agriculture
Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

UMLINDI
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INSTITUTE FOR SOIL, CLIMATE AND WATER

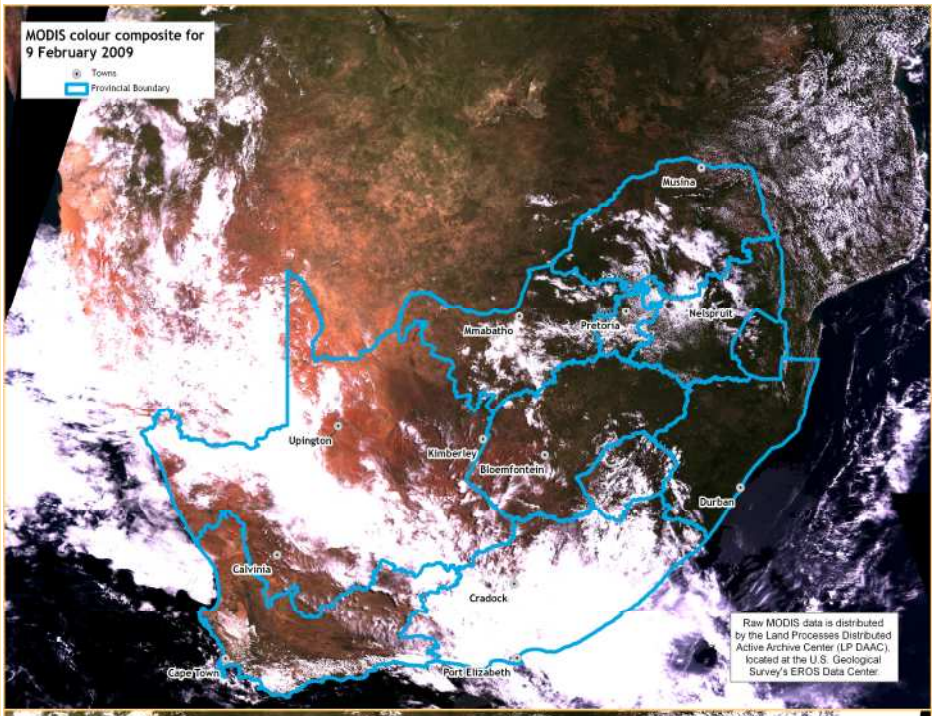
- Latest vegetation conditions as deduced from SPOT VEGETATION
- Rainfall for February 2009

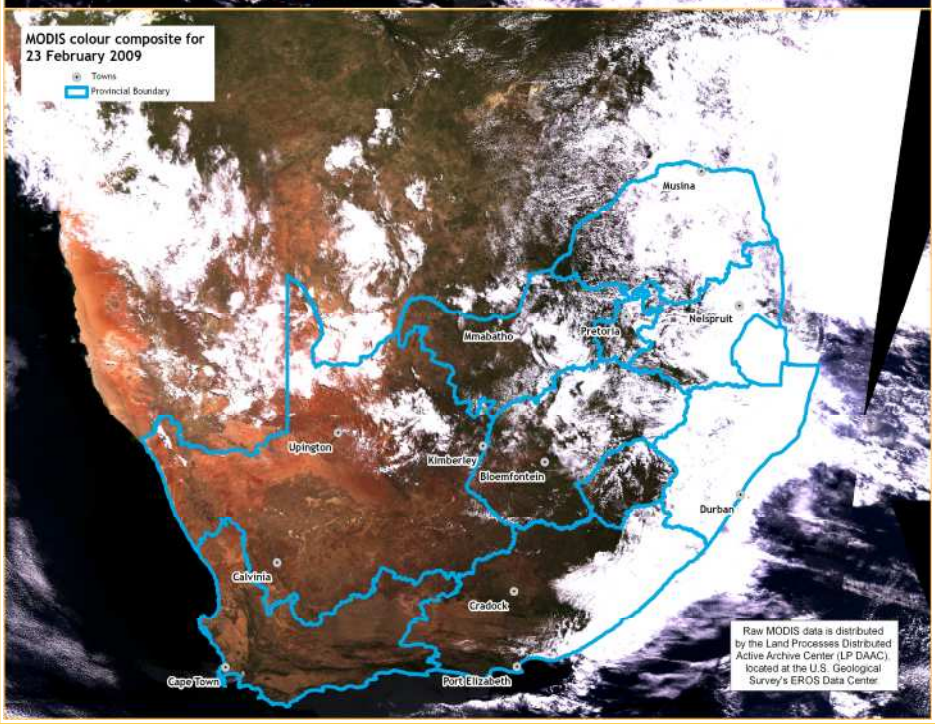
CONTENTS:

ARC • LNR
Excellence in Research and Development

Images of the Month

These images represent to a large extent the weather patterns as experienced during February 2009. The image for 9 February shows a cloud band located over the western parts of South Africa and Namibia, as moisture circulated southeastward around the peripheries of an upper air high pressure system to the north, east of an upper air trough to the west. Except for the major activity in the west, thunderstorms (of a more isolated nature) still occurred in the tropical moist air over the northeastern parts of the country.
The image of the 23rd shows large amounts of tropical moisture moving over the northern and eastern parts of the country due to the movement of a weak tropical system from the east and a high pressure system to the south and east of the country. Large amounts of tropical moisture were introduced over the area and widespread showers occurred. The availability of tropical moist air over the northern and eastern parts was responsible for the occurrence of normal to above-normal rainfall over some of the northeastern parts of the country while the preferred location of the main cloud band was responsible for widespread above-normal rainfall over the central and western parts. The cloud band can still be seen, stretching from Namibia into central South Africa on the 23rd.





Vegetation Conditions

Vegetation Mapping

The Normalised Difference Vegetation Index (NDVI) is computed from the equation:

NDVI=(IR-R)/(IR+R)

where:
IR = Infrared reflectance &
R = Red band

NDVI images describe the vegetation activity. A decadal NDVI image shows the highest possible "greenness" values that have been measured during a 10-day period.

Vegetated areas will generally yield high values because of their relatively high near infrared reflectance and low visible reflectance. For better interpretation and understanding of the NDVI images, a temporal image difference approach for change detection is used.

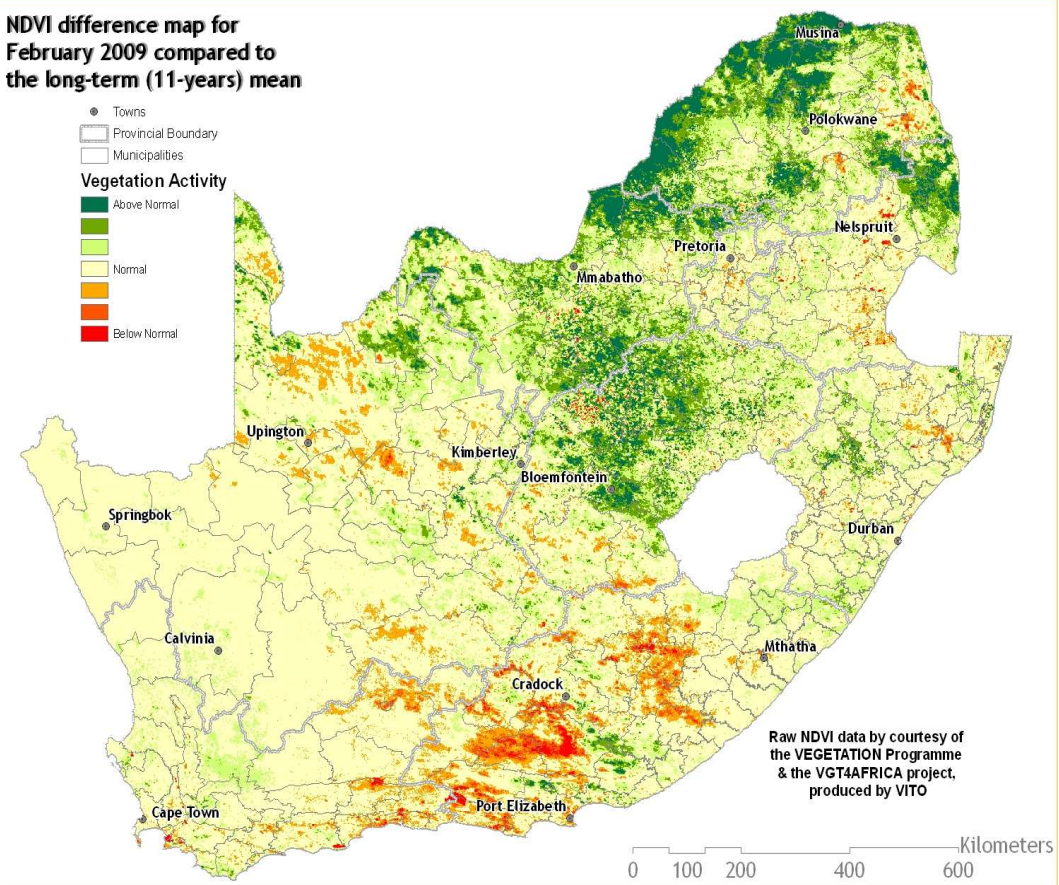


Figure 1

Figure 1:
Vegetation conditions for February were normal throughout most of the summer rainfall region, however, lower vegetation activity can be seen in the northeastern region of Limpopo. Lower vegetation activity can also be seen in the Eastern Cape (see also Figures 10-11, 13 & 15).

