

# FAS/OGA/IPAD Introduction & Geospatial Data Applied to Global Agriculture Monitoring



USDA Foreign Agricultural Service (FAS)  
Office of Global Analysis (OGA)  
International Production Assessment Division (IPAD)  
[curt.reynolds@fas.usda.gov](mailto:curt.reynolds@fas.usda.gov)

March 31, 2010

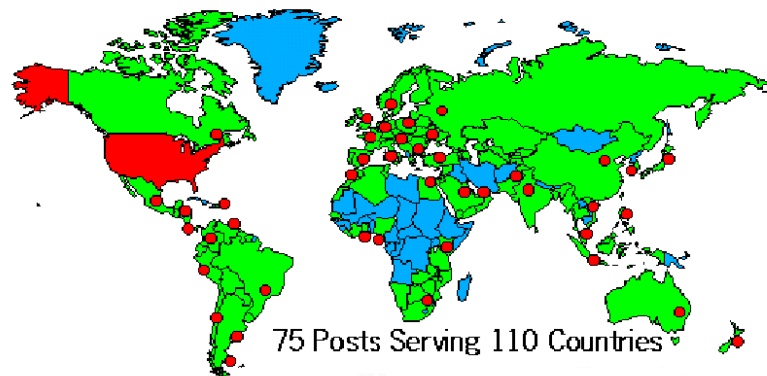
**USDA/FAS/OGA/IPAD**

Linking U.S. Agriculture   
**FAS** to the World

# Foreign Agricultural Service (FAS) of USDA

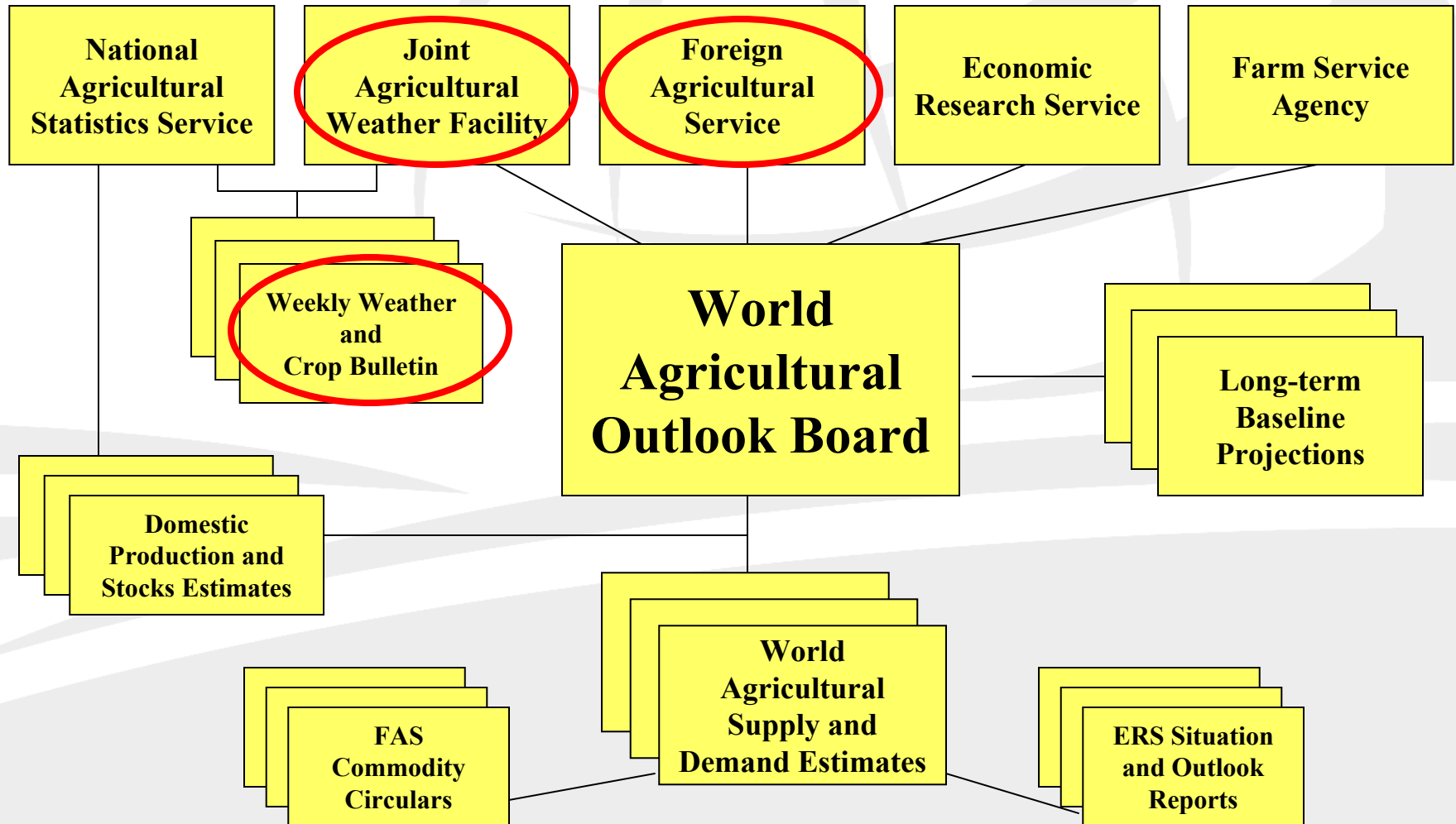
***Linking U.S. agriculture to the world to enhance export opportunities and global food security.....***

FAS Attachés Cover Over 70% of Global Land Area, and 85% of Foreign Global Population



- FAS is primarily responsible for USDA's:
  - Overseas activities with attachés located at 75 posts
  - Market development,
  - International trade agreements and negotiations,
  - Collection and analysis of statistics and market information.
- <http://www.fas.usda.gov/aboutfas.html>

# USDA's Economic Information System



# USDA's Economic Intelligence System

**United States:** Crop estimates (supply/demand) prepared every month by USDA's **NASS** (National Agricultural Statistical Service).

**Foreign Countries:** Crop estimates (supply/demand) **audited & published** every month by USDA's **ICEC** (Interagency Commodity Estimates Committee):

- **WAOB** (World Agricultural Outlook Board)
- **FAS** (Foreign Agricultural Service)
- **ERS** (Economic Research Service)

- **World Agricultural Supply & Demand Estimates (WASDE)** estimates released to commodity markets on the **9-12<sup>th</sup> day of each month at 8:30AM.**
- **PSD Online** from FAS provides historical and current crop estimates.

USDA/FAS  
Economic  
Analysis

Chicago Board of Trade  
(CBOT) & other  
commodity markets

USDA  
Publications

- ‡ Trade Policy
- ‡ Exporter Assistance & Export Programs
- ‡ Food Aid & Export Credit Programs
- ‡ UMR (Usual Marketing Requirements)

- ‡ USDA decision-makers
- ‡ U.S. Ag Producers & Traders
- ‡ Commodity Price Discovery
- ‡ Commodity Price Adjustments

# The Day of Lock-up



- **Why:** Maintain integrity with level playing field
- **How often:** Monthly, second week
- **When:** 2:00 a.m.
- **Where:** Secured wing in South Building
- **What:**
  - Incorporate NASS domestic estimates
  - Finalize PSDs and reports
  - Secretary Vilsack briefed and **WASDE report is released at 8:30 a.m.**, before markets open
  - FAS reports and databases released at 9:00 a.m.

# USDA's Economic Intelligence System

- Lockup End Results: Monthly estimates for each country are available on the internet at:

- **WASDE Circular from WAOB released on the 9-12th day of each month at 8:30AM.** (since Sept. 1973)

<http://www.usda.gov/oce/commodity/wasde/>

- **Monthly World Production, Market and Trade Reports**

<http://www.fas.usda.gov/currwmt.asp>

- **PSD Online from FAS**

<http://www.fas.usda.gov/psdonline/>

The screenshot shows the USDA Office of the Chief Economist website. The main heading is 'Commodity Forecasts'. Below it, there is a section for 'World Supply and Demand Estimates' (WASDE) and a 'Latest WASDE Report' section. The WASDE section includes a search bar and a 'Go' button. The 'Latest WASDE Report' section provides information about the most recent report, including the date and time of release.

The screenshot shows the USDA Foreign Agricultural Service website. The main heading is 'Global Crop Production Analysis'. Below it, there is an 'Overview' section and a 'WAP - Current Report' section. The 'Overview' section provides information about the World Agricultural Production (WAP) reports. The 'WAP - Current Report' section includes a search bar and a 'Go' button.

The screenshot shows the USDA Foreign Agricultural Service website's 'PSD Online' search interface. It features a search bar with a 'Go' button and a table of search results. The table has columns for 'Commodity', 'Data Type', 'Country', and 'Year'. The 'Commodity' column lists various agricultural products, and the 'Year' column shows a range from 1997 to 2008.

# Goals of USDA's Economic Intelligence System

- Objective
  - Provide independent and unbiased information for commodity markets.
- Reliable
  - Best available information at current point in time.
  - Analysis based on sound data.
- Timely
  - Scheduled and immediate release for public, traders and commodity markets.

# FAS Office of Global Analysis (OGA)

## International Production Assessment (IPAD) Division

### IPAD's Mission Statement:

*Produce the most objective and accurate assessment of the global agriculture production outlook, and the conditions affecting global food security.*



- **USDA's "Production and Supply Database"** (PSD Online) is used for market intelligence (<http://www.fas.usda.gov/psd/>)
- **IPAD's Heritage**- Joint **USDA/NASA/NOAA** remote sensing programs from 1975-1988.
  - **LACIE** (mid-1970's): researched how to monitor agriculture with **Landsat & NOAA** satellite series.
  - **AGRISTARS** (1980's): developed automated applications using Landsat, NOAA, and weather data from U.S. Air Force Weather Agency (AFWA).



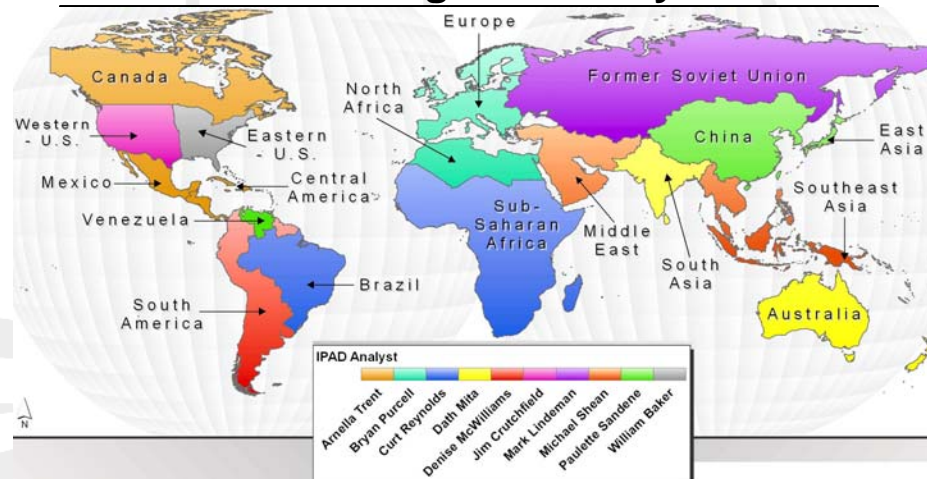
# IPAD Data Sources & Output Products

- FAS Field Travel
- Official Country Reports
- News Wire Services
- FAS Attaché Reports  
(<http://www.fas.usda.gov/>)

- *Weather Data* (stations & satellites)
- *Crop models* (stations & satellites)
- *Vegetation Data* (satellites)

- Medium-resolution & temporal coverage
  - NOAA-AVHRR (1 & 8-km)
  - SPOT-IV (1-km)
  - MODIS (250-meters)
- High-resolution satellites
  - Landsat-7 (30-meters with 185-km swath width)
  - AWiFS on IRS satellite (70-m with 740-km swath width)

## 10 GIS Regional Analysts



## Crop Production Estimates Released Each Month

- **World Agricultural Supply & Demand Estimates (WASDE)**
- **World Agricultural Production (WAP) Circular**
- **Production & Supply Database (PSD Online)**

# Summary Satellites Used by IPAD

- Geo-stationary satellites monitor weather (rainfall & temperature) which is collected/processed by US Air Force Weather Agency (AFWA) at 25-km resolution
  - GOES (North & South America)
  - METEOSAT (Europe & Africa), and
  - GMS (Asia and Australia)
- Polar-orbiting satellites monitor NDVI & generate false-color composites for year-to-year comparisons (at 250-m resolution)
  - Daily repeat cycle
    - NOAA-AVHRR (1-km and 8-km resolution),
    - SPOT-VGT ( 1-km resolution),
    - Terra/Aqua Satellites (MODIS sensor with 250 meter resolution)
    - SSM/I (Special Sensor Microwave Imager (SSM/I, 25-km) to monitor surface wetness
  - 16-day and 24-day (5-day) repeat cycle
    - Landsat-7 (30-m) and AWiFS (55-m) on IRS
- Radar altimeter satellites monitor lake water-level variations (with 10-day overpass)
  - 70+ lakes: TOPEX/Poseidon (1992-2002), Jason-1 (2002-2009), OSTM Jason 2 (2009-present)
  - 300+ lakes: ERS and ENVISAT from ESA

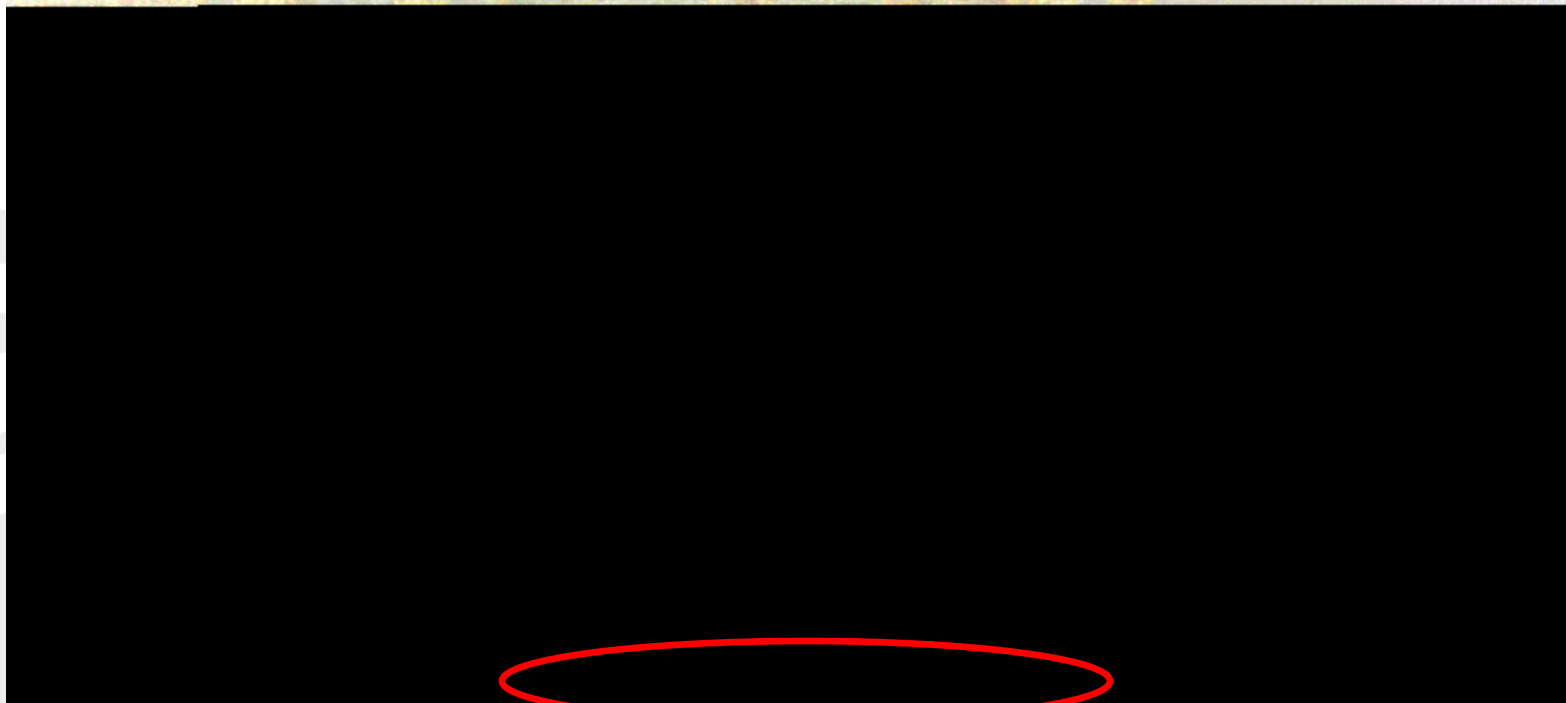
# Global Reservoir and Lake Monitor (GRLM)

Source: [http://www.pecad.fas.usda.gov/cropexplorer/global\\_reservoir/](http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/)

**GRLM measures reservoir/lake height variations from 1992-present for 70+ lakes worldwide by utilizing satellite radar altimeters.**

