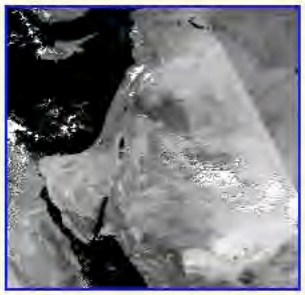
Detailed Description

Color Key | Case pending | Case closed | Case reopened | QA note

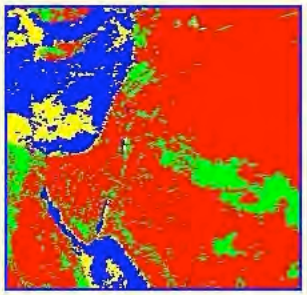
Large Image

Case #:CC_AVH09C1_06194 **Opening date:** 07/13/06 **Last update:** 07/13/06
Status: Pending

Some pixels along coastlines which appear to be in clear areas are flagged as cloud. This example is taken from an area including part of the Mediterranean Sea and Arabian Peninsula, on day 18 of 1997. In the first image, many coastlines are visible in areas that appear to be clear. The second image shows the clear/cloud and land/ocean quality flags for the same region and day. The land areas are red if flagged clear and green if flagged cloudy or partly cloudy.The ocean areas are shown in blue if clear and yellow if cloudy or partly cloudy. A strip of yellow and green pixels occurs along coastlines in some areas that are otherwise flagged as clear.



AVH09C1.A1997018.N14.001.2006034202854.hdf
SDS: RHO2(grayscale)



AVH09C1.A1997018.N14.001.2006034202854
SDS:QC
Red:land,clear
Green: land, cloudy or partly cloudy
Blue: ocean, clear
Yellow: ocean, cloudy or partly cloudy

Occurrence: All AVHRR Version 1 data.
PGE: v1.0

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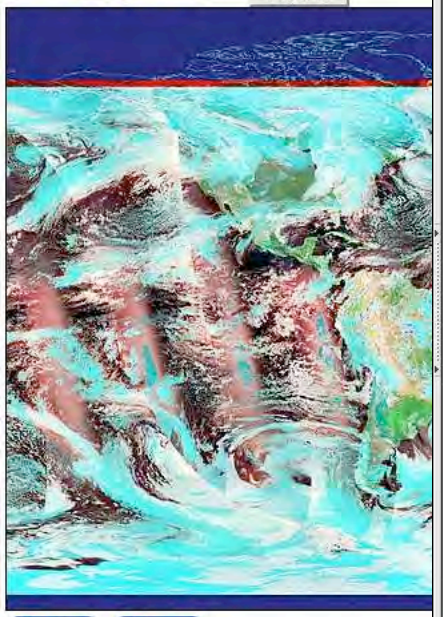
TEST2, AVH09C1,day 199903

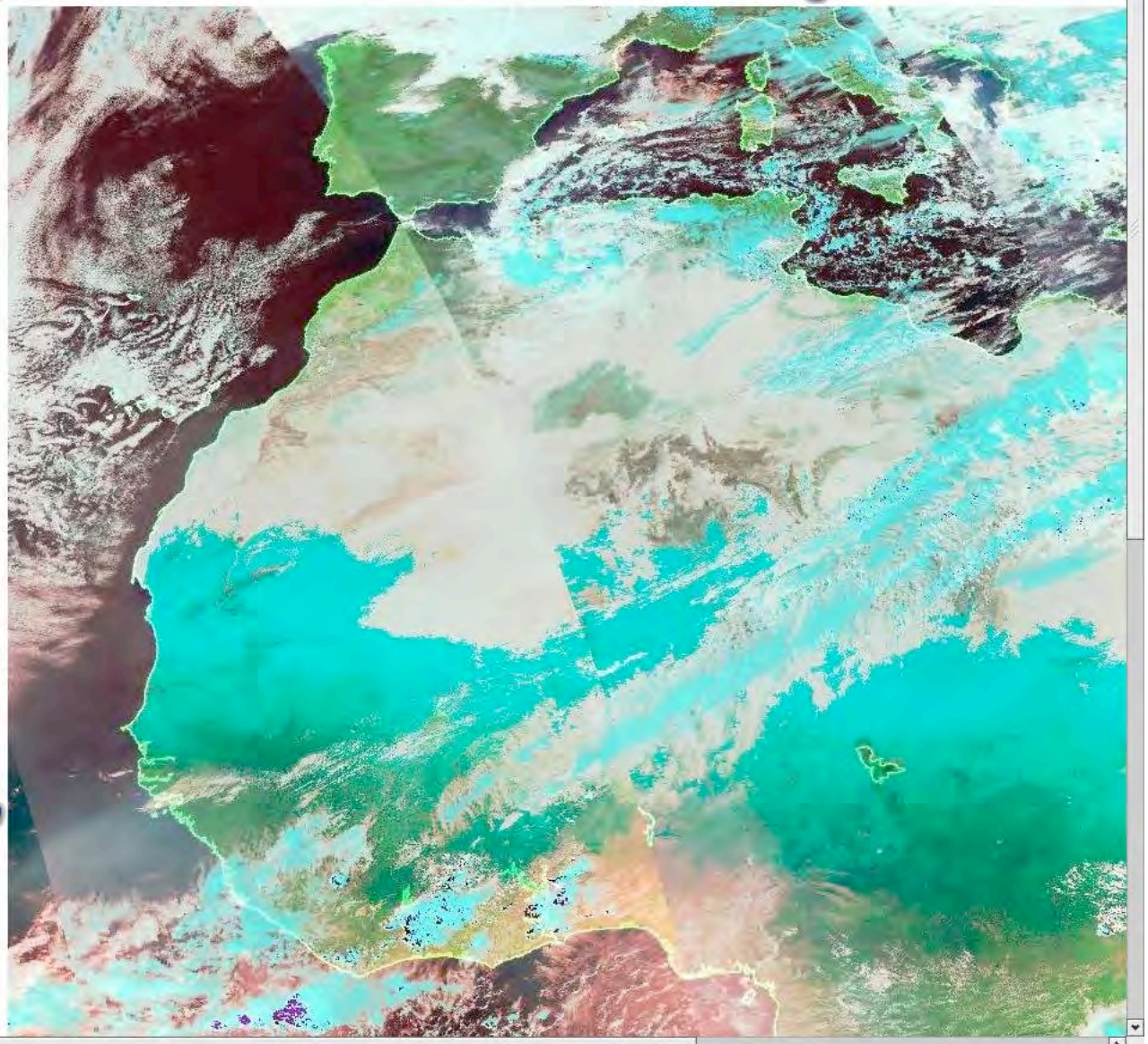
Select a region you want zoom in:
Note: If you can not drag a box on the image, ple
right: 900,450).

1 day 1 day Zoom In



1 day 1 day Zoom In

AVB09C1, day 1999033, TEST2



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AVHRR Algorithm Test

Test Date	Revision History	Glob
10/2006		NOA
12/2006		NOA

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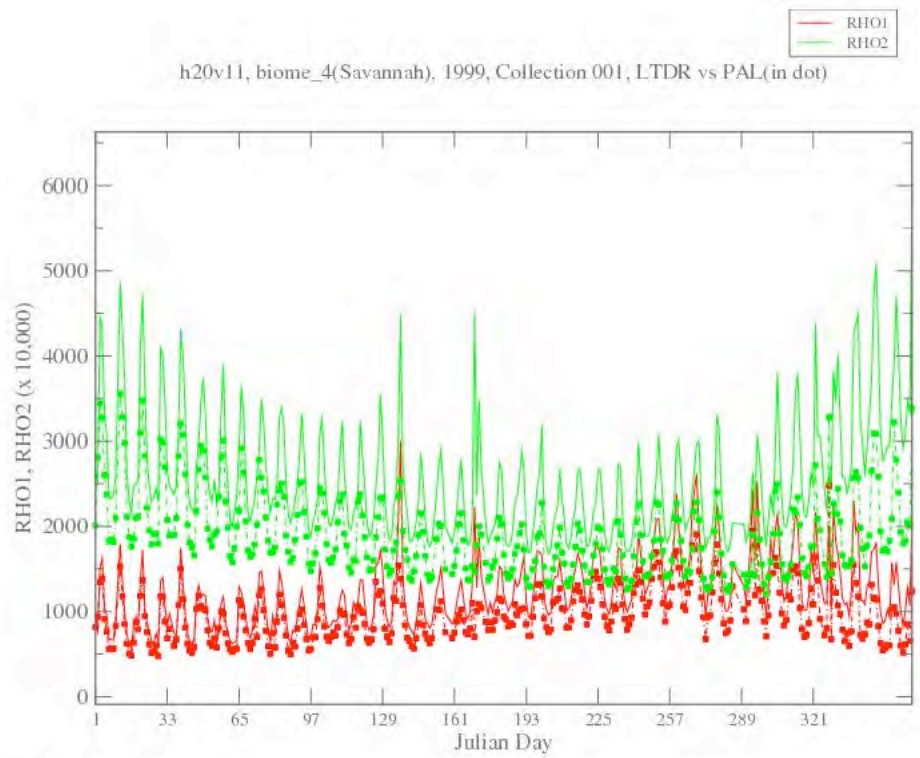

