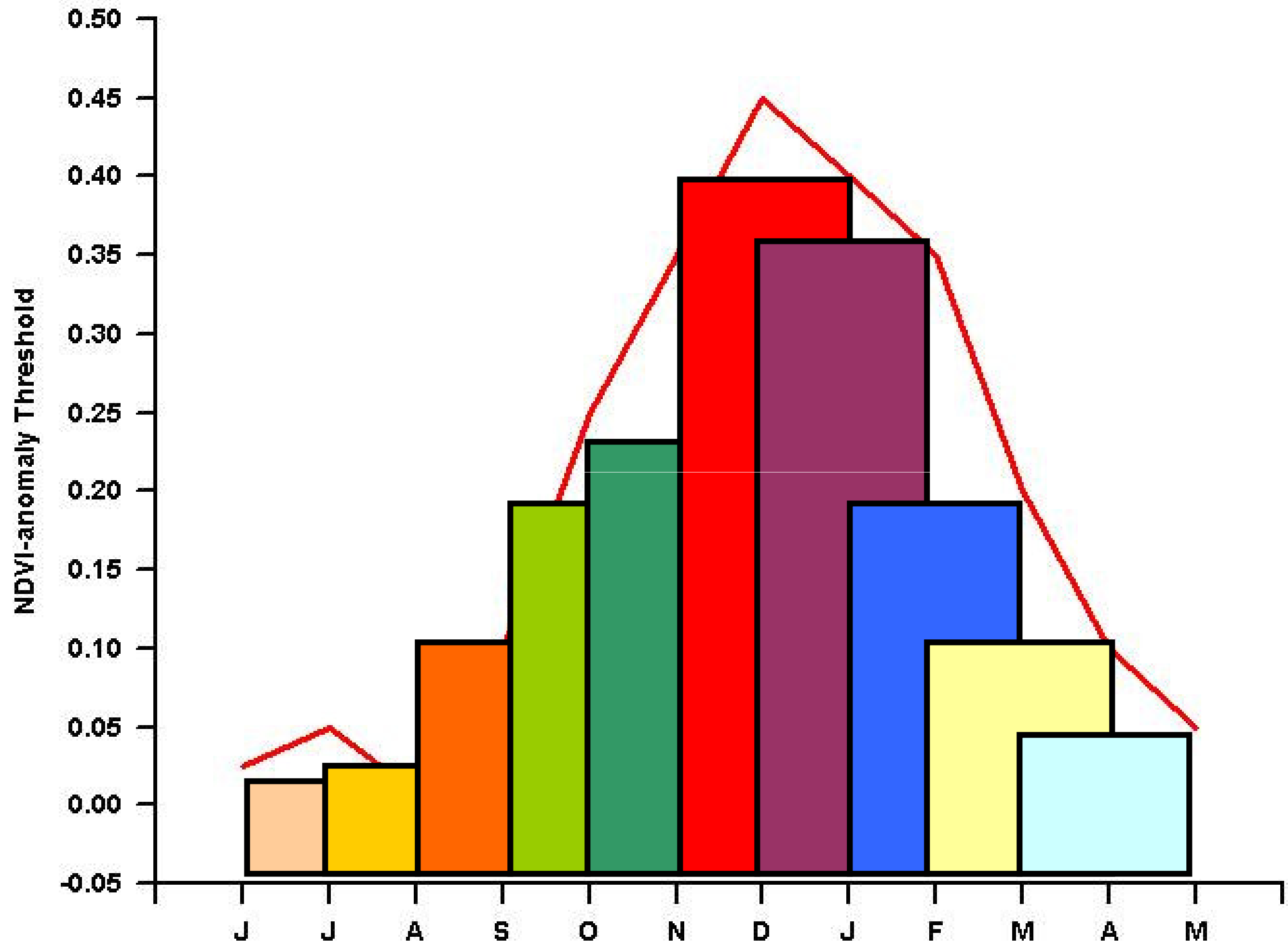
5b.RVF Risk Mapping – Dynamic Implementation



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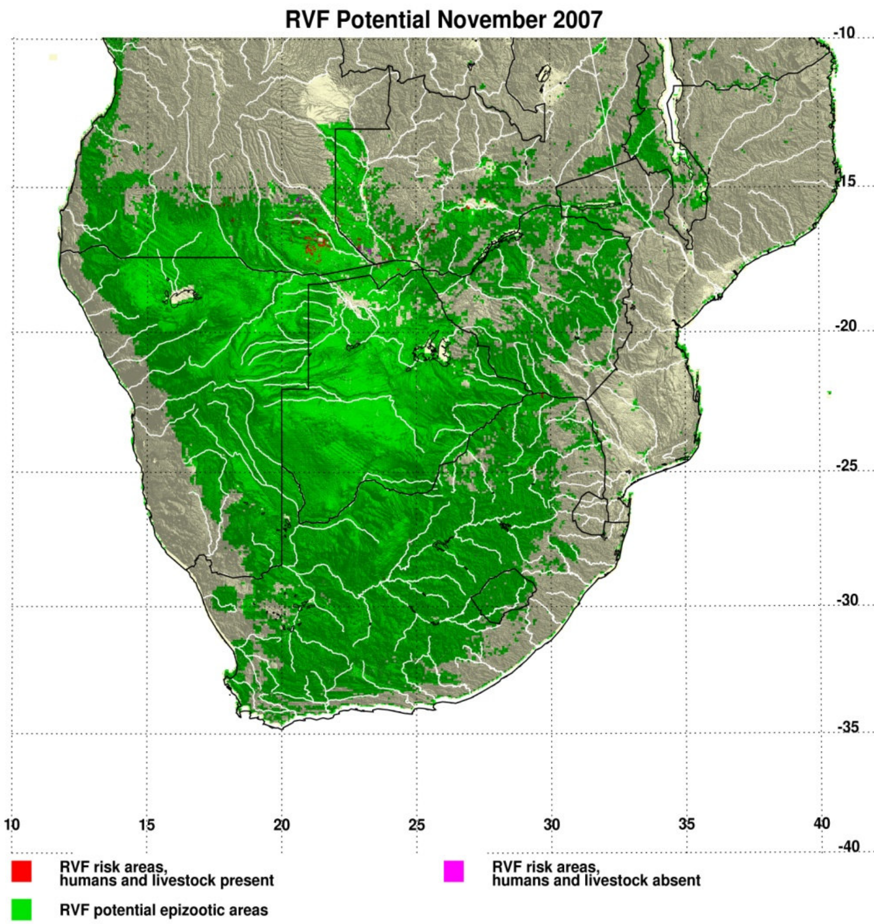
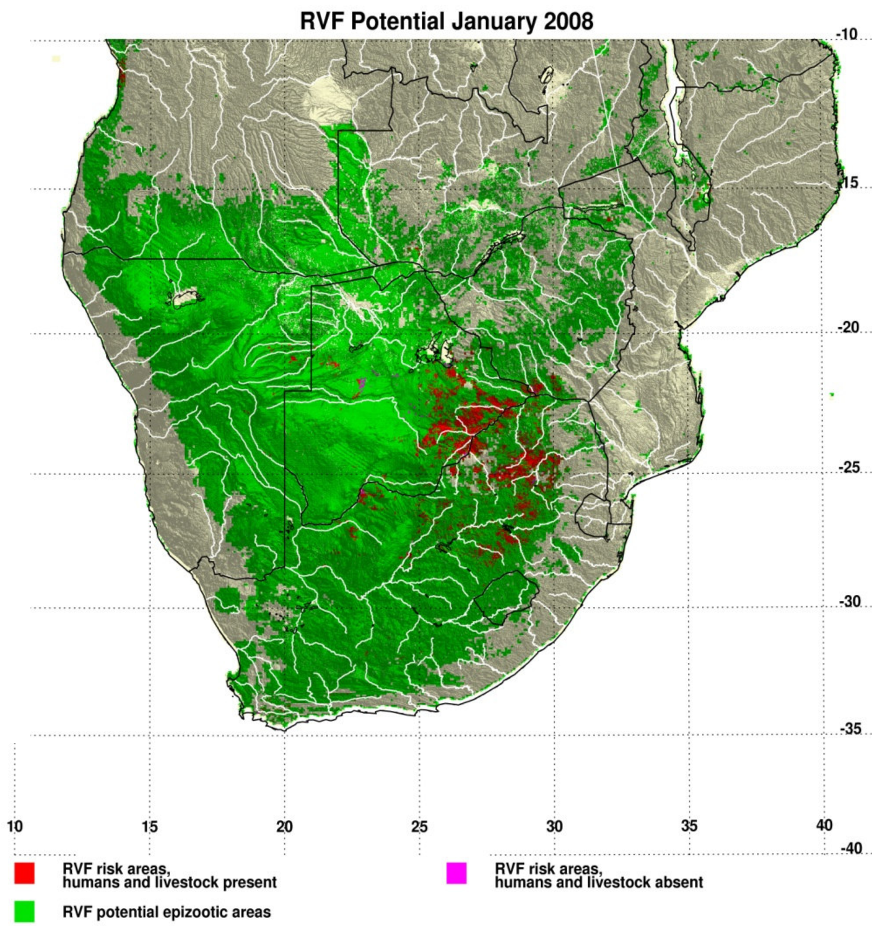
3c. RVF Potential Risk Products