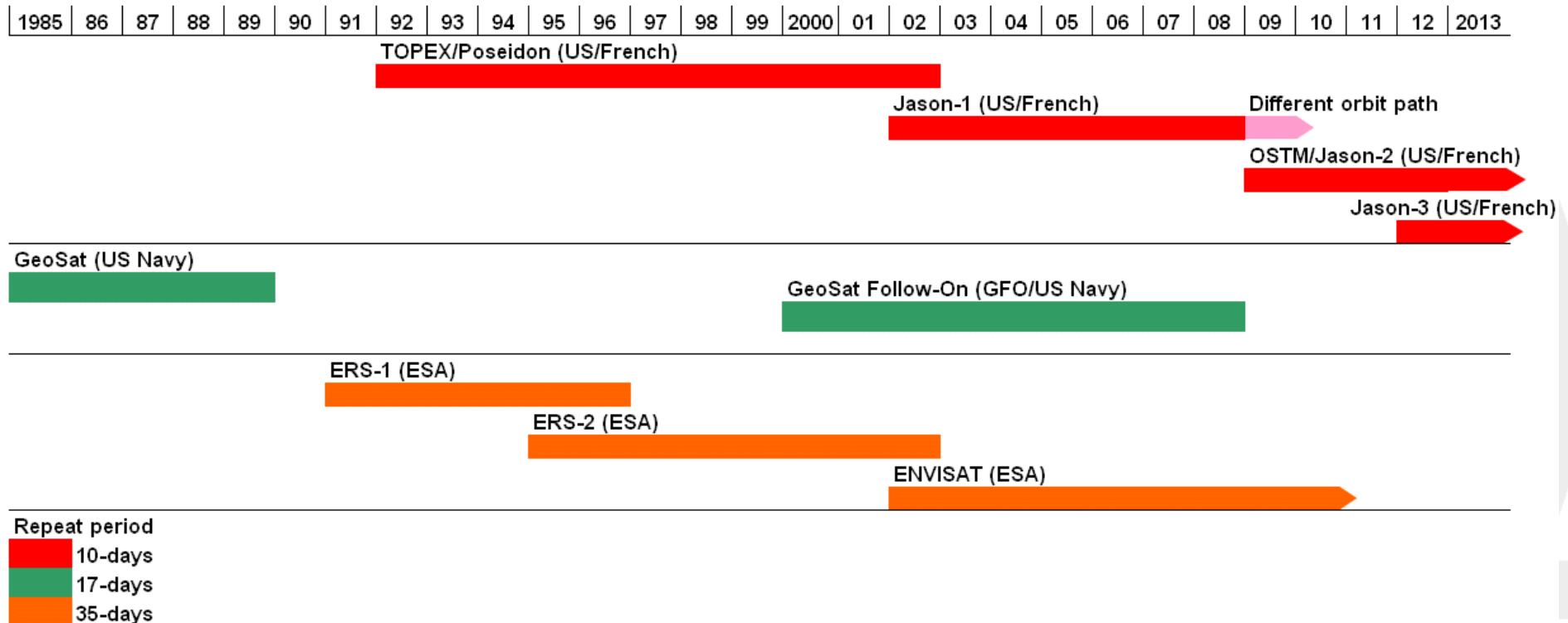
USDA United States Department of Agriculture  
Foreign Agricultural Service

Linking U.S. Agriculture   
FAS to the World



Linking U.S. Agriculture   
FAS to the World

# Timeline for Satellite Radar Altimetry



## Recent Events:

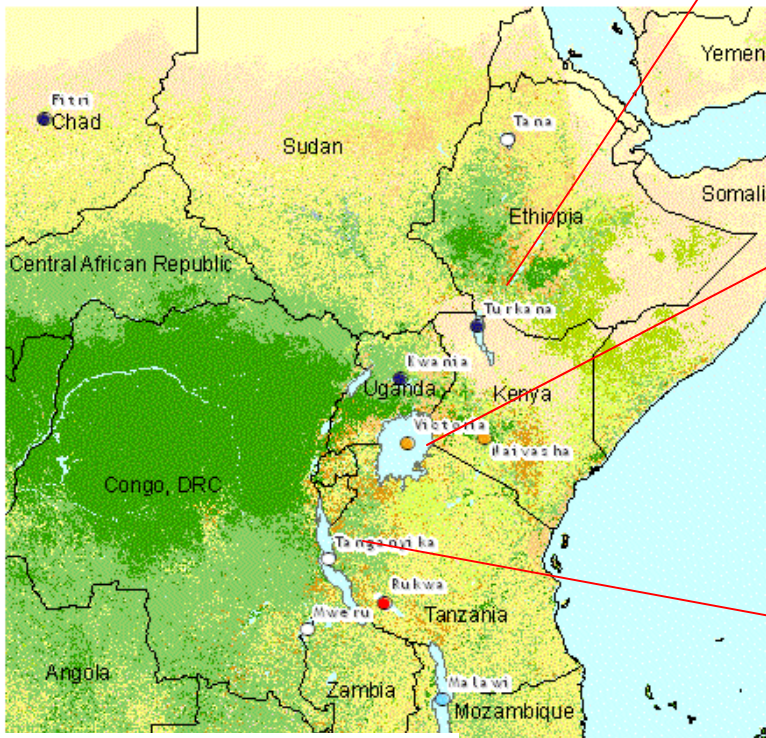
- **Sept. 17, 2008:** End of Mission for GFO (Geosat Follow-On)
- **June 20, 2008:** Jason-2 or OSTM (Ocean Surface Topography Mission) was launched and follows Jason-1 orbit
- **Feb. 14, 2009:** Jason-2 continues along TOPEX/Poseidon/Jason-1 orbits and Jason-1 moved to new satellite orbit

# 1997/98 El Niño Effects on East Africa Lakes

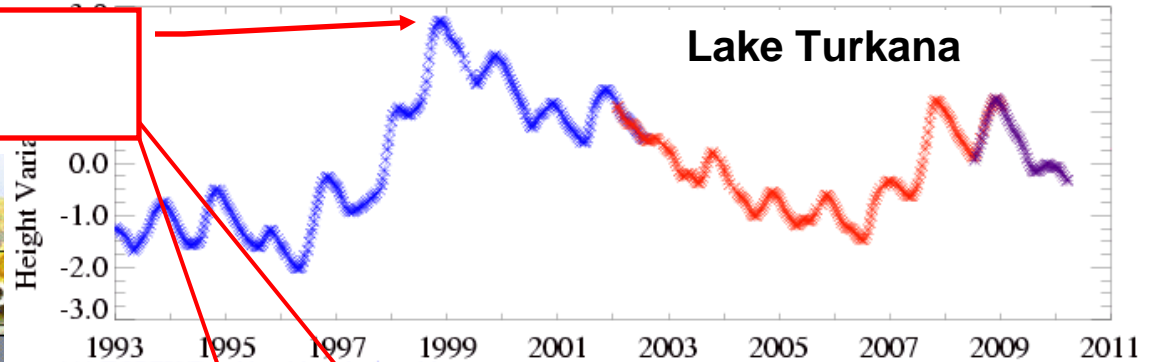
**Decrease in regional lake water levels after 1997/98 El Niño.**



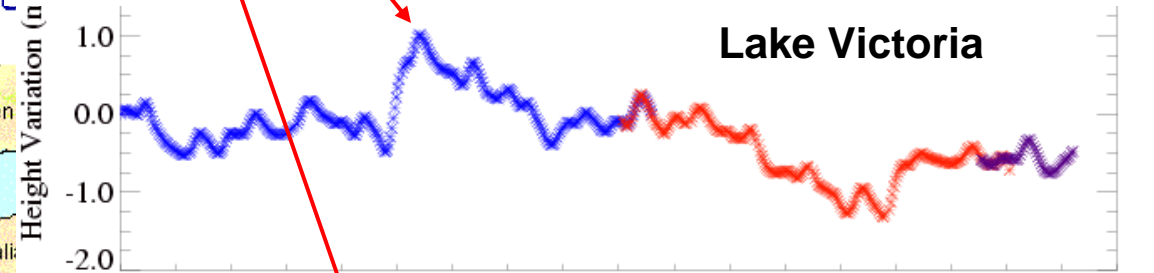
**Global Reservoir and Lake Elevation Database**  
 Click on a blue circle to see Lake Level Variations



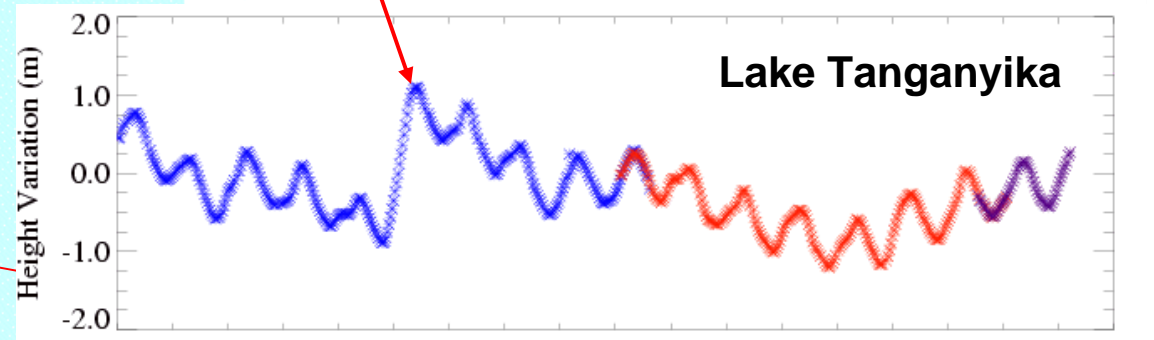
[http://www.pecad.fas.usda.gov/cropexplorer/global\\_reservoir/](http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/)



\*\*\* TOPEX/Poseidon historical archive  
 \*\*\* Jason-1 Interim GDR 20hz altimetry  
 \*\*\* OSTM Interim GDR 20hz altimetry  
 Version TPJO.1  
 Last valid elevation: 20 Mar., 2010



\*\*\* TOPEX/Poseidon historical archive  
 \*\*\* Jason-1 Interim GDR 20hz altimetry  
 \*\*\* OSTM Interim GDR 20hz altimetry  
 Version TPJO.1  
 Last valid elevation: 13 Mar., 2010

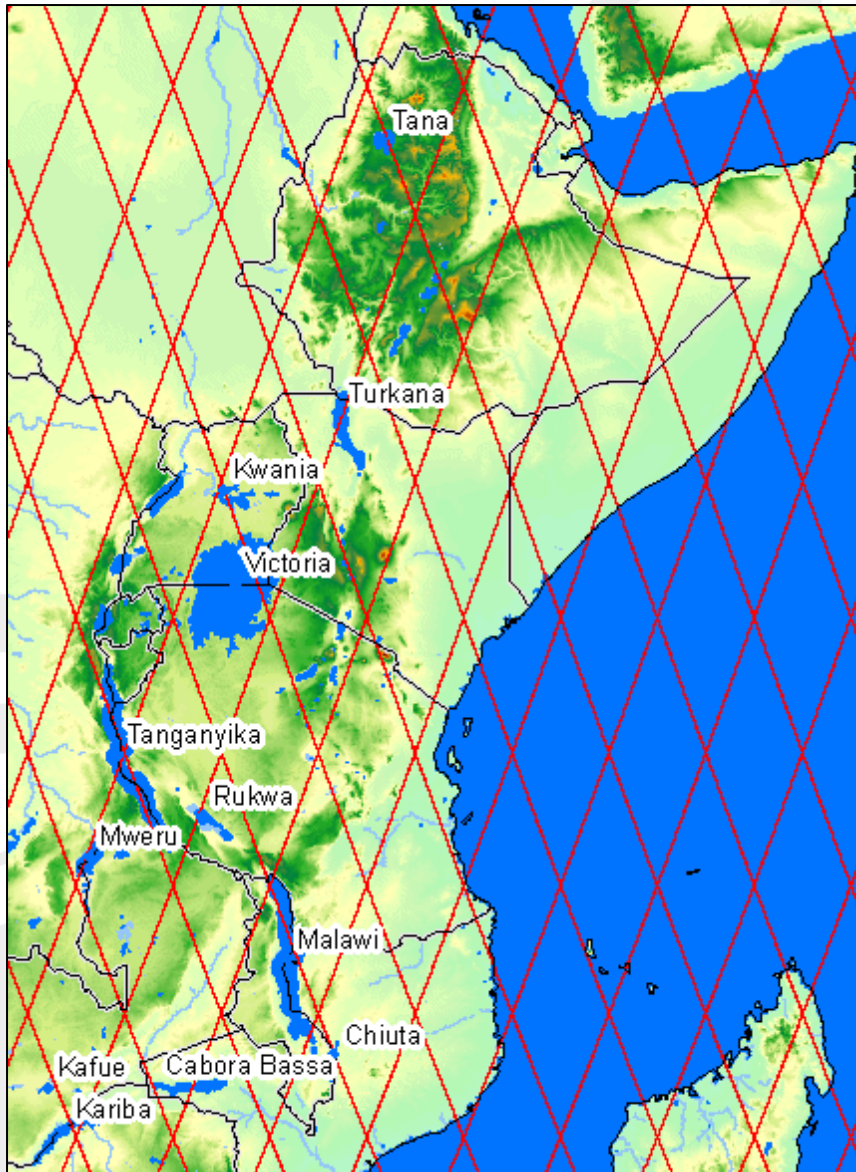


\*\*\* TOPEX/Poseidon historical archive  
 \*\*\* Jason-1 Interim GDR 20hz altimetry  
 \*\*\* OSTM Interim GDR 20hz altimetry  
 Version TPJO.1  
 Last valid elevation: 17 Mar., 2010

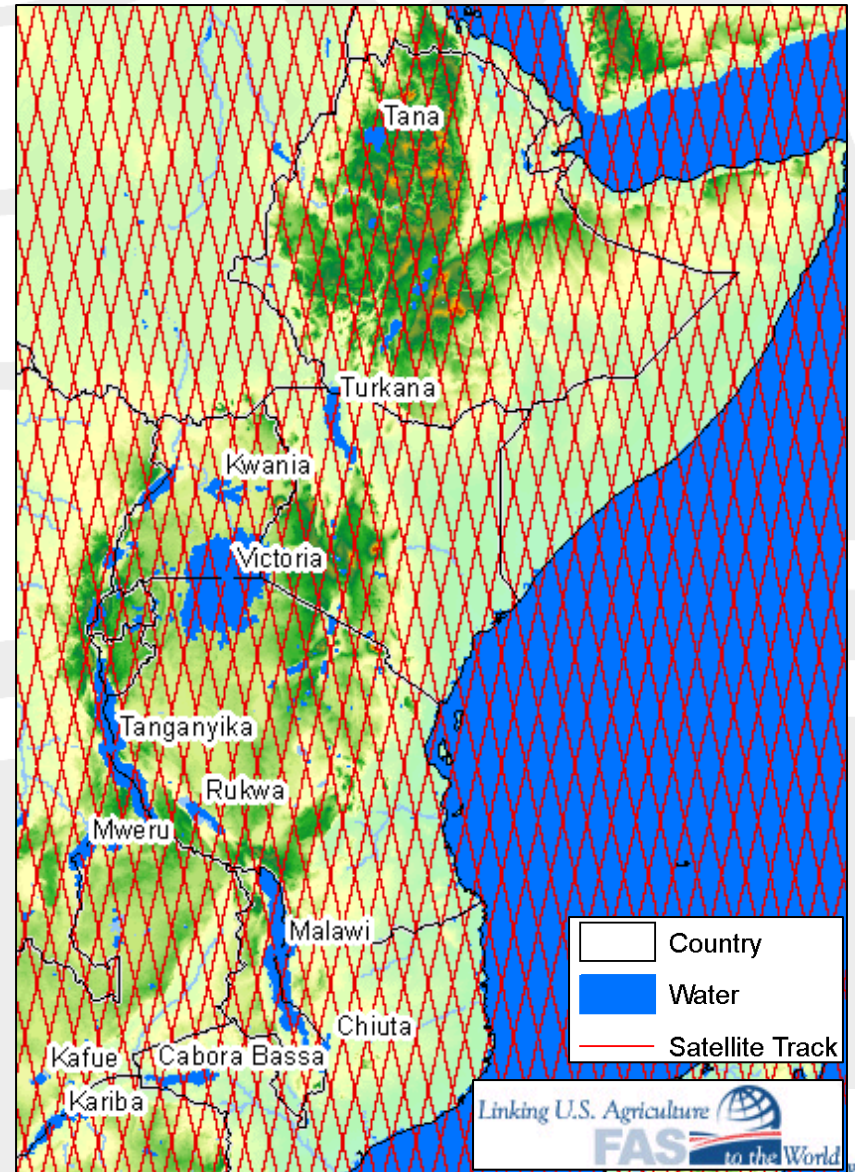


# Different Satellite Orbits and Repeat Cycles

OSTM/Jason-2 Satellite Orbit with 10-day Repeat Cycle

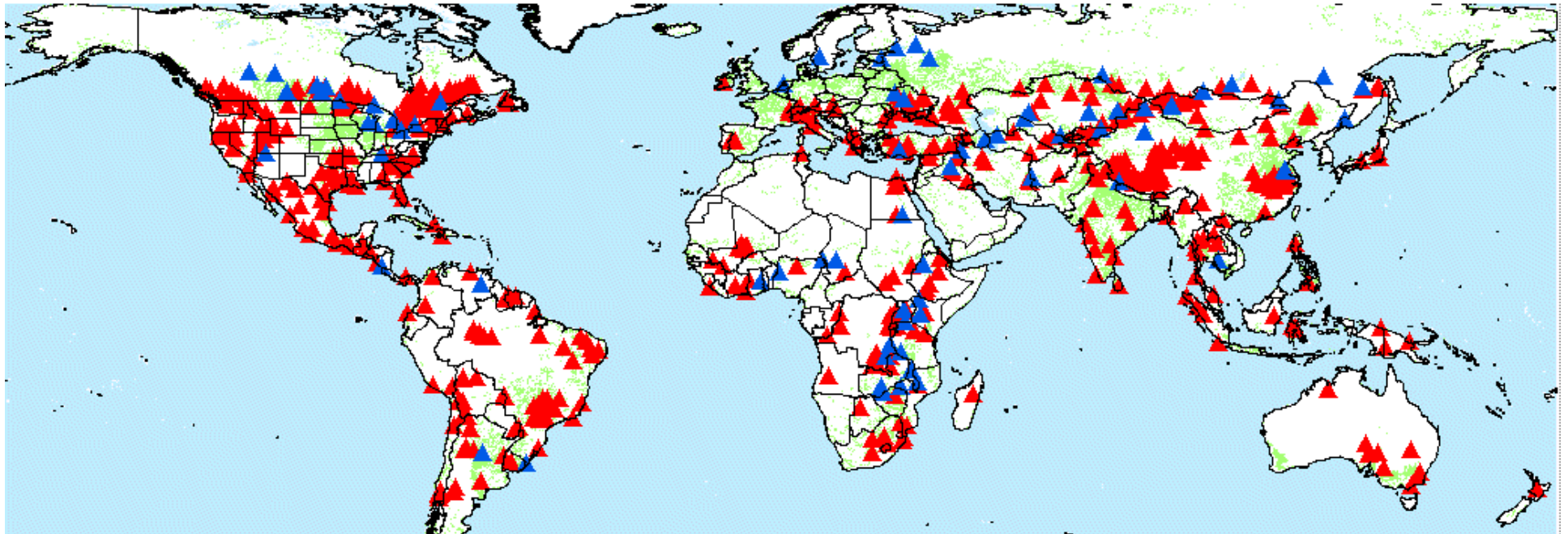


ENVISAT Satellite Orbit with 35-day Repeat Cycle



# Potential GRLM Improvement with ENVISAT

Current Lakes Monitored by Jason-2/OSTM and Potential Lakes Monitored by ENVISAT



▲ Current Jason-2/OSTM Lakes (73)