Mon Jan 15 14:54:21 2007

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AVHRR Alg

Test Date	Re Hi
10/2006	
12/2006	

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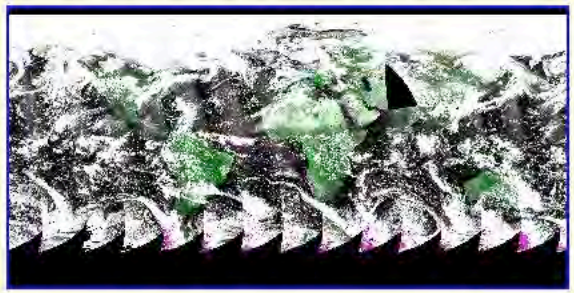
Detailed Description

Color Key	Case pending	Case closed	Case reopened	QA note

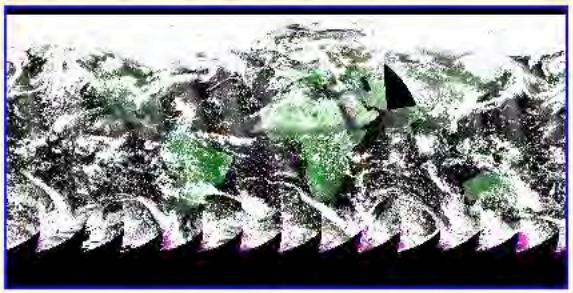
Large Image

Case #:T1_SD_AVH09C1_06319d **Opening date:** 11/15/06 **Last update:** 11/15/06
Status: Pending

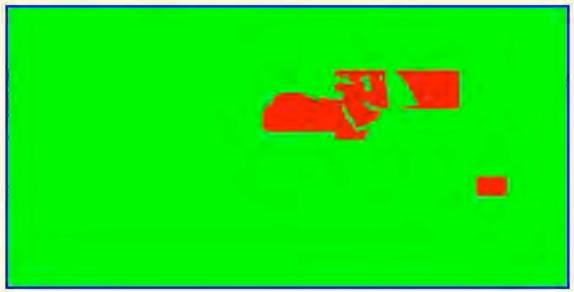
Desert flag is incorrectly popluated in both the beta and the reprocessed version of NOAA-7
Following example shows an example global dataset and the cloud flag from the beta version and the reprocessed version.



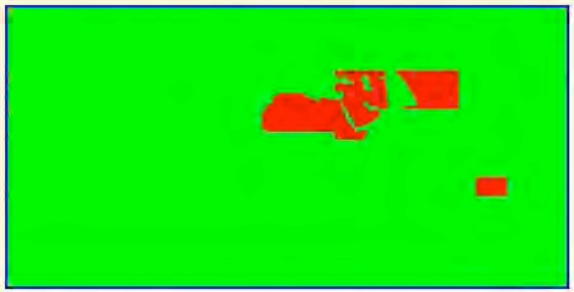
AVH09C1.A1983120.N07.001.2006029114357.hdf (beta version)
SDS: RGB Composite of ch 1, 2, and 1



AVH09C1.A1983120.N07.001.2006276025550.hdf (reprocessed version)
SDS: RGB Composite of ch 1, 2, and 1



AVH09C1.A1983120.N07.001.2006029114357.hdf
SDS: Desert flag(red: yes, green: no)



AVH09C1.A1983120.N07.001.2006276025550.hdf
SDS: Desert flag(red: yes, green: no)

Note: Most of the data days could show spatial shift in the data between the beta and reprocessed version. This above example uses a data day where the shift is less than a pixel.

Occurrence:
PGE:

Future Work

- Animation of
  - global browse
  - Regional browse
- Support new products
- Data Intercomparison time series

Intercomparison of LTDR and PAL Datasets
(using NOAA-14 year 1999 data)

Sadashiva Devadiga,

January 18, 2007

Overview

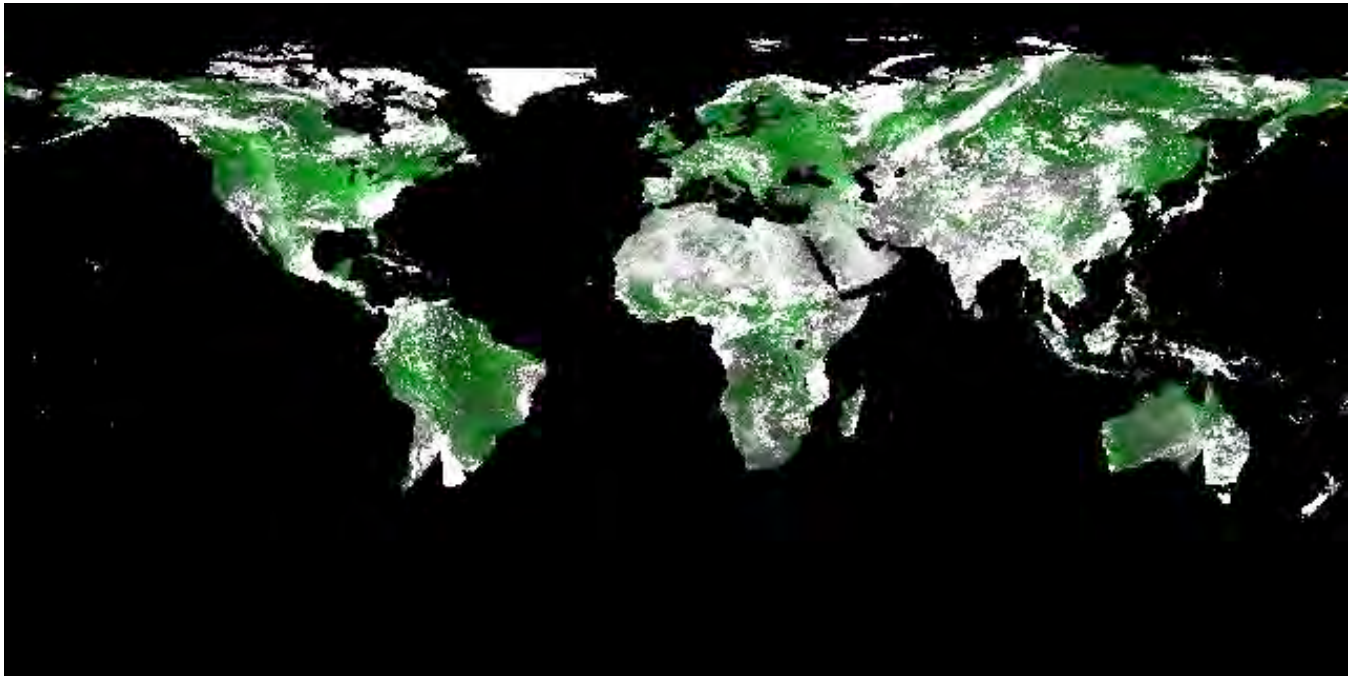
- PAL dataset
- Preprocessing of PAL data
- Filtering of PAL and LTDR data sets
- Spatial comparison
- Temporal comparison
- Conclusion

PAL Datasets
(Pathfinder AVHRR Land data)

- PAL Daily Dataset
  - Daily data sets are global, 8km terrestrial data mapped to an equal area projection.
  - Data sets include NDVI, surface reflectance from channels 1 and 2, brightness temperature from channels 3, 4, and 5, solar and scan geometry, CLAVR Flag, quality control flag, and date and hour of observation.
  - Each dataset is available as tiles in flat binary format.
  - Uses CLAVR algorithm for cloud detection.
  - Ch1 and ch2 are corrected for Rayleigh scattering and ozone absorption, **but not corrected for aerosol or water vapor**.

Preprocessing PAL data

- Stitch the tiles to make one global product for each parameter (8km resolution).
- Reproject the global data to 5km CMG using nearest neighbor resampling.



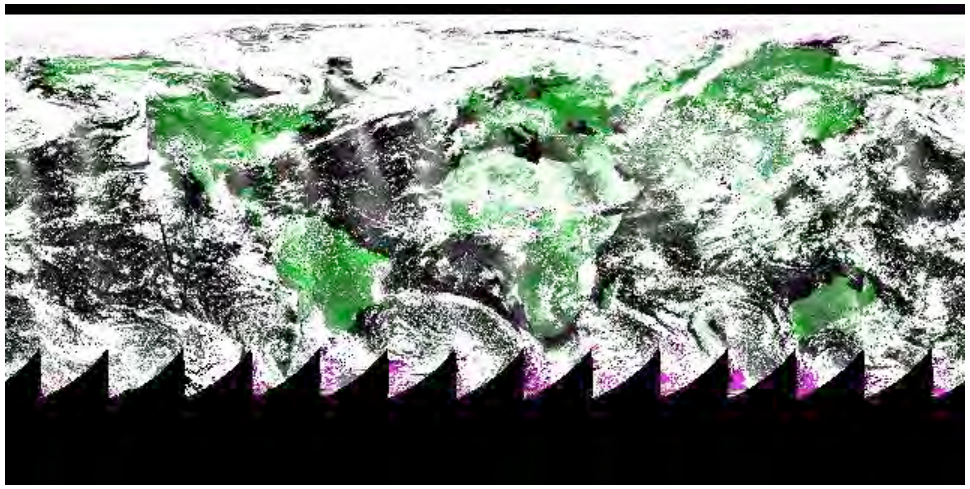
Day 1999-193 (July 12): RGB composite of ch1, ch2 and ch1

Filtering of PAL and LTDR Data

- Use Observations only if
  - Flagged as clear– use cloud flag in LTDR and CLAVR in PAL.
  - Channel is flagged as valid in LTDR
  - Valid observation in both data sets
- Use same observation sets from PAL and LTDR.