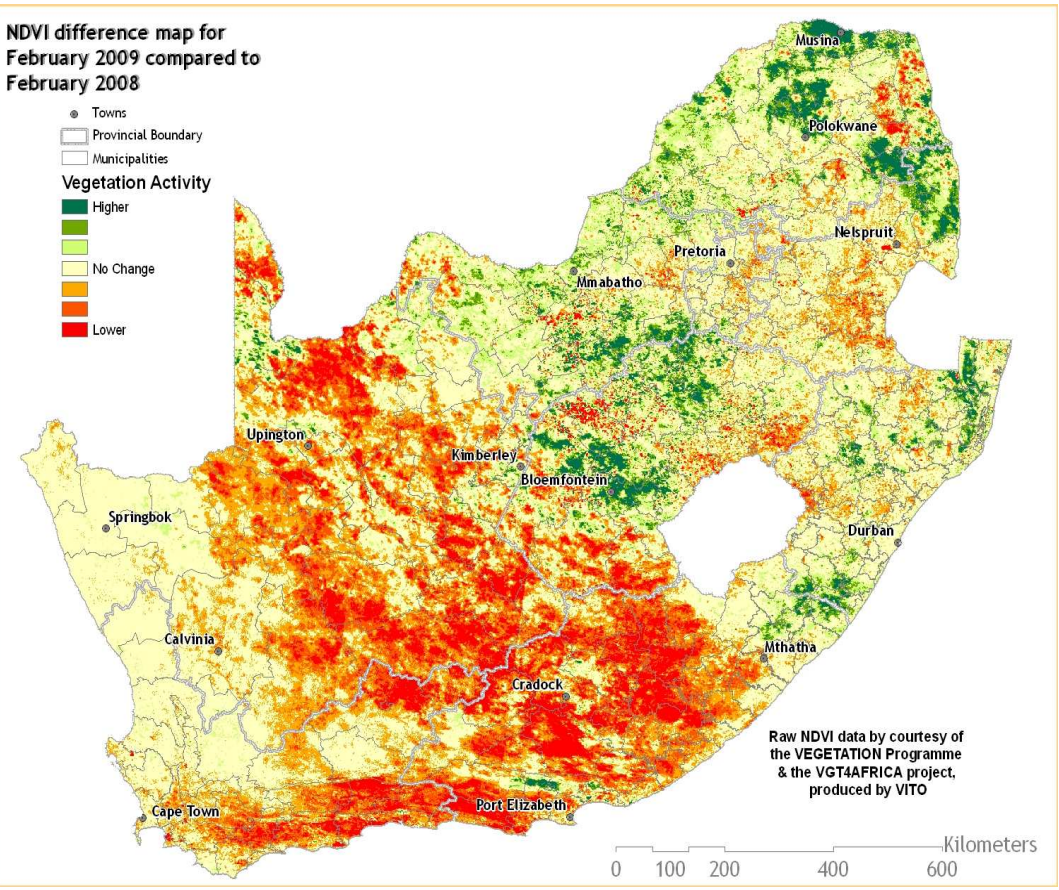


Figure 2

Figure 2:
Vegetation activity is lower throughout the central region of South Africa in February 2009 than it was in 2008.Very low vegetation activity can be seen in the Eastern Cape, southern Free State and eastern region of the Northern Cape.