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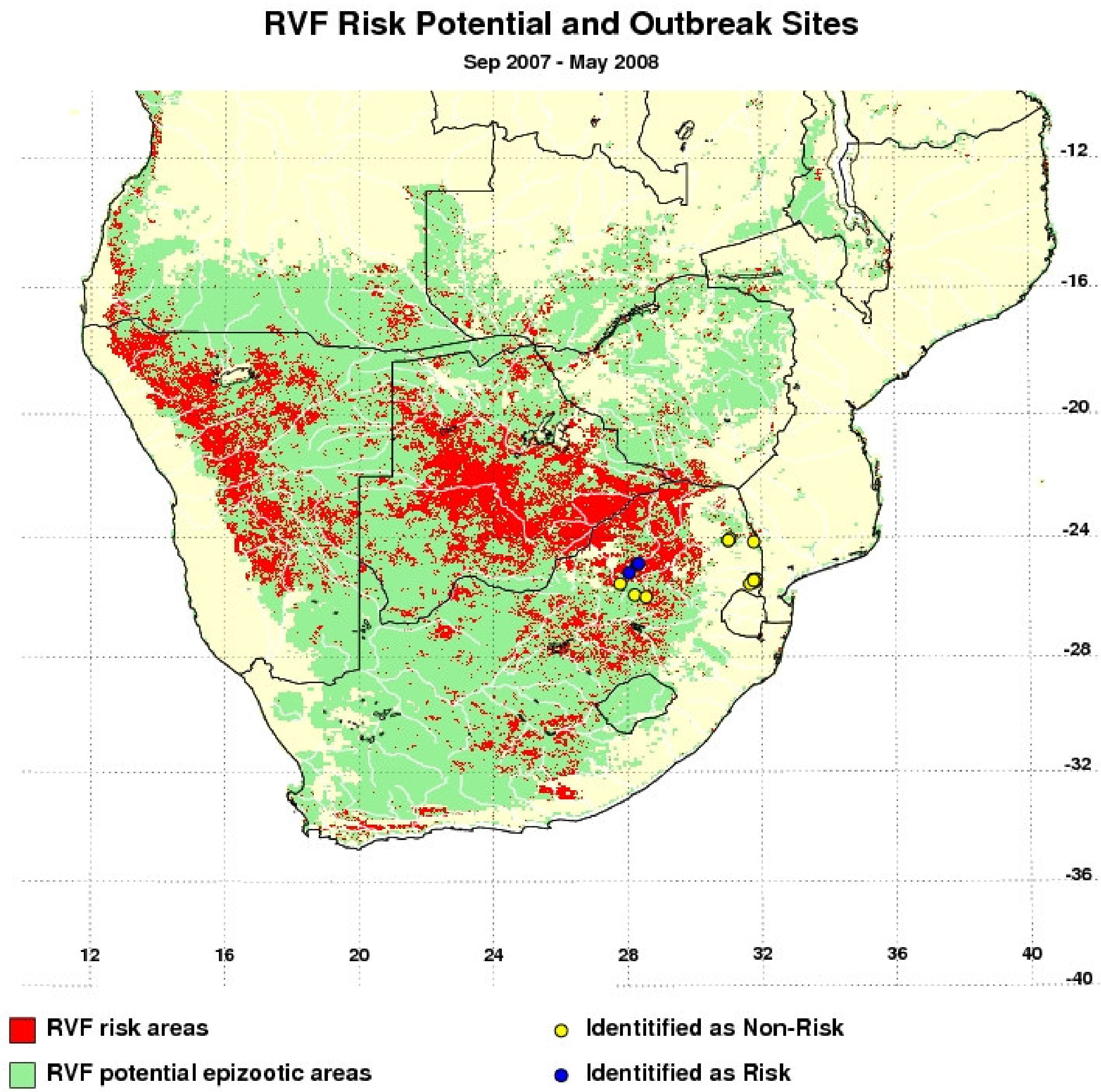
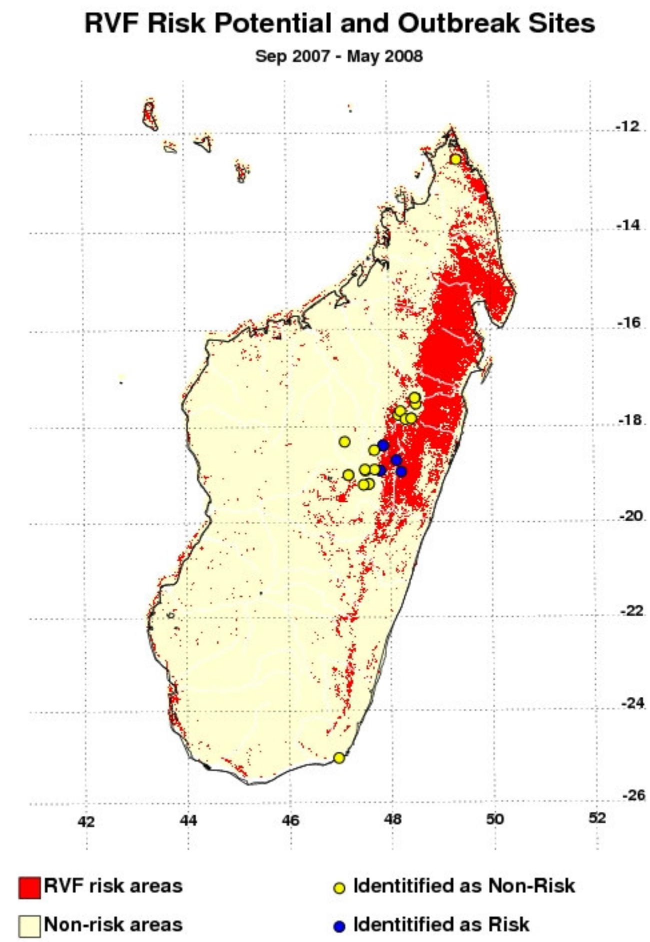
6. Supporting Field Surveillance





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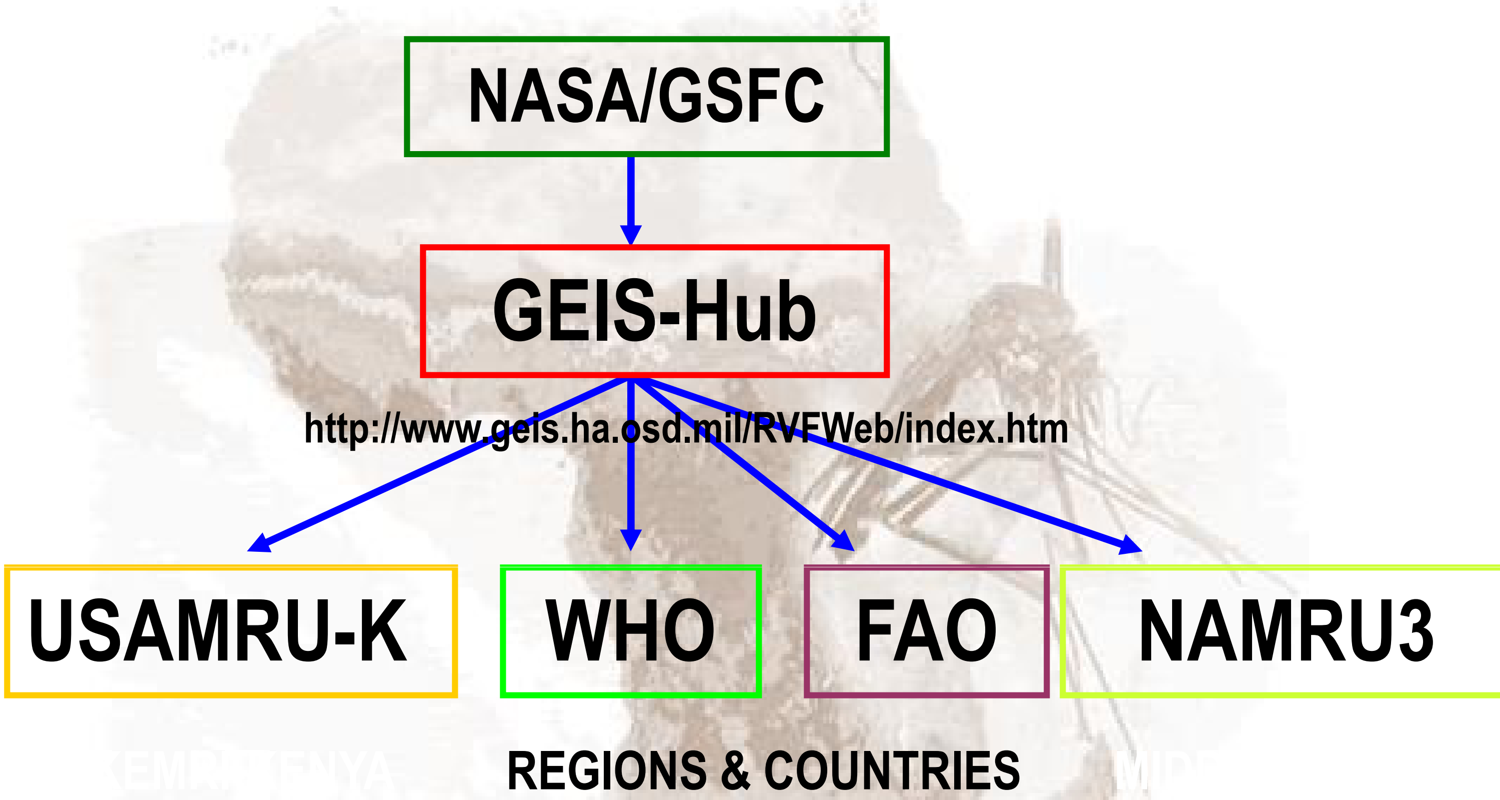
7a. Information Dissemination Infrastructure



Early warnings – incremental monthly public domain, Alerts – customized e.g. EMPRES

7b. FAO Alerts: Emergency Prevention System (EMPRES) for Transboundary Animal and Plant Pests and Diseases

EMPRES WATCH

emergency prevention systems

Possible RVF activity in the Horn of Africa

1. Introduction

Rift Valley fever (RVF) is an arthropod-borne viral disease of ruminants, camels and humans. It is a significant zoonosis which may present itself from an uncomplicated influenza-like illness to a haemorrhagic disease with severe liver involvement and ocular or neurological lesions. In animals, RVF may be unapparent in non-pregnant adults, but outbreaks are characterised by the onset of abortions and high neonatal mortality. Transmission to humans may occur through close contact with infected material (slaughtering or manipulation of runts), but the virus (Phlebovirus) is transmitted in animals by various arthropods including 6 mosquito genus (*Aedes, Culex, Mansonia, Anopheles, Coquillettidia* and *Eretmapodites*) with more than 30 species of mosquitoes recorded as infected and some of them been proved to have a role as vectors. Most of these species get the infection by biting infected vertebrates, yet some of these (specifically *Aedes* species) transmit the virus to their eggs. These infected pools of eggs can survive through desiccation during months or years and restart the transmission after flooding, and then other species (*Culex* spp.) may be involved as secondary vectors.