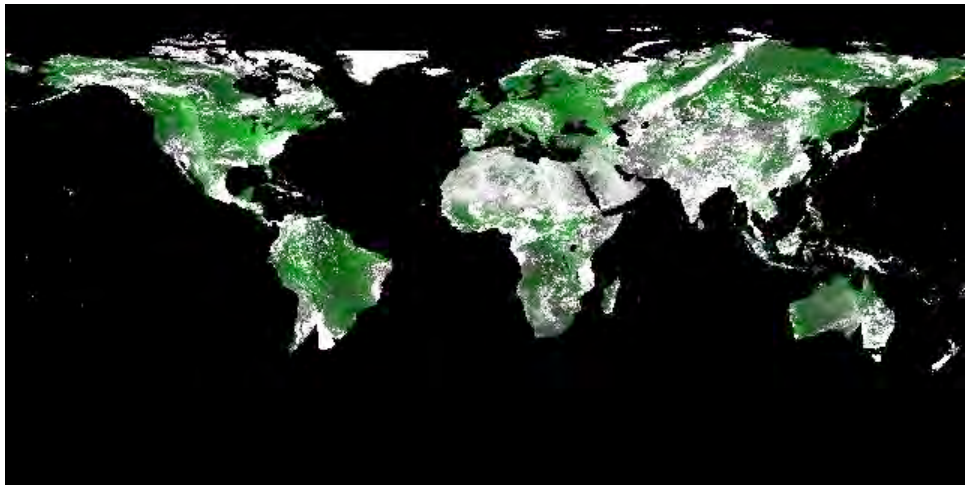
Filtering of PAL and LTDR Data

Data before filtering: RGB composite of ch1, ch2 and ch1



LTDR

1999-193

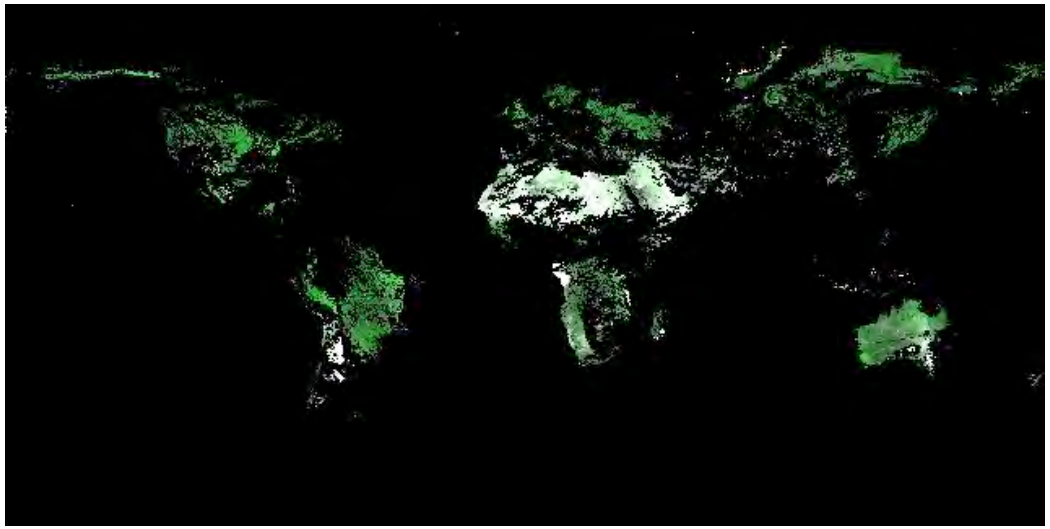


PAL

1999-193

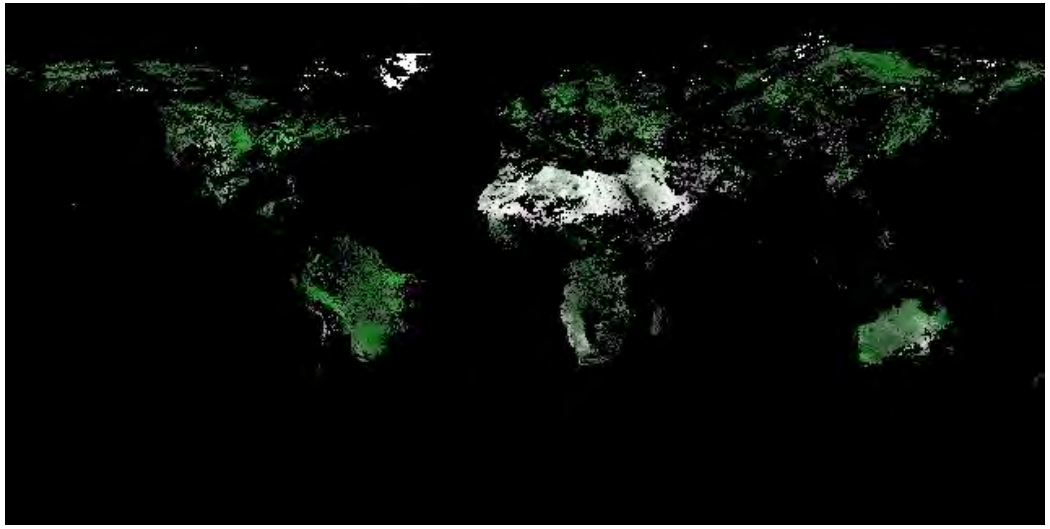
Filtering of PAL and LTDR Data

Data after filtering: RGB composite of ch1, ch2, and ch1



LTDR

1999-193



PAL

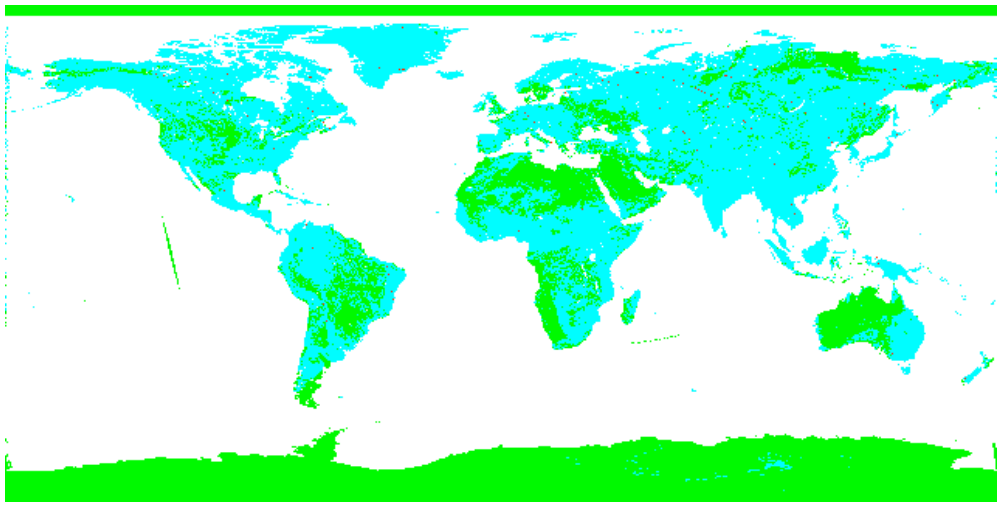
1999-193

Spatial Comparison

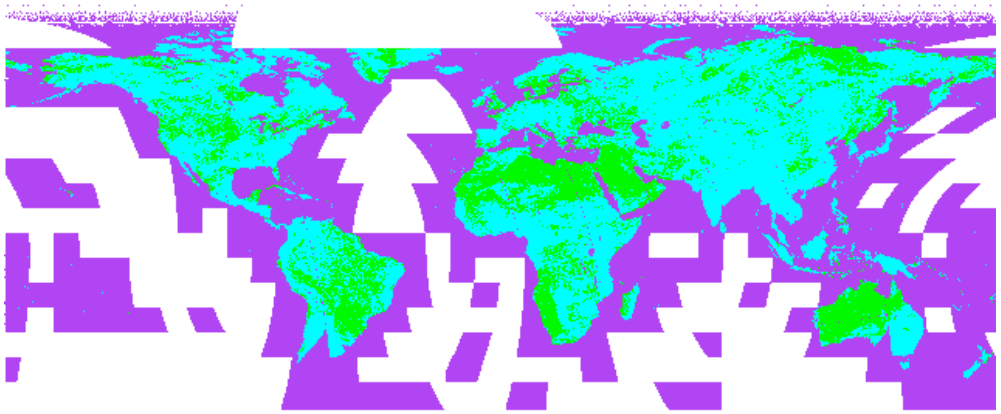
- Only filtered good quality observations are used in the intercomparison.
- Pixelwise difference are used to compare the data sets (global and spatial subset)
- Compared spatial subsets using scatter plots.