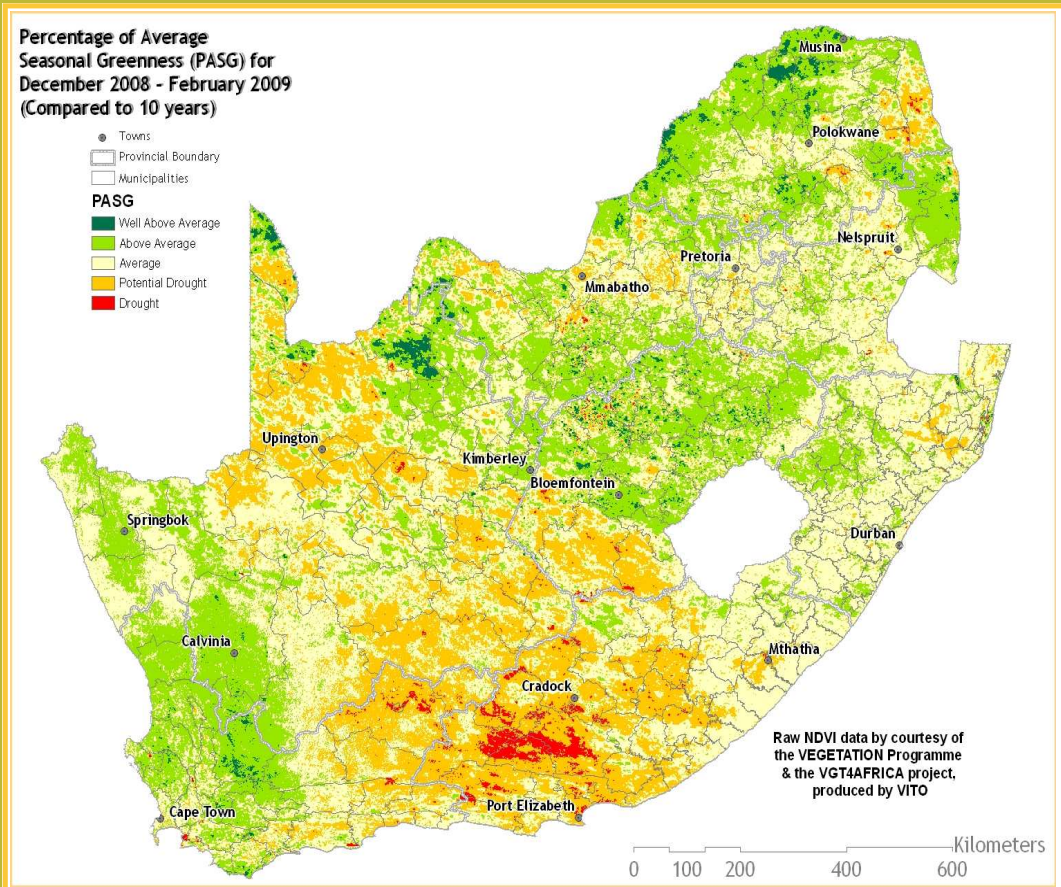


Figure 3

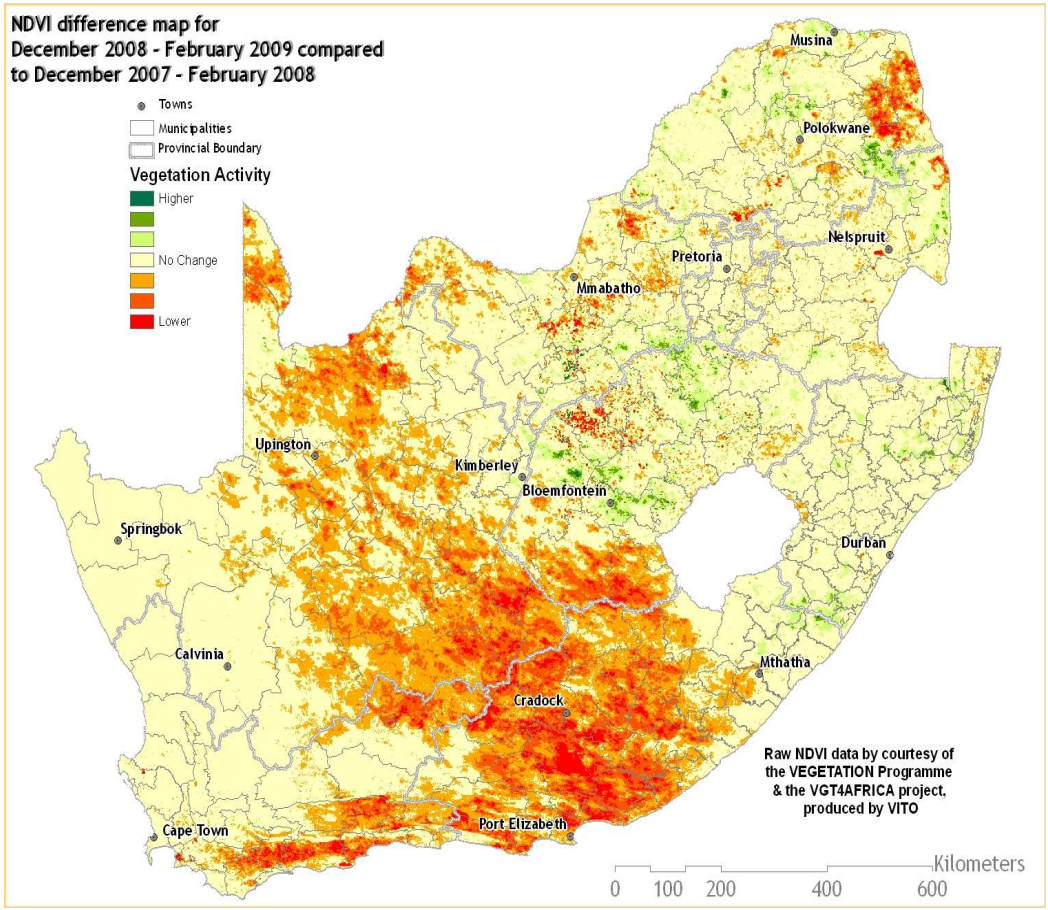


Figure 4

Vegetation Mapping cont.... ***(from p. 2)***

Interpretation of map legend

NDVI values range between 0 and 1. These values are incorporated in the legend of the difference maps, ranging from –1 (lower vegetation activity) to 1 (higher vegetation activity) with 0 indicating normal/ the same vegetation activity or no significant difference between the images.

Cumulative NDVI maps: Two cumulative NDVI datasets have been created for drought monitoring purposes:
Winter - January to December.
Summer - July to June

Figure 3:
The PASG map for December 2008 to February 2009 shows higher vegetation conditions over parts of the central summer rainfall region (see also Figure 8). Areas of concern, with lower vegetation conditions, include large parts of eastern Limpopo (Figure 12), the Northern Cape and the Eastern Cape (Figures 10-11, 13 & 15) provinces.

Figure 4:
The three-month difference map for December 2008 to February 2009 shows lower vegetation activity in the 2008/09 season, than in the 2007/08 season over the central region of South Africa.

Vegetation Conditions & Rainfall

NDVI and Rainfall Graphs

Figure 5: Orientation map showing the areas of interest for February 2009. The district colour matches the border of the corresponding graph.

Figures 6-9: Indicate areas with higher cumulative vegetation activity for the last year.

Figures 10-15: Indicate areas with lower cumulative vegetation activity for the last year.