Table of Contents

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3. Monitoring of climatic indicators	3
4. Recent warning message	3
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6. FAO in action	6
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This vertical infection explains how the disease can persist between outbreaks.

RVF virus (RVFV) is recorded to occur from South Africa to Saudi Arabia including Madagascar, in varied bioclimatic ecotypes, ranging from wet and tropical countries such as the Gambia, irrigated regions such as the Senegal River Valley or the Nile Delta, to hot and arid areas such as Yemen or Chad. The occurrence of RVF can be endemic or epidemic, depending on the climatic and vegetation characteristics of different geographic regions. In the high rainfall forest zones in coastal and central African areas it is reported to occur in endemic cycles which are poorly understood. Currently available evidence suggests that this may happen annually after heavy rainfall, but at least every 2-3 years otherwise. In contrast, in the epidemic areas in East Africa, RVF epidemics appear at 5 to 15 year cycles. These areas are generally relatively high rainfall plateau grasslands, which may be natural or cleared from forests. In the much drier bushed Savannah grasslands and semi-arid zones, which are characteristic for the Horn of Africa, epidemic RVF has manifested itself only a few times in the past 40 years, in 1961-62, 1982-83, 1989 and in 1997-1998.

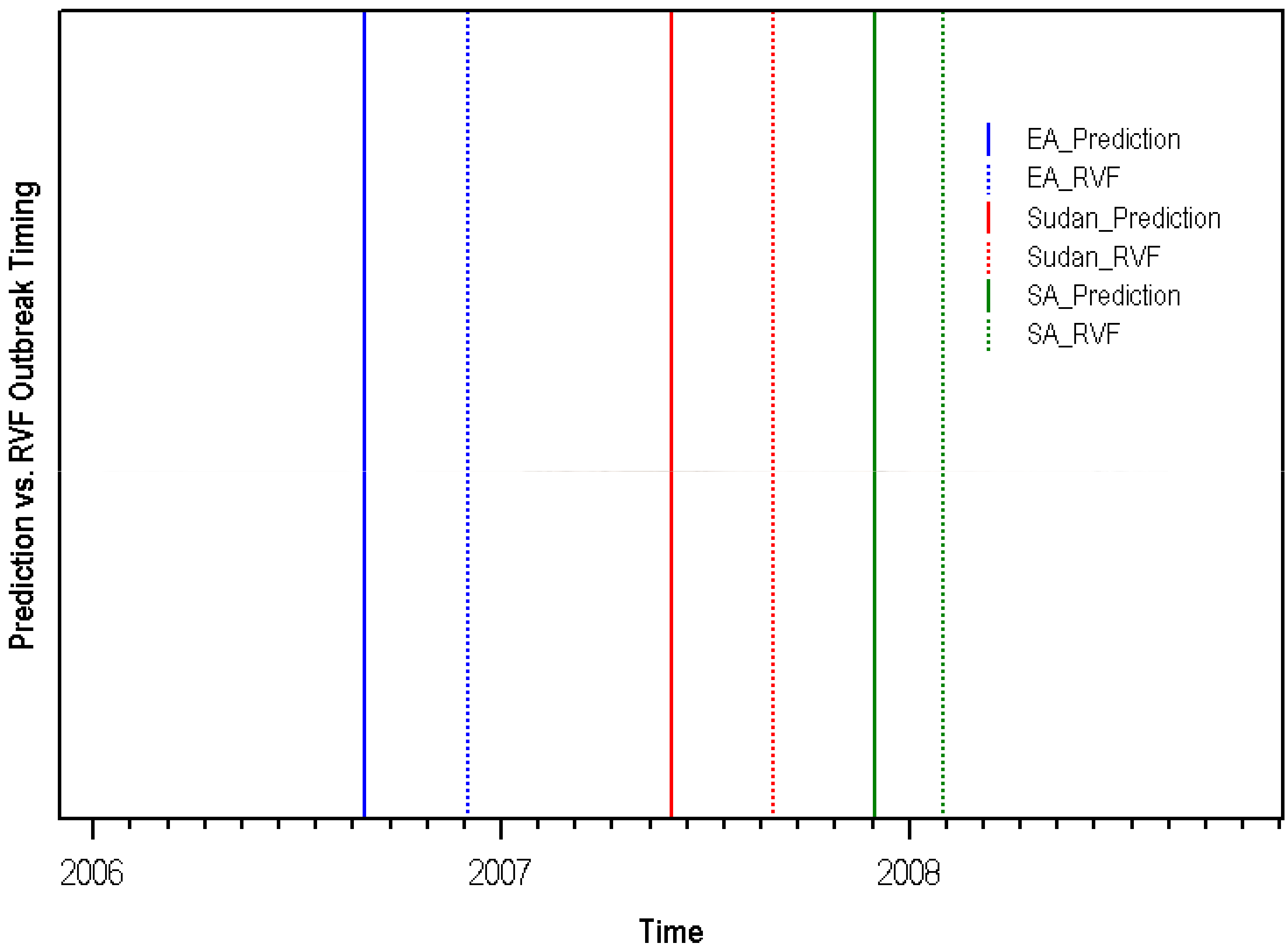
In addition the possibility exists that RVFV may spread outside traditionally endemic areas, or even out of the continent of Africa, mostly due to the large range of vectors capable of transmitting the virus and requires a level of viraemia in ruminants and humans that is sufficiently high to infect mosquitoes. Such a situation occurred following the unusual floods of 1997-1998 in the Horn of Africa countries, and subsequently the disease spread to the Arabian Peninsula in 2000.

2. Disease ecology and climatic drivers in the horn of Africa

The ecology of RVF has been intensively explored in East Africa. Historical information has shown that pronounced periods of RVF virus activity in Africa have occurred during periods of heavy, widespread and persistent

http://www.fao.org/ag/againfo/programmes/en/empres/home.asp

Prediction vs. Outbreak Timing



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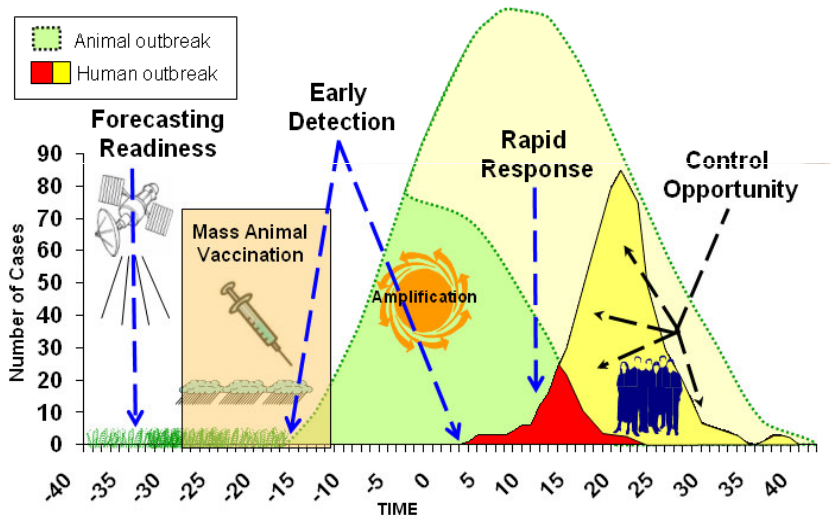
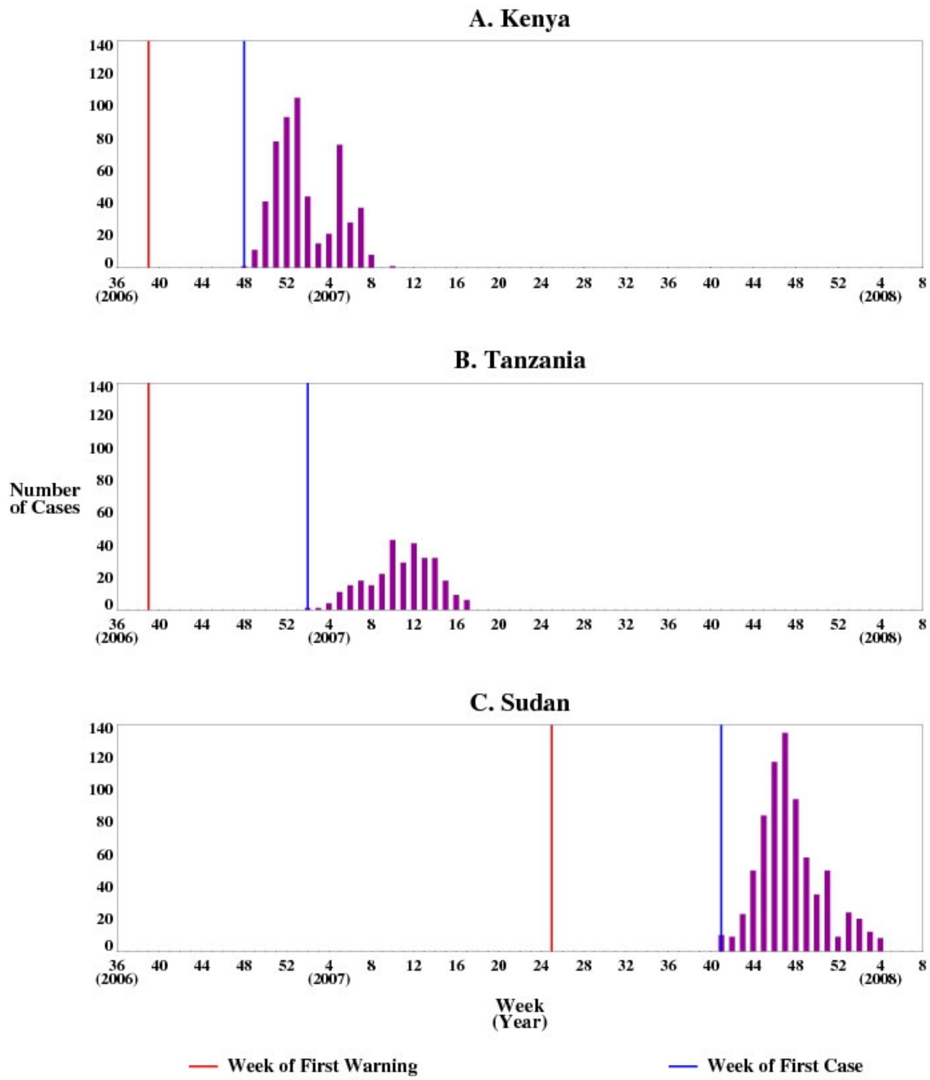
8b. Prediction vs. Outbreak Timing – 2006 - 2008