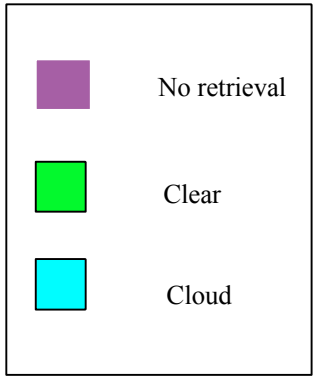
Cloud Flag Comparison - 1999193

LTDR

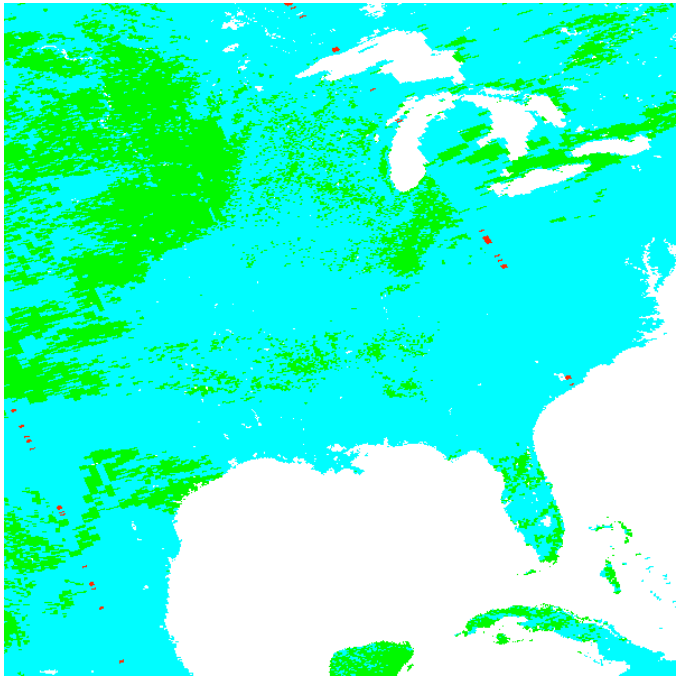


PAL

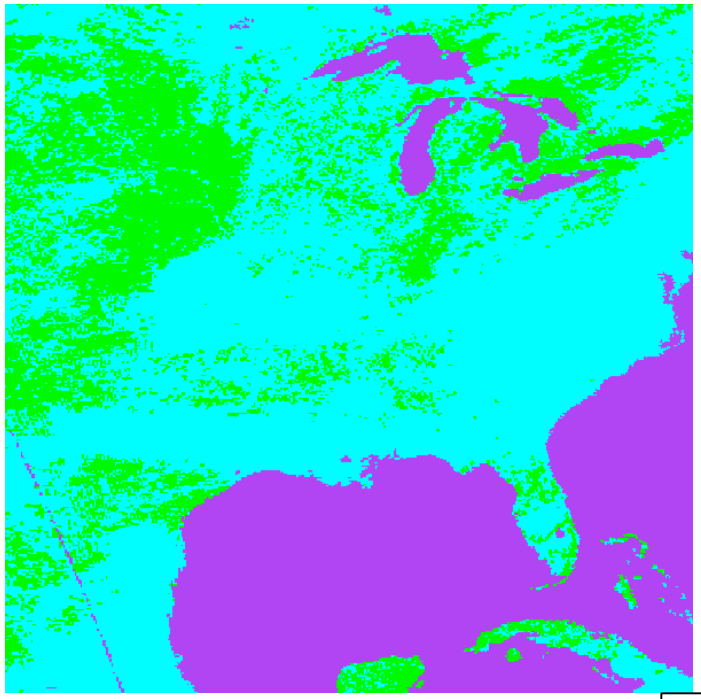




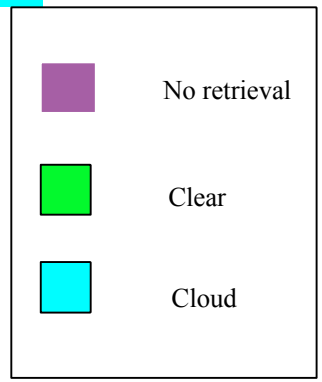
Cloud Comparison – 1999193
Spatial subset