▲ Potential ENVISAT Lakes (611)

■ Croplands



Data Source: [http://www.pecad.fas.usda.gov/cropexplorer/global\\_reservoir/](http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/)



# Global Agricultural Monitoring (GLAM)

(Joint USDA/NASA funded project)

Area

Yield

**AWiFS (56-m)  
Landsat (30-m)**

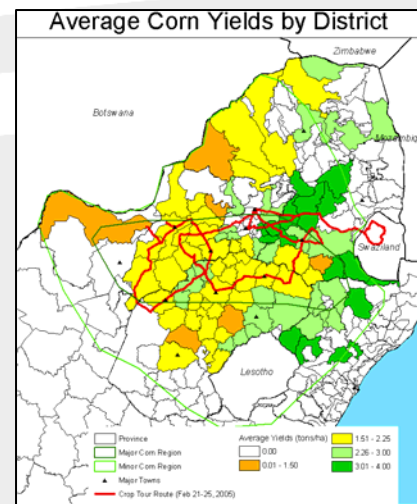
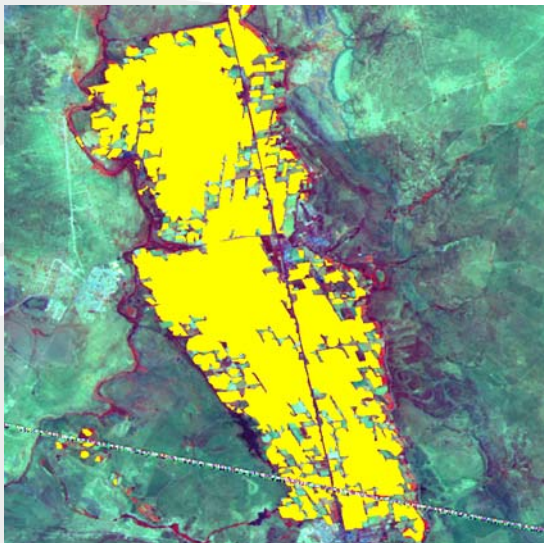
**MODIS-CropNDVI (250-meter)  
Time Series Maps and Graphs**

*Semi-automated  
classification algorithms*

*Regression and analog  
year algorithms*

**Change in Area Estimates and  
Mid-season Dominate Crop Masks**

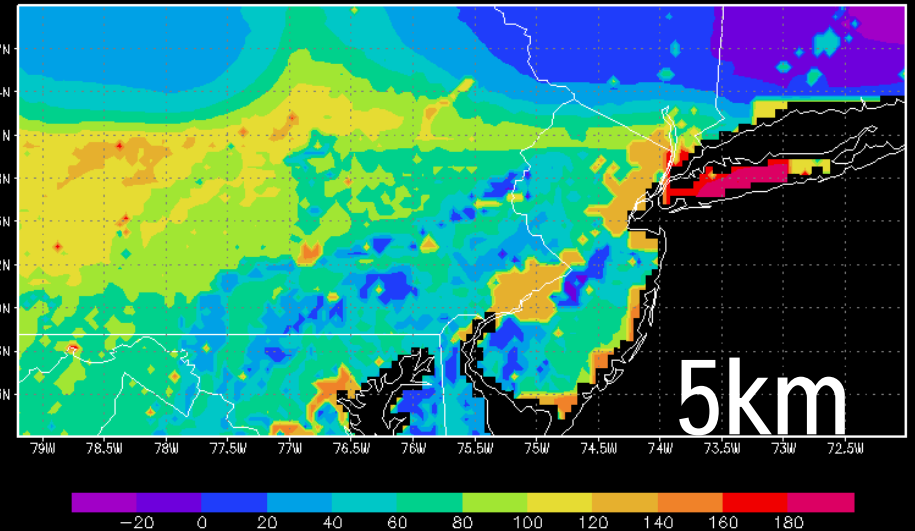
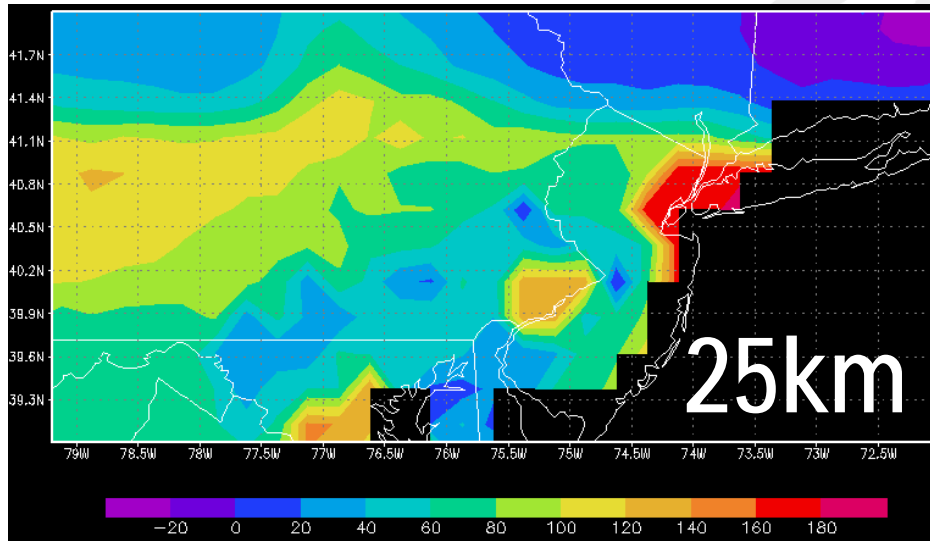
**Mid-season to End-of-season  
Yield Estimates and Maps**



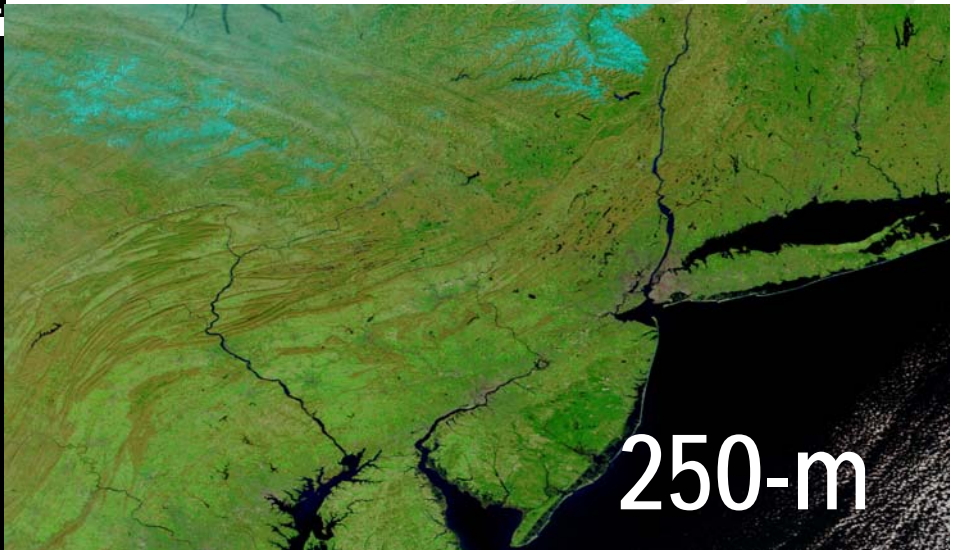
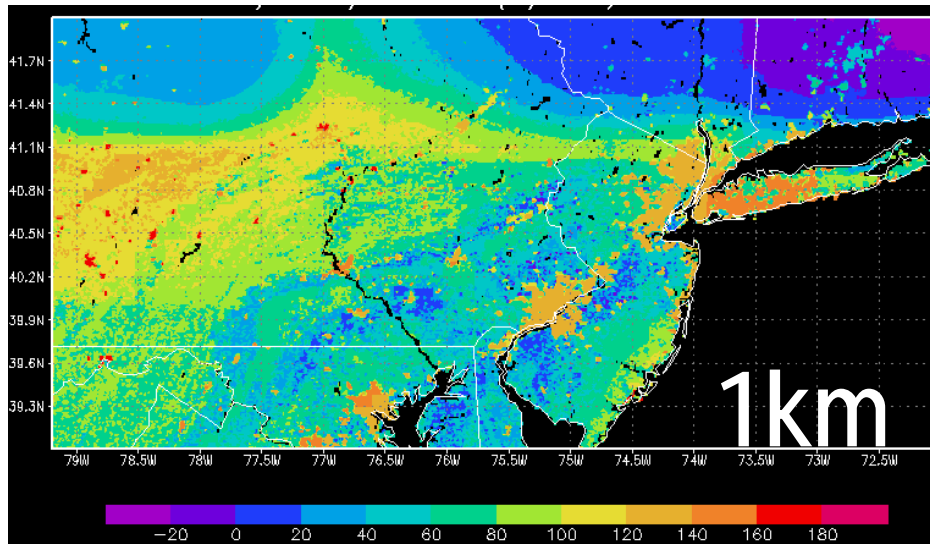
March 31, 2010

USDA/FAS/OGA

# Precipitation (25-km) to MODIS-NDVI (250-m)



GRADS: COCLA/IGES 2004-01-07-14:05



# World Meteorological Organization (WMO)

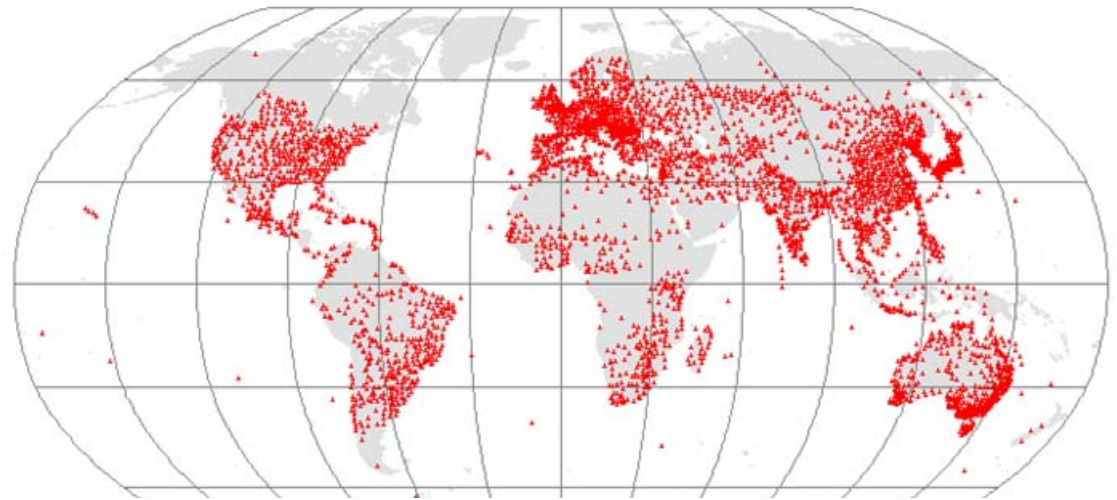
## Daily Data Loaded Next Day:

- 24-hour precipitation
- Max Temp
- Min Temp
- Snow Coverage

## PECAD Adds to CADRE:

- Average Daily Temperature
- Cumulative precipitation
- Potential ET
- Soil Moisture
- Crop Calendar
- Corn Hazard (Alarm)
- Winterkill Model

**"Yesterday's Weather Delivered Today"**



**Daily weather data provided by  
approximately 7000 WMO ground stations**

# Air Force Weather Data (AFWA)

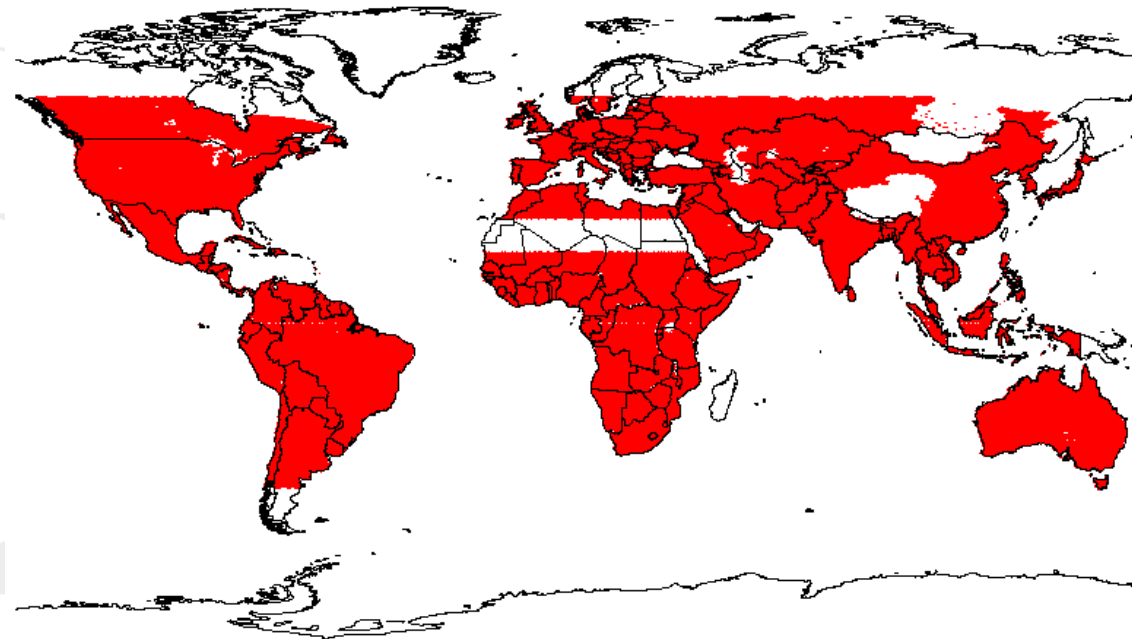
Spatial Coverage of AFWA Weather Data

## Daily AFWA Data Loaded Next Day:

- 24-hour precipitation
- Max Temp
- Min Temp
- Snow Coverage
- Actual and Potential ET
- Solar and IR Radiation

## PECAD Adds to CADRE:

- Average Daily Temperature
- Cumulative precipitation
- Potential ET
- Soil Moisture
- Crop Calendar
- Corn Hazard (Alarm)
- Relative Yield Reduction
- Winterkill Model



□ Countries  
■ AFWA Grid Cells (85,200)