Kenya, Tanzania, Somalia: 4-5 months

Sudan: 5-6 months

Southern Africa: 2-3 Months





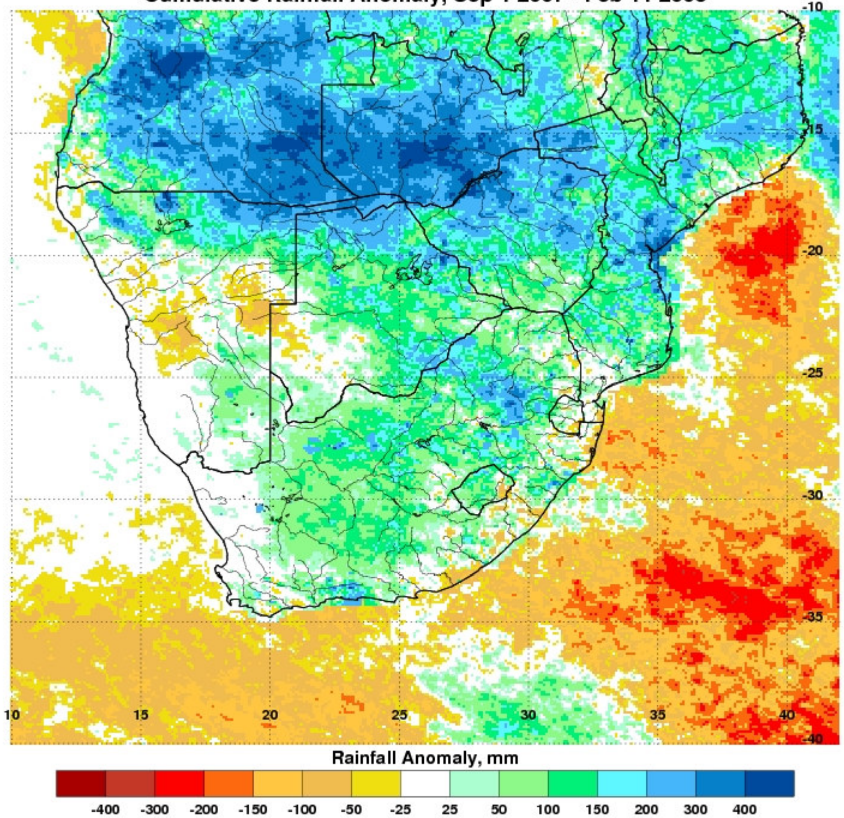
Anyamba et al (In Review AJTMH)

Real Time Monitoring and Prediction

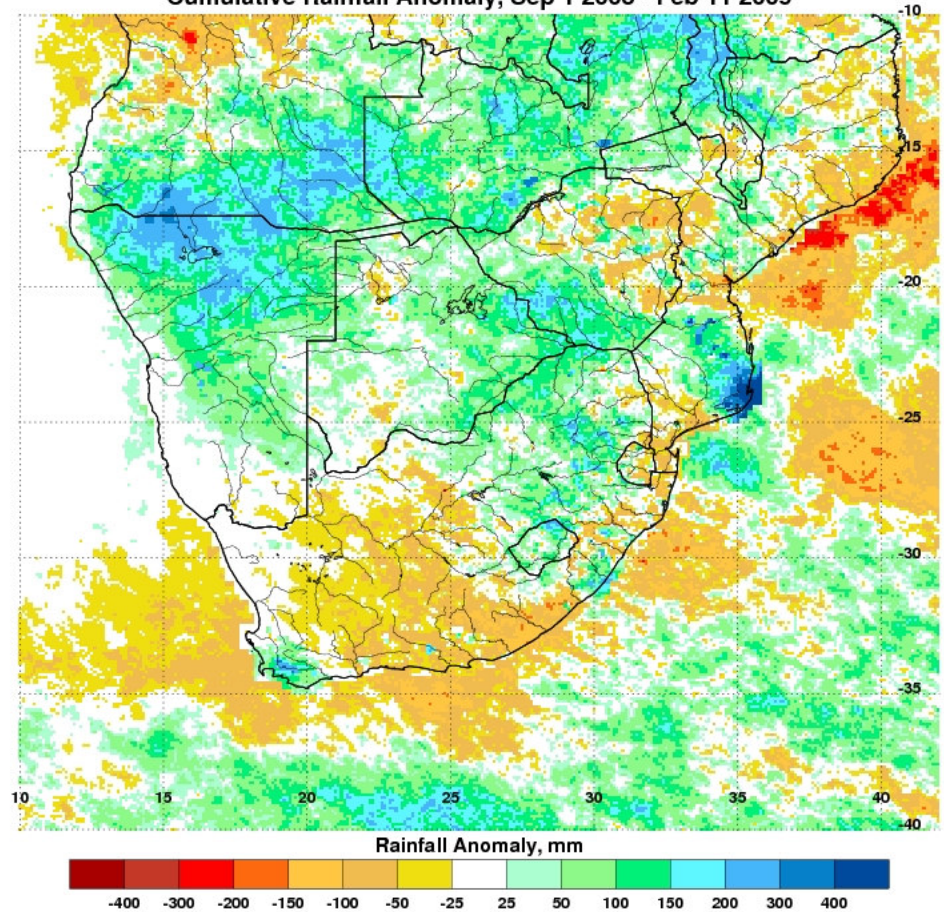
- Rainfall – Cumulative > Daily
- Sentinel Site Rainfall Monitoring > Daily
- Ecology – NDVI > 10 days
- RVF Risk Maps > 10 days

Southern Africa: Rainfall -- Cumulative

Cumulative Rainfall Anomaly, Sep 1 2007 - Feb 11 2008



Cumulative Rainfall Anomaly, Sep 1 2008 - Feb 11 2009



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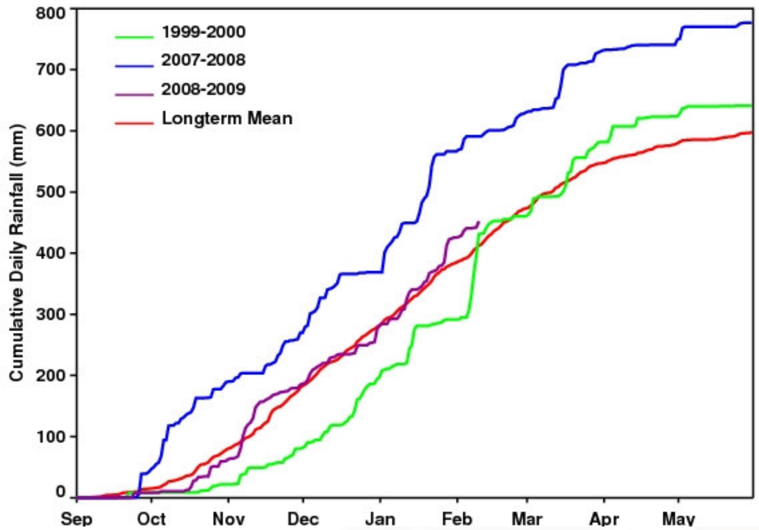
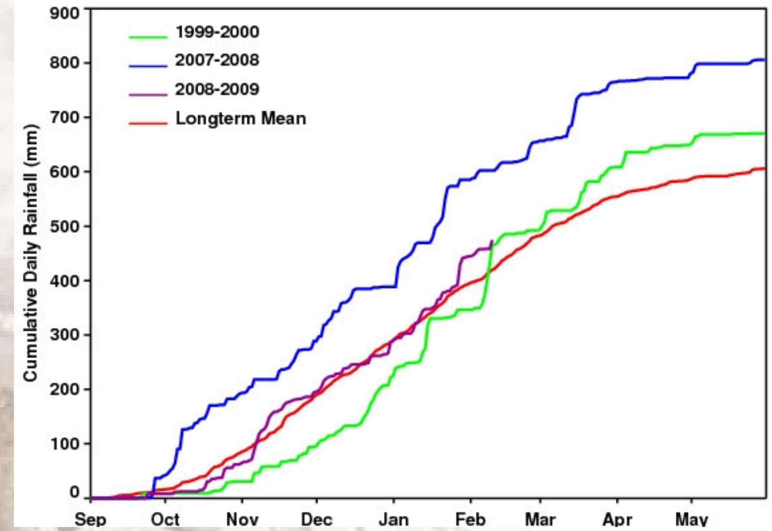
Southern Africa: Real Time Monitoring- Rainfall

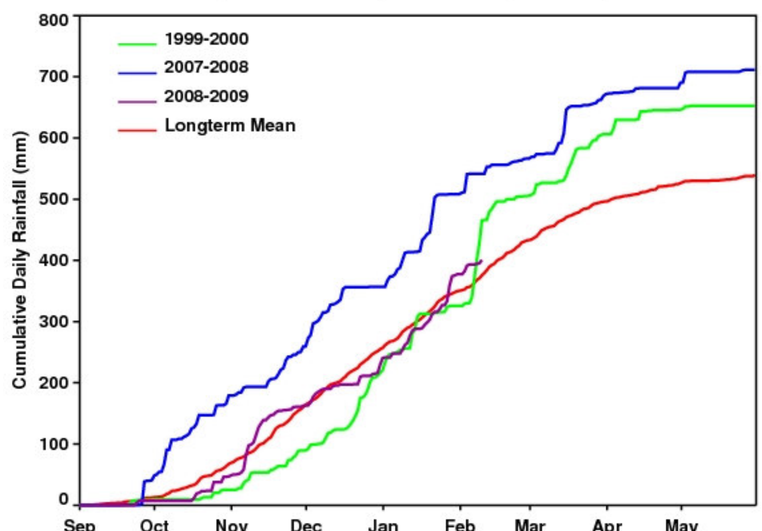
ARC Irene Animal Production Research Centre (South Africa): 28.22°E,25.90