LTDR

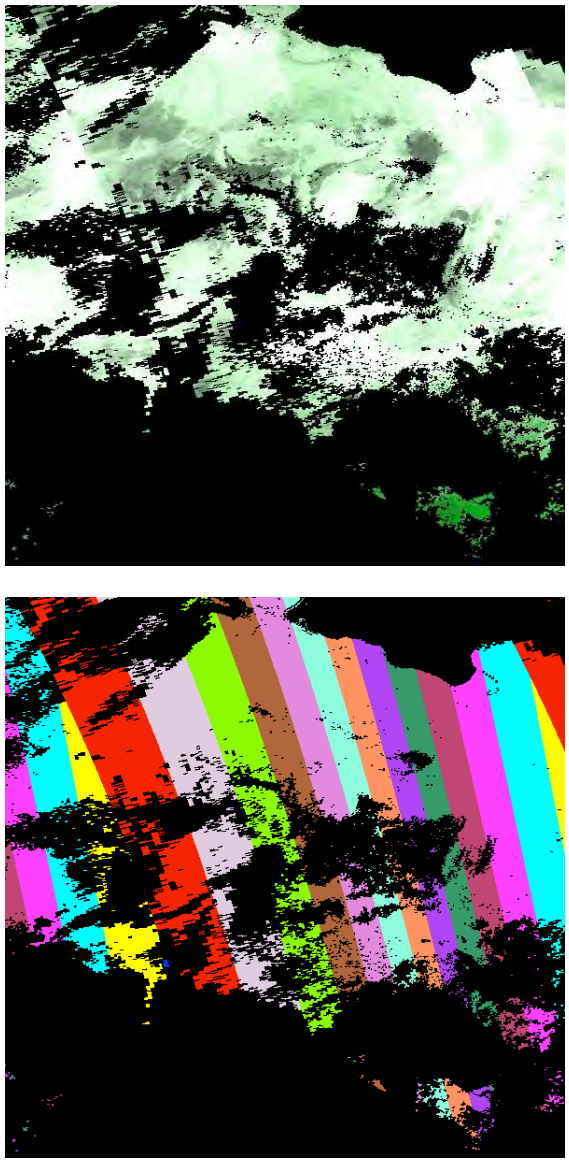


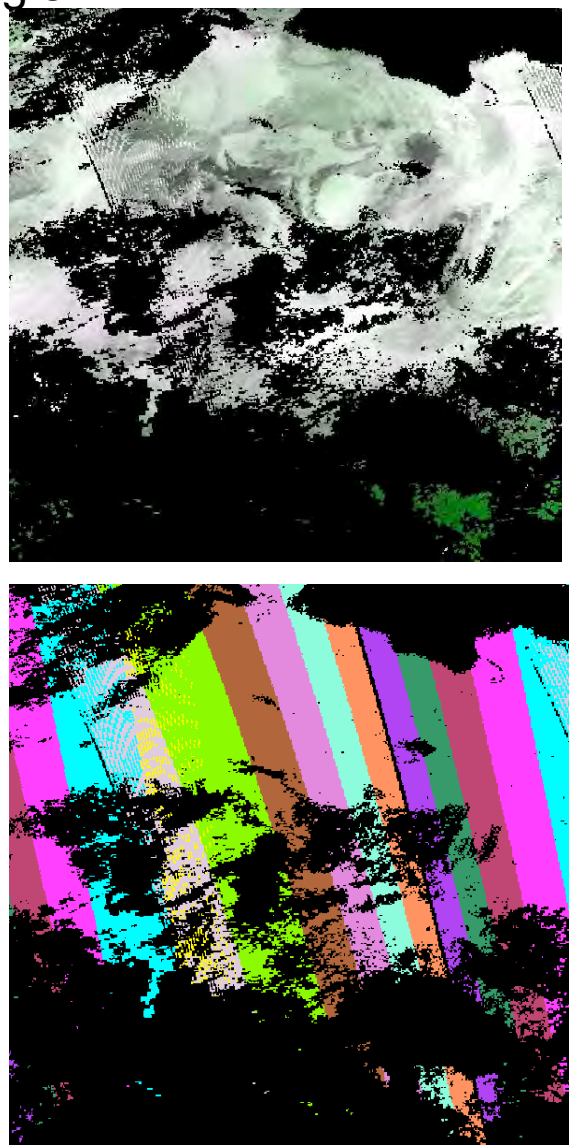
PAL



Spatial Comparison of Viewing Geometry 1999193

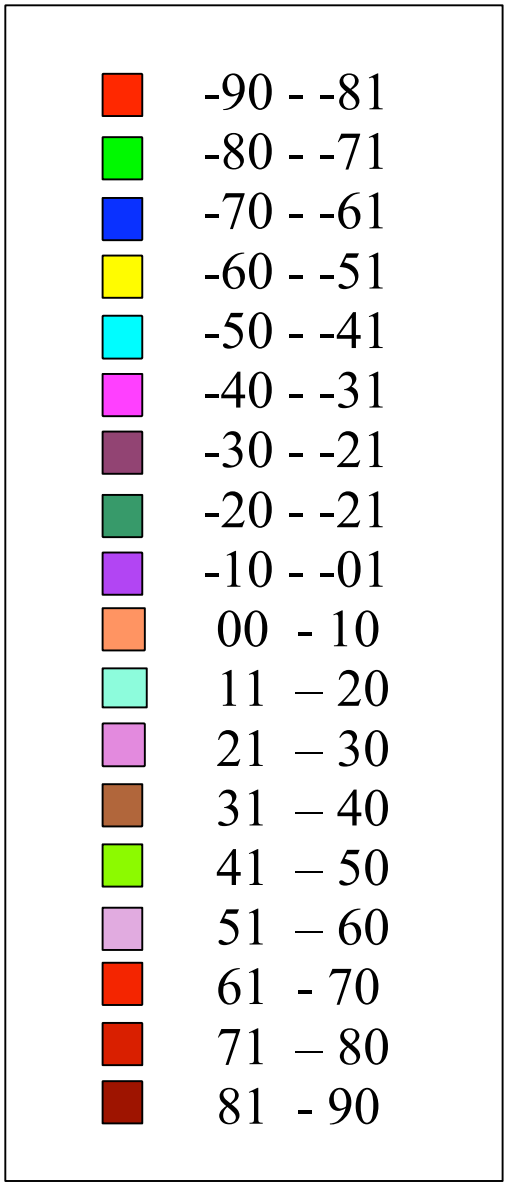
VZEN in LTDR and SCAN Angle in PAL





LTDR

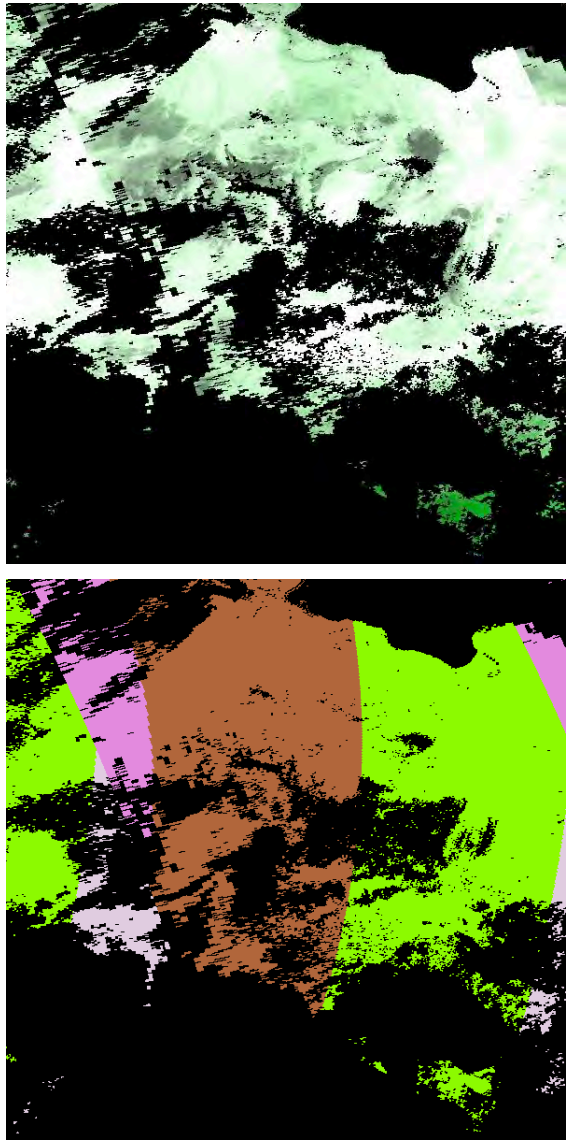
PAL

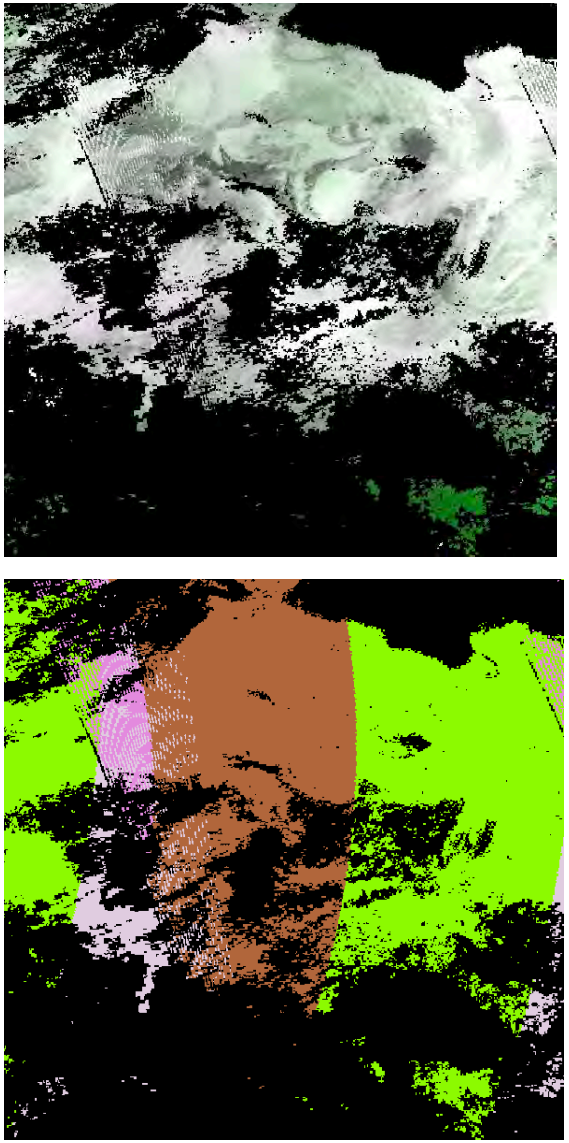


Spatial Comparison of Viewing Geometry - 1999193

SZEN Angle in LTDR and PAL

LTDR



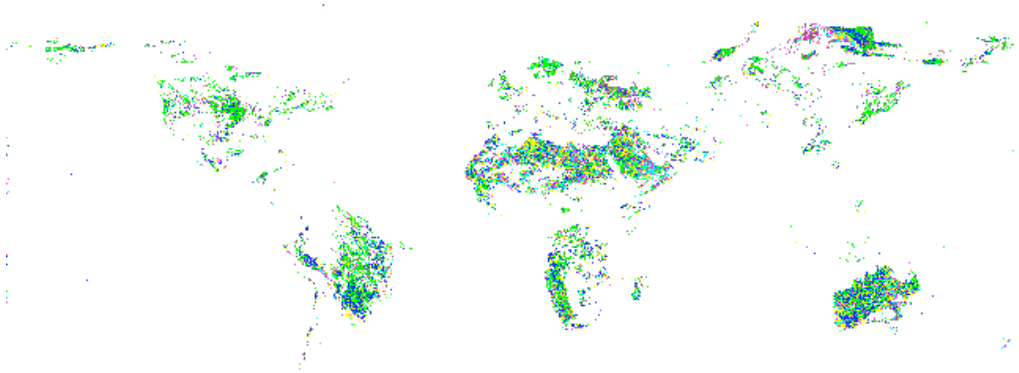


PAL

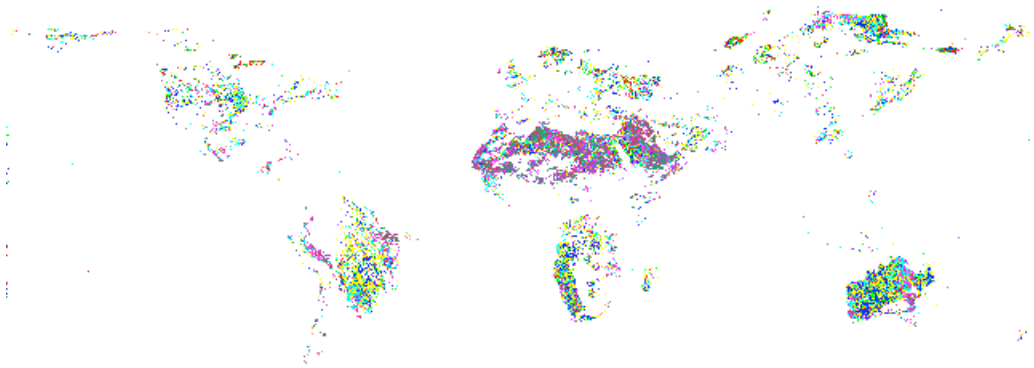
Spatial Comparison

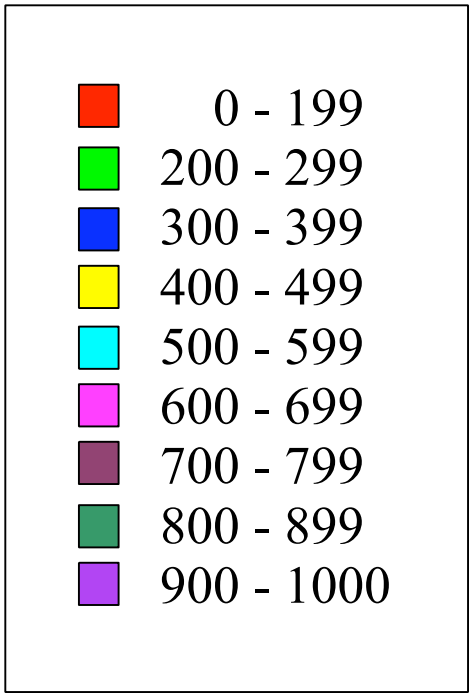
Pixel-wise difference 1999-193

CH1



CH2

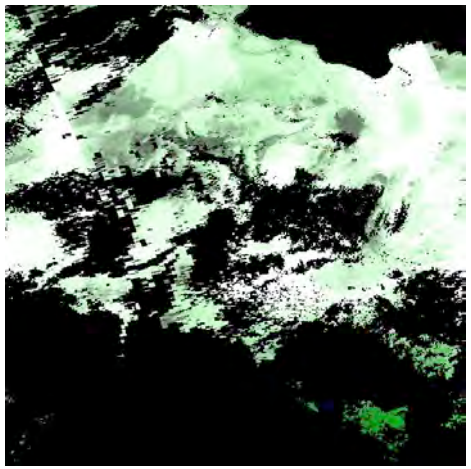


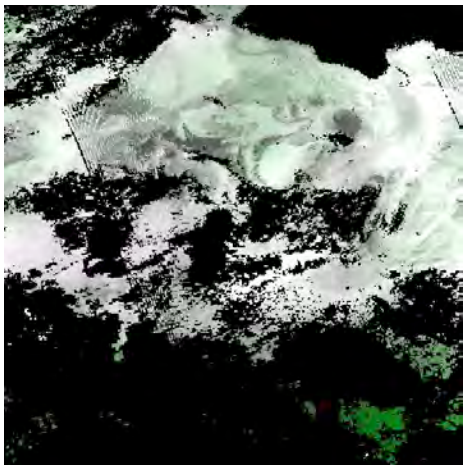


Spatial Comparison

Pixel-wise difference 1999-193

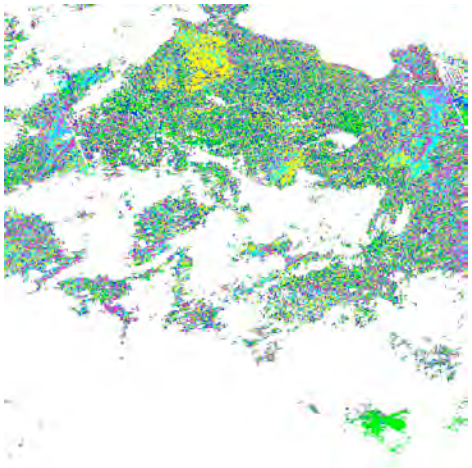
LTDR

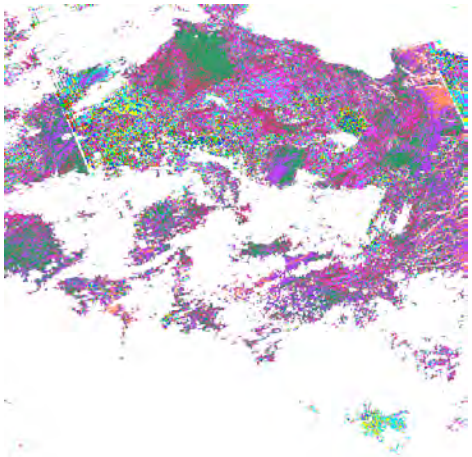




PAL

CH1





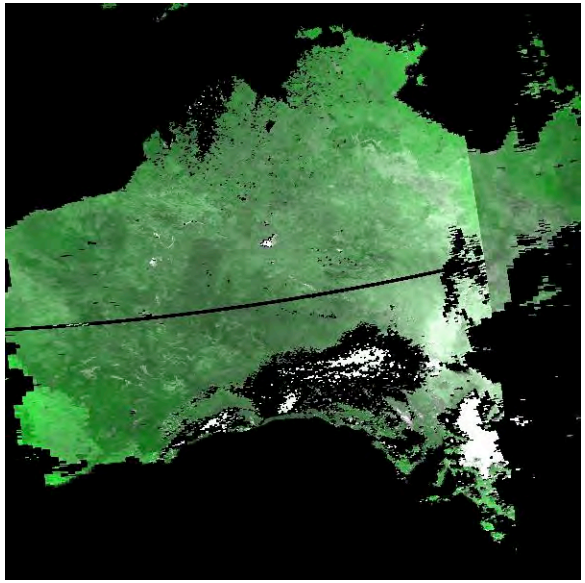
CH2

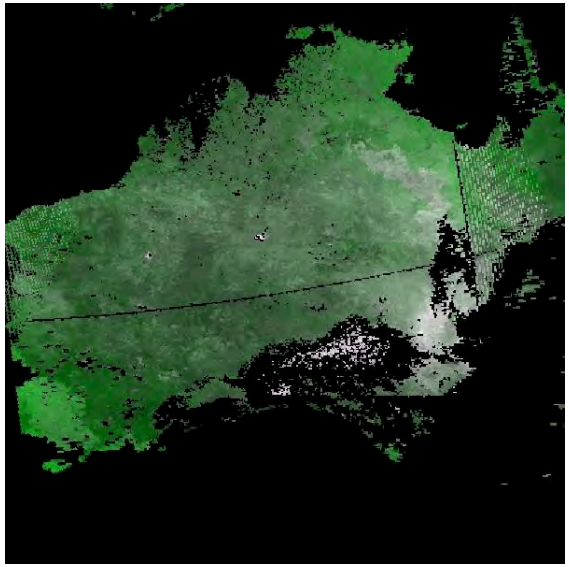
- 0 - 199
- 200 - 299
- 300 - 399
- 400 - 499
- 500 - 599
- 600 - 699
- 700 - 799
- 800 - 899
- 900 - 1000