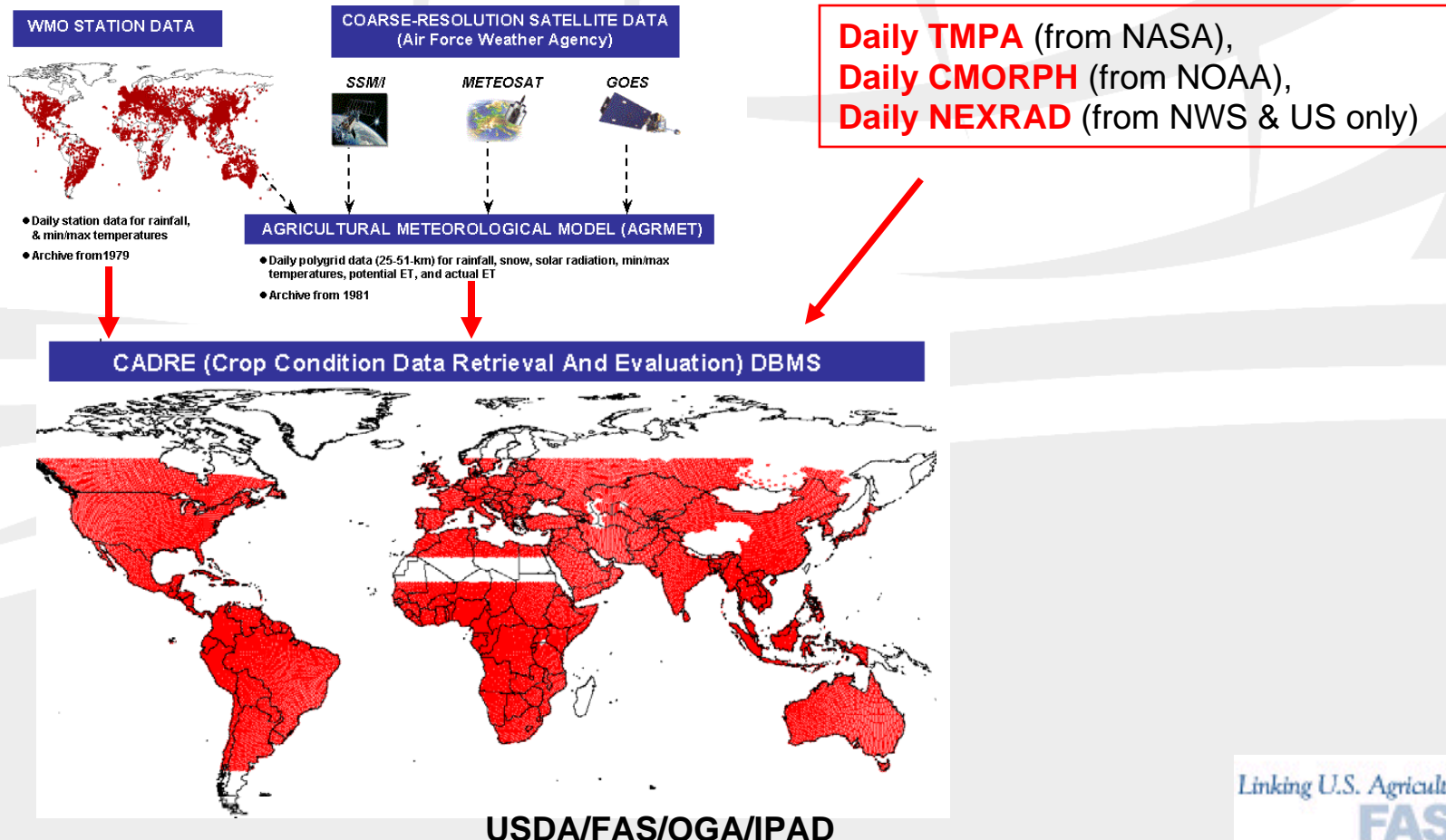
 Production Estimates and  
Crop Assessment Division (PECAD)  
Foreign Agricultural Service (FAS)  
<http://www.fas.usda.gov/pecad/>

# CADRE

## (Crop Assessment Data Retrieval & Evaluation)

CADRE is a *geospatial* database that stores (in Oracle):

- **Daily weather station data** (from WMO/GTS)
- **Daily weather grid cell data** (from AFWA)
  - Grid cell resolution (25km near equator & 51km near poles)
- **Daily TMPA** (from NASA), **Daily CMORPH** (from NOAA), and **Daily NEXRAD** (from NWS)



# Summary Global Precipitation Data Sets Utilized by IPAD

Product/Source <sup>1</sup>	Spatial Resolution	Coverage	Infrared Geostationary Satellites (IR)	Passive Microwave (PMW)	Active Radar	Ground Station Gauge (SG)
GTS/WMO and NOAA/NWS (for USA)	approx. 7500 stations report daily	Global	No	No	No	Yes
AGRMET/AFWA	47-km at 60° latitude (true) and 25-km at the equator	Global 60° N-S	Yes	SSM/I	No	Yes, GTS/WMO, NOAA/NWS, and others
CMORPH/NOAA-CPC	8-km at equator	Global 60° N-S	Yes	SSM/I, TMI, AMSR-E, AMSU-B	No	No
TMPA-RT (3B42RT)/NASA-DISC	0.25 degrees or approx. 28-km	Global/ 50° N-S	Yes	SSM/I, TMI, AMSR-E, AMSU-B	No	No <sup>2</sup>
NEXRAD/NOAA-NWS	4-km	USA/ lower 48	Yes <sup>3</sup>	No	Ground Doppler	Yes, NOAA/NWS

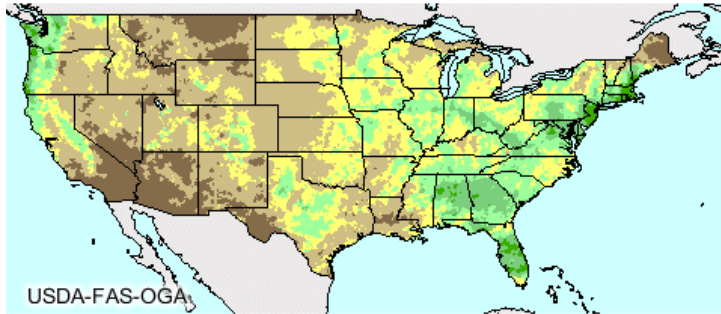
1. USDA/FAS' CADRE receives daily all precipitation products listed and Crop Explorer aggregates the daily products into 10-day time periods for agricultural monitoring.
2. Station gauges (SG) are added more than one month later to the 3B42RT product to produce an after real-time global precipitation product called 3B42 (V6).
3. Satellite precipitation estimates (SPE) are incorporated in regions where there is limited or no radar coverage.

# NEXRAD, Old-AFWA, WMO

## NexRad Precipitation

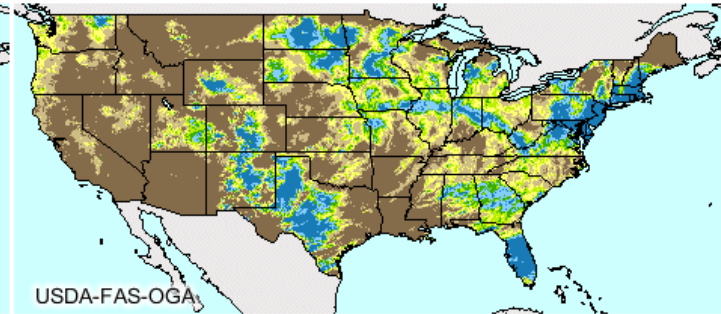
03/11/10 - 03/20/10 **Previous 10-day**

*Click on a U.S. region to view its thematic map.*



## NexRad Decadal Percent Normal Precipitation

03/11/10 - 03/20/10

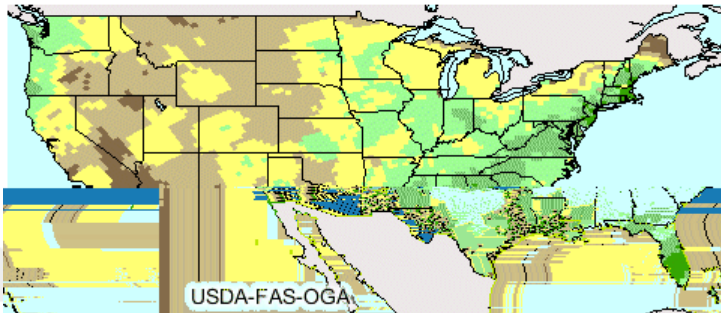


## AFWA Precipitation

[View in Google Earth](#)

03/11/10 - 03/20/10 **Previous 10-day**

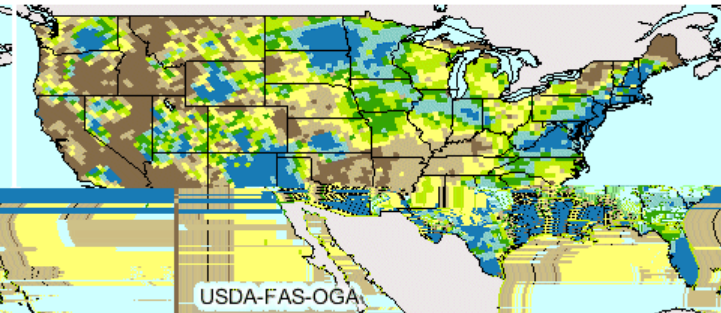
*Click on a U.S. region to view its thematic map.*



## AFWA Decadal Percent Normal Precipitation

[View in Google Earth](#)

03/11/10 - 03/20/10

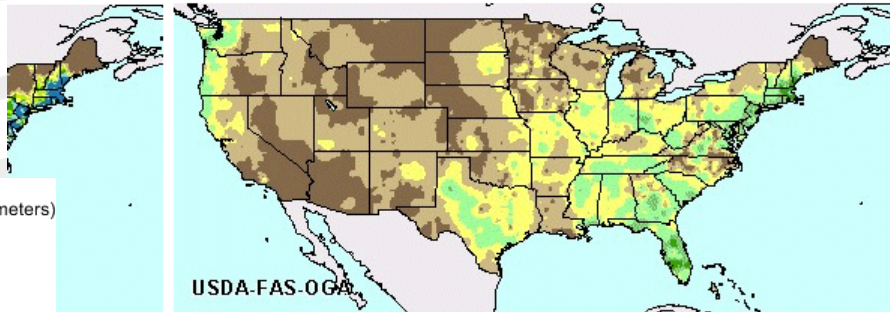


[Google Earth](#)

## WMO Precipitation

[View in Google Earth](#)

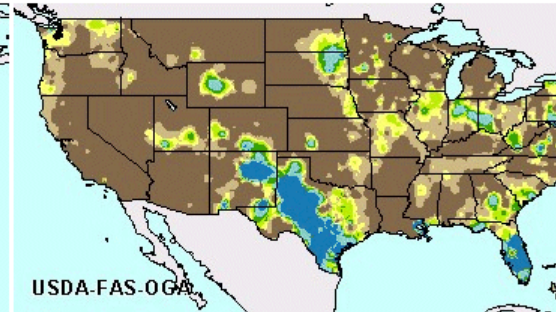
03/11/10 - 03/20/10 **Previous 10-day**



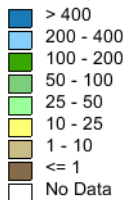
## WMO Decadal Percent Normal Precipitation

[View in](#)

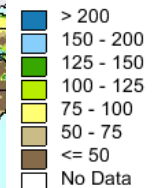
03/11/10 - 03/20/10



Precipitation (Millimeters)



Decadal Percent of Normal (%)



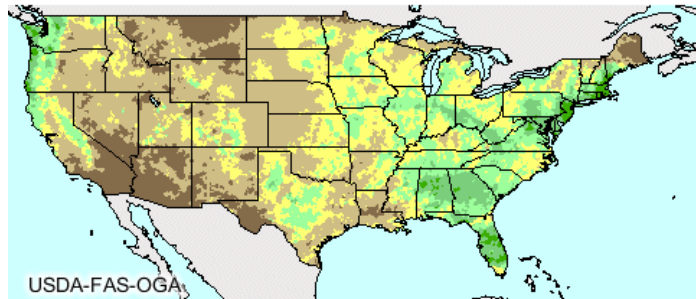
USDA/FAS/OGA/IPAD

# NEXRAD, NOAA-CMORPH, and TMPA-NASA

## NexRad Precipitation

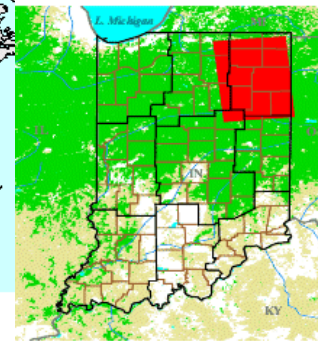
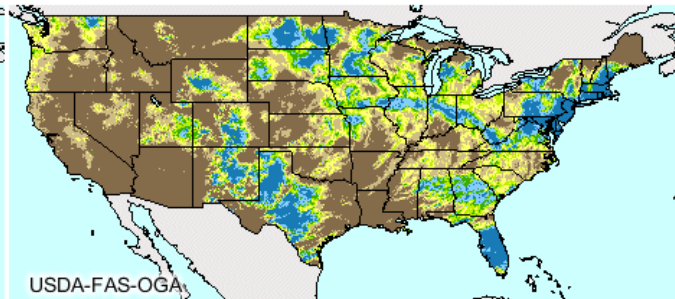
03/11/10 - 03/20/10 **Previous 10-day**

*Click on a U.S. region to view its thematic map.*



## NexRad Decadal Percent Normal Precipitation

03/11/10 - 03/20/10



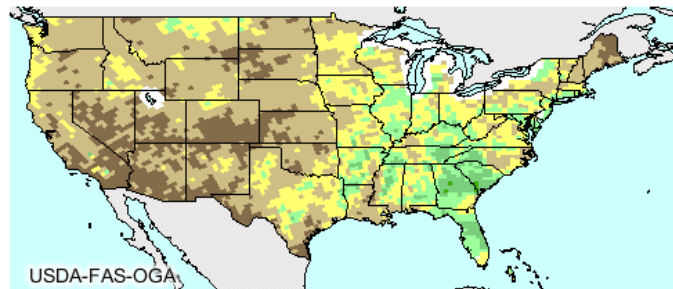
**Indiana CRD 30**  
View Satellite Image

## TMPA Precipitation

[View in Google Earth](#)

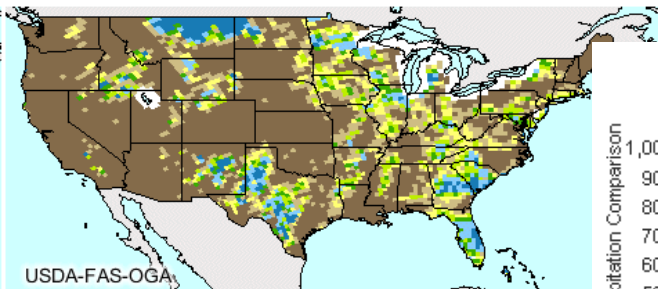
03/11/10 - 03/20/10 **Previous 10-day**

*Click on a U.S. region to view its thematic map.*



## TMPA Decadal Percent Normal of Precipitation

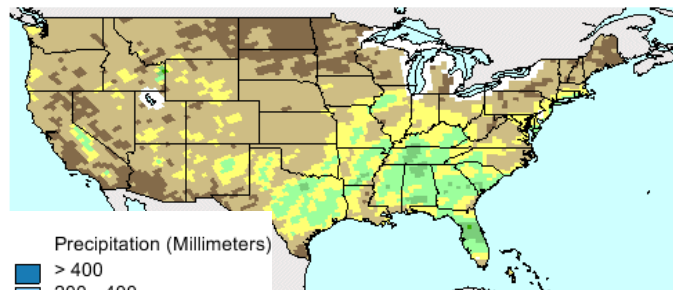
03/11/10 - 03/20/10



## CMORPH Precipitation

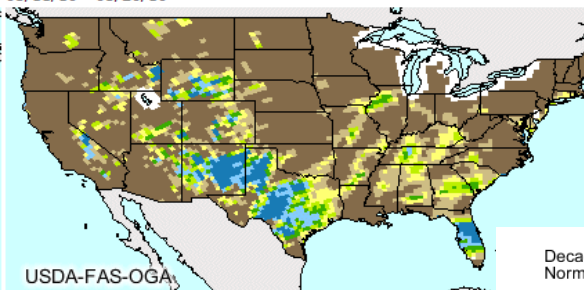
[View in Google Earth](#)

03/11/10 - 03/20/10 **Previous 10-day**

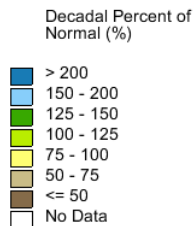
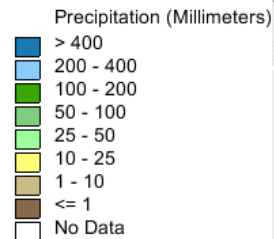
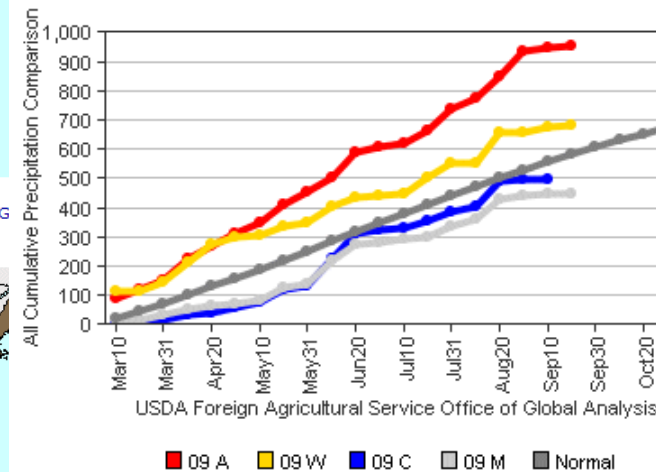