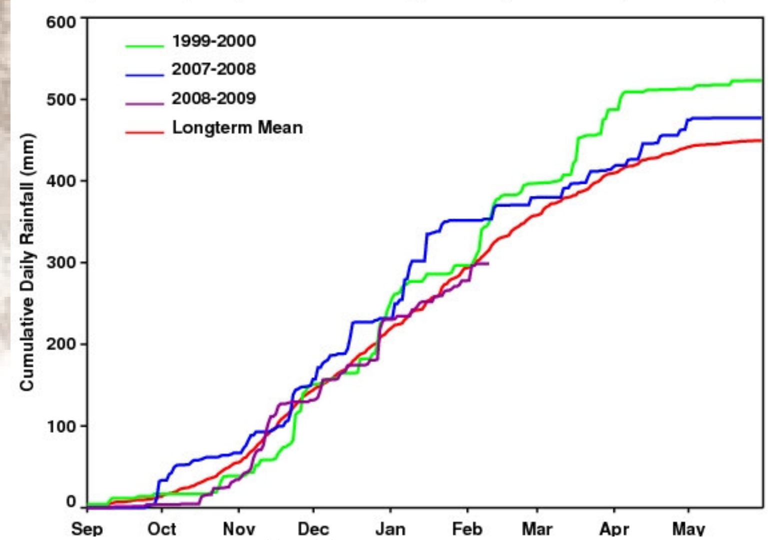
Witpoort Farm (South Africa): 28.55°E,25.97°S



Mamagalieskraal Farm (South Africa): 27.78°E,25.53°S



Steyn Farm Ngwenya Buffalo Breeding Bomas (South Africa): 31.85°E,25.39'



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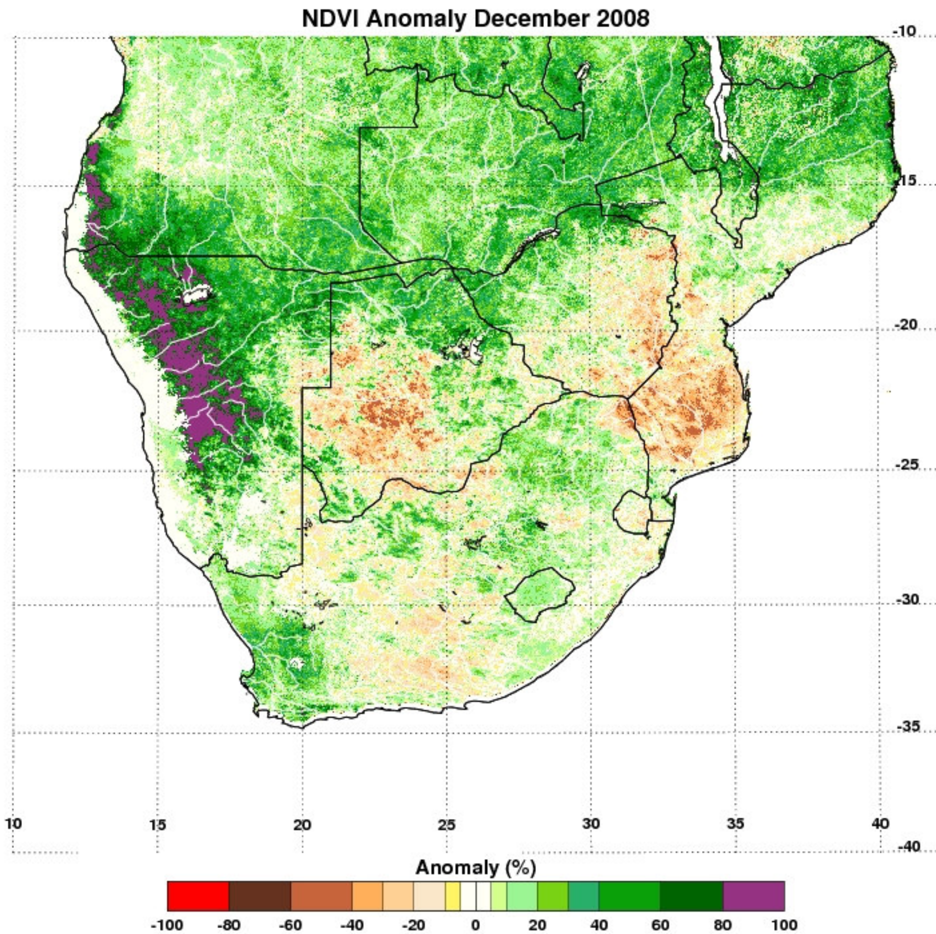
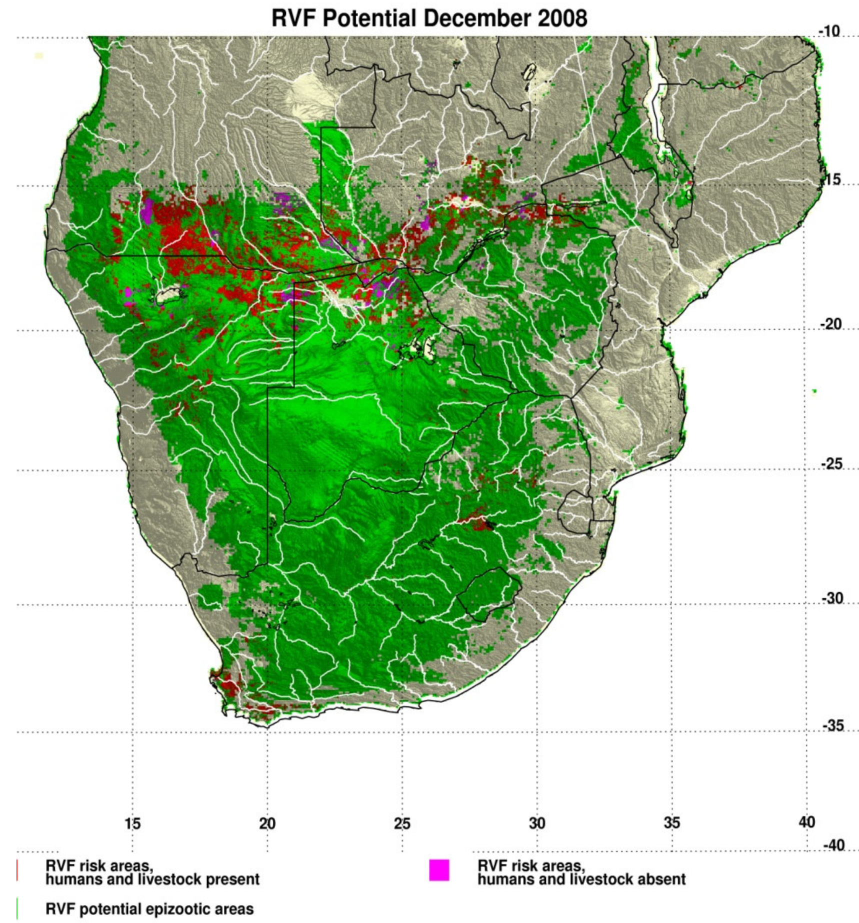
Southern Africa: NDVI Anomalies, RVF Potential Risk





