

Long Term Land Data Records

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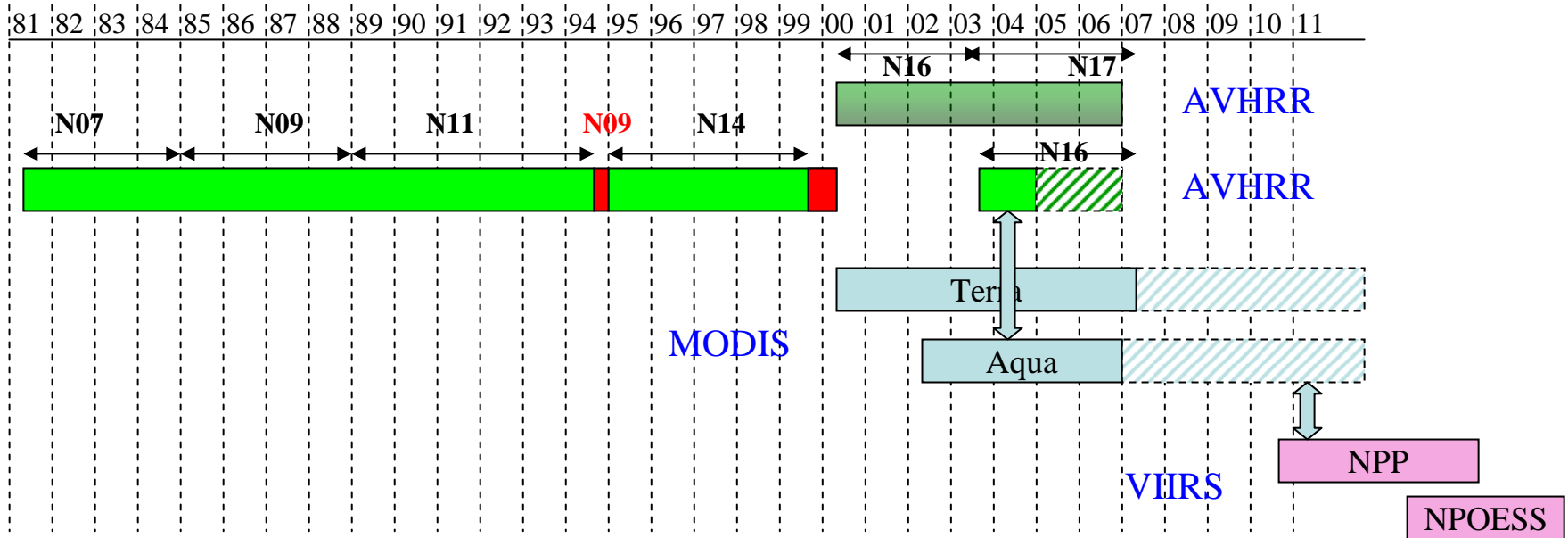
NOAA: Anna Pinheiro