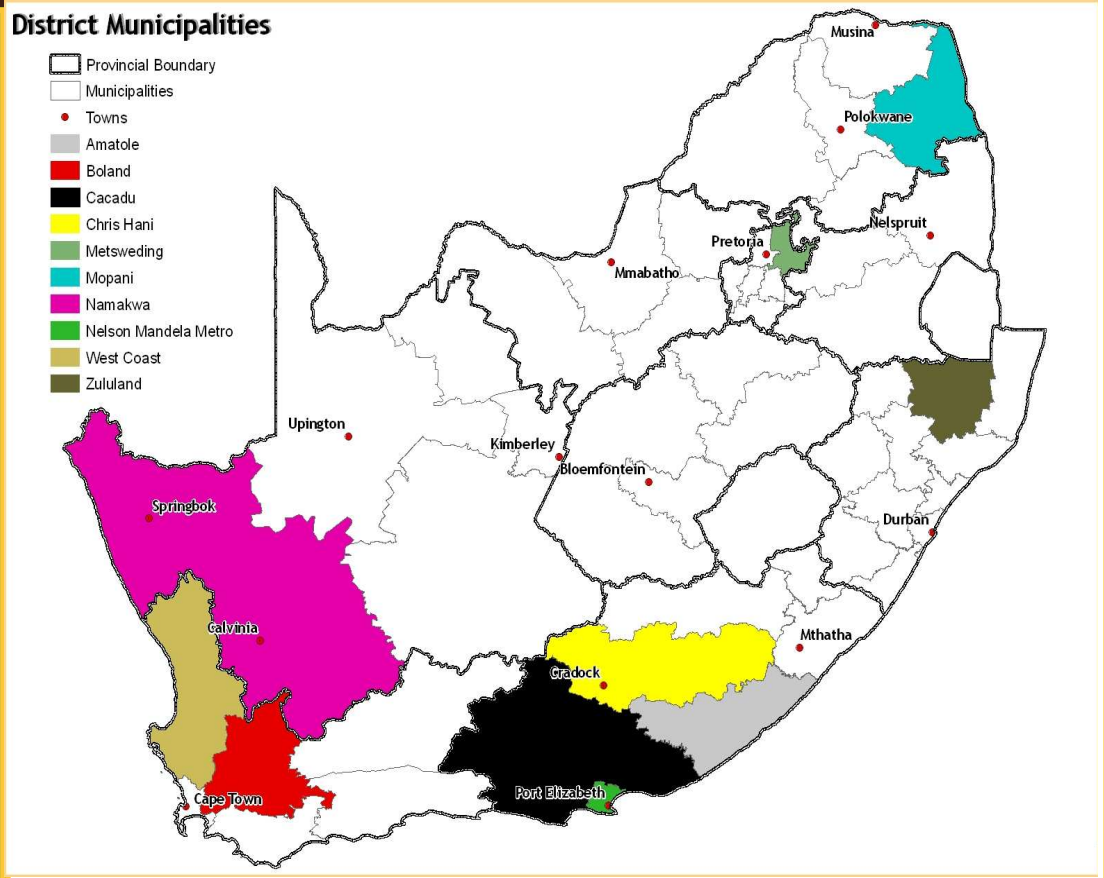


Figure 5

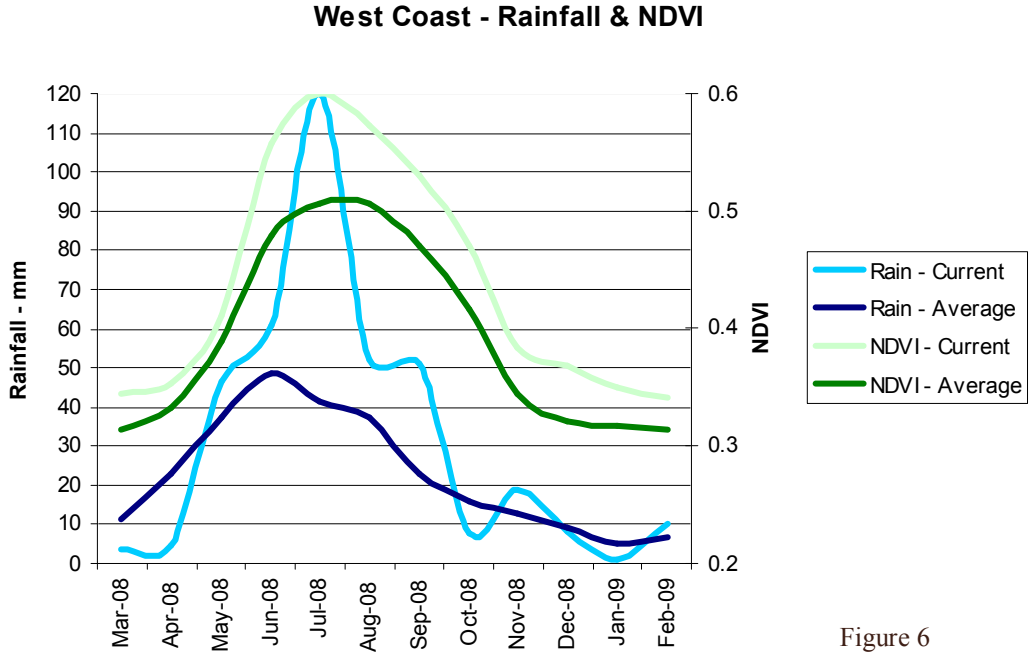


Figure 6

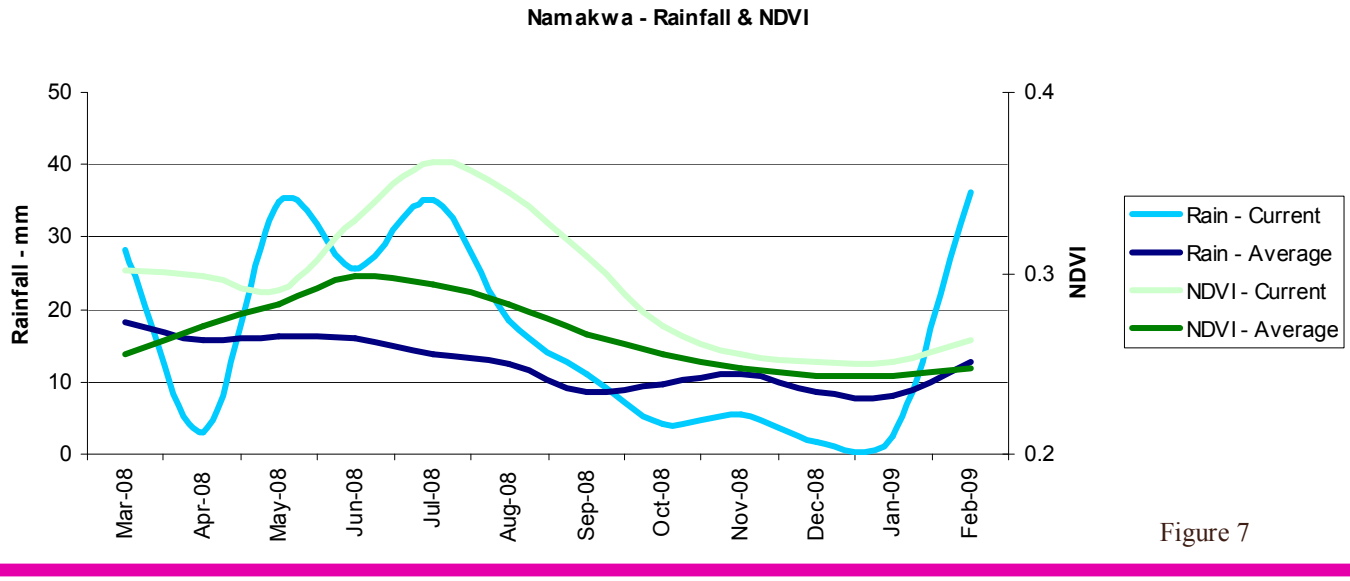


Figure 7

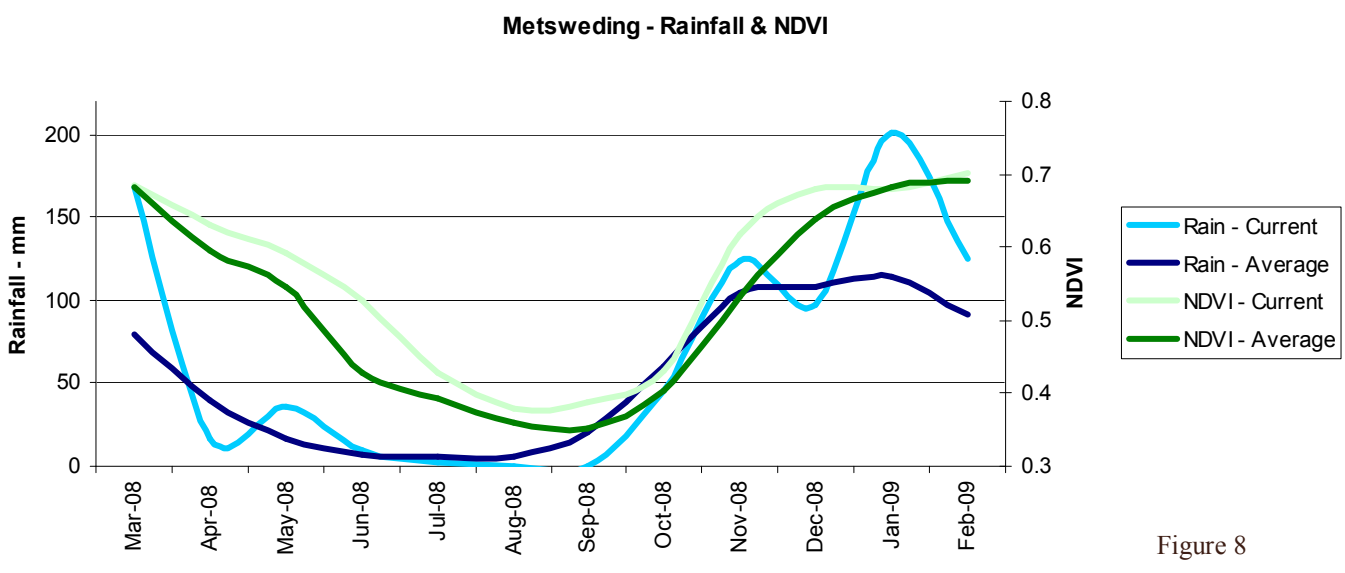
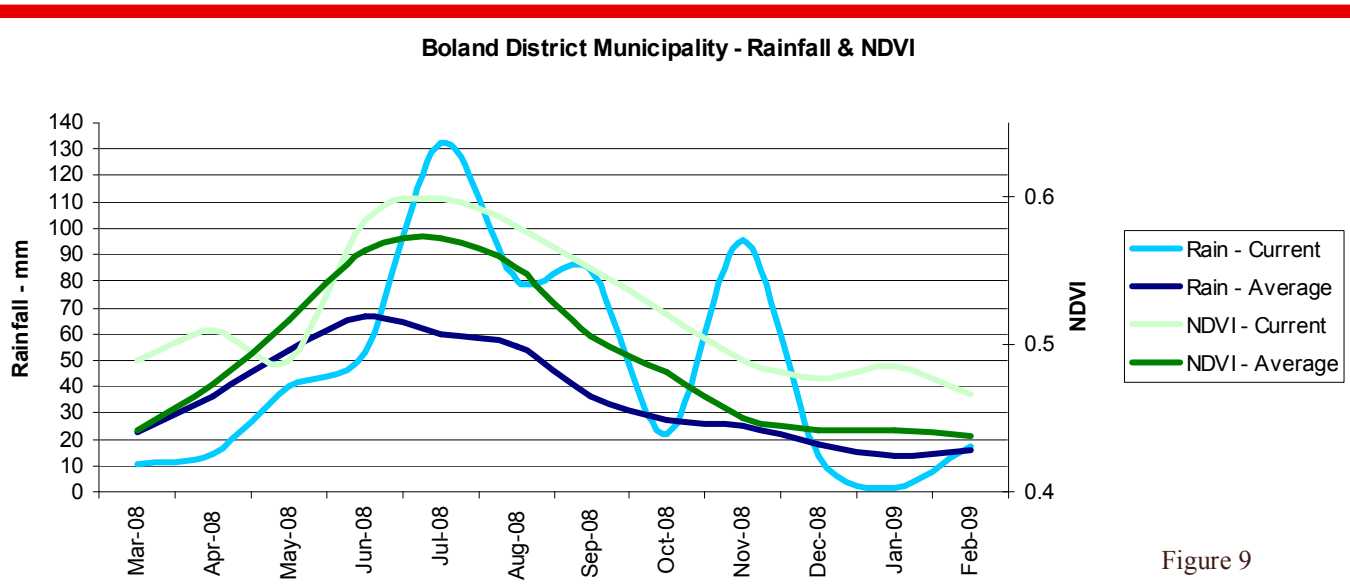


Figure 8



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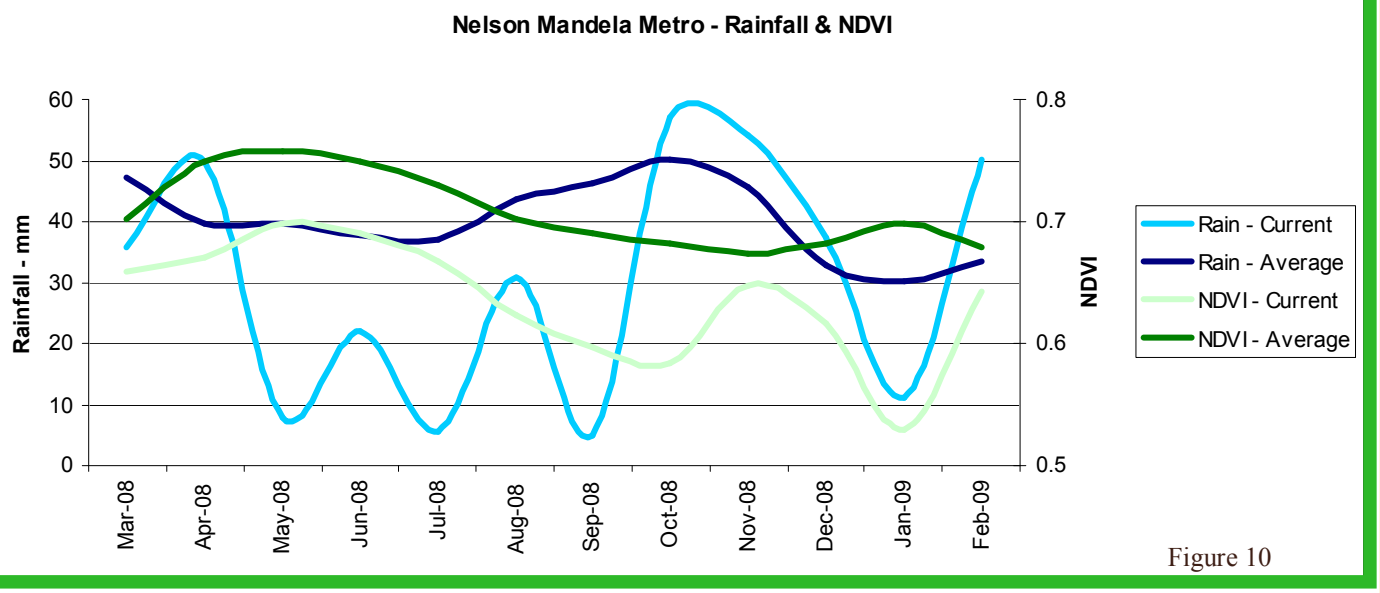