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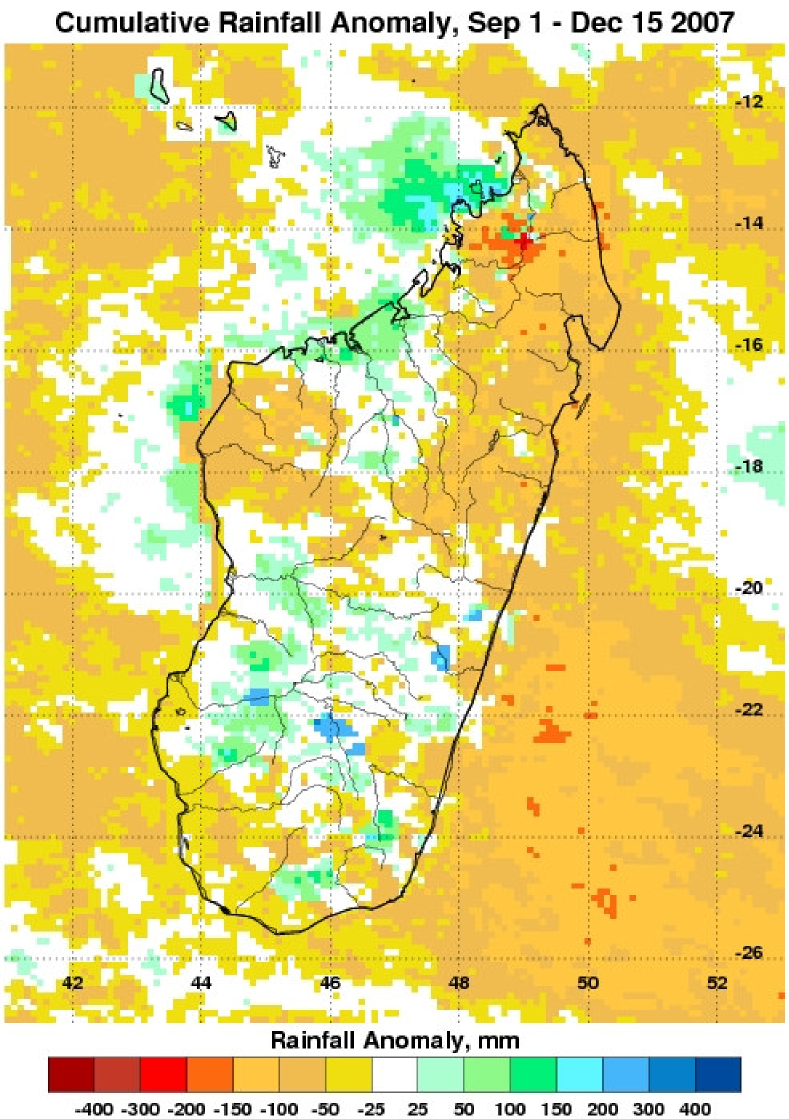
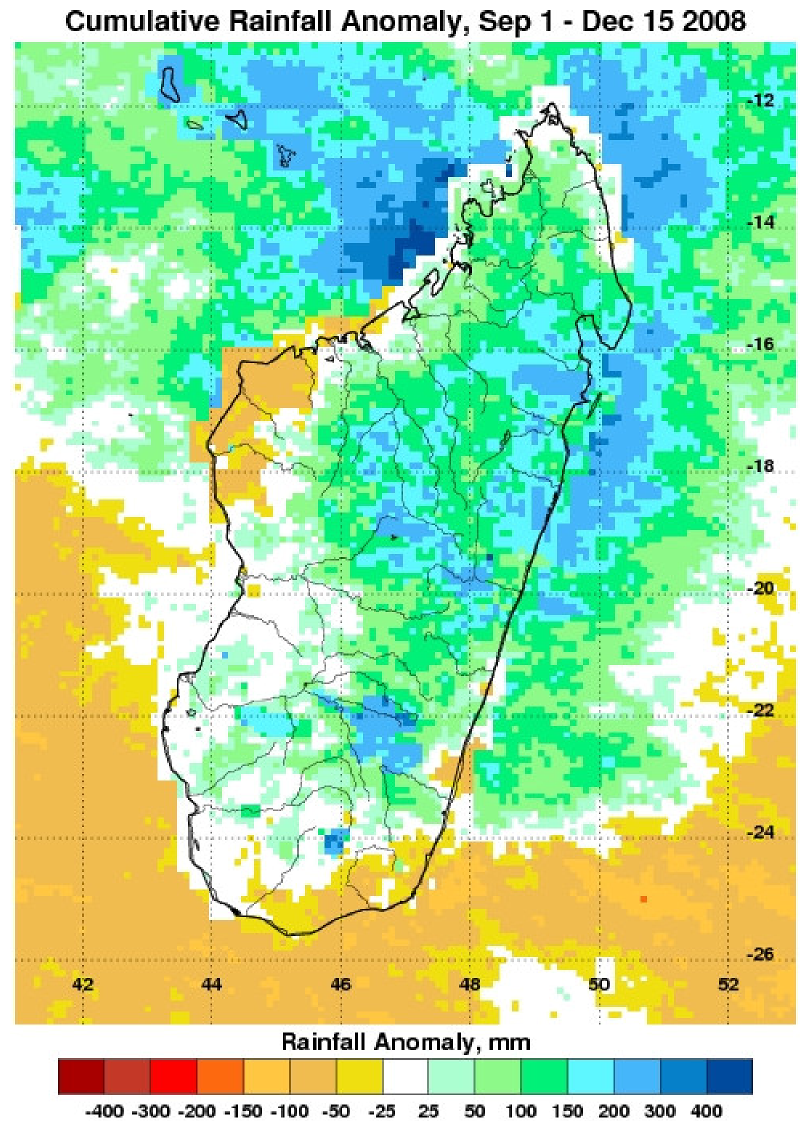
Madagascar: Rainfall -- Cumulative





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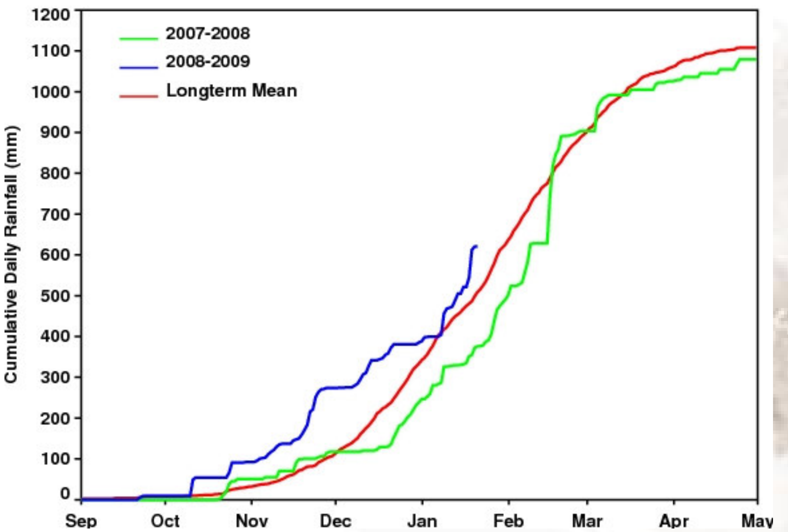
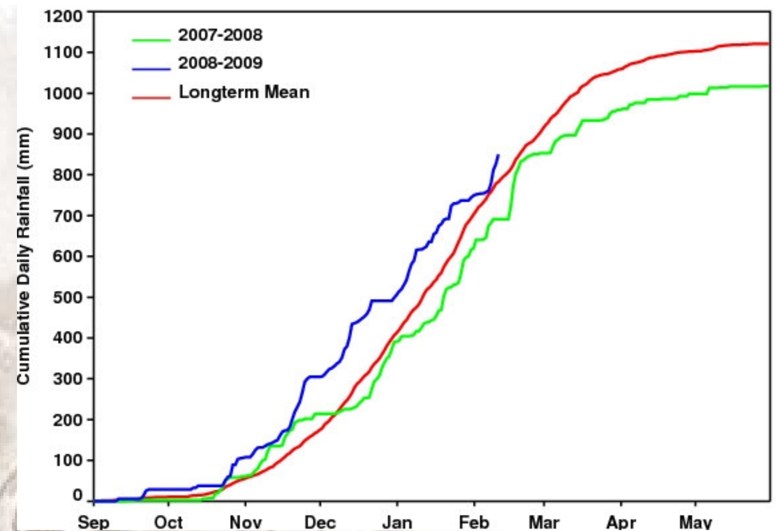
Madagascar: Rainfall – Time Series

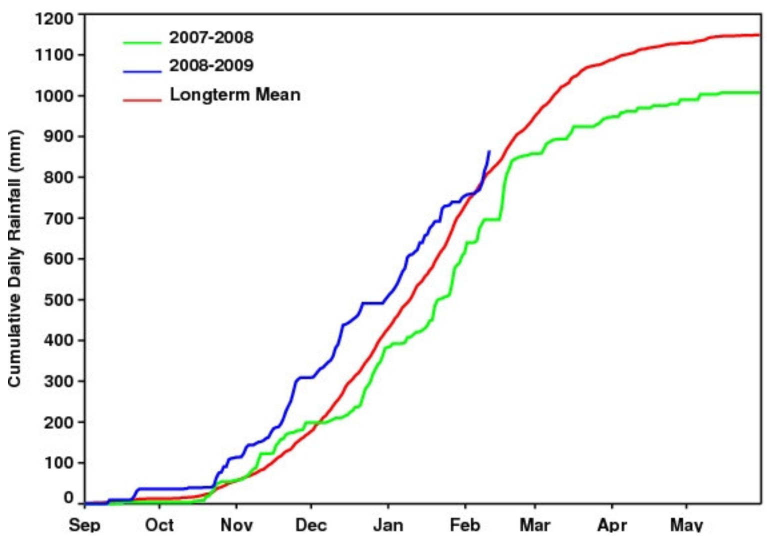
Ambatondrazaka (Madagascar): 48.43°E,17.83°S



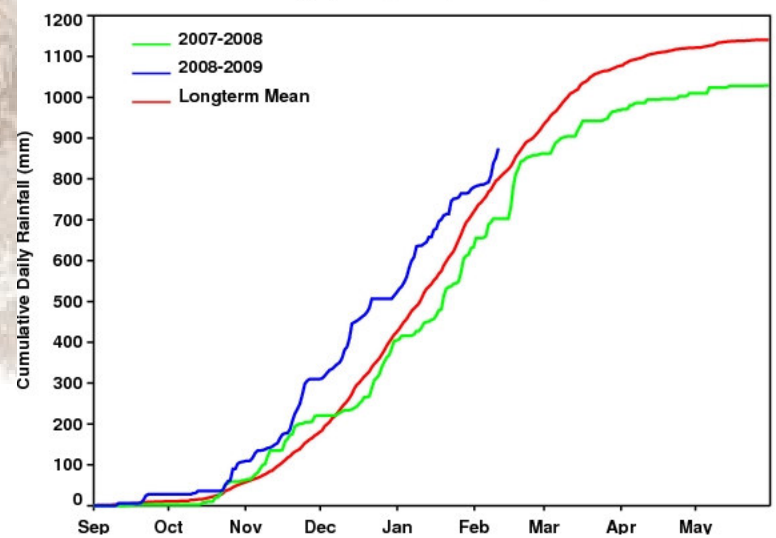
Andramasina District (Madagascar): 47.59°E,19.19°S