South Dakota State: David Roy

Boston University: Crystal Schaff

LCLUC Meeting May, 2, 2008

Data Sources - LTDR



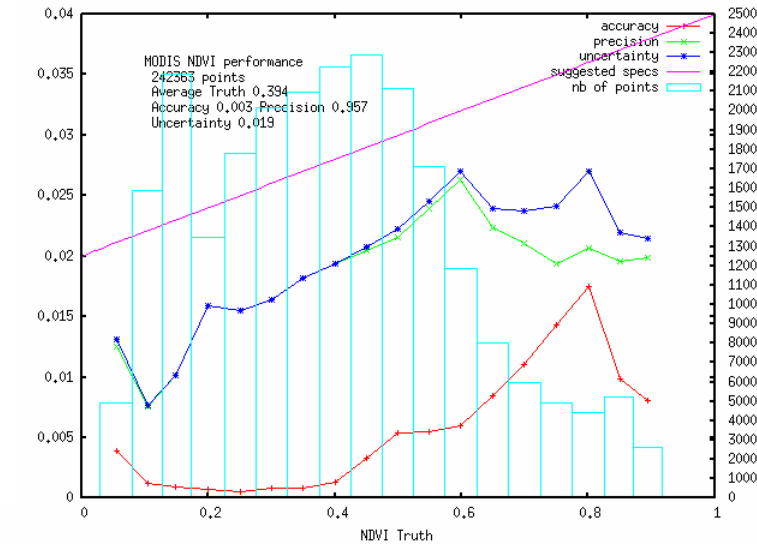
AVHRR (GAC) 1982-1999 + 2003-2006

MODIS (MO(Y)D09 CMG) 2000-present

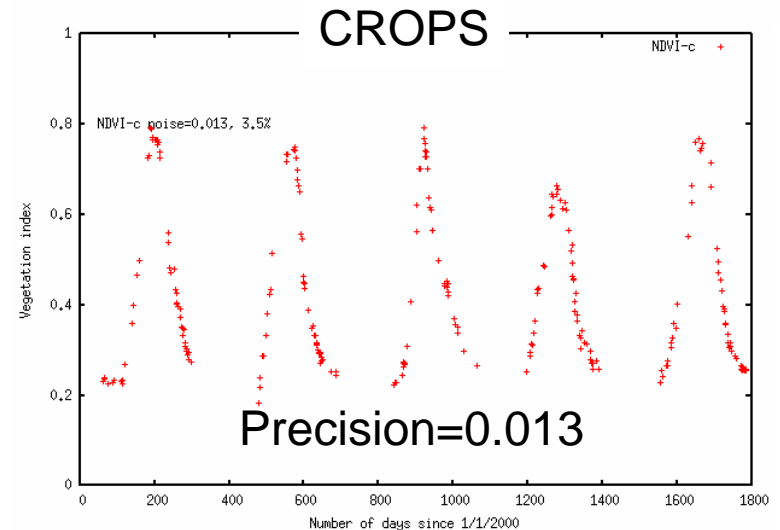
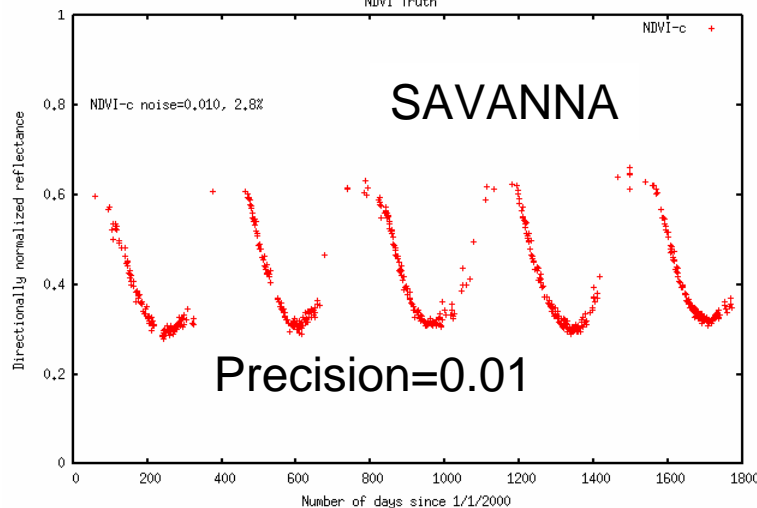
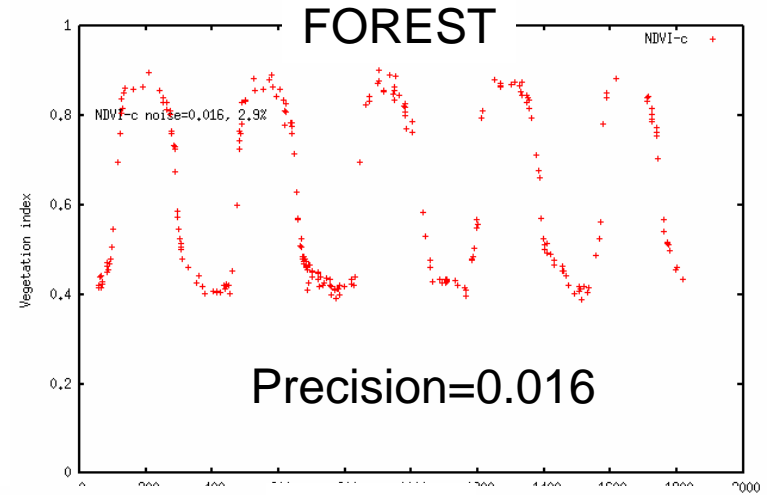
VIIRS 2010 – 2020 (global gridded comparison products)

MODIS used as a reference for past and future land data record (example NDVI)

Evaluation over AERONET (2003)
 $0.007 < \text{Precision} < 0.017$

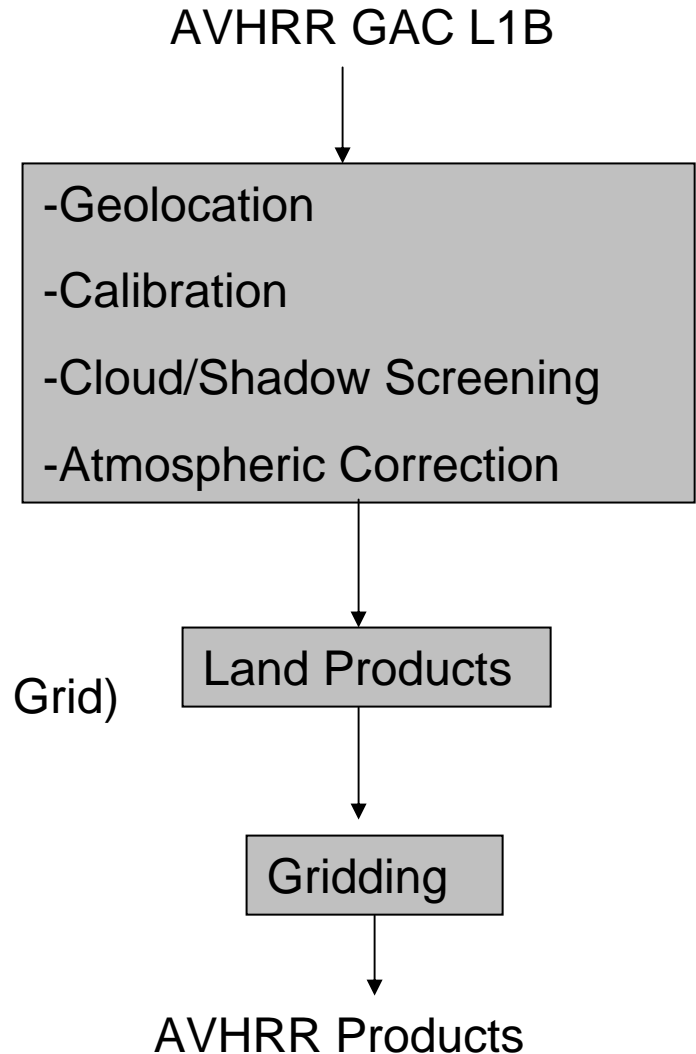


Independent evaluation of the precision
 Over 2000-2004 CMG daily time series



AVHRR Data Production and Status

- Algorithms:
 - Vicarious calibration (Vermote/Kaufman)
 - Cloud screening: CLAVR-1
 - Partial Atmospheric Correction:
 - Rayleigh (NCEP)
 - Ozone (TOMS)
 - Water Vapor (NCEP)
- Products:
 - Daily surface reflectance (AVH09C1)
 - Daily NDVI (AVH13C1)
- HDF-EOS Format:
 - Linear Lat/Lon projection
 - Spatial resolution: 0.05° (Climate Modeling Grid)
- Time Period:
 - 1981 – 2000 completed
- Distribution:
 - ftp and web



LTDR Web Page

The image shows two browser windows from Mozilla Firefox. The left window displays the main LTDR website at <http://ltdr.nascom.nasa.gov/ltdr/ltdr.html>. The page features the LTDR logo, two satellite images of Earth, and the heading "Land Long Term Data Record". Below this, a paragraph describes the project as a NASA-funded REASoN project to produce a global coarse-resolution AVHRR, MODIS, and VIIRS dataset. A navigation menu includes links for "Project Overview and Science Background", "Documents and Presentations", "AVHRR Vicarious Calibration", "Data Products", "Participants", "Feedback", and "Updates/ Changes History".