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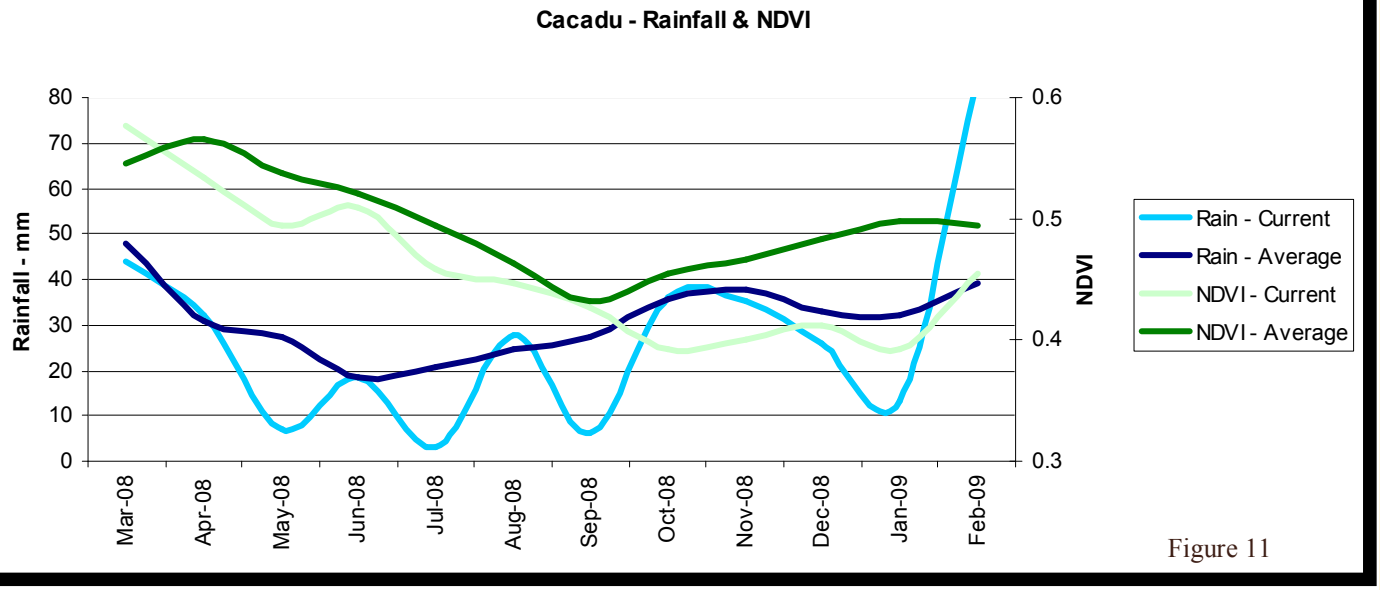