Spatial Comparison

Scatter Plot: X Axis – LTDR, Y-Axis - PAL

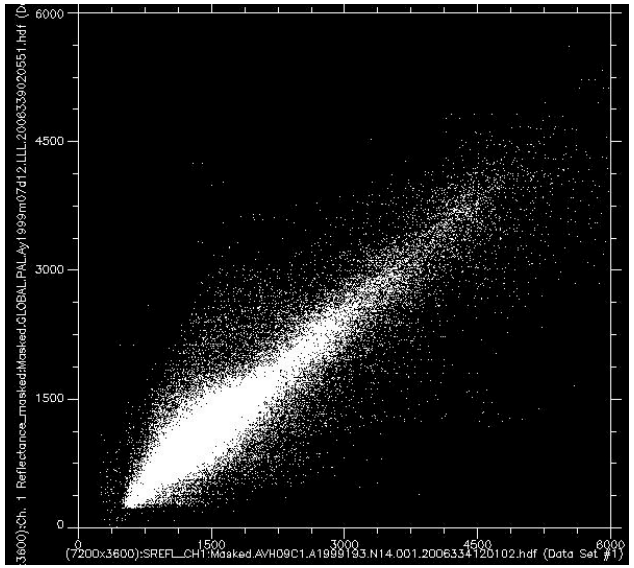
LTDR

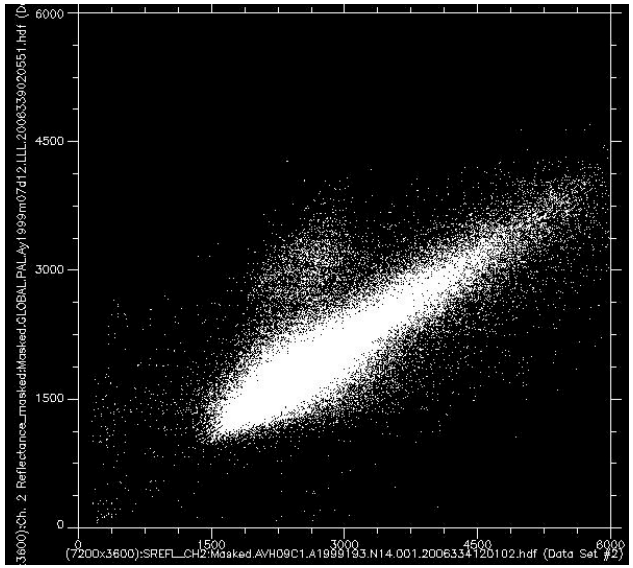




PAL

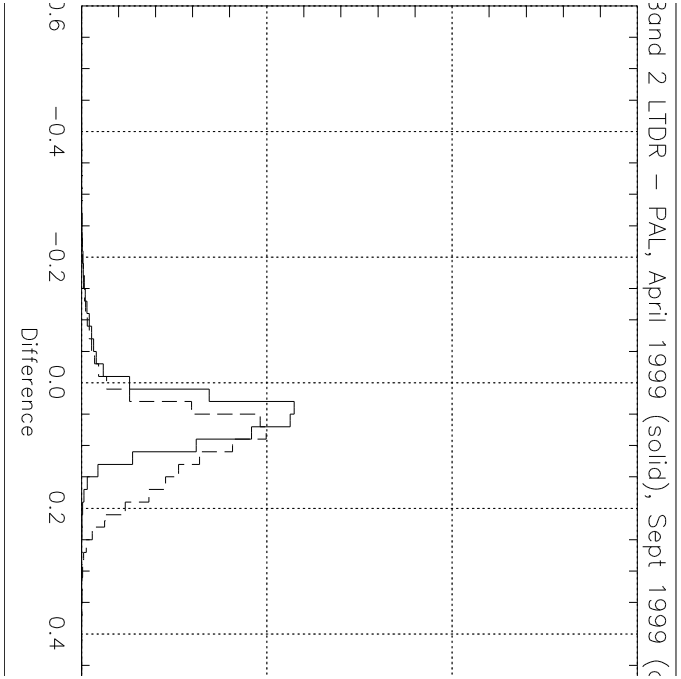
CH1

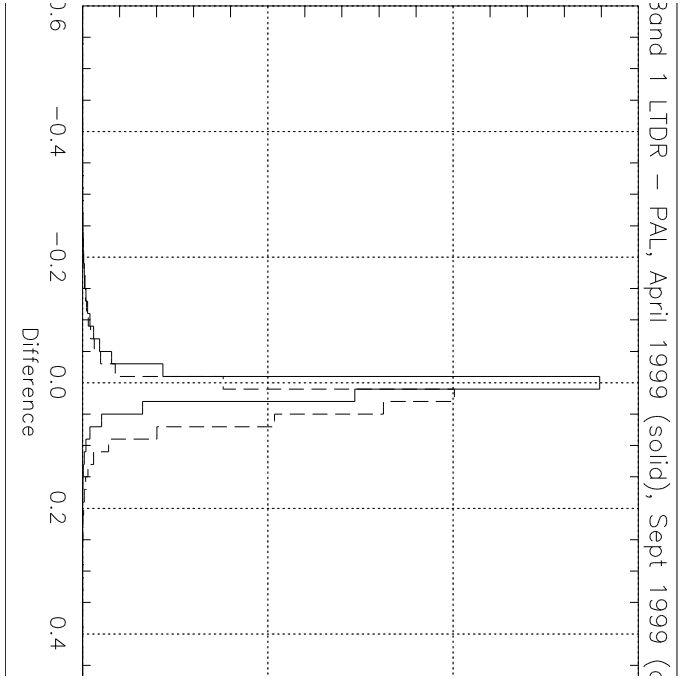




CH2

Histogram of difference in retreived reflectance (LTDR – PAL)





Temporal Comparison

- Time Series of daily summary statistics (mean and standard deviation) are computed for each data sets from the LTDR and PAL daily product.
- Only filtered observations are used in the computation of statistics.
- Same set of observations from PAL and LTDR are used.
- Time series statistics are computed for
  - Aeronet sites (50km x 50km)
  - Biomes at MODIS golden tiles (1200km x 1200km)
  - Biomes (global).
- Complete results are available at http://ltdr.nascom.nasa.gov/cgi-bin/QA_WWW/sciTest.cgi (Click on “NOAA-14 Time Series” in the displayed table.
- Time Series plots are available for ch1 and ch2 reflectance and NDVI. Number of observations used in the statistics computation are also plotted.