The right window shows the "AVHRR Calibration" page at http://ltdr.nascom.nasa.gov/ltdr/avhrr_calib.html. It includes the heading "AVHRR Calibration" and a paragraph explaining the need for consistent calibration. It mentions the use of vicarious calibration approaches like the one by Vermote and Kaufman (1995) and provides links to calibration coefficients for NOAA-7, NOAA-9, NOAA-11, NOAA-14, and NOAA-16.

Below the text are two scatter plots. The top plot shows "Degradation in channel 1 (from ocean observations)" on the y-axis (ranging from 0.8 to 1.1) against "Year" on the x-axis (ranging from 1980 to 2005). Data points are color-coded by satellite: NOAA-7 (black), NOAA-9 (blue), NOAA-11 (green), NOAA-14 (red), and NOAA-16 (magenta). The bottom plot shows "Change in channel 2 ratio (from cloud observations)" on the y-axis (ranging from 1.05 to 1.3) against "Year" on the x-axis (ranging from 1980 to 2005). Data points are color-coded by satellite: NOAA-7 (black), NOAA-9 (blue), NOAA-11 (green), NOAA-14 (red), and NOAA-16 (magenta).

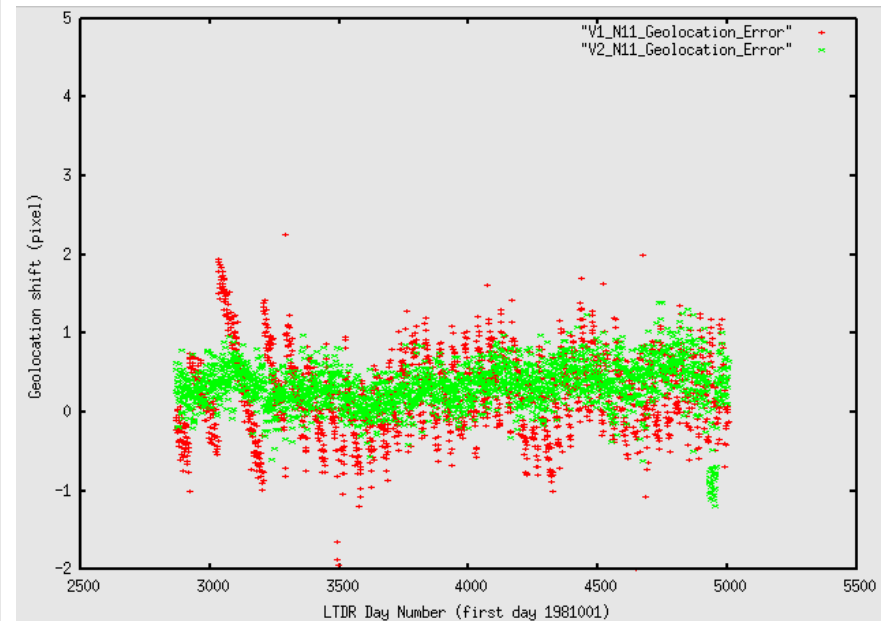
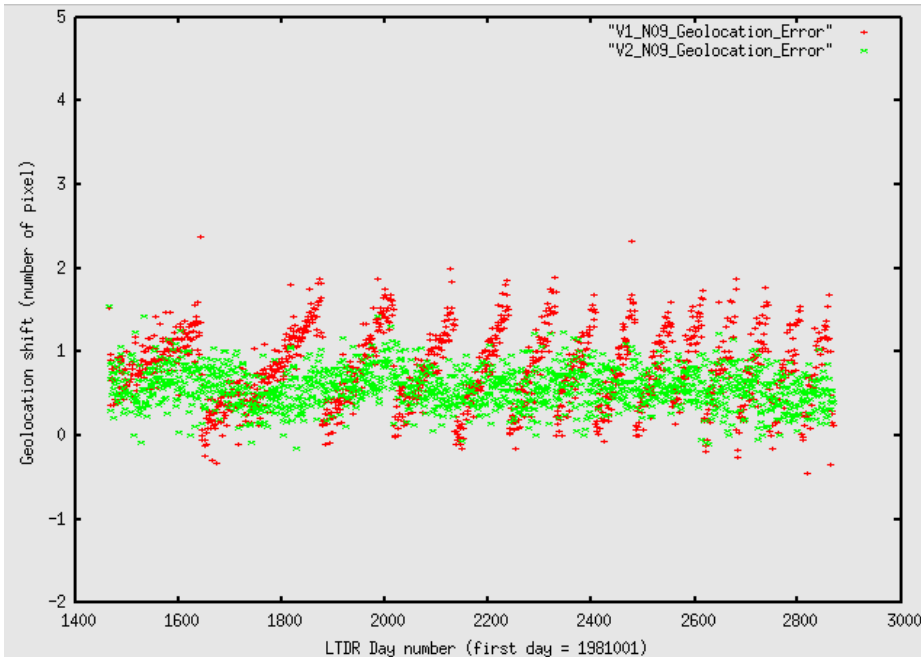
Data Sets

- Beta Quality (Version 1)
 - Released in Summer 2006
 - Evaluation of data revealed following issues
 - Geolocation shift due to bad ephemeris
 - Calibration error
 - Cloud mask error
- Version 2
 - Released in Summer 2007
 - Improved geolocation, water vapor and calibration