Figure 11

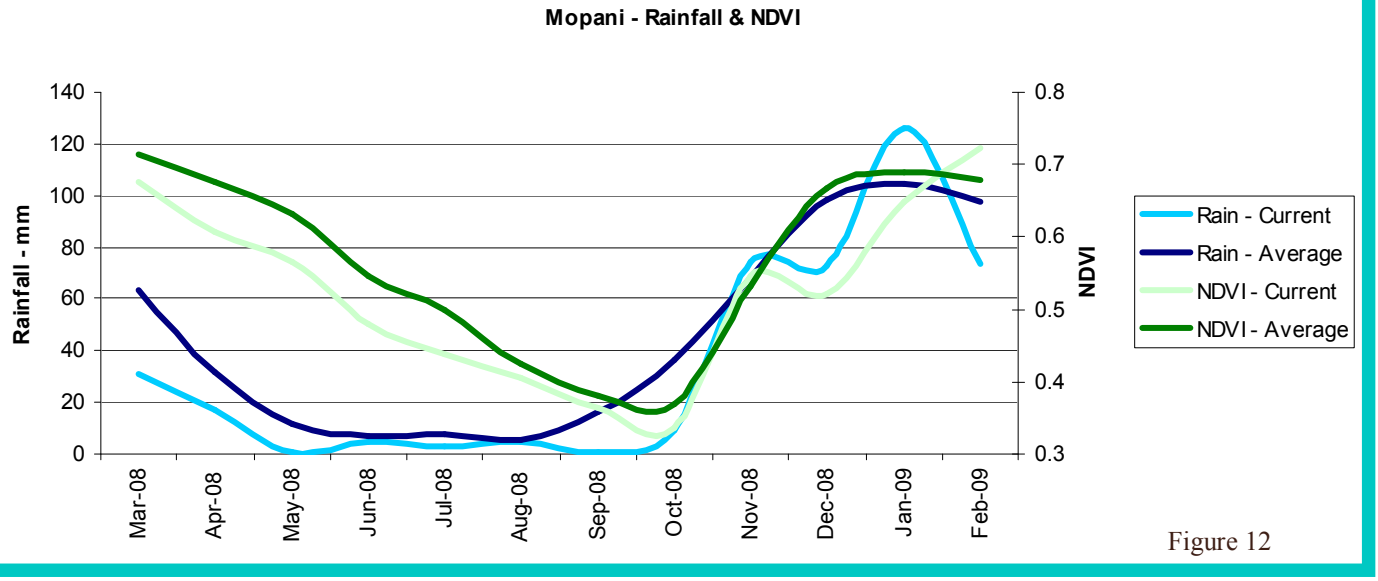


Figure 12

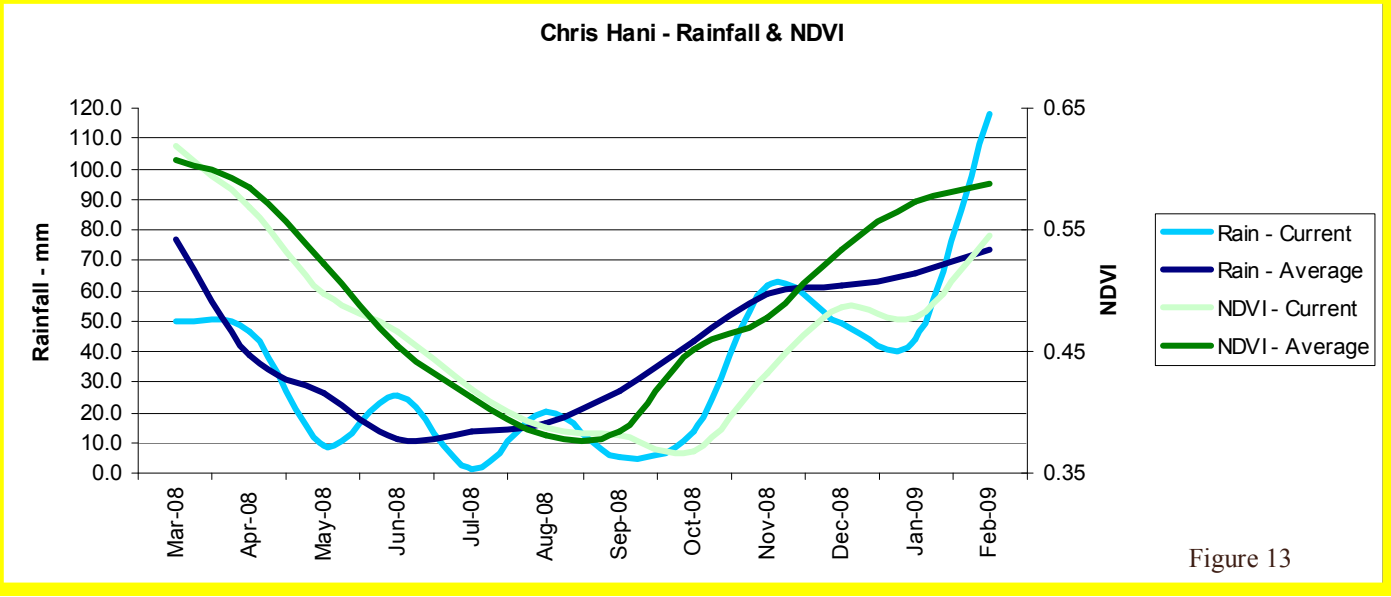


Figure 13

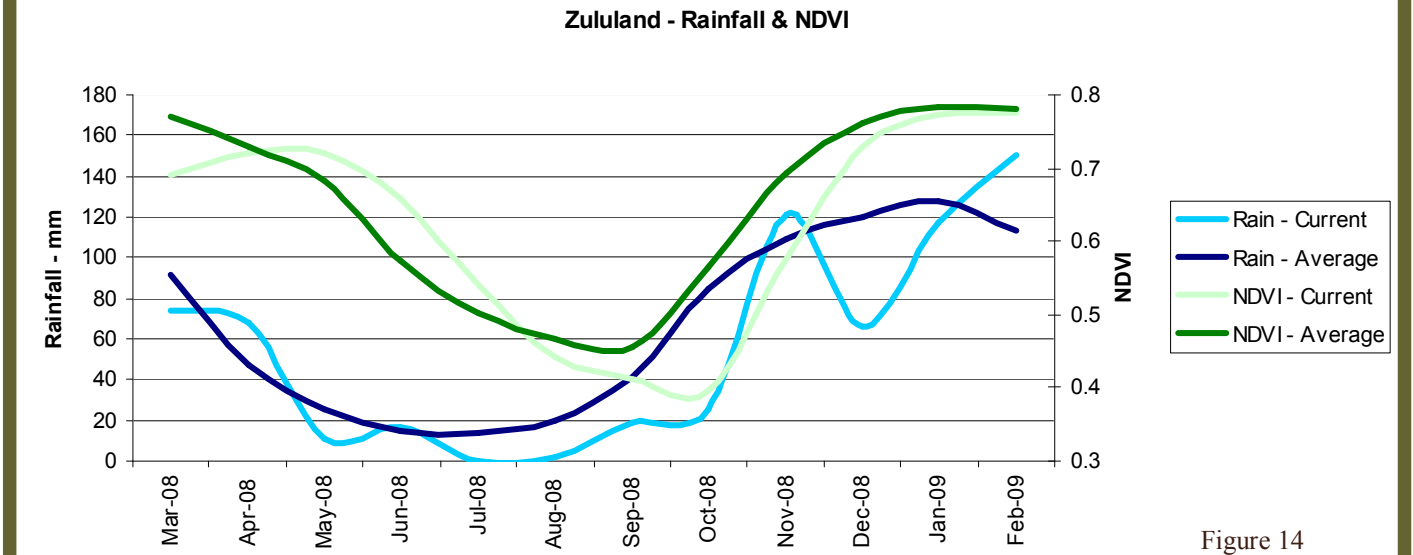


Figure 14

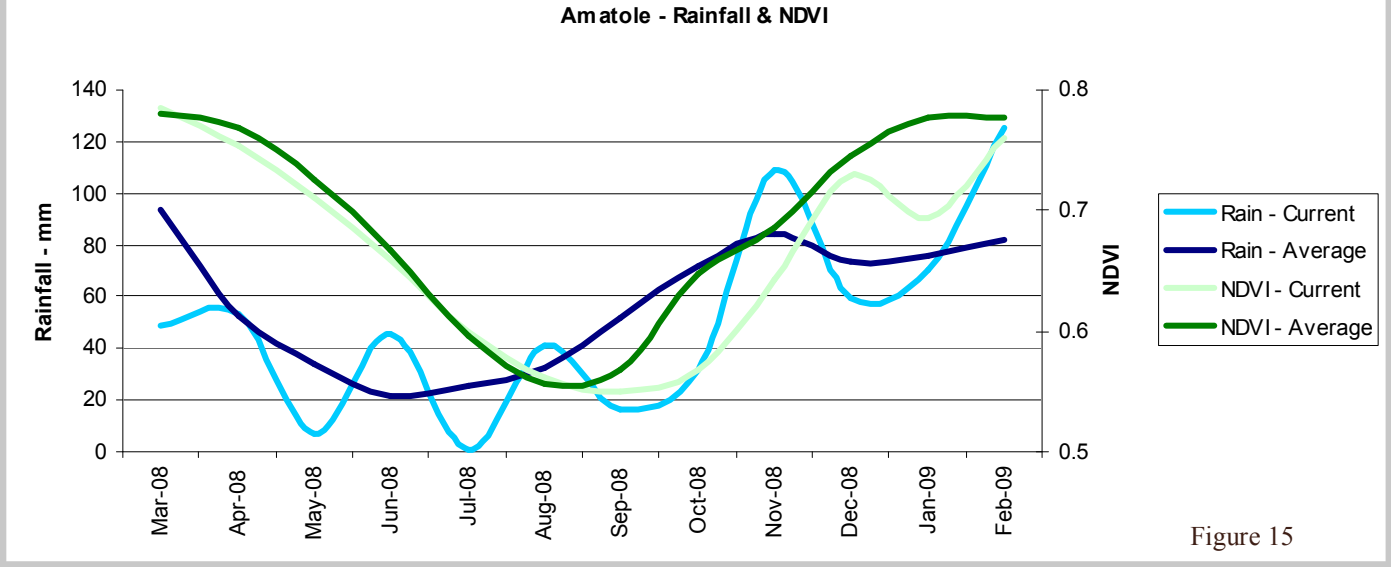
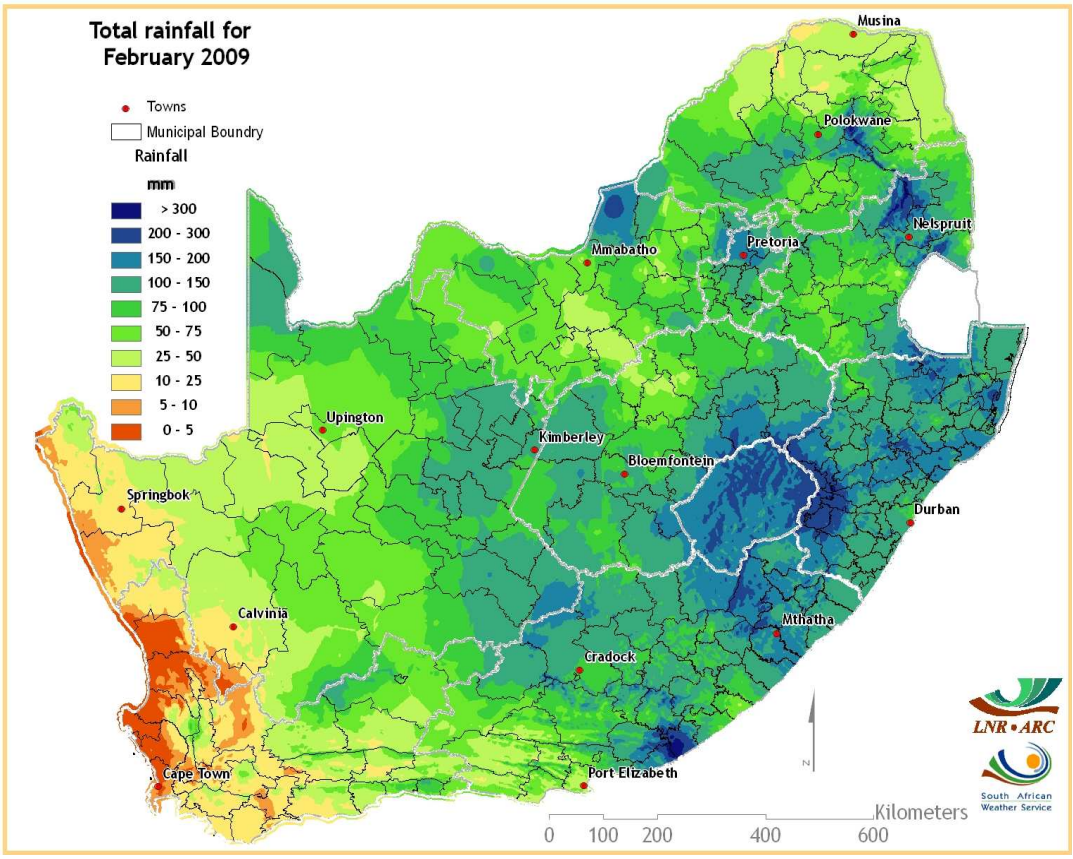


Figure 15

Rainfall

Overview February 2009:

In contrast to the previous two months during which rainfall activity was confined to the central and eastern parts of the country, the area of precipitation spread westward during February to include even the west coast. The only area that recorded no rain during February was the western parts of the Western Cape Province to the north of Cape Town. Thunder-storms occurred over the northeastern parts of the country during the beginning of the month due to upper air instability and tropical moisture over the region. After this, the movement of upper air troughs favoured the western and central parts of the country for precipitation. Until the 23rd, conditions remained such that the major cloud bands developed over the western and central parts of the country while isolated thunder-storms developed over the eastern parts. On this day, large amounts of tropical moisture started to invade the northeastern parts due to the movement of a tropical system from the northeast, similar to what happened twice in January. Scattered thundershowers occurred in the north-east while the upper air trough still caused thundershowers over the southern parts. By the end of the month, an upper air trough moved eastward over the country causing thunder-storms in the northeast while it cleared from the west as dry air invaded the country.