## CMORPH Decadal Percent of Normal Precipitation

03/11/10 - 03/20/10



All Cumulative Precipitation Comparison in Indiana CRD 30



USDA/FAS/OGA/IPAD

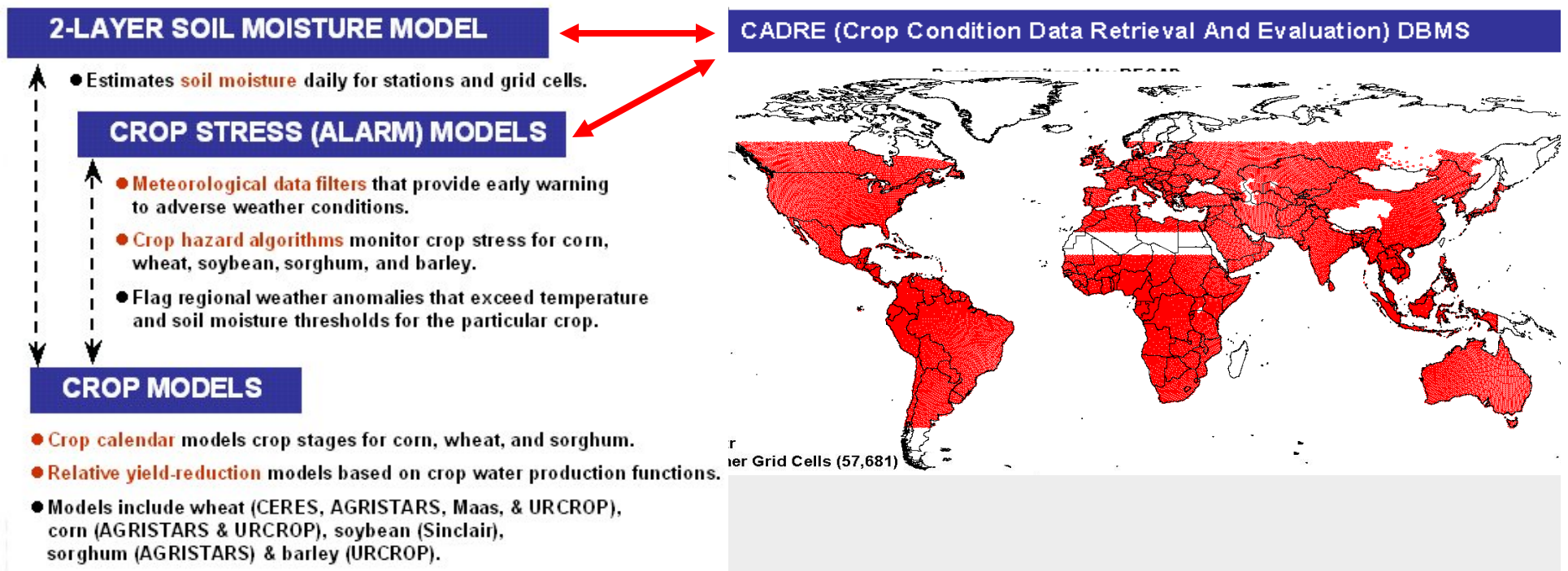


# CADRE

CADRE stores **baseline geospatial data sets:**

- **Climate 30-year normals & NDVI multi-year averages**
- **Soils water holding capacity**
- **Average crop planting dates**

CADRE calculates and stores daily **soil moisture, crop calendar and crop modeling data.**



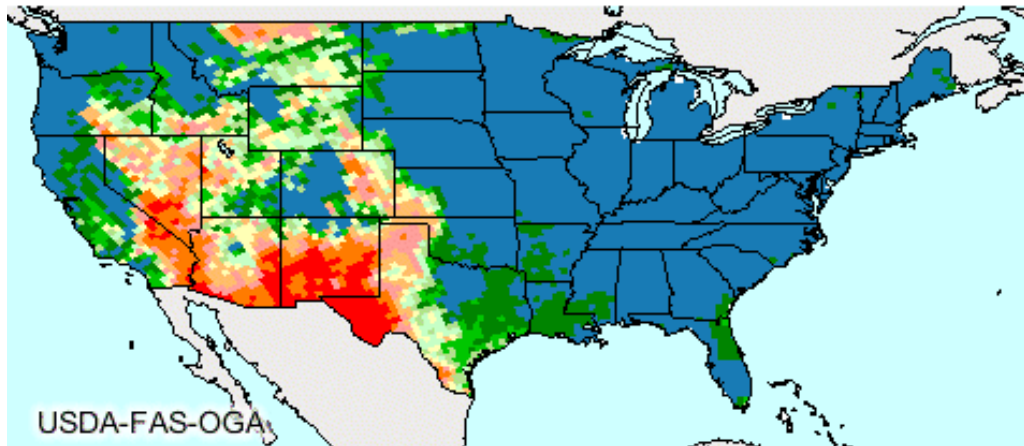
# AFWA & WMO Soil Moisture

(modified 2-layer Palmer Model)

**AFWA Percent Soil Moisture**  [View in Google Earth](#)

03/11/10 - 03/20/10 [Previous 10-day](#)

*Click on a U.S. region to view its thematic map.*

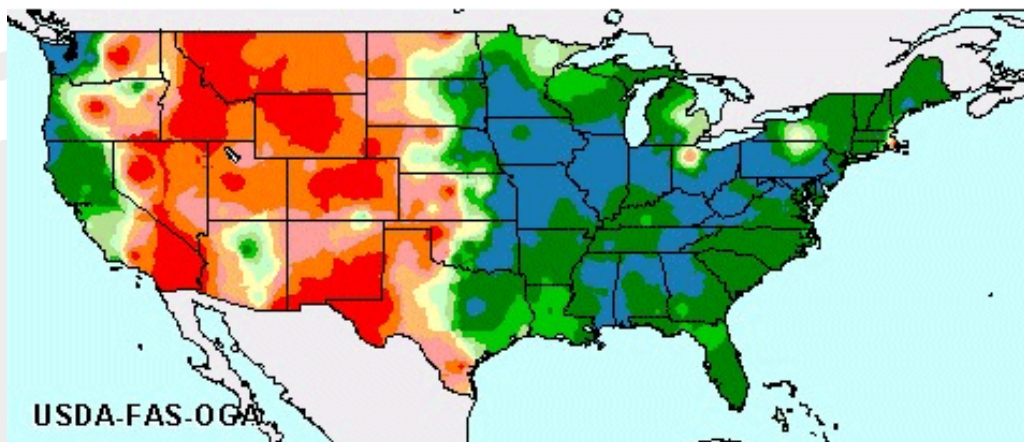


Percent Soil Moisture (%)



**WMO Percent Soil Moisture**  [View in Google Earth](#)

03/11/10 - 03/20/10 [Previous 10-day](#)



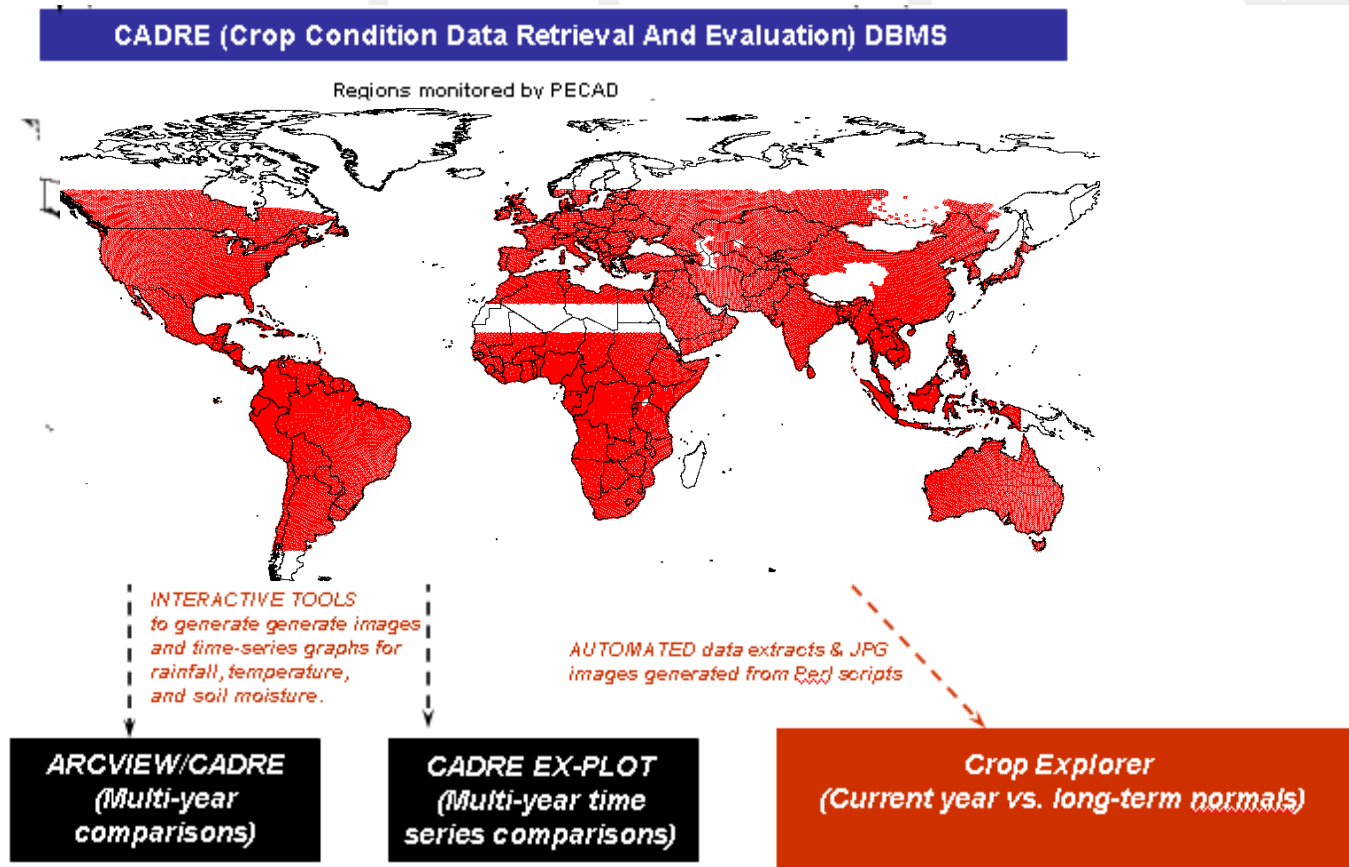
# Summary Global Soil Moisture Data Sets Utilized by IPAD

Product	Data Source (process agency)	Spatial Resolution	Coverage	Input Data	Infrared Geostationary Satellites	Passive Microwave	Ground Station with Gauge
<b>“Station” 2-layer Soil Moisture Model (modified Palmer)</b>	GTS/WMO and NOAA-NWS for USA (USDA/FAS)	16,000 total stations	Global	Daily rainfall and min/max temperatures for PET calculations	No	No	Yes, approx. 7500 stations report daily
<b>“Grid cell” 2-layer Soil Moisture Model (modified Palmer)</b>	AGRMET/AFWA (USDA/FAS)	47-km at 60° latitude (true) and 25-km at the equator	Global 60° N-S	Daily rainfall and min/max temperatures for PET calculations	Yes	SSM/I	Yes, GTS/WMO, NOAA/NWS, and others
<b>“Corrected” (AMSR-E) 2-layer Soil Moisture Model (modified Palmer)</b>	AGRMET/AFWA and MODIS/AMSR-E (USDA/ARS/HRSL)	47-km at 60° latitude (true) and 25-km at the equator	Global 60° N-S	“Grid cell” Soil Moisture “corrected” every 3-days with MODIS/AMSR-E data	Yes	SSM/I and “corrected” with MODIS/AMSR-E data	Yes, GTS/WMO, NOAA/NWS, and others
<b>Surface Wetness</b>	SSM/I (WeatherPredict Consulting-WPC)	1/3-degree or approx. 37-km	Global/ 80° N-S	Current week compared to 20-year climatology	No	SSM/I	No

# CADRE

CADRE allows data to be displayed:

- Automatic: “Crop Explorer” products are displayed on the Internet every 10-days and for summer/winter growing seasons
- Interactive: Arcview GIS extractions for any region and time period.



# Crop Explorer

(displays numerous weather and vegetation condition data sets over major crop regions every 10-days)

**Explore by Region**

**North America**  
United States  
Canada

**Central America**  
Mexico  
Central America and Caribbean

**South America**  
Brazil  
Northern South America  
Southern South America

**Europe**  
Europe

**Middle East**  
Iran, Iraq, Syria and Turkey

**Oceania**  
Australia

**Former Soviet Union**  
Kazakhstan  
Russia, Azerbaijan, Armenia and Georgia  
Ukraine, Moldova, and Belarus

**Africa**  
North Africa  
Southern Africa  
East Africa  
West Africa

**Asia**  
Eastern China  
South Asia  
Southeast Asia  
Central Asia  
Korea

**News & Events**

- Cyclone Nargis Maps
- Irrawaddy Delta, Burma
- Lake Victoria's Falling Waters
- The FAS Crop Explorer: A Web Success Story
- ASRC Sag Award Press Release

**Related Sites**

- Agricultural Production
- Articles and Reports
- Explore by Crop
- Future of Land Imaging
- Geographic Search
- Global Crop Production
- Global Reservoirs/Lakes
- Landsat GloVis
- MODIS Image Gallery
- MODIS Image Archive
- MODIS NDVI Gallery
- MODIS NDVI Time Series

**Explore by Commodity**

Mixed Grain  
Wheat  
Corn  
Cotton  
Meal, Copra  
Millet  
Mixed Grain  
Oats  
Oil, Palm  
Oilseed, Copra  
Oilseed, Cottonseed

**Articles and Reports**

[Continued Drought in 2009/10.](#)

## Maps and time-series charts for:

### Weather Data (AWFA, WMO, CMORPH, TMPA, and NEXRAD)

- Dekadal (10-day) precipitation & temperatures compared to climate normals

### Soil Moisture & Crop Models

- Modified Palmer two-layer soil moisture
- Behind firewall: Crop calendars for wheat, corn, & sorghum and corn hazard/alarm model.

### Vegetation Indices (polar-orbiting satellites)

- GAC (8-km) (behind firewall)
- SPOT-VEG (1-km)
- MODIS (250-m)

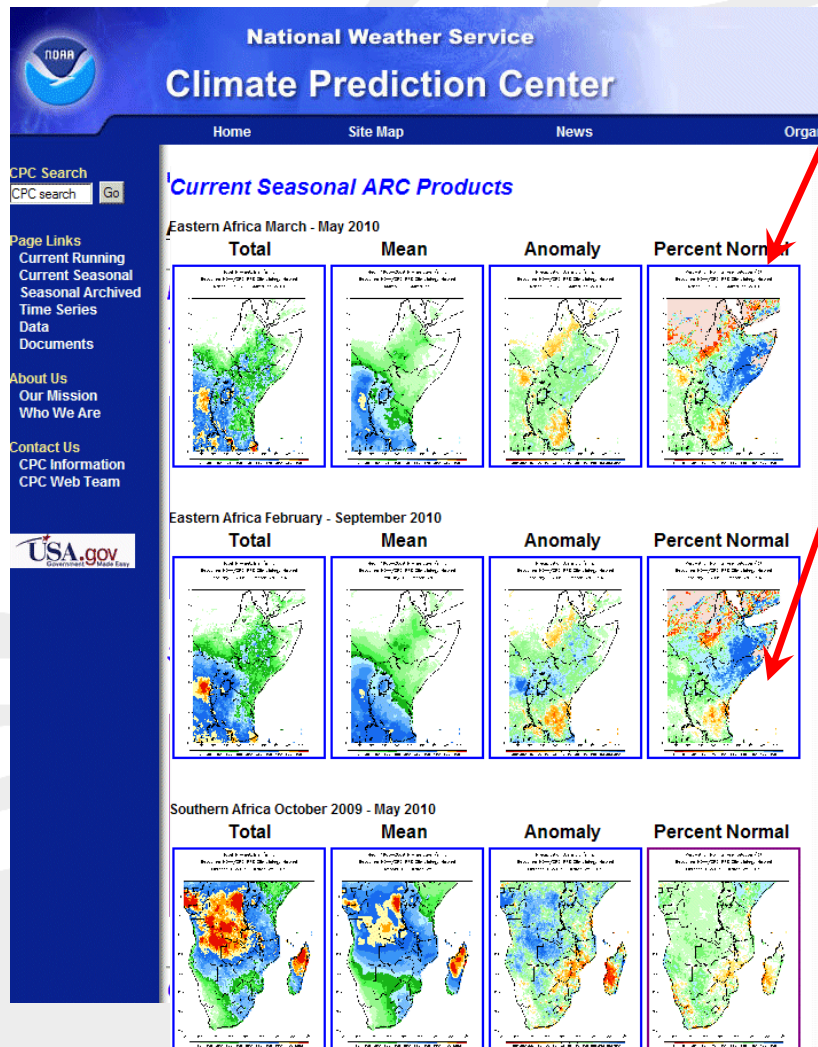
### Daily MODIS

- Aqua and Terra (250-m)

### Lake/Reservoir Heights

- TOPOX/Poseidon, Jason-1, Jason-2
- GFO
- ERS, ENVISAT

# FAS/IPAD & NOAA/CPC Are Partners with USAID's FEWS-NET (Africa & beyond)



**Growing Season Products for Africa**

**CPC Rainfall Estimate (RFE) product (8-km) with Meteosat, SSM/I, and ground stations merged**

NOAA CPC Source: [http://www.cpc.ncep.noaa.gov/products/fews/AFR\\_CLIM/afr\\_clim\\_season.shtml](http://www.cpc.ncep.noaa.gov/products/fews/AFR_CLIM/afr_clim_season.shtml)

# Growing Seasons for Other Continents?

National Weather Service  
Climate Prediction Center

Home Site Map News

HOME > Monitoring & Data > Global Climate Data > Global Regional Climate Maps > South America

*Regional Climate Maps: South America*

**Southern South America**

Weekly	Monthly	3-Month
<a href="#">Total Precipitation</a>	<a href="#">Total Precipitation</a>	<a href="#">Total Precipitation</a>
<a href="#">Maximum Temperature</a>	<a href="#">Percent of Normal Precipitation</a>	<a href="#">Percent of Normal Precipitation</a>
<a href="#">Minimum Temperature</a>	<a href="#">Average Temperature</a>	<a href="#">Average Temperature</a>
<a href="#">Temperature Anomaly</a>	<a href="#">Temperature Anomaly</a>	<a href="#">Temperature Anomaly</a>