Geolocation Accuracy N09 and N11

Red points: Version 1.0 geolocation accuracy

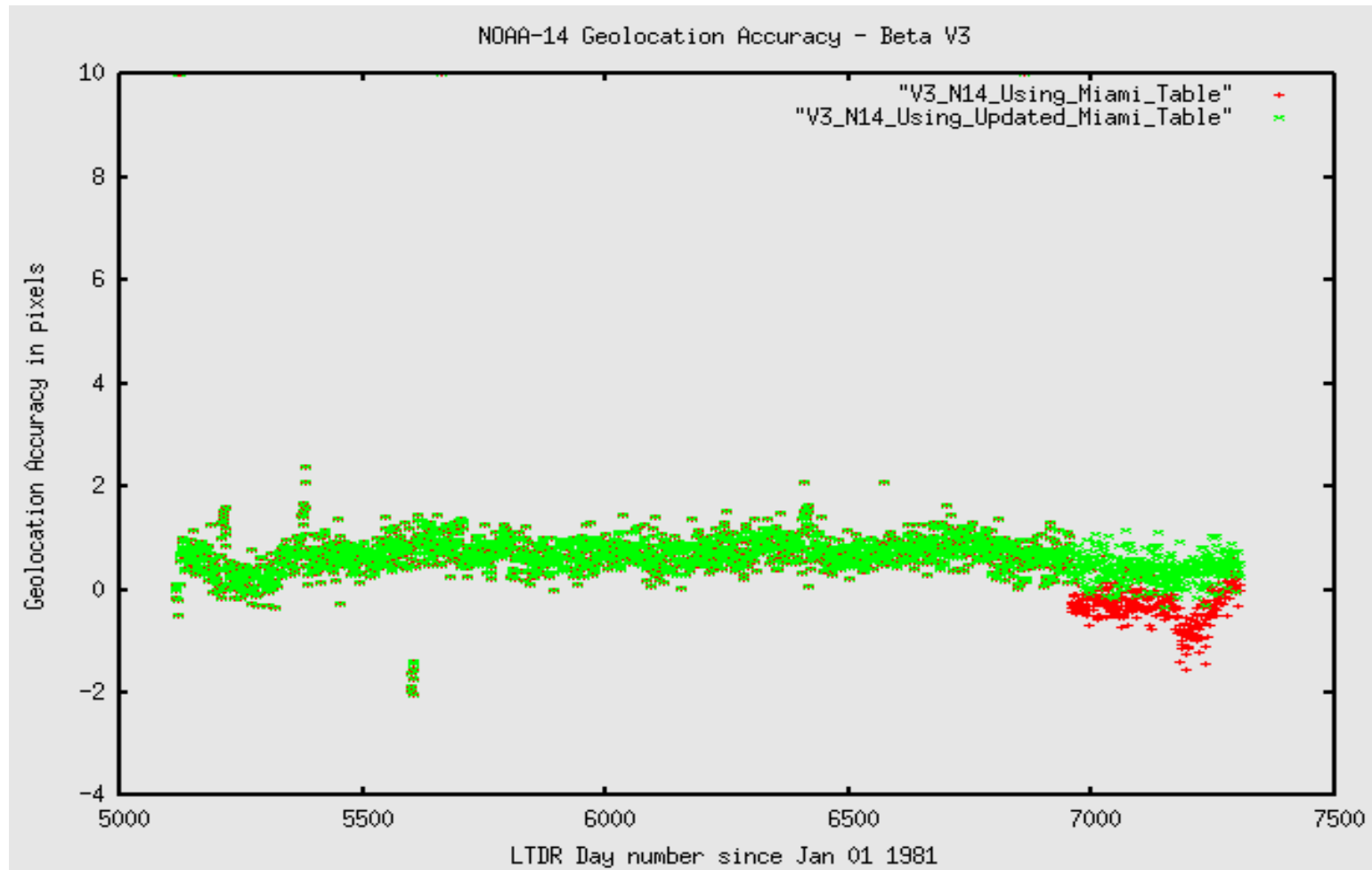
Green points: Version 2.0 geolocation accuracy



Geolocation Accuracy N14

Red points: Version 2.0 geolocation accuracy (Miami Clock corrections)

Green points: Version 3.0 geolocation accuracy (adjusted clock corrections)



Calibration of NOAA 16 AVHRR



Available online at www.sciencedirect.com



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Environment

www.elsevier.com/locate/rse

Calibration of NOAA16 AVHRR over a desert site using MODIS data

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Abstract

This paper presents a new approach to AVHRR-sensors cross-calibration in the visible to shortwave-infrared spectral domain using an a-priori, well calibrated sensor (MODIS). The approach has been tested over a stable Sahara desert site and was initially applied to compare the absolute calibration coefficients of three different bands of the Terra and Aqua MODIS instruments. The observed agreement was better than 1% for bands 1 (0.67 μm), 2 (0.87 μm) and 7 (2.13 μm). The approach was then applied to cross-calibrate the AVHRR sensor onboard NOAA16. The absolute calibration coefficients derived for bands 1 and 2, using the Terra MODIS as a reference, were compared to the vicarious coefficients derived using the ocean and clouds method (Vermote E.F. and Kaufman Y.J. (1995). Absolute calibration of AVHRR visible and near-infrared channels using ocean and cloud views, International Journal of Remote Sensing, 16, 13, 2317–2340). The coefficients were consistent within less than 1%. © 2006 Elsevier Inc. All rights reserved.

Keywords: Calibration; AVHRR; MODIS



Fig. 2. Location of the 20 km by 20 km calibration site (centered on the red square). The image represents an area of 1000 km by 1000 km.