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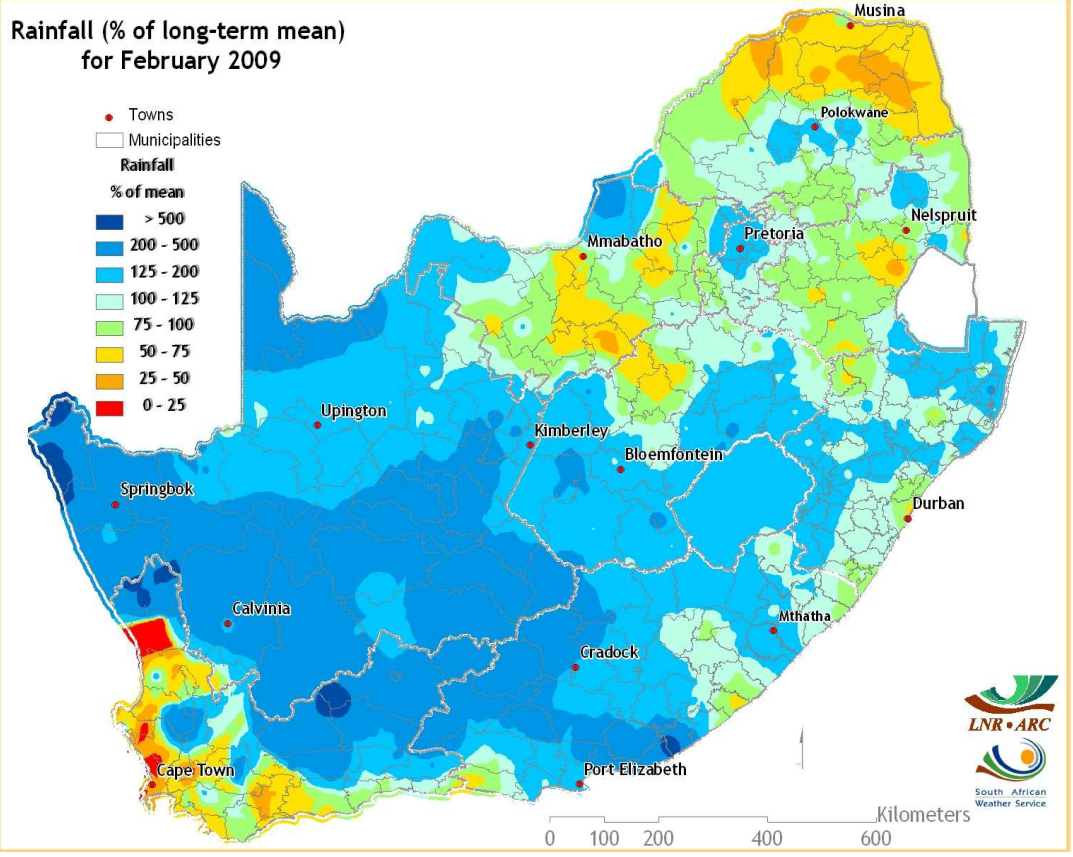

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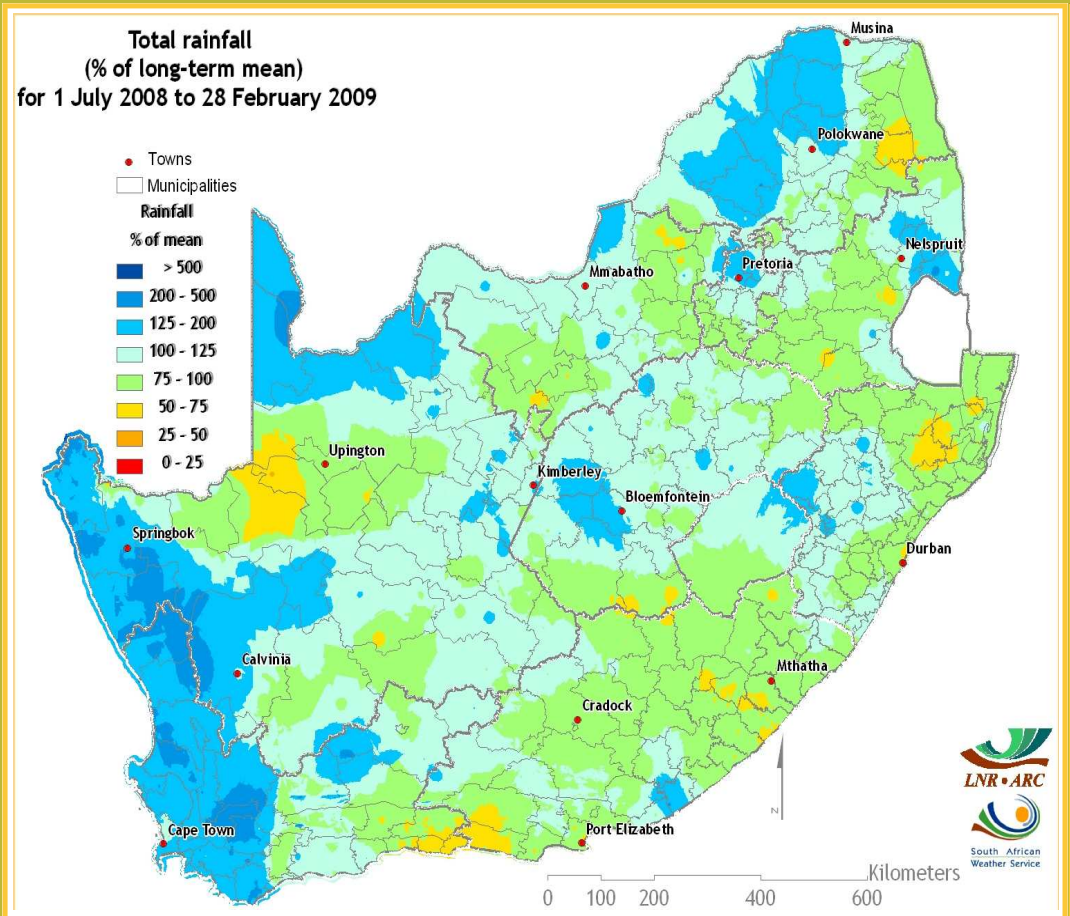