Antananarivo-Avaradrano (Madagascar): 47.52°E,18.92°S



Behenjy (Madagascar): 47.48°E,19.21°S



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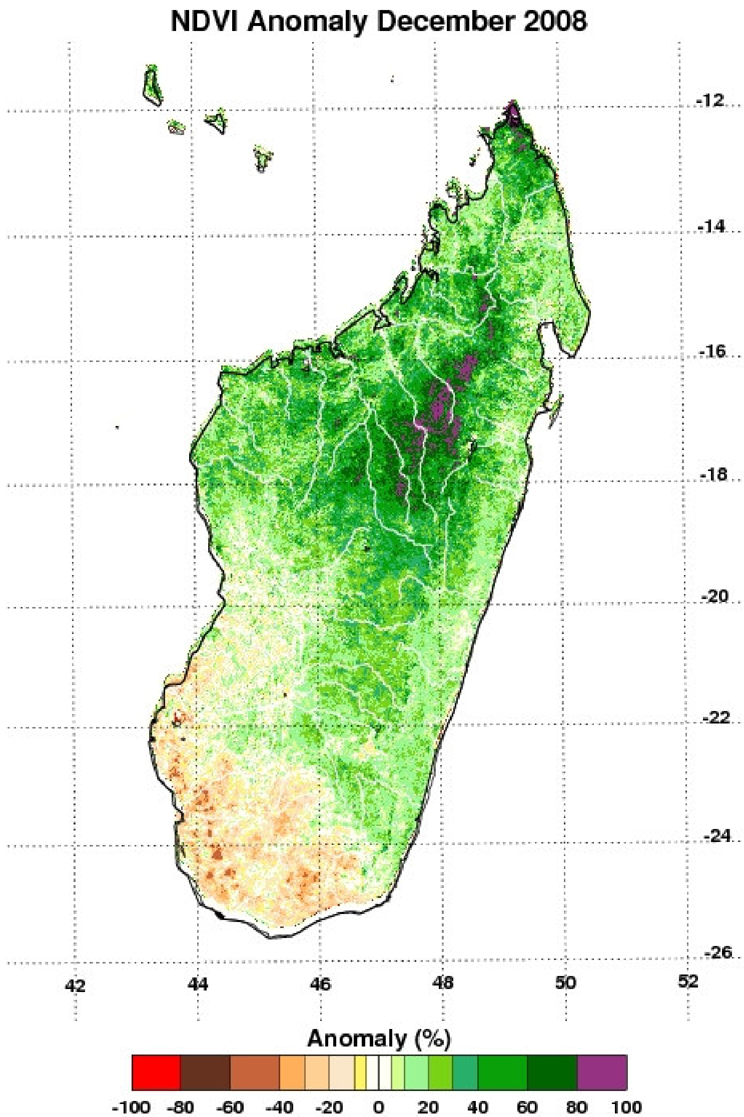
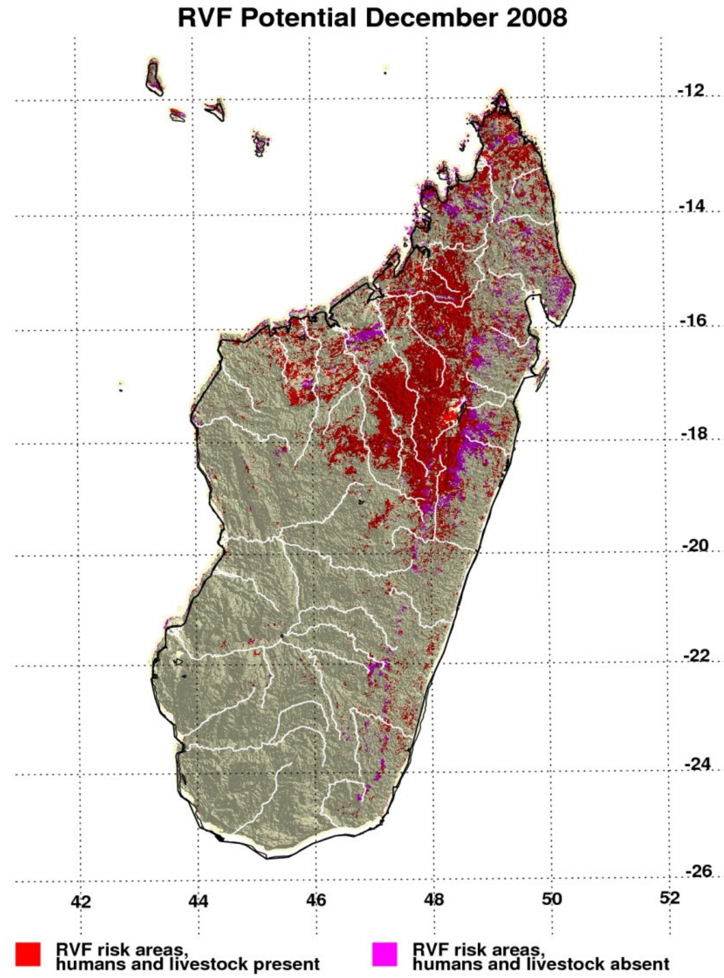
Madagascar: NDVI Anomalies, RVF Potential Risk





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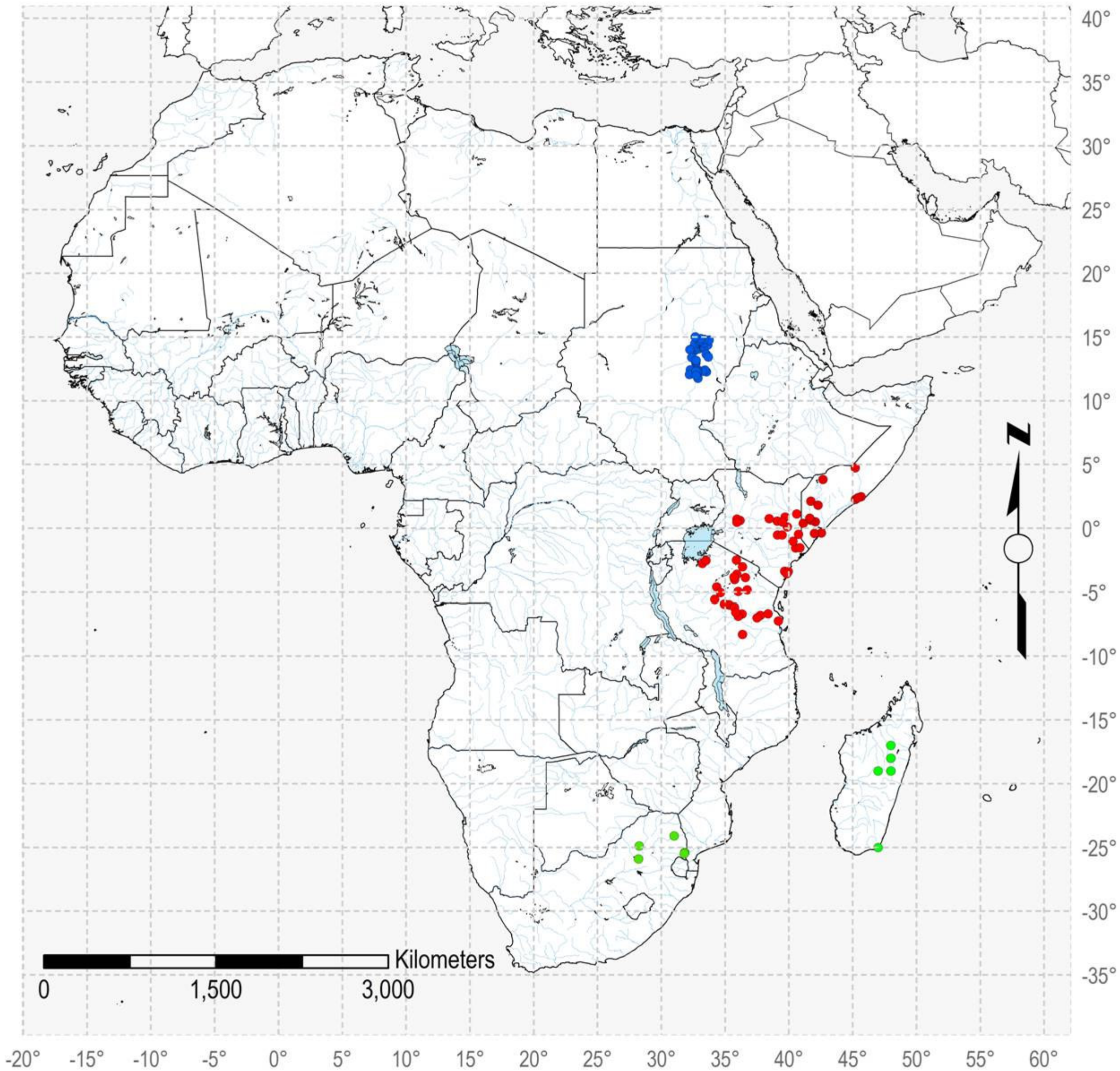
Geographic Distribution of 2006-2008 Rift Valley Fever Outbreaks



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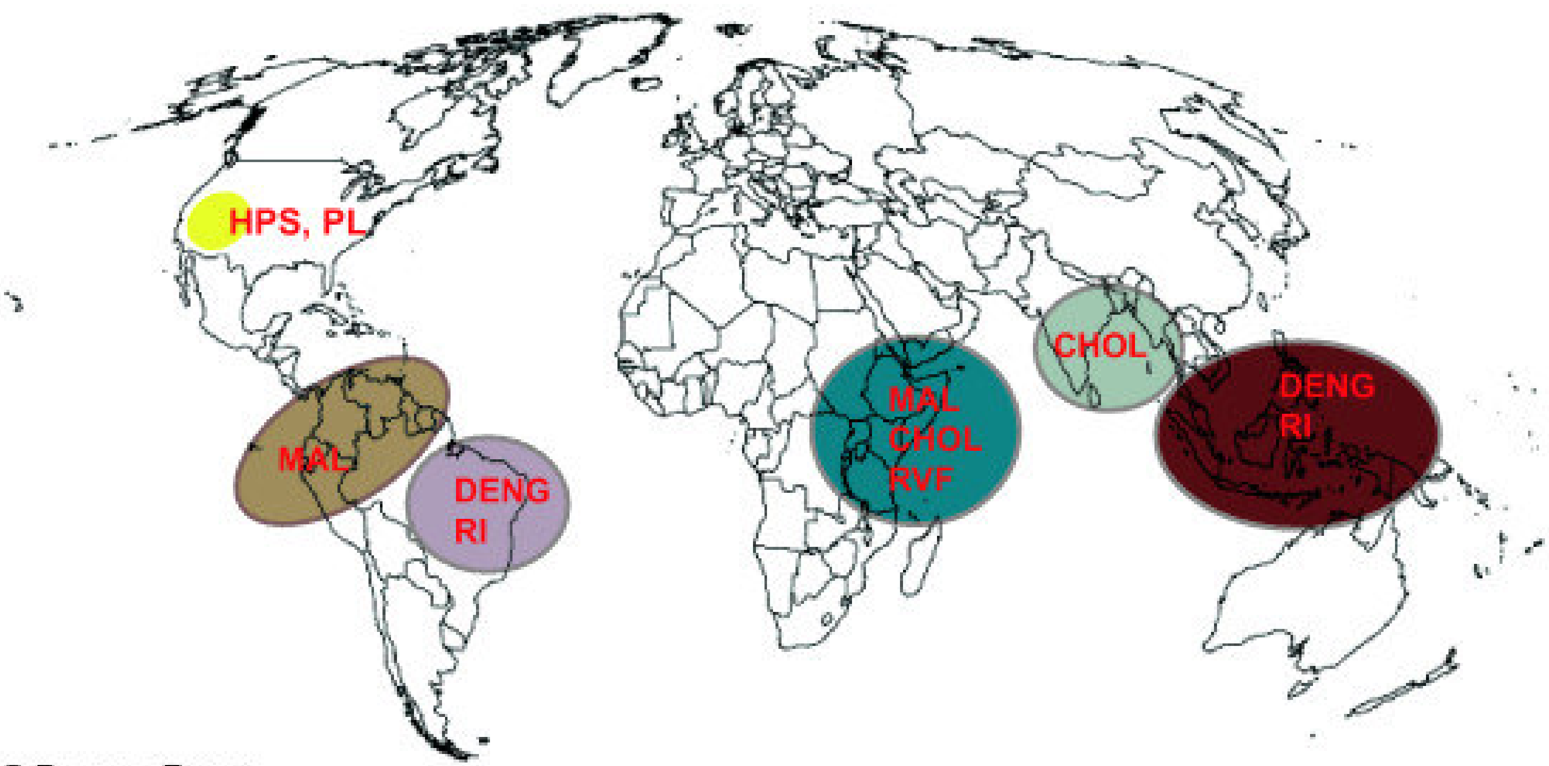
Global Climate Anomalies – Disease Patterns