The coefficients were consistent within less than 1%

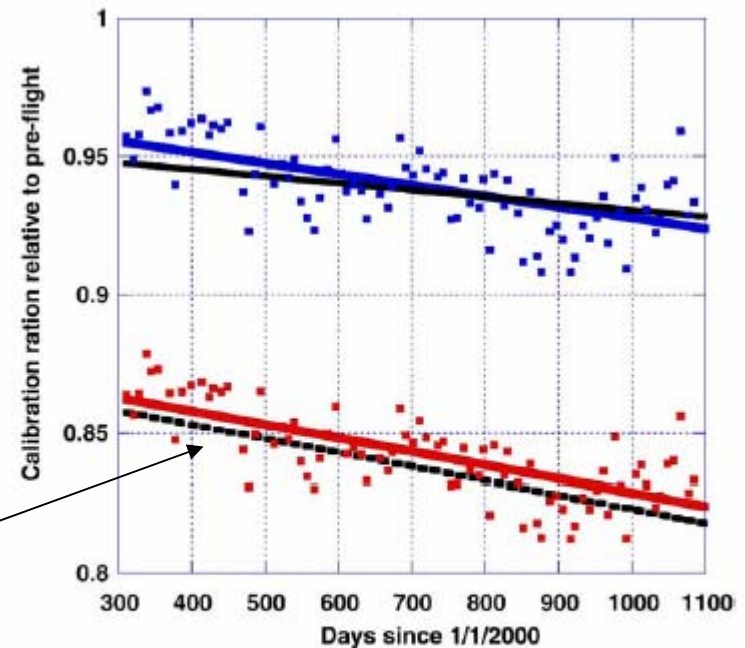
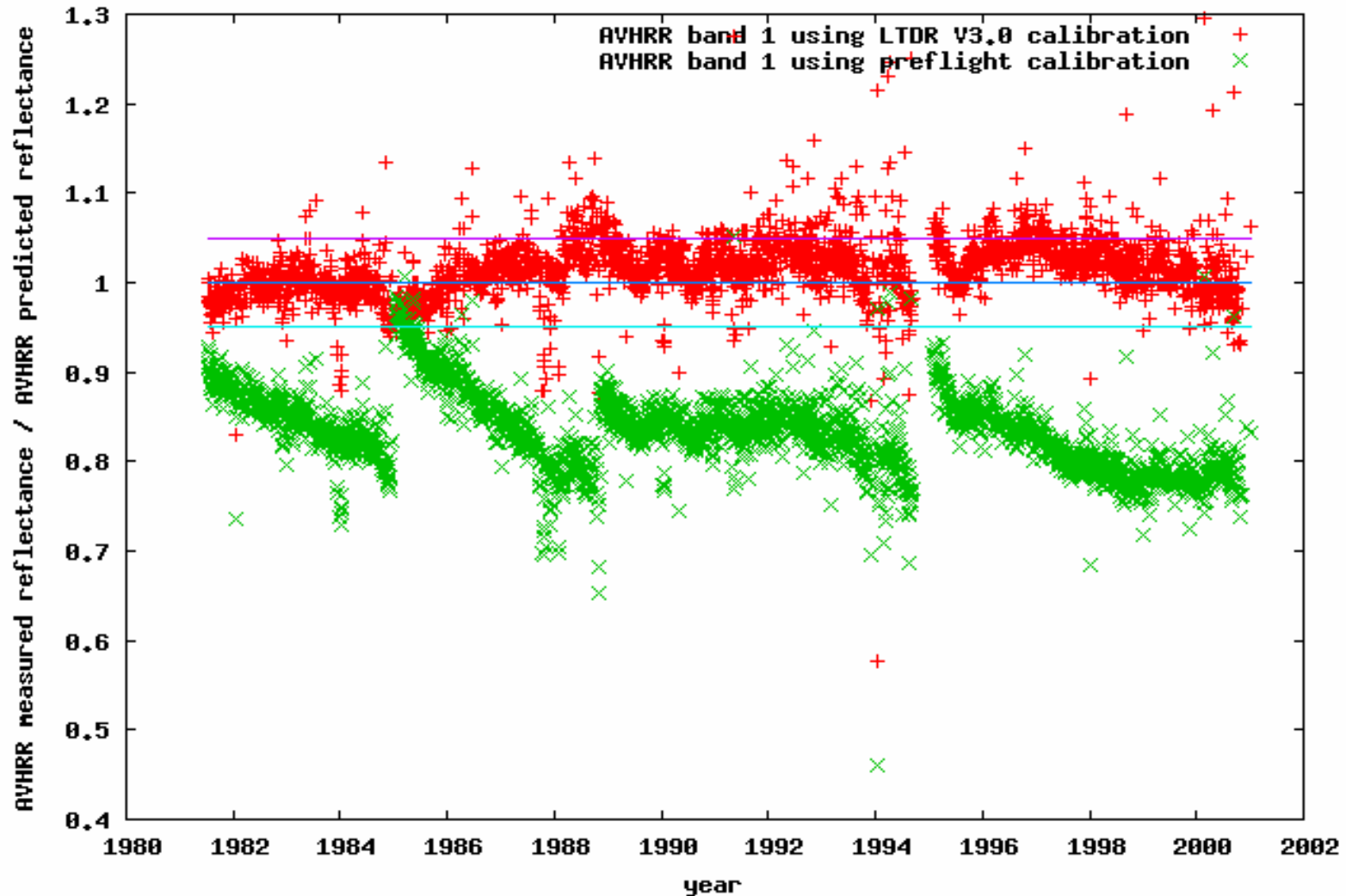


Fig. 11. Comparison of the desert calibration trends for band 1 (black solid line) and band 2 (black interrupted line), with the trends obtained using the Ocean and Clouds method (Vermote and Kaufman, 1995) for band 1 (blue line and square) and band 2 (red line and square).