**Northern South America**

Weekly	Monthly	3-Month
<a href="#">Total Precipitation</a>	<a href="#">Total Precipitation</a>	<a href="#">Total Precipitation</a>
<a href="#">Maximum Temperature</a>	<a href="#">Percent of Normal Precipitation</a>	<a href="#">Percent of Normal Precipitation</a>
<a href="#">Minimum Temperature</a>	<a href="#">Average Temperature</a>	<a href="#">Average Temperature</a>
<a href="#">Temperature Anomaly</a>	<a href="#">Temperature Anomaly</a>	<a href="#">Temperature Anomaly</a>

**Growing Season Products (4-6 months) for South America and other continents??**

NOAA CPC Source: [http://www.cpc.noaa.gov/products/analysis\\_monitoring/regional\\_monitoring/south\\_america.shtml](http://www.cpc.noaa.gov/products/analysis_monitoring/regional_monitoring/south_america.shtml)

USDA/FAS/OGA/IPAD

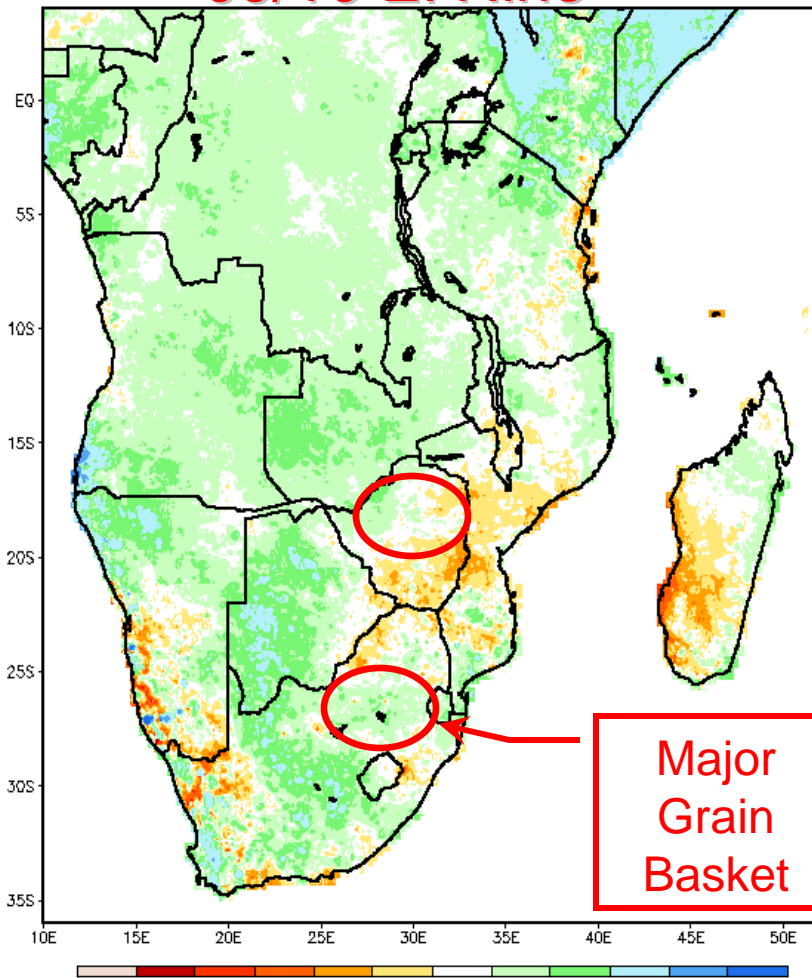
# Southern Africa El Niño Comparison

Percent of Normal Precipitation (%)

Based on NOAA/CPC RFE Climatology Method

October 1 2009 – March 28 2010

**09/10 El Niño**

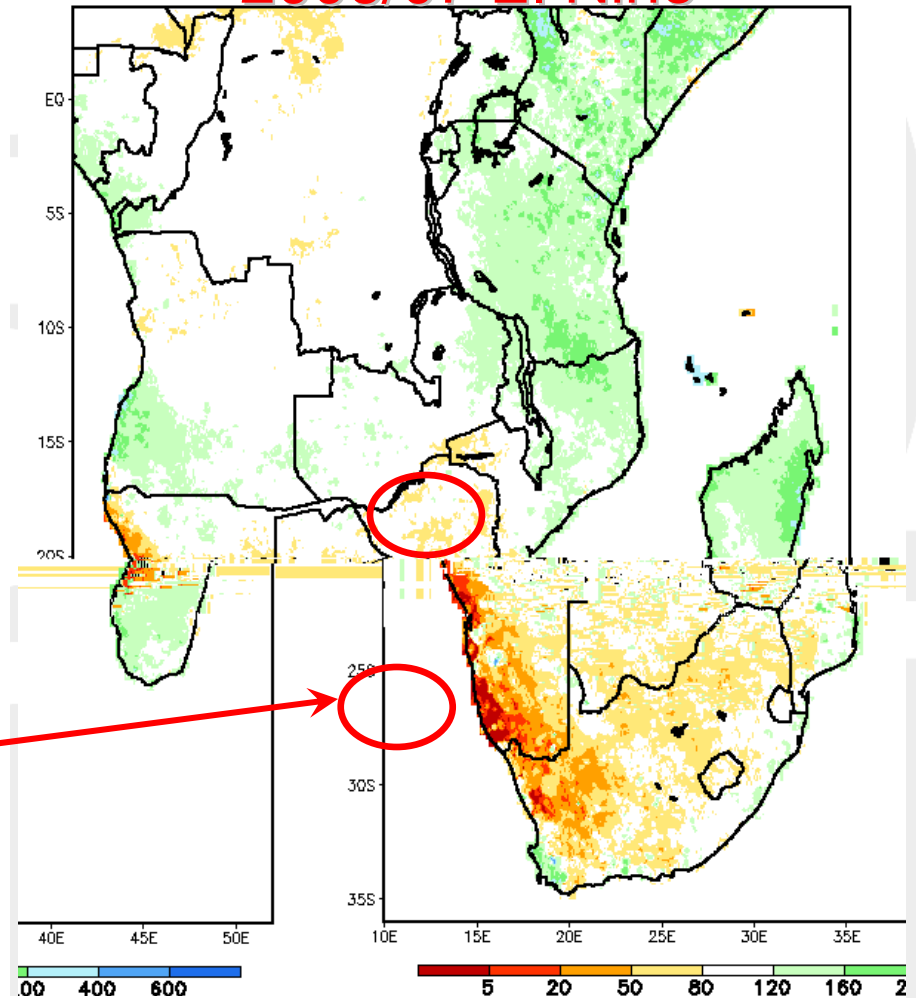


Percent of Normal Precipitation (%)

Based on NOAA/CPC RFE Climatology Method

October 1 2006 – June 3 2007

**2006/07 El Niño**

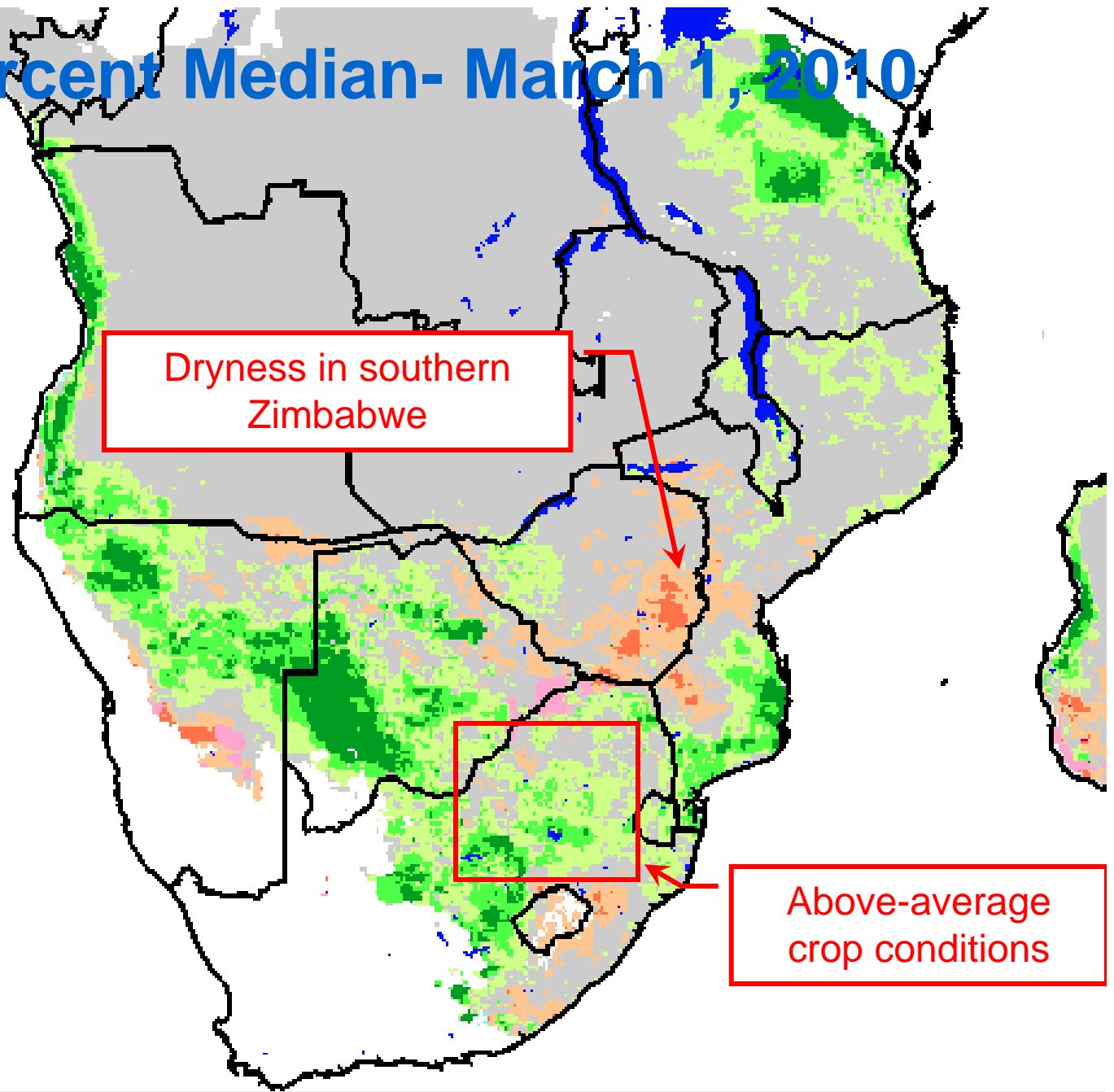
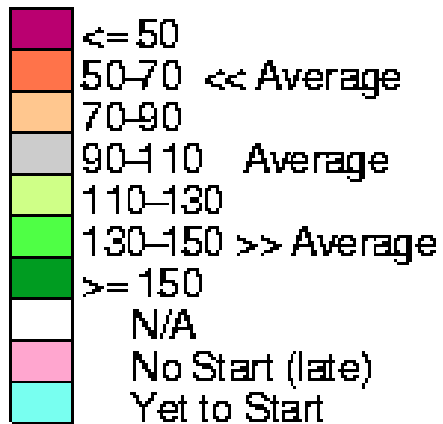


NOAA CPC Source: [http://www.cpc.ncep.noaa.gov/products/fews/AFR\\_CLIM/afr\\_clim\\_season.shtml](http://www.cpc.ncep.noaa.gov/products/fews/AFR_CLIM/afr_clim_season.shtml)



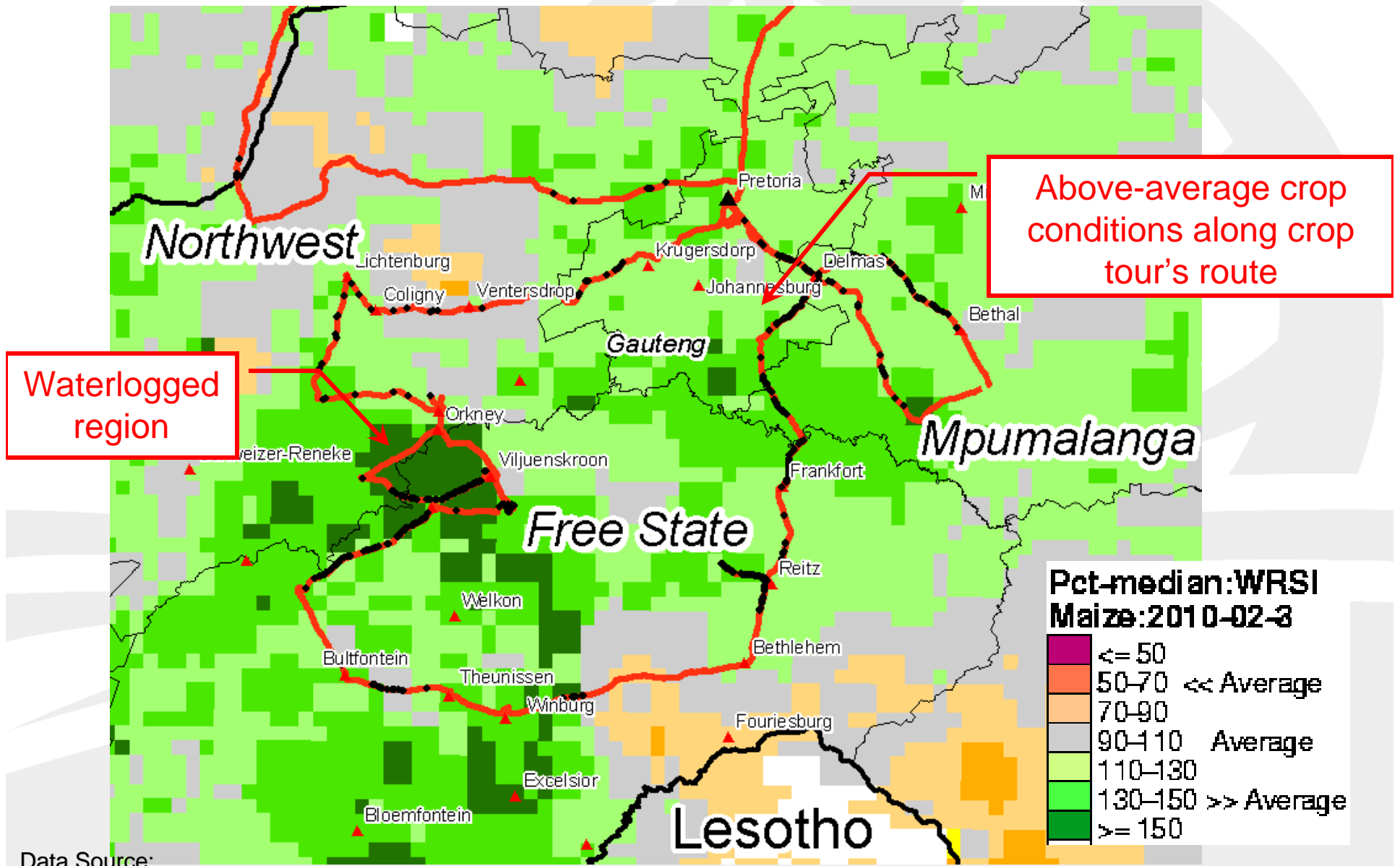
# WRSI Percent Median- March 1, 2010

Pct-median:WRSI  
Maize:2010-02-3



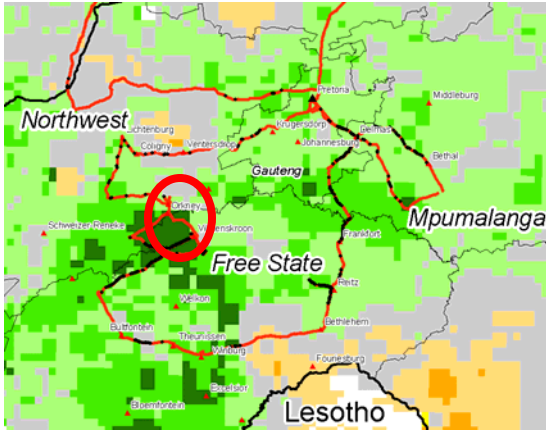
Data Source:  
<http://earlywarning.usgs.gov/adds/>