Temporal Comparison

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Time Series for NOAA-14 Test

A time series of summary statistics derived from all the LTDR products at a number of fixed globally distributed locations is maintained and monitored by the LTDR QA personnel in order to enable synoptic quality assessment via the internet. Time series statistics are extracted at all aeronet sites and also nine MODIS Land Golden Tiles. Product time series are important because they capture algorithm sensitivity to surface (e.g. vegetation phenology), atmosphere (e.g. aerosol loading) and remote sensing (e.g. sun-surface-sensor geometry) conditions that change temporally, and because they allow changes in the instrument characteristics and calibration to be examined. Please select the year and an aeronet site (listed in aphabetical order) or tile and biome combination).

First: **Second:** ◉ Aeronet ○ Golden Tile

Year:
1992
1993
1994
1995
1996
1997
1998
1999
2000
all

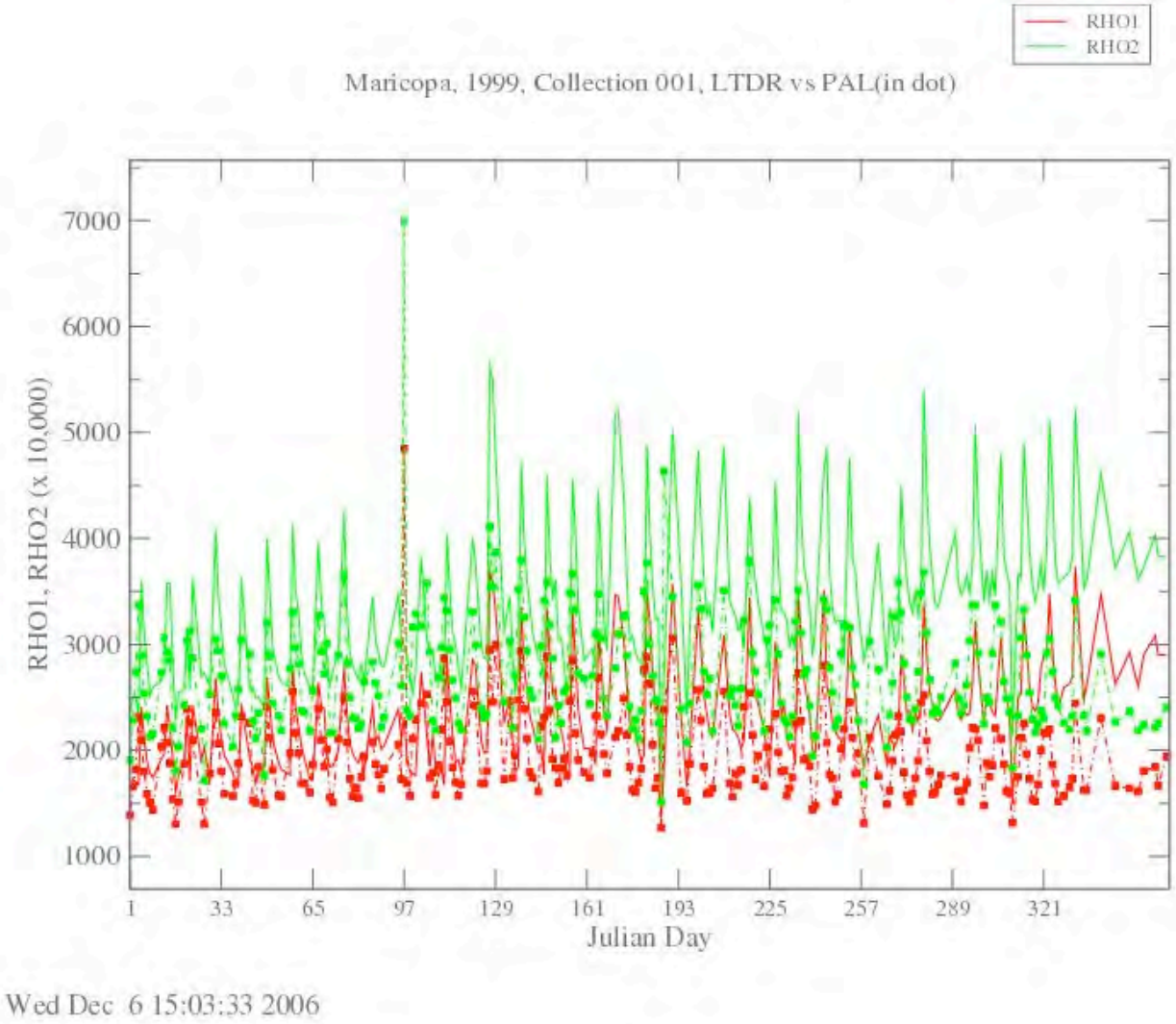
Aeronet area: (Search areas beginning with the selected letter)
A B C D E F G H I J

Tiles:
h09v05 (Southwestern U.S.)
h11v03 (Northwestern Canada)
h11v08 (Northern Amazon)
h11v11 (Northern Chile)
h17v07 (Sahel)
h20v11 (Southern Africa)
h24v04 (Northwestern China)
h26v04 (Northeastern China)
h30v11 (Central Australia)
Global

Biomes:
biome_0 (Water)
biome_1 (Grasses/Cereal)
biome_2 (Shrubs)
biome_3 (Broadleaf Crops)
biome_4 (Savannah)
biome_5 (Broadleaf Forest)
biome_6 (Needleleaf Forest)
biome_7 (Unvegetated)
biome_8 (Urban)