Extension of calibration evaluation to NOAA 7,9,11 and 14 (on-going)

V3.0 Calibration evaluation over Lybian desert



AVHRR AND MODIS daily time series used to investigate vegetation onset in Europe

GEOPHYSICAL RESEARCH LETTERS, VOL. 35, L02404, doi:10.1029/2007GL032472, 2008



Mild winter and spring 2007 over western Europe led to a widespread early vegetation onset

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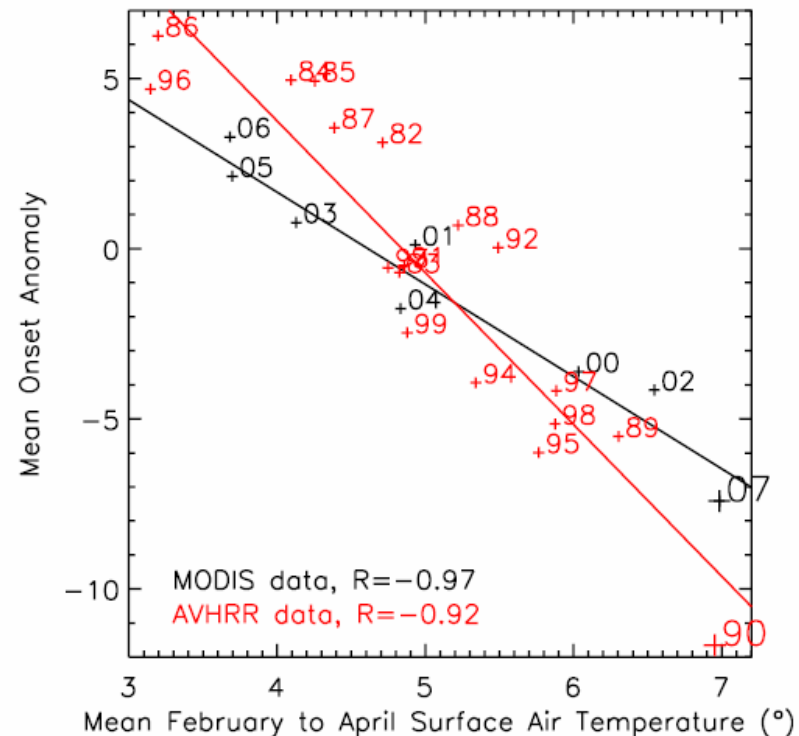
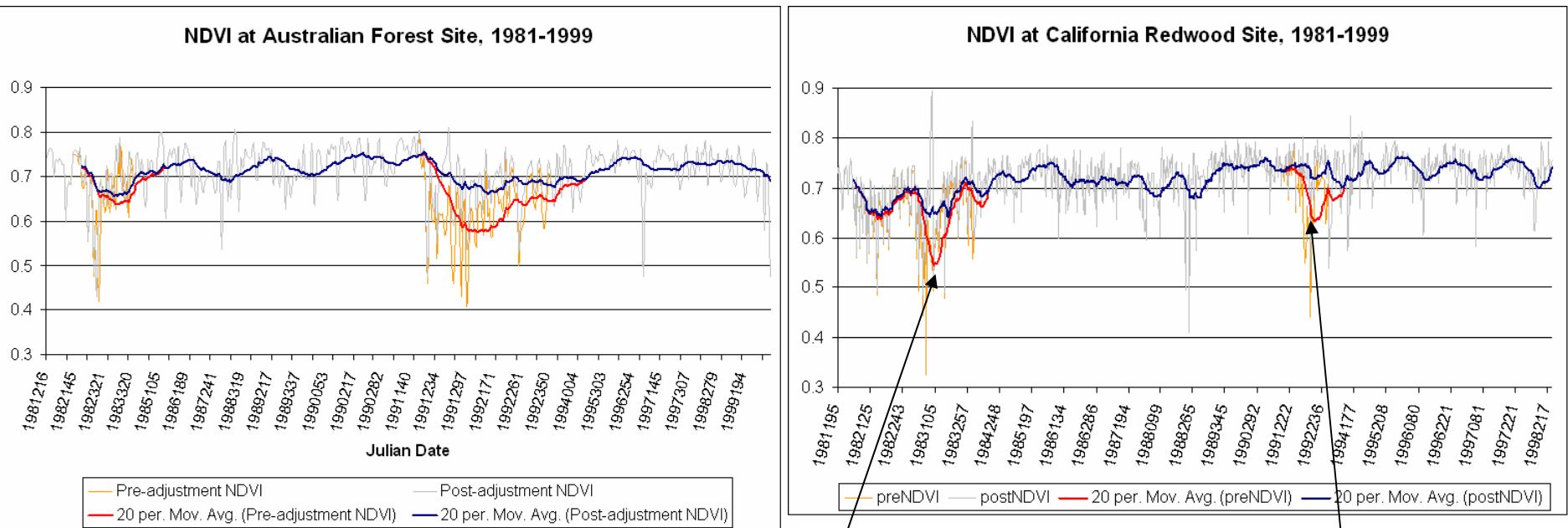


Figure 2. Scatterplot of the vegetation onset date anomaly against the February–April mean temperature. Both parameters have been averaged at the subcontinent scale. The phenology parameters have been derived from the MODIS data for the 2000–2007 period and AVHRR data for the 1982–1999 period. The temperatures are 2m air temperatures from the NCEP reanalysis [Kalnay *et al.*, 1996].