# WRSI Percent Median (March 1, 2010)



Data Source:  
<http://earlywarning.usgs.gov/adds/>

# Bothaville, RSA (Feb 25, 2010)

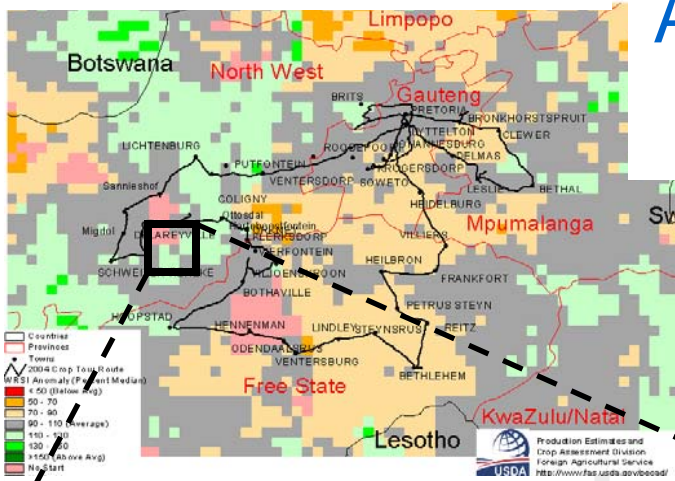


**Waterlogged corn  
near Bothaville**

S 27° 21.214' E 026° 40.599' 1323 m

02/25/2010 2:36:44 PM

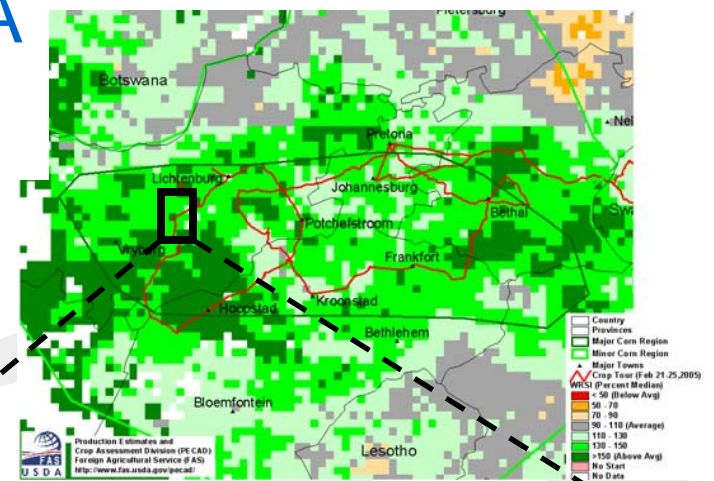
WRSI Relative Yield (2003/04)



# Albertshoek, RSA

(Crop failure May 2004, but bumper harvest May 2005)

WRSI Relative Yield (2004/05)



South Africa Crop Tour (Feb. 19-26, 2004)

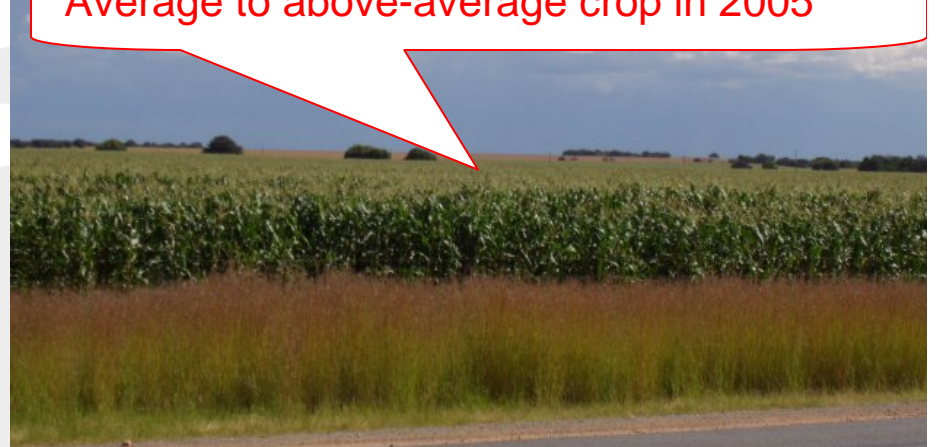
South Africa Crop Tour (Feb. 21-25, 2005)

Neutral Year: Feb. 24, 2004

El Niño Year: Feb. 22, 2005

Crop failure in 2004

Average to above-average crop in 2005



S 27° 03.034' E 025° 39.261' 1380 m

02/24/2004 02:20:26 PM

S 27° 07.244' E 025° 32.006' 1359 m

02/22/2005 3:06:27 PM

- GPS and digital camera data integrated with relative-yield model.

# WRSI (March 20, 2007) – El Niño Year

Numerous late-planted fields died from water stress in March, 2007.

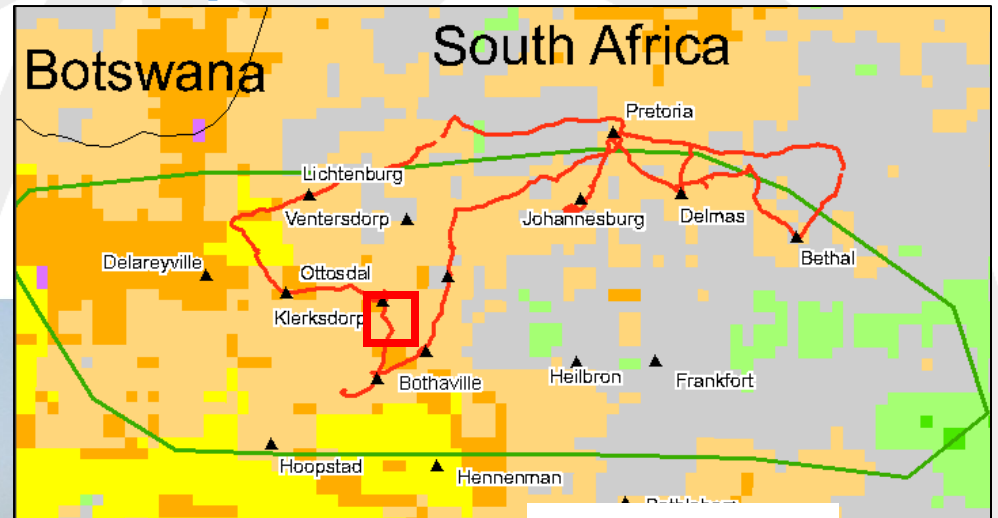


S 27° 17.184' E 026° 48.634'

4454 ft

02/21/2007 8:47:49 AM

WRSI Data Source:  
<http://igskmncnwb015.cr.usgs.gov/adds/>



**Crop Tour Route (Feb 19-22, 2007)**

- Countries
- Major Corn Region
- Minor Corn Region
- ▲ Towns

**Percent Median (WRSI)**

- ≤ 50
- 50 - 70 << Average
- 70 - 90
- 90 - 110 Average
- 110 - 130
- 130 - 150 >> Average
- 150 - 250
- Yet to Start
- No Start

Historical Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)], calculated with respect to the 1971-2000 base period. For historical purposes El Niño and La Niña episodes are defined when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2002	-0.1	0.1	0.2	0.4	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.4
2003	1.2	0.9	0.5	0.1	-0.1	0.1	0.4	0.5	0.6	0.5	0.6	0.4
2004	0.4	0.3	0.2	0.2	0.3	0.5	0.7	0.8	0.9	0.8	0.8	0.8
2005	0.7	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.1
2007	0.8	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.7	-1.0	-1.1	-1.3
2008	-1.4	-1.4	-1.1	-0.8	-0.6	-0.4	-0.1	0.0	0.0	0.0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	0.6	0.7	0.8	0.9	1.2	1.5	1.8
2010	1.7											
2011												
2012												
2013												
2014												
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												
2026												
2027												

**NOAA/CPC Source:**  
[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/index.shtml](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml)

# Historical El Niño and La Niña Episodes

Based on the ONI computed using ERSST.v3b

Highest		Lowest	
<u>El Niño</u>	<u>ONI Value</u>	<u>La Nina</u>	<u>ONI Value</u>
JAS 1951 - NDJ 1951/52	0.8	ASO 1949 – FMA 1951	-1.7
MAM 1957 – MJJ 1958	1.7	MAM 1954 – DJF 1956/57	-2.1
JJA 1963 – DJF 1963/64	1.0	ASO 1962 – DJF 1962/63	-0.8
MJJ 1965 – MAM 1966	1.6	MAM 1964 – DJF 1964/65	-1.1
OND 1968 – MJJ 1969	1.0	NDJ 1967/68 – MAM 1968	-0.9
ASO 1969 – DJF 1969/70	0.8	JJA 1970 – DJF 1971/72	-1.3
AMJ 1972 – FMA 1973	2.1	AMJ 1973 – MAM 1976	-2.0
ASO 1976 – JFM 1977	0.8	SON 1984 – ASO 1985	-1.0
ASO 1977 - DJF 1977/78	0.8	AMJ 1988 – AMJ 1989	-1.9
AMJ 1982 – MJJ 1983	2.3	ASO 1995 – FMA 1996	-0.7
JAS 1986 – JFM 1988	1.6	JJA 1998 – MJJ 2000	-1.6
AMJ 1991 – JJA 1992	1.8	SON 2000 – JFM 2001	-0.7
AMJ 1994 – FMA 1995	1.3	ASO 2007 – AMJ 2008	-1.4
AMJ 1997 – AMJ 1998	2.5		
AMJ 2002 – FMA 2003	1.5		
MJJ 2004 – JFM 2005	0.9		
JAS 2006 - DJF 2006/07	1.1		

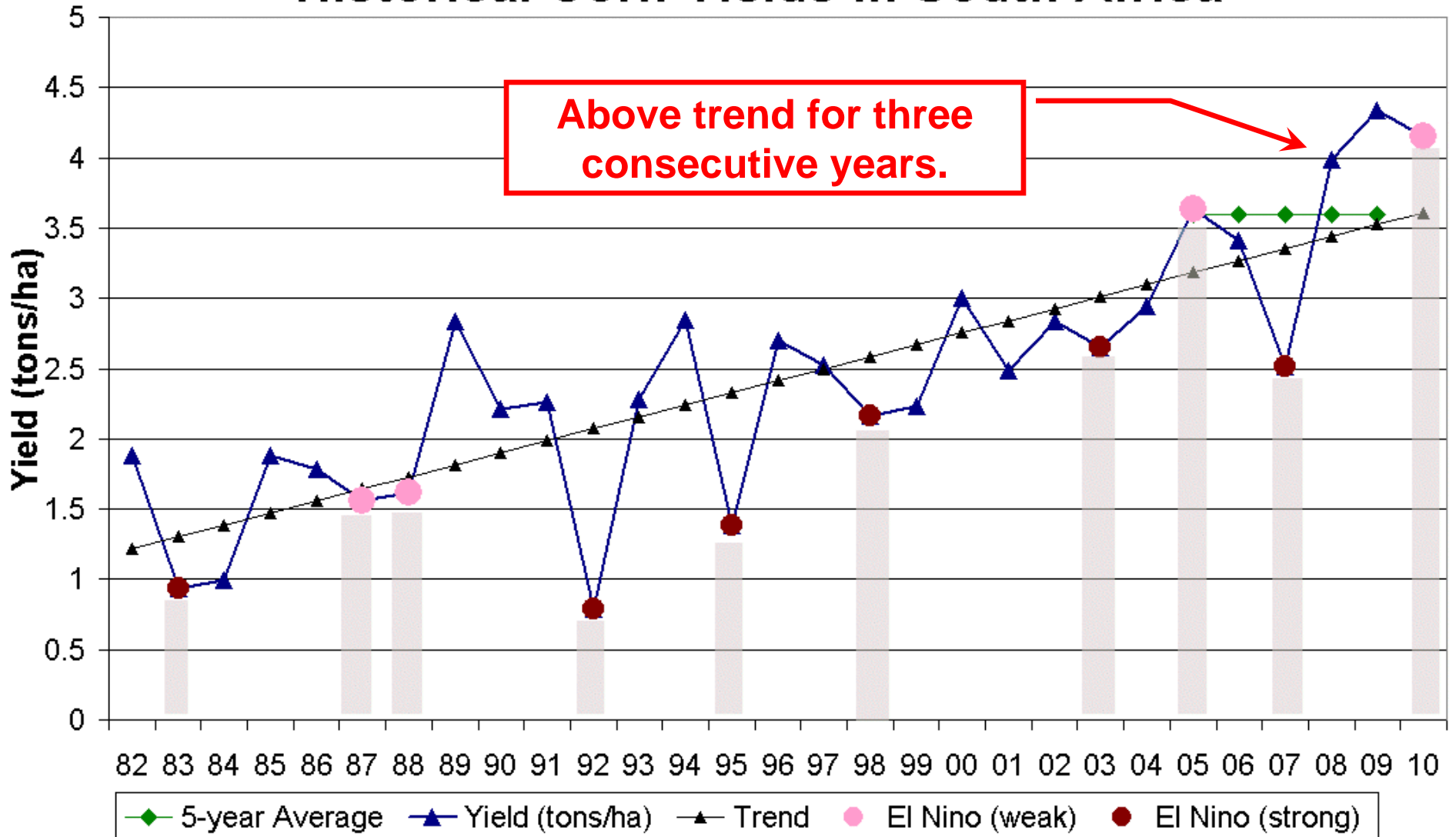
**NOTE:**

After updating the ocean analysis to ERSST.v3b, a new La Niña episode was classified (ASO 1962-DJF 1962/63) and two previous La Niña episodes were combined into one single episode (AMJ 1973- MAM 1976).

**NOAA/CPC Source:**

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/index.shtml](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml)

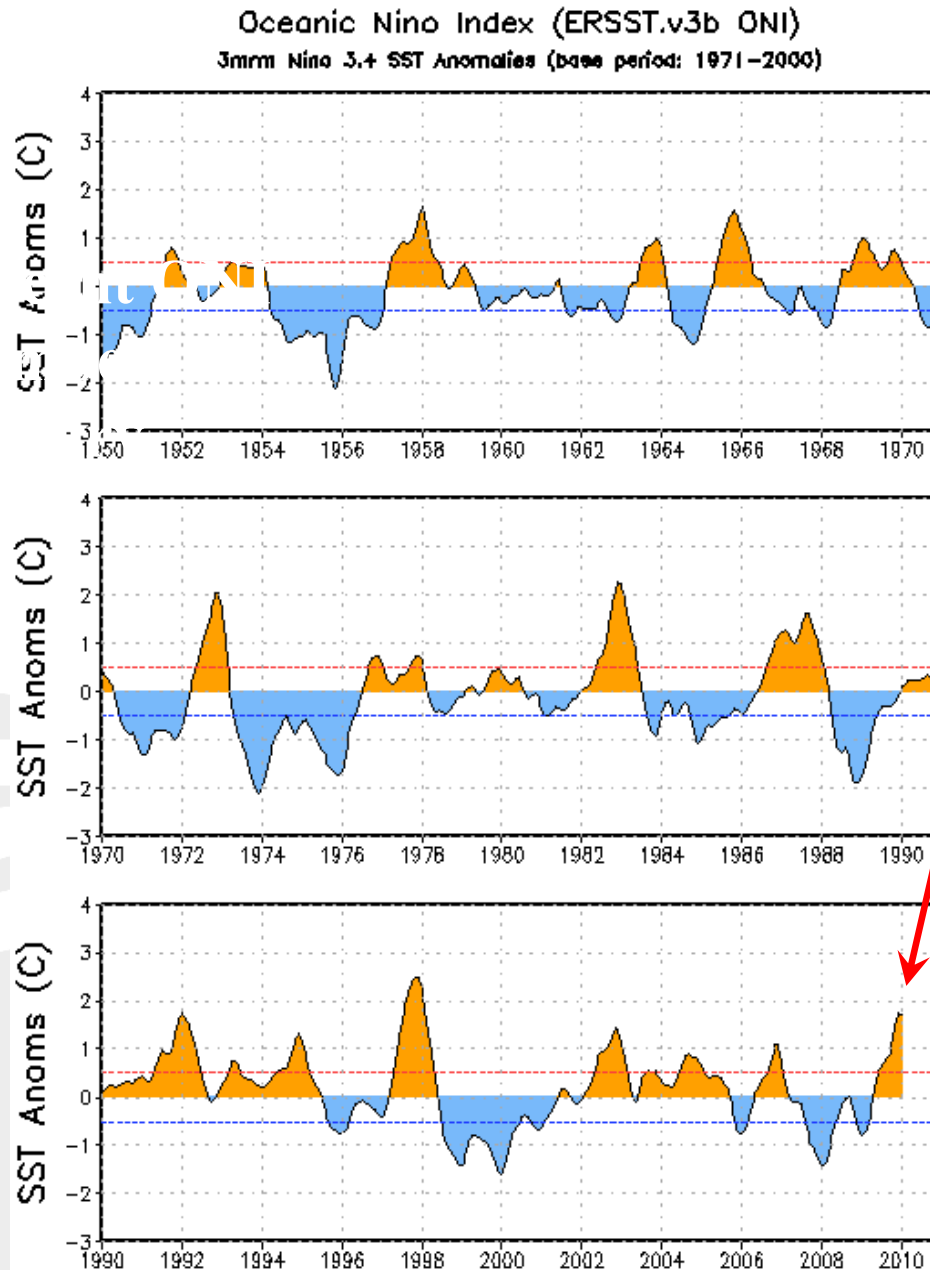
# Historical Corn Yields in South Africa



Data Source: Historical yield data from USDA's PSD Online and El Niño classification from NOAA's Climate Prediction Center (CPC)