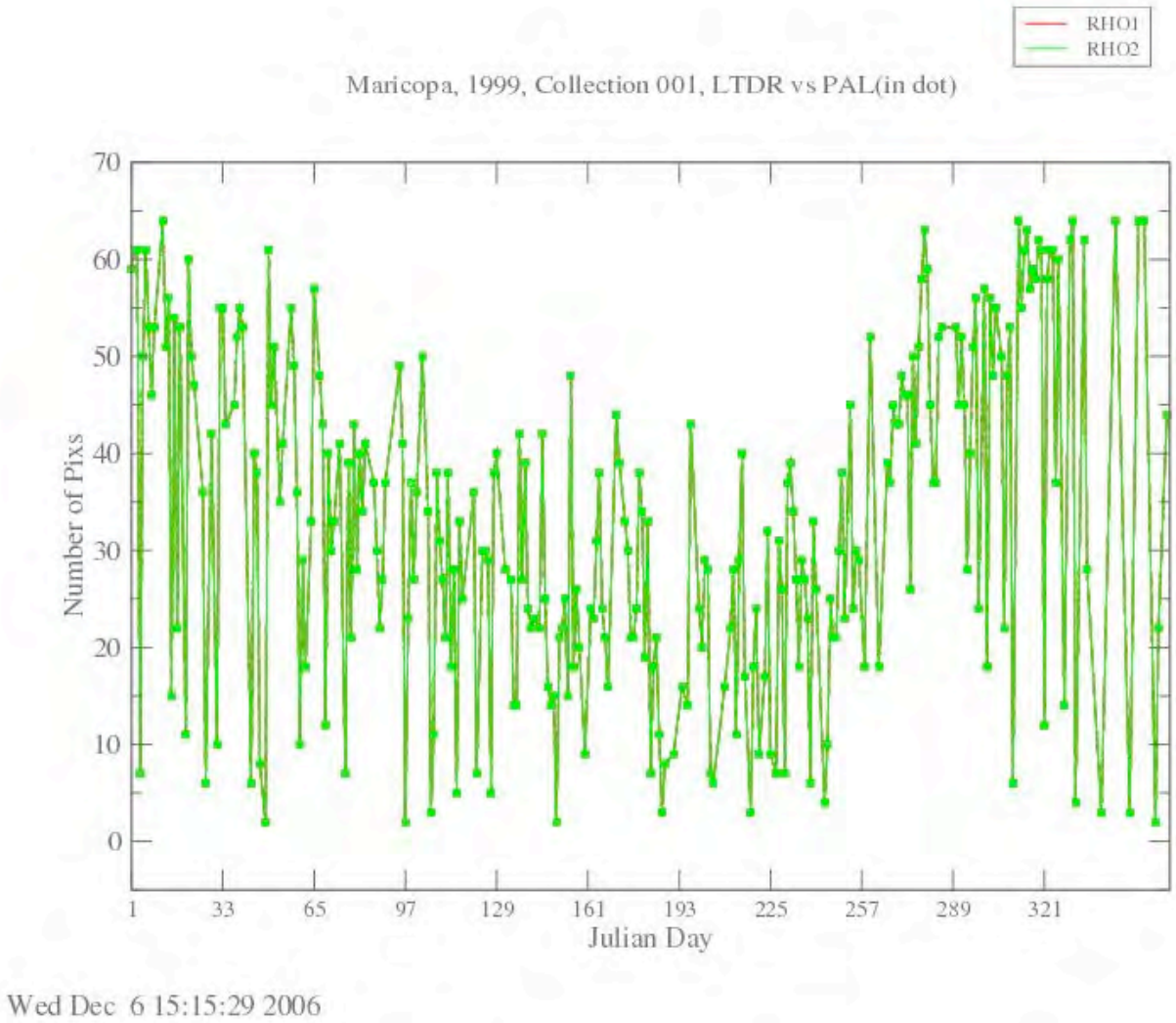
Submit the Request

Temporal Comparison



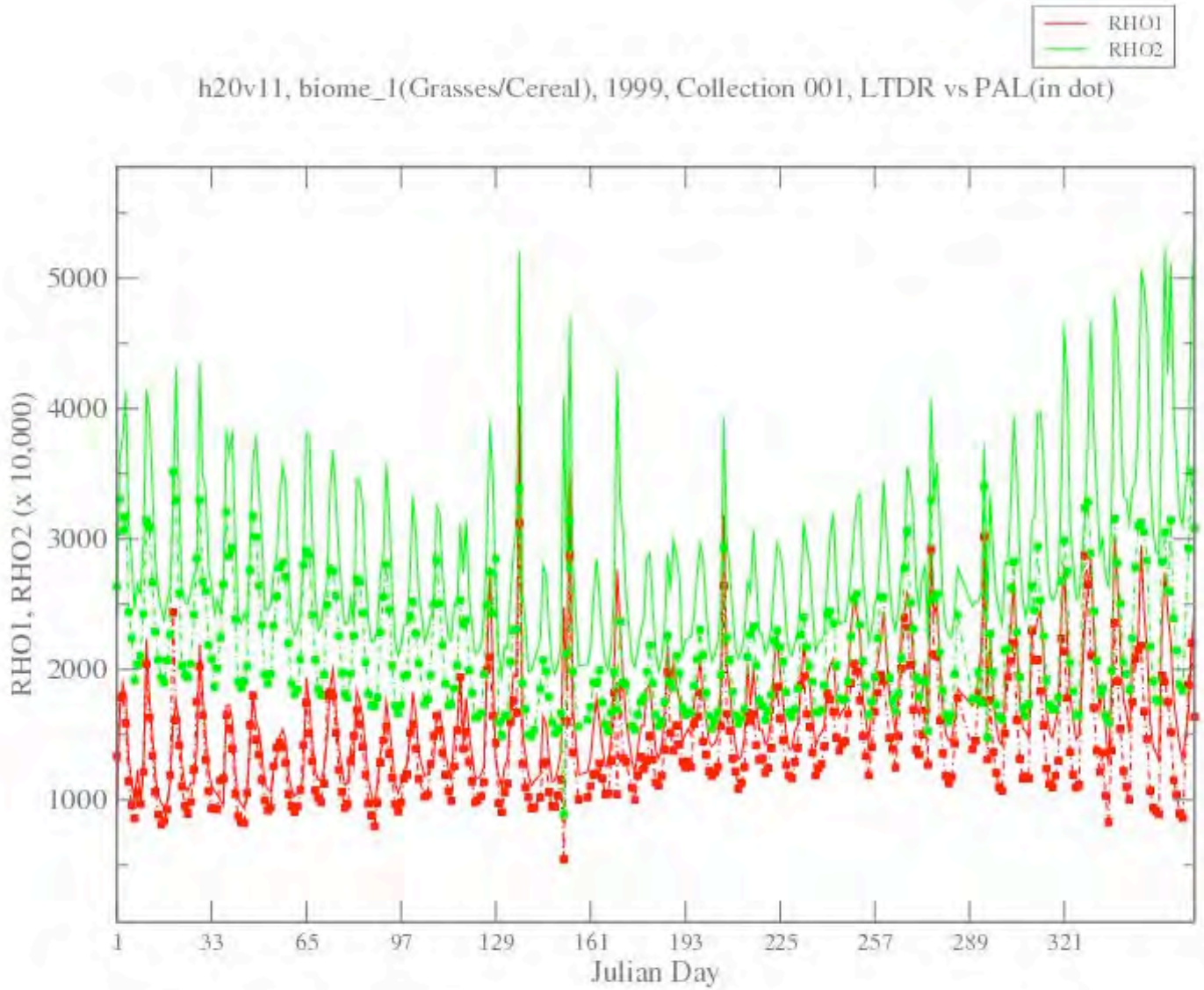
Maricopa Year 1999

Temporal Comparison



Maricopa Year 1999

Temporal Comparison



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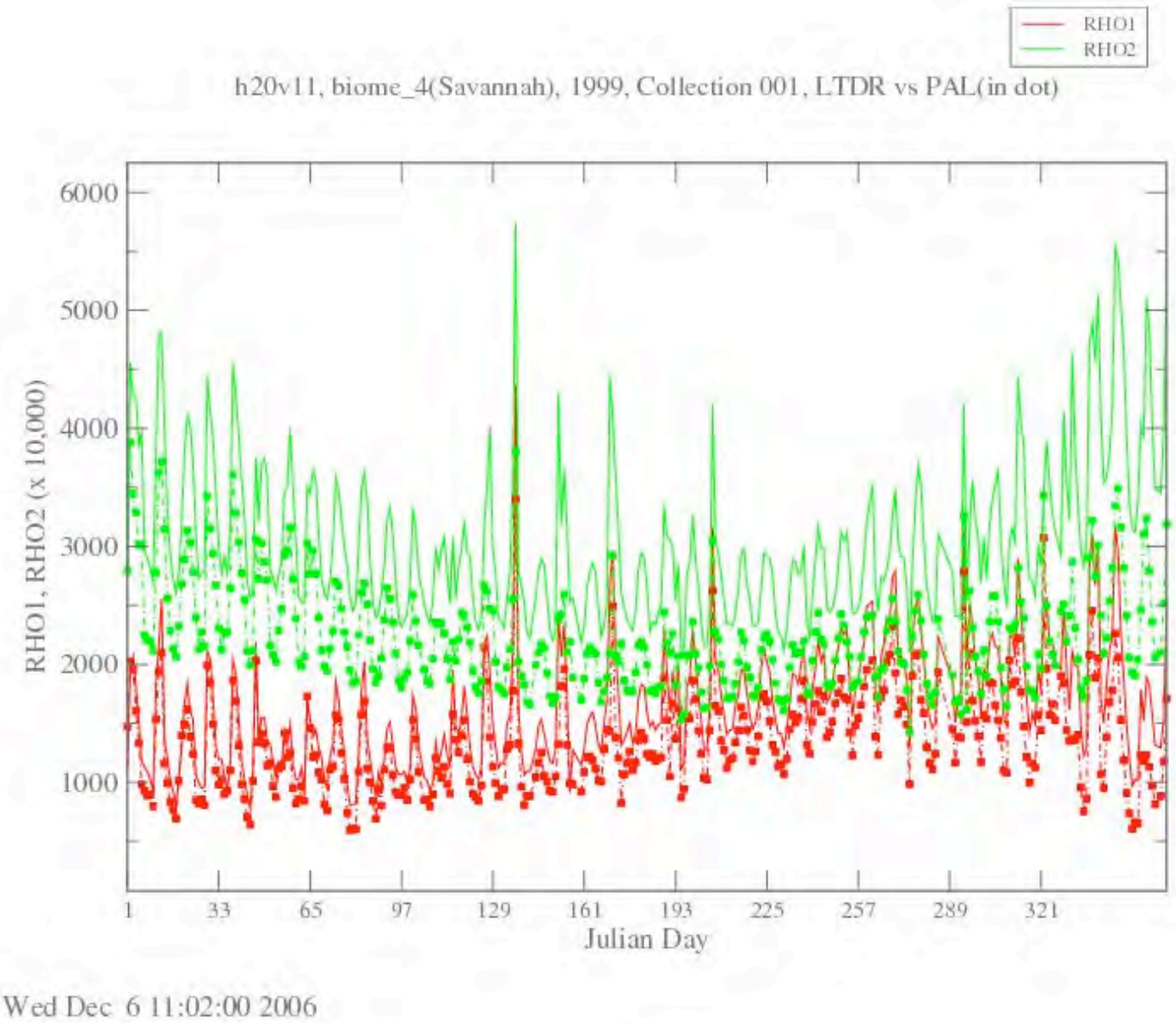
Temporal Comparison



Conclusion

•Higher values of surface reflectance retrieved in LTDR for both ch1 and ch2 compared to PAL – due to water vapor correction in LTDR.

•Visual inspection do not reveal any obvious problem or artifact in LTDR compared to PAL

•Time series plots of PAL and LTDR are comparable except for the consistent magnitude difference seen across all season over all biomes and aeronet sites.