Figure 18

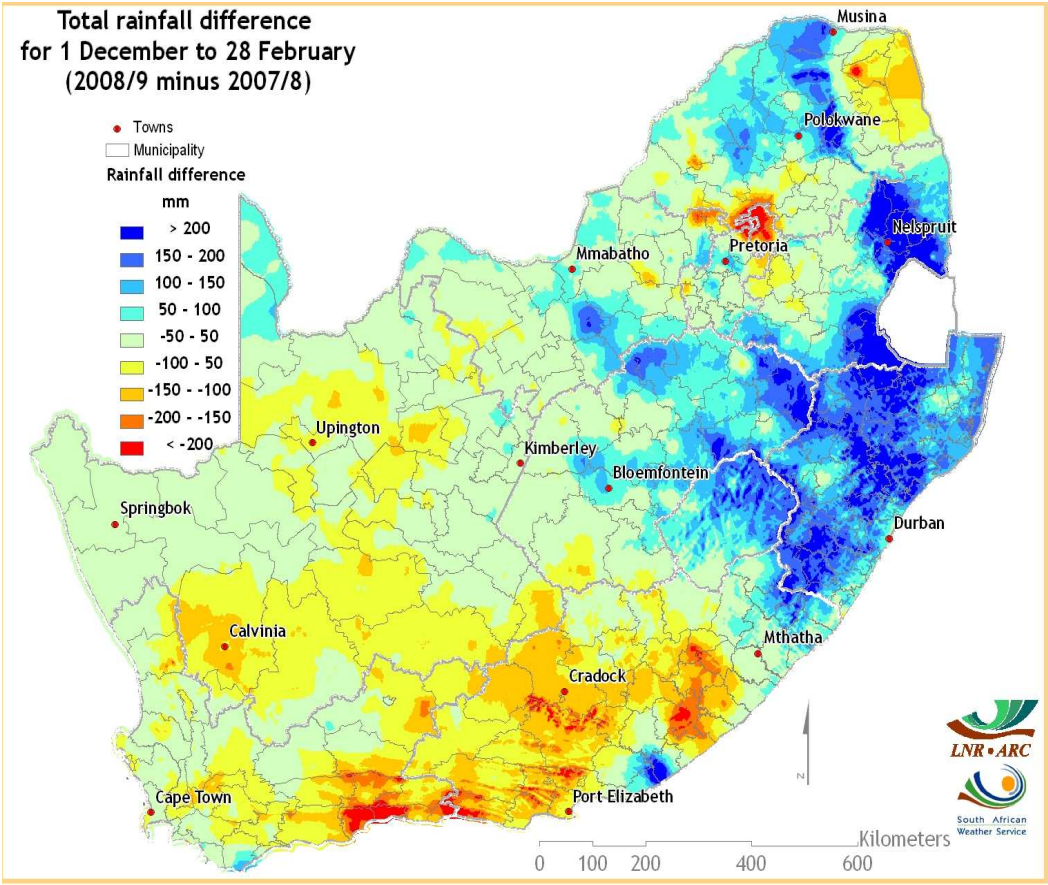

Figure 19

Figures 16 & 17:
Only the extreme western parts of the country received less than 10 mm of rain in February. Almost the entire country received more than 50 mm of rain while large areas over the central and eastern parts received in excess of 100 mm. The highest falls (more than 200 mm) occurred over the escarpment and isolated areas to the southeast of that. The rainfall pattern represents more than 200% of the average over most of the western and southern interior. Only isolated areas in the northeast and the far western winter rainfall areas received below-normal rainfall.

Figure 18:
For the period July 2008 to February 2009, above-normal rainfall occurred over the northern and western parts of the country while some areas in the south and east received below-normal rainfall.

Figure 19:
While most of the eastern parts of the country received more rain during December 2008 to February 2009, the southern parts and western interior received less rain than for the same period a year earlier.

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Agrometeorology

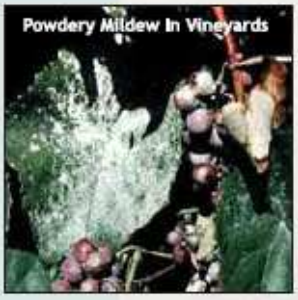
The AgroMet Division of ARC-ISCW conducts and implements research in the field of Agrometeorology and Climatology to promote sustainable utilization of the region's climate, soil and water resources.

Since 1940, ARC-ISCW AgroMet has installed a countrywide network of weather stations aimed at satisfying the climatological requirements of Agriculture in particular. This network has grown to the stage where there are now 110 mechanical weather stations and 455 automatic weather stations.

Since 1940, ARC-ISCW AgroMet has collected all the available climate information from its own climate monitoring network as well as from other organizations such as the South African Weather Service. This collection has now grown to ± 10 000 data points in the climate databank.

ARC-ISCW AgroMet is involved in the following activities:

- **Climate Monitoring (Weather Station Network), Data Management and Dissemination**
  - *Sending out reports, including Disease Warnings, Indices and Daily Data Reports*
  - *Disease warnings include: Powdery Mildew and Downy Mildew warnings*
  - *Indices calculated are: Evapotranspiration, Chill Units, Heat Units and other Temperature Thresholds*
  - *Elements include: Rainfall, Air Temperature, Sunshine Duration, Solar Radiation, Relative Humidity, Evaporation, Wind Speed and Wind Direction*
- **Climate Analysis for Agricultural Purposes**
- **Crop Micro- and Meso-Climate Monitoring**
- **Crop-Climate Matching**
  - *Crop Suitability Surfaces*
- **Crop Growth Modeling**
- **Developing new Climatic Related Early Warning Systems**
- **Spatial Interpolation of Climate Elements**
  - *Long-term Climate Surfaces*
  - *Climate Monitoring*
- **Climate Classification according the Köppen Climate Zones**



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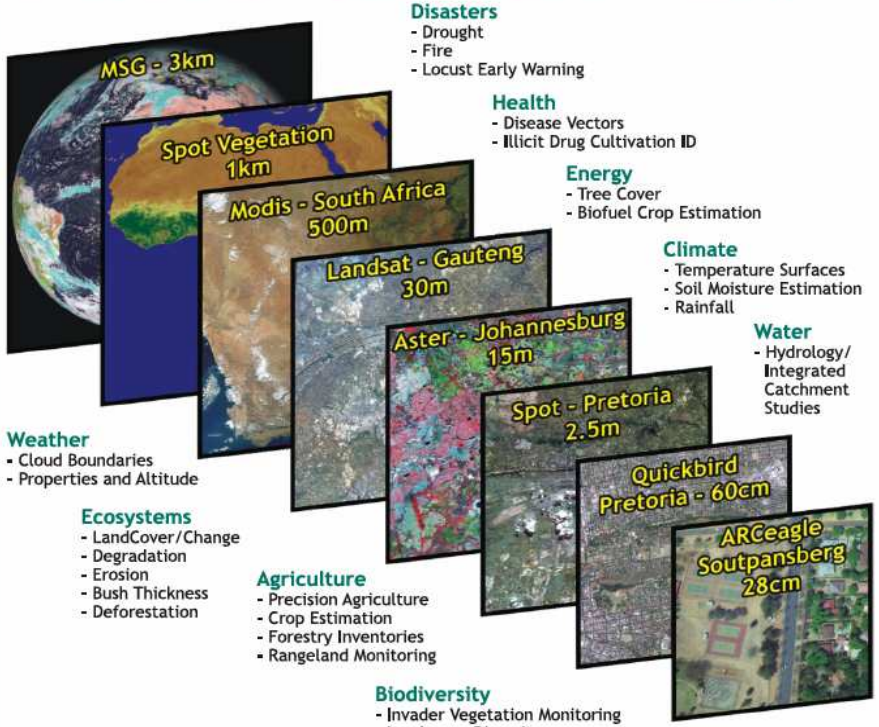

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The Coarse Resolution Imagery Database (CRID)

NOAA AVHRR

The ARC-ISCW has an archive of daily NOAA AVHRR data dating from 1985 to 2004. This database includes all 5 bands as well as the Normalised Difference Vegetation Index (NDVI), Active Fire and Land Surface Temperature (LST) images. The NOAA data are used, for example, for crop production and grazing capacity estimation.

MODIS

MODIS data is distributed by the Land Processes Distributed Active Archive Center (LP DAAC), located at the U.S. Geological Survey's EROS Data Center. The MODIS sensor is more advanced than NOAA with regard to its high spatial (250 m^2 to 1 km^2) and spectral resolution. The ARC-ISCW has an archive of MODIS (version 4 and 5) data.

- MODIS V4 from 2000 to 2006
- MODIS V5 from 2000 to present

Datasets include:

- MOD09 (Surface Reflectance)
- MOD11 (Land Surface Temperature)
- MOD13 (Vegetation Products)
- MOD14 (Active Fire)
- MOD15 (Leaf Area Index & Fraction of Photosynthetically Active Radiation
- MOD17 (Gross Primary Productivity)
- MCD43 (Albedo & Nadir Reflectance)
- MCD45 (Burn Scar)

Coverage for version 5 includes South Africa, Namibia, Botswana, Zimbabwe and Mozambique.
More information:
http://modis.gsfc.nasa.gov

VGT4AFRICA and GEOSUCCESS

SPOT NDVI data is provided courtesy of the VEGETATION Programme and the VGT4AFRICA project. The European Commission jointly developed the VEGETATION Programme. The VGT4AFRICA project disseminates VEGETATION products in Africa through EUMETCast. ARC-ISCW has an archive of VEGETATION data dating from 1998 to the present. Other products distributed through VGT4AFRICA and GEOSUCCESS include Net Primary Productivity, Normalised Difference Wetness Index and Dry Matter Productivity data.

Meteosat Second Generation (MSG)

The ARC-ISCW has an operational MSG receiving station. Data from April 2005 to the present have been archived. MSG produces data with a 15-minute temporal resolution for the entire African continent. Over South Africa the spatial resolution of the data is in the order of 3 km. The ARC-ISCW investigated the potential for the development of products for application in agriculture. NDVI, LST and cloud cover products were some of the initial products derived from the MSG SEVIRI data. Other products derived from MSG used weather station data, including air temperature, humidity and solar radiation.

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The operational Coarse Resolution Imagery Database (CRID) project of ARC-ISCW is funded by the National Department of Agriculture. Development of the monitoring system was made possible through LEAD funding from the Department of Science and Technology.

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What does Umlindi mean?
UMLINDI is the Zulu word for "the watchman".

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