

# CNES Strategy for Health and the Environment

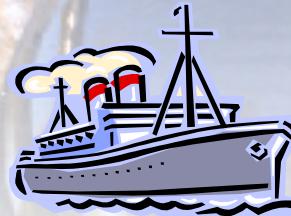
Murielle LAFAYE,  
Coordinator of CNES Applications Team  
Co-lead GEO CoP Health and the Environment  
CEOS SBA Health Coordinator

## CNES Tele-Health Programme

- **Telemedecine (diagnosis, data collecting networks)**
- **Humanitarian aid**
- **Education and Training**
- **Health and the Environment = Tele-epidemiology**

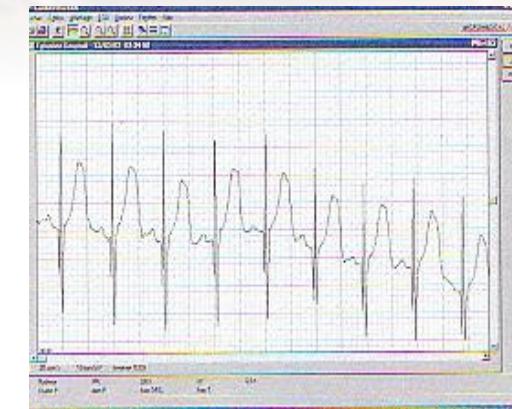
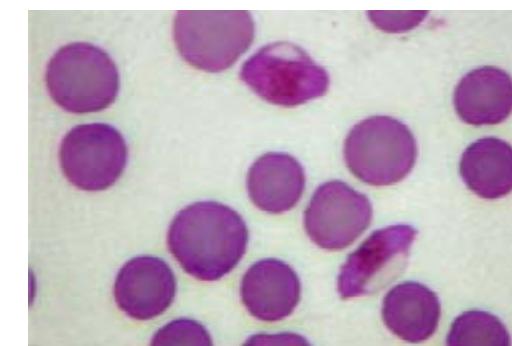
## Telemedecine facilities and networks

- Maritime
- Aeronautics
- Expeditions, trekking
- Humanitarian aid and Refugies



# Telemedicine in French Guyana

## Epidemiological Data Collecting Network and Diagnosis