Correction for stratospheric aerosol

Red curve: AVHRR NDVI not corrected for stratospheric aerosol

Blue curve: AVHRR NDVI corrected for stratospheric aerosol

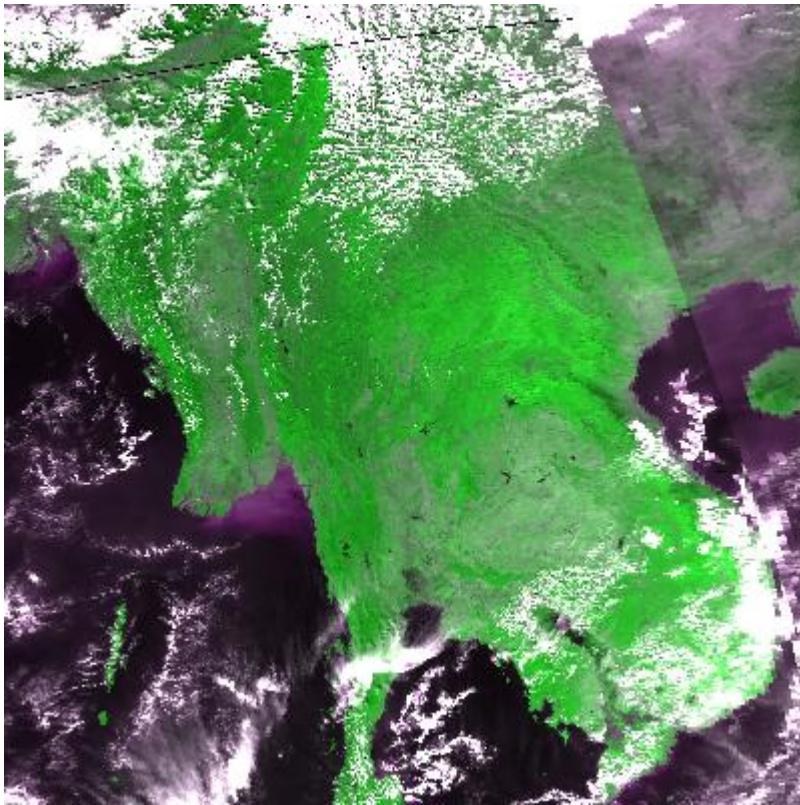


El Chichon

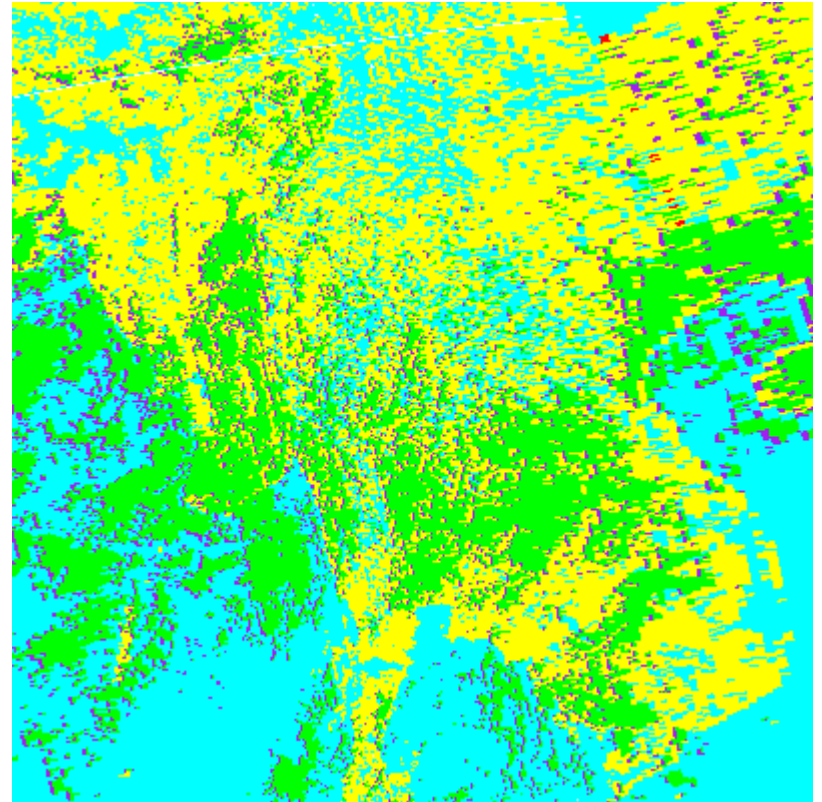
Pinatubo

Cloud Mask Issue

AVH09C1.A1996001.N14.2007270140627.jpg

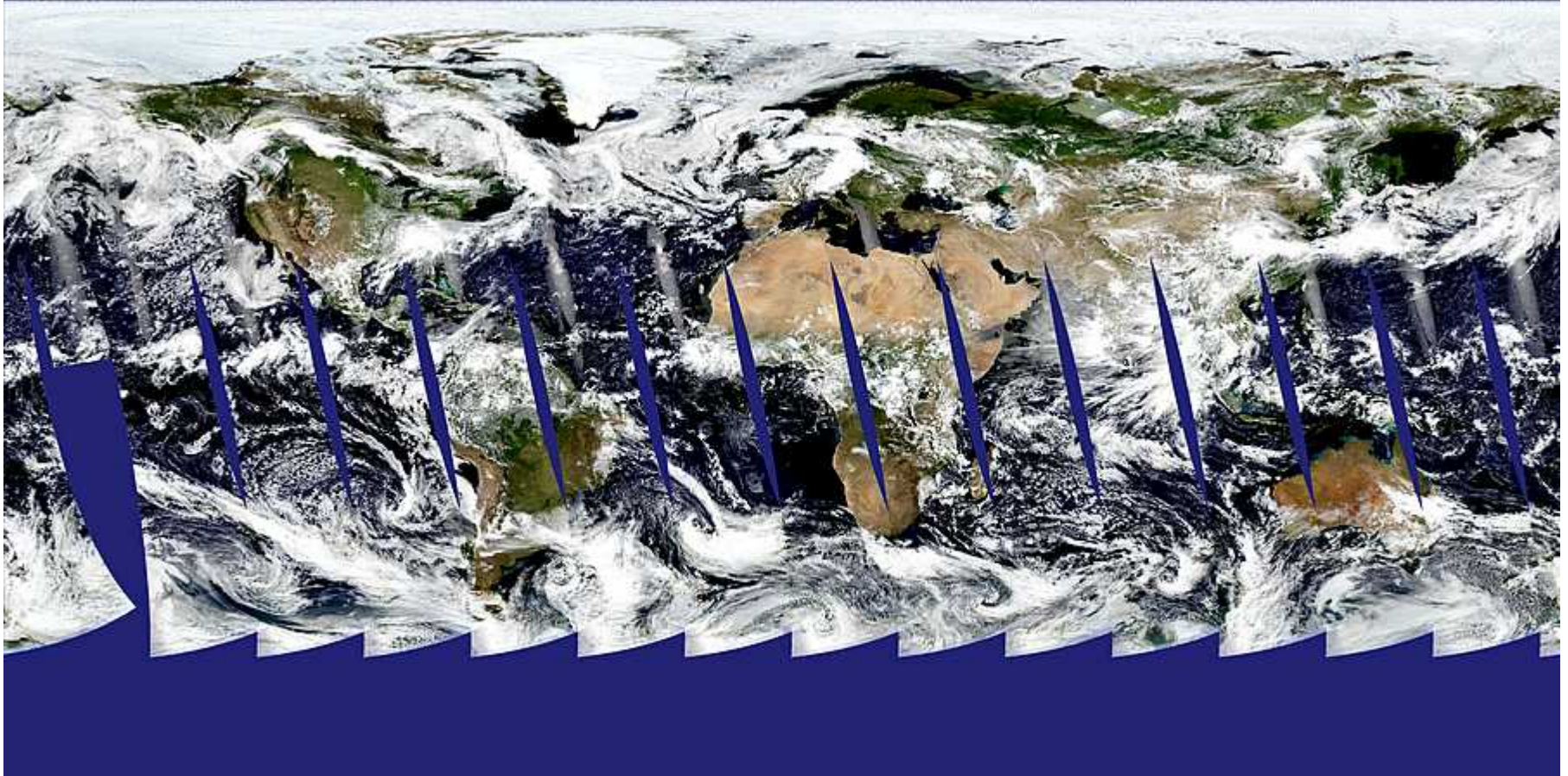


RGB composite of Surf Ref from
Ch1,Ch2