# ONI (°C): Evolution since 1950

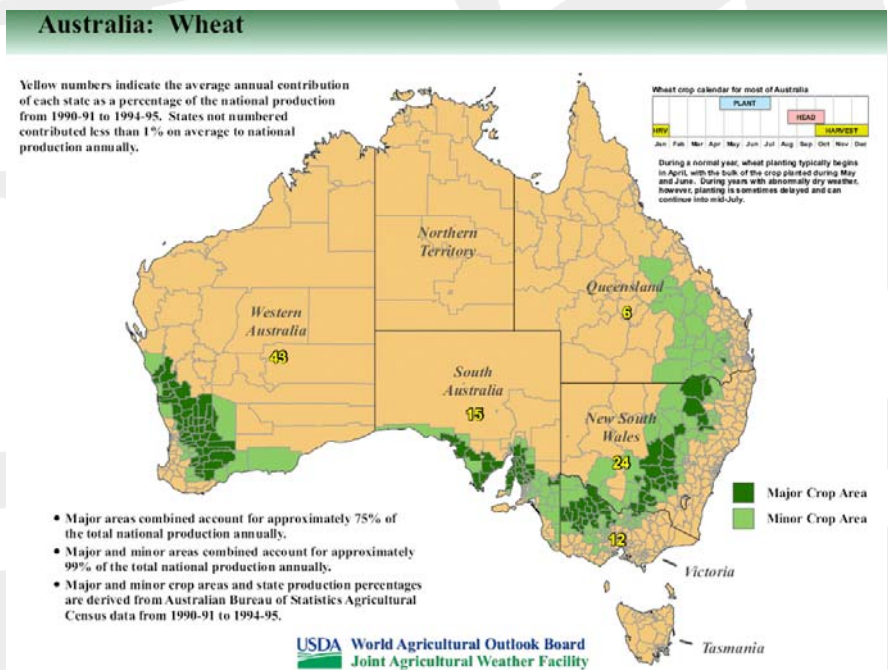
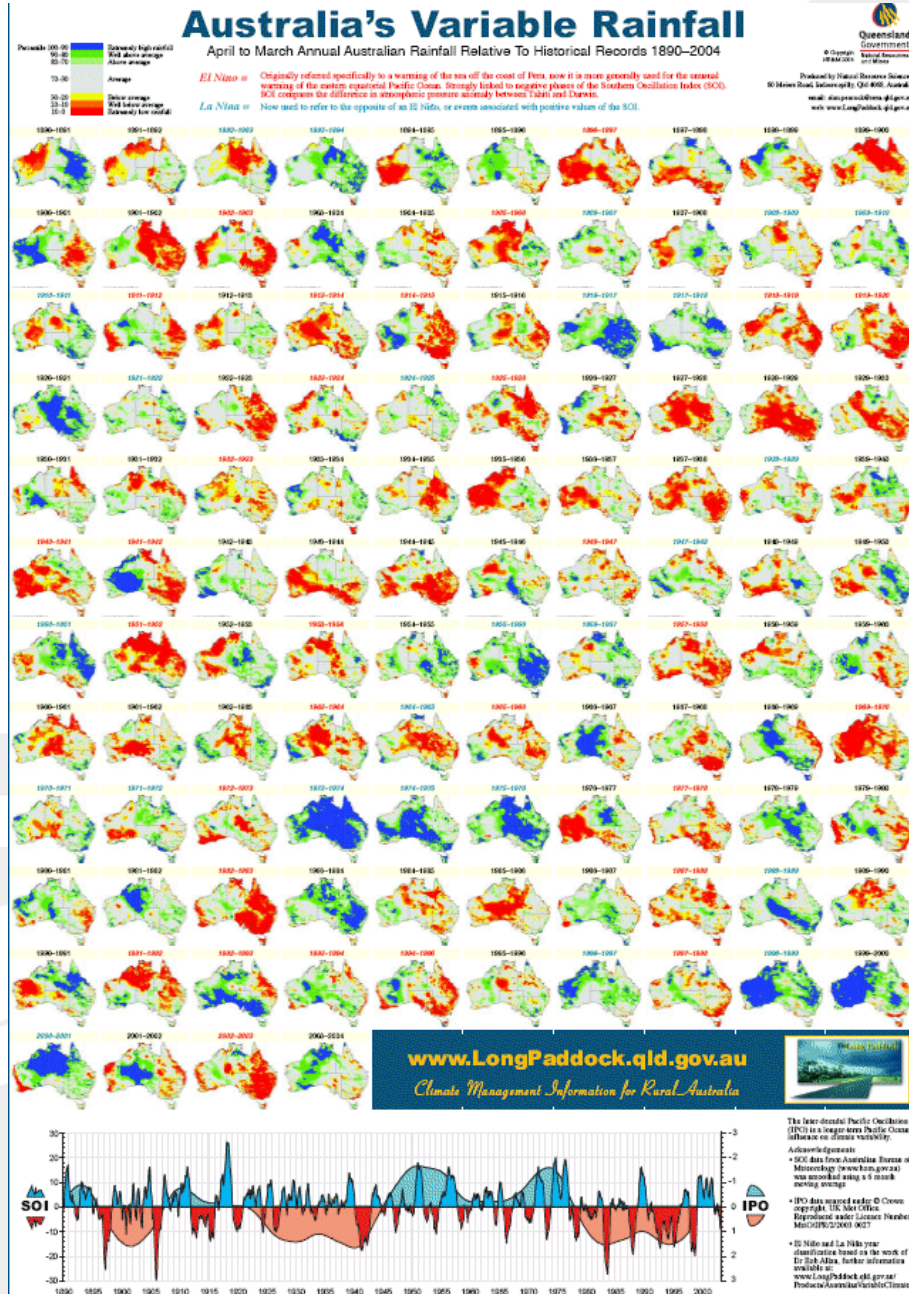


NOAA/CPC Source:  
[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/index.shtml](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml)

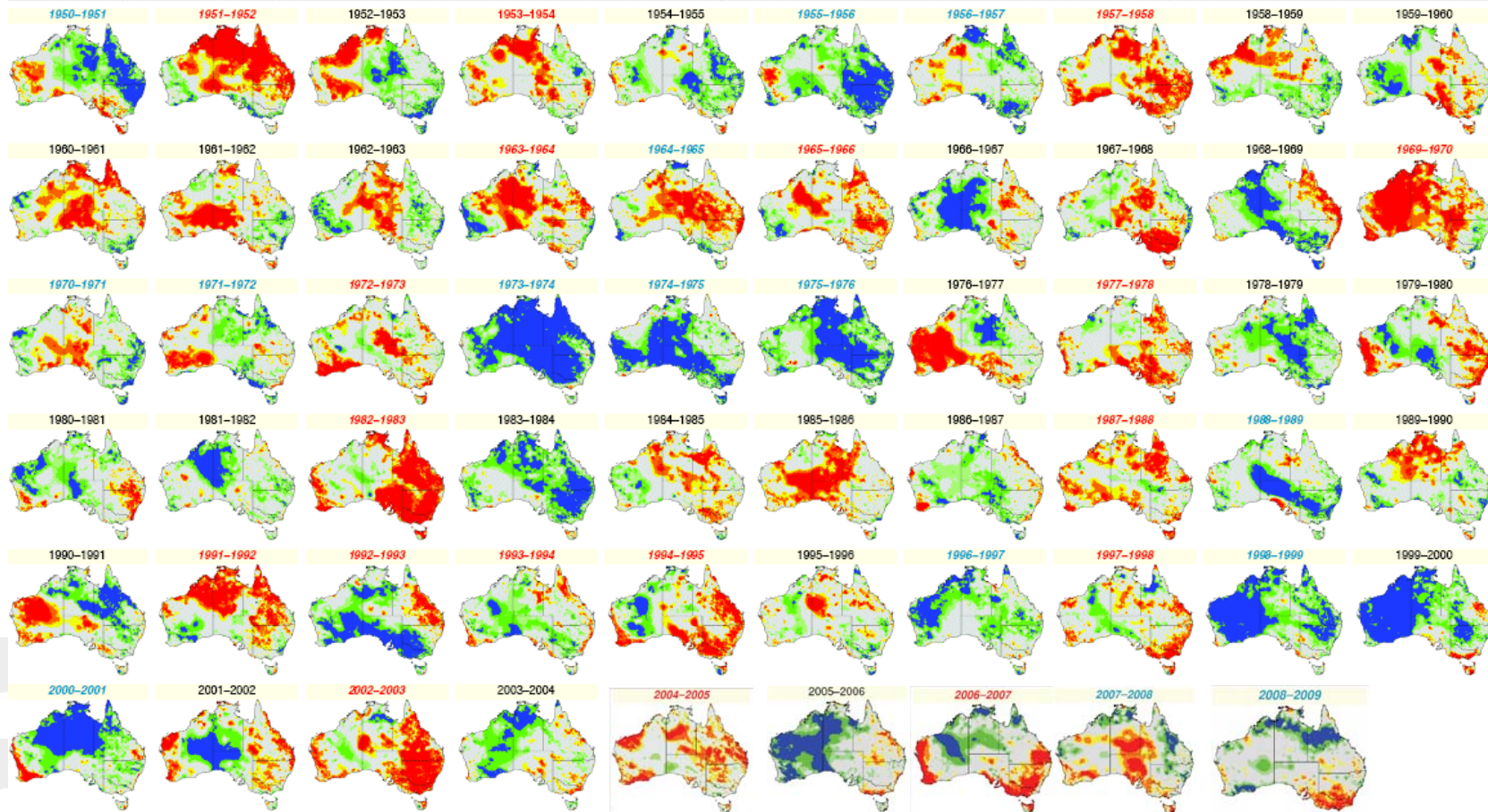
**Waterlogged corn fields in South Africa when should be drought.**

El Niño  
neutral  
La Niña

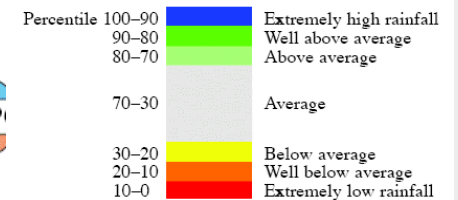
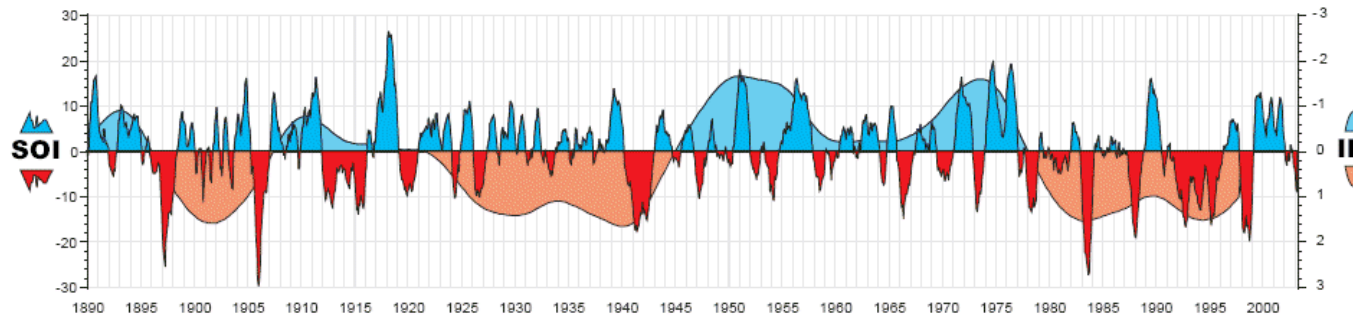
# Historical Rainfall in Australia



# Historical Rainfall in Australia



The inter-decadal Pacific Oscillation (IPO) is a longer term Pacific Ocean

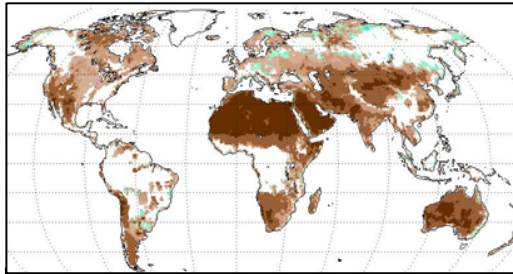


available at:  
[www.LongPaddock.qld.gov.au/Products/AustraliaVariableClimate/](http://www.LongPaddock.qld.gov.au/Products/AustraliaVariableClimate/)

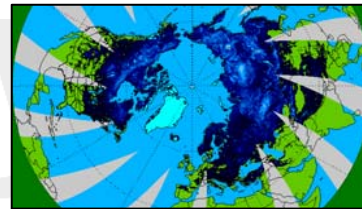
# Near Future Observations



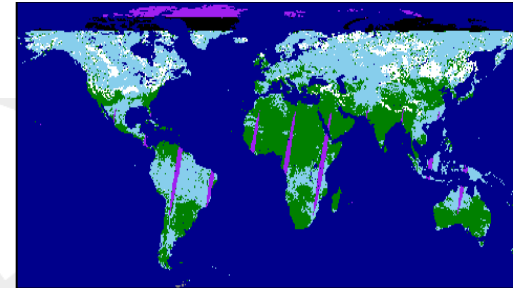
Vegetation/Carbon  
(Landsat, AVHRR, MODIS, *VIIRS*, MetOp, *DESDynI*, *ICESat-II*, *HyspIRI*, *LIST*, *ASCENDS*)



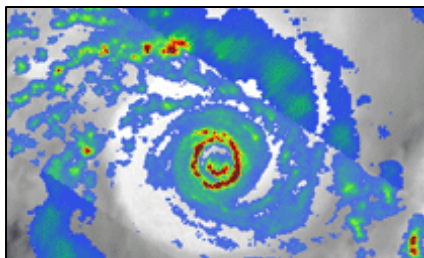
Surface soil moisture  
(SMMR, TRMM, AMSR-E, *SMOS*, *Aquarius*, *SMAP*)



Snow water equivalent  
(AMSR-E, SSM/I, *SCLP*, *GCOM-W*, *MIS*)



Snow cover fraction  
(MODIS, *VIIRS*, *MIS*)

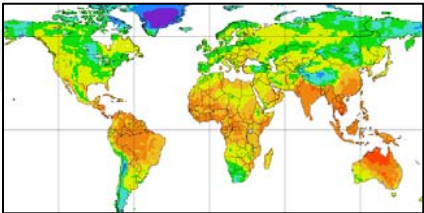
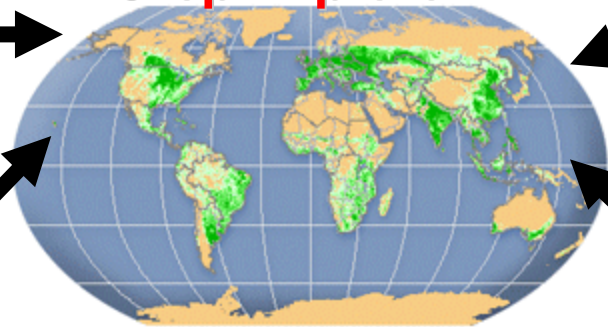


Precipitation  
(TRMM, *GPM*)

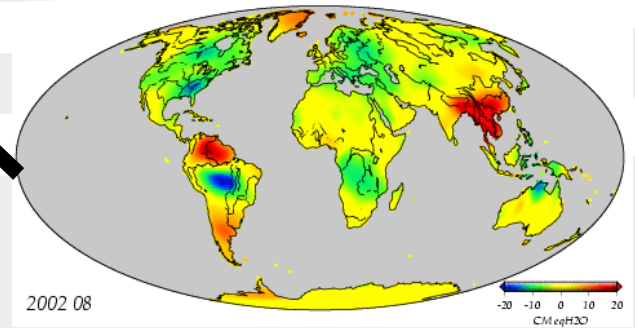


Water surface elevation  
(Jason-2, *SWOT*)

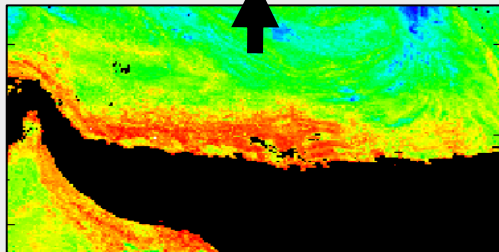
**New Inputs for Crop Explorer??**



Radiation  
(CERES, *CLARREO*)



Terrestrial water storage  
(GRACE, *GRACEII*)



Land surface temperature  
(MODIS, AVHRR, GOES, ...)

Modified from NASA- Peters-Lidard

# Possible CPC Assistance for Improving Global Agriculture Monitoring

- Improve ***daily*** global station gauge network from WMO/GTS, NWS & NOAAPORT/JAWF.
- Integrate daily global station network into daily CMORPH product (action: AFWA/NASA/NOAA)
- Set-up global growing season product for each continent
  - similar to RFE Africa/FEWSNET seasonal products at CPC.

# Summary OGA/IPAD & FAS Web Outreach

- FAS PS&D On-line
  - <http://www.fas.usda.gov/psd/psdselection.asp>
- FAS (attache reports)
  - <http://www.fas.usda.gov/scriptsw/attacherep/default.asp>
- OGA/IPAD analyst updates
  - <http://www.pecad.fas.usda.gov/search.cfm>
- OGA/IPAD Crop Explorer (weather & NDVI)
  - <http://www.pecad.fas.usda.gov/cropexplorer/index1.cfm>
- OGA/IPAD Archive Explorer (AWiFS Landsat images)
  - <http://www.pecad.fas.usda.gov/remote.cfm>
- OGA/IPAD PSD Mapper
  - <http://www.pecad.fas.usda.gov/ogamaps/>
- OGA/IPAD Photo Gallery (geo-referenced)
  - [http://www.pecad.fas.usda.gov/photo\\_gallery/pg\\_regions.cfm?CE\\_Region\\_ID=eafrica](http://www.pecad.fas.usda.gov/photo_gallery/pg_regions.cfm?CE_Region_ID=eafrica)
- OGA/IPAD Tropical Cyclone Monitor
  - <http://151.121.3.217/TropicalCycloneMonitor/>
- GLAM-MODIS Web Products-NASA/USDA
  - MODIS (2002-present) time series data
    - <http://pekko.geog.umd.edu/usda/test/>
  - Daily MODIS data from Rapid Response System
    - [http://www.pecad.fas.usda.gov/cropexplorer/modis\\_summary/index.cfm](http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm)
  - Global Reservoir Monitor
    - [http://www.pecad.fas.usda.gov/cropexplorer/global\\_reservoir/](http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/)
  - NASA Earth Observatory's Agriculture Hazards
    - [http://earthobservatory.nasa.gov/NaturalHazards/category.php?cat\\_id=6](http://earthobservatory.nasa.gov/NaturalHazards/category.php?cat_id=6)