DENG Dengue Fever
RI Respiratory Illness
CHOL Cholera
MAL Malaria
RVF Rift Valley Fever
HPS Hanta Virus Pulmonary Syndrome
PL Plague

Anyamba et al (IJHG,2006)
Chretien et al (IOM, 2008)

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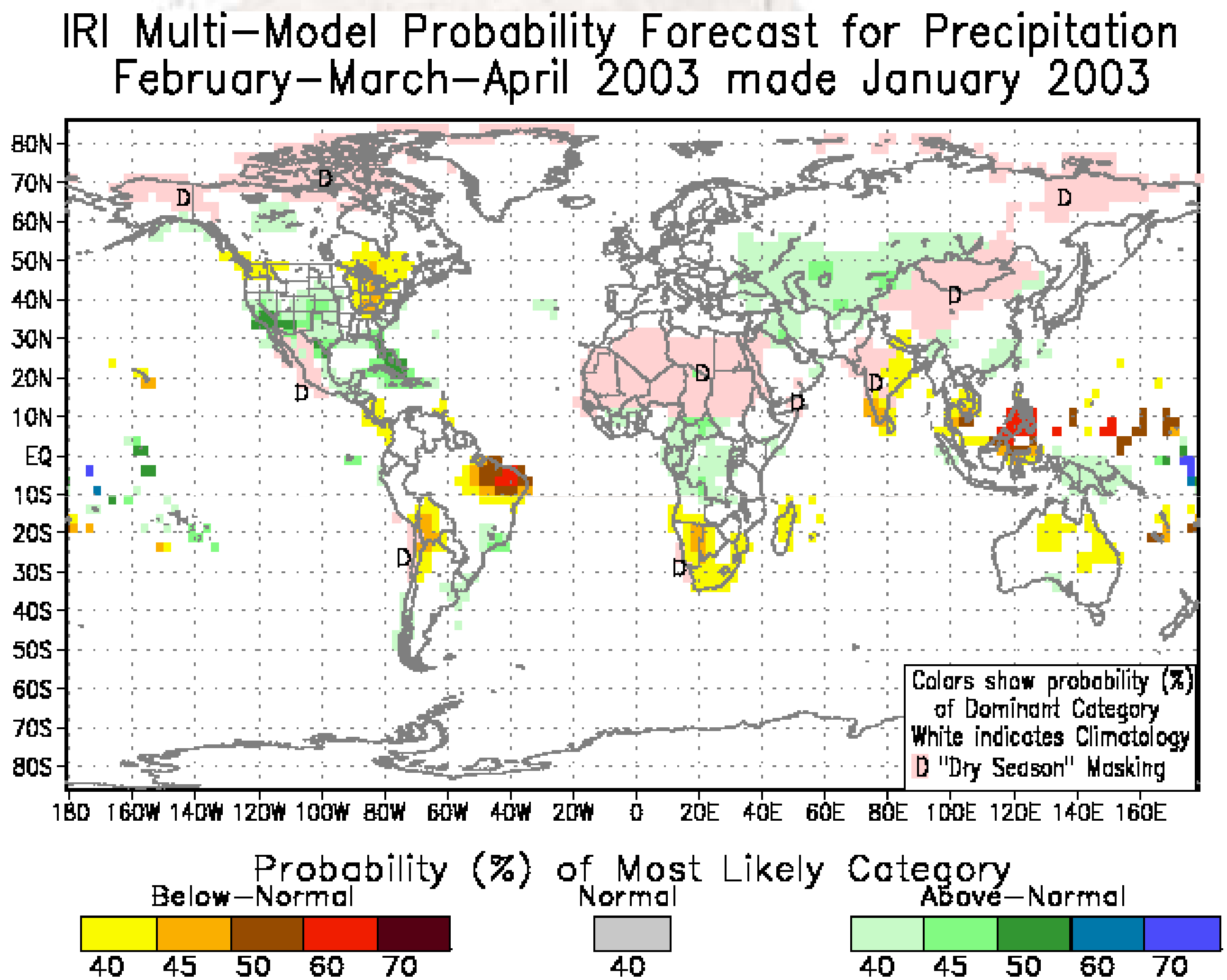
Long Range Forecasts



Conclusions

- Early warning provided framework for response 1.5 – 2 months compared to 1997-98, mid-Dec vs. mid-Feb
- An unusual event in the WIO region developed leading to excess rainfall over Sudan and the Sahel region in the summer of 2007 leading to the potential for a RVF outbreak
- Forecasting conditions associated with vector-borne disease outbreaks is critical for timely and efficient planning of operational control programs
- Global and resultant regional, local climate anomalies can be used to forecast potential disease risks that will give decision makers additional tools to make rational judgments concerning disease prevention and mitigation strategies
- Public Health & Trade – Economy Sectors of the economy that can benefit most from climate/environmental and short term climate forecasts.

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Conclusions

- Good Early Warnings/Predictions are not Good Enough without Field Surveillance and Response Planning
- Early Warnings should be used to structure systematic response planning i.e. what can be done with a 3, 4, 5 month early warning – social mobilization, vector control, vaccination, resource mobilization etc
- Need for enhanced cooperation between MoH, Met Services and Livestock Development – use of customized regional and country level seasonal climate forecasts

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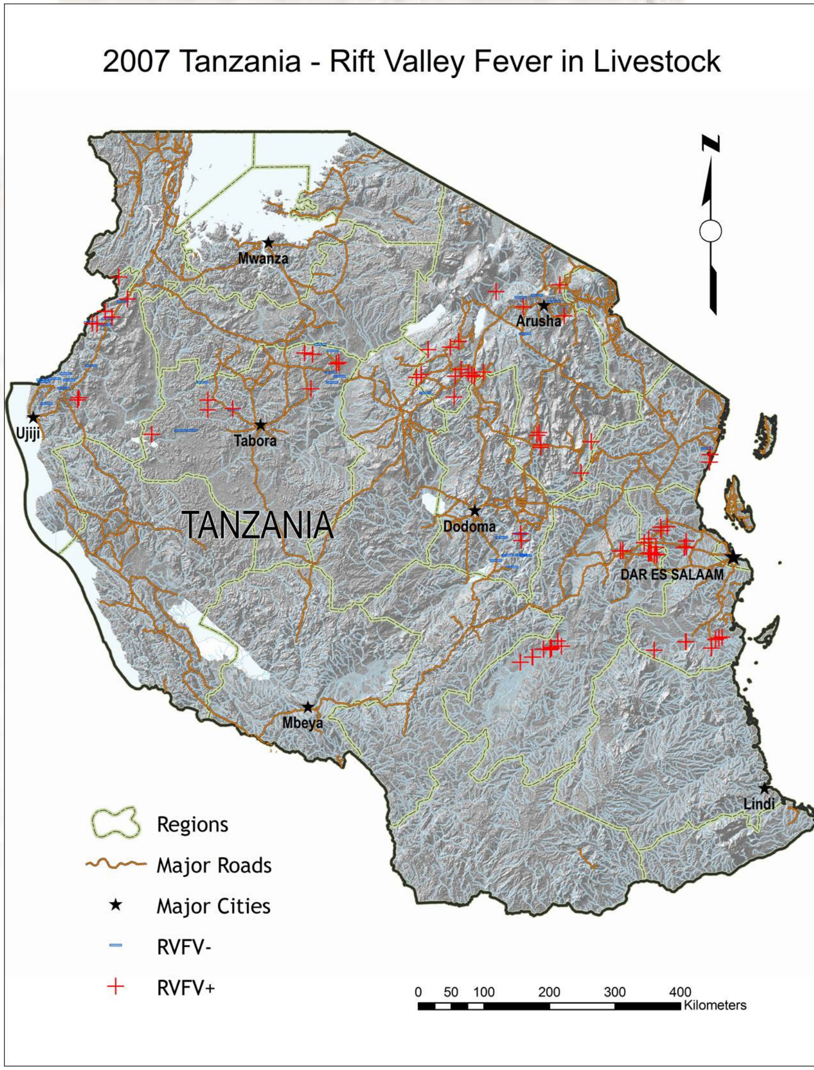
Missing Link - Vectors & Livestock Surveillance



Department of Defense Global Emerging Infections System

NASA

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- NOAA Climate Prediction Center, Camp Springs, Maryland.
- USDA Foreign Agricultural Service (FAS), Washington D.C.

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- Rosemary Sang & KEMRI Field Team
- Robert Breiman, Allan Hightower CDC Team – Kenya
- Pierre Formenty, WHO;
- Stephan De La Rocque, FAO
- Bob Swanepoel, NCID, South Africa

Collaborators

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- **World Health Organization – Pandemic Alert and Response Department, Geneva**
- **Food and Agricultural Organization (FAO), Rome.**