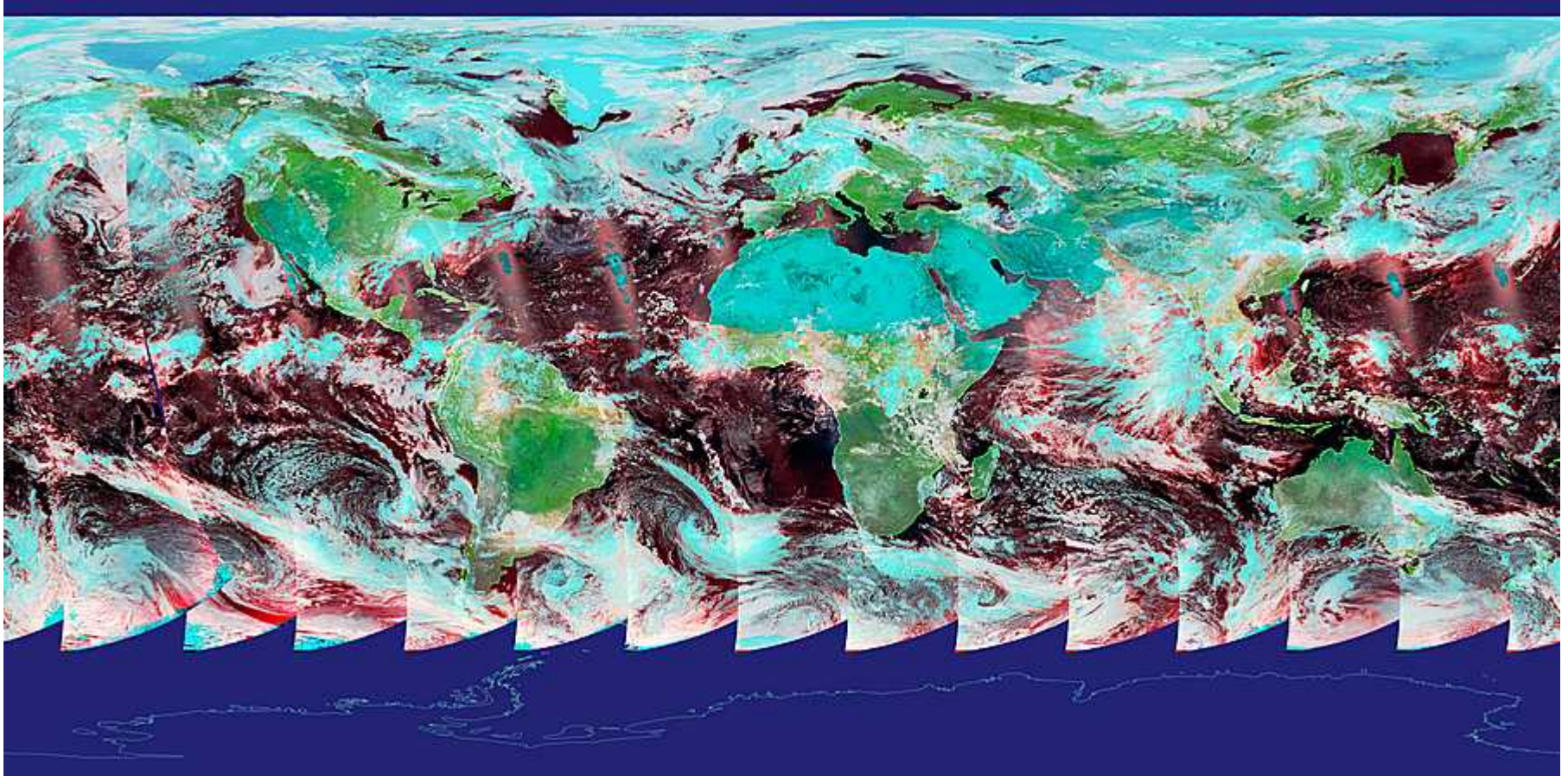


CLAVR-1 Cloud Mask: Green – Clear,
Cyan – Cloud, Yellow – partial cloud

MODIS-Aqua CMG 07/01/2003



AVHRR CMG 07/01/2003



Version 3 Data Set

- Improvements in cloud screening and correction for tropospheric aerosol
 - developed from near-coincident NOAA16-Aqua MODIS data
- Correction for stratospheric aerosol
- Covers: 1981-1999, 2003
- Available: Late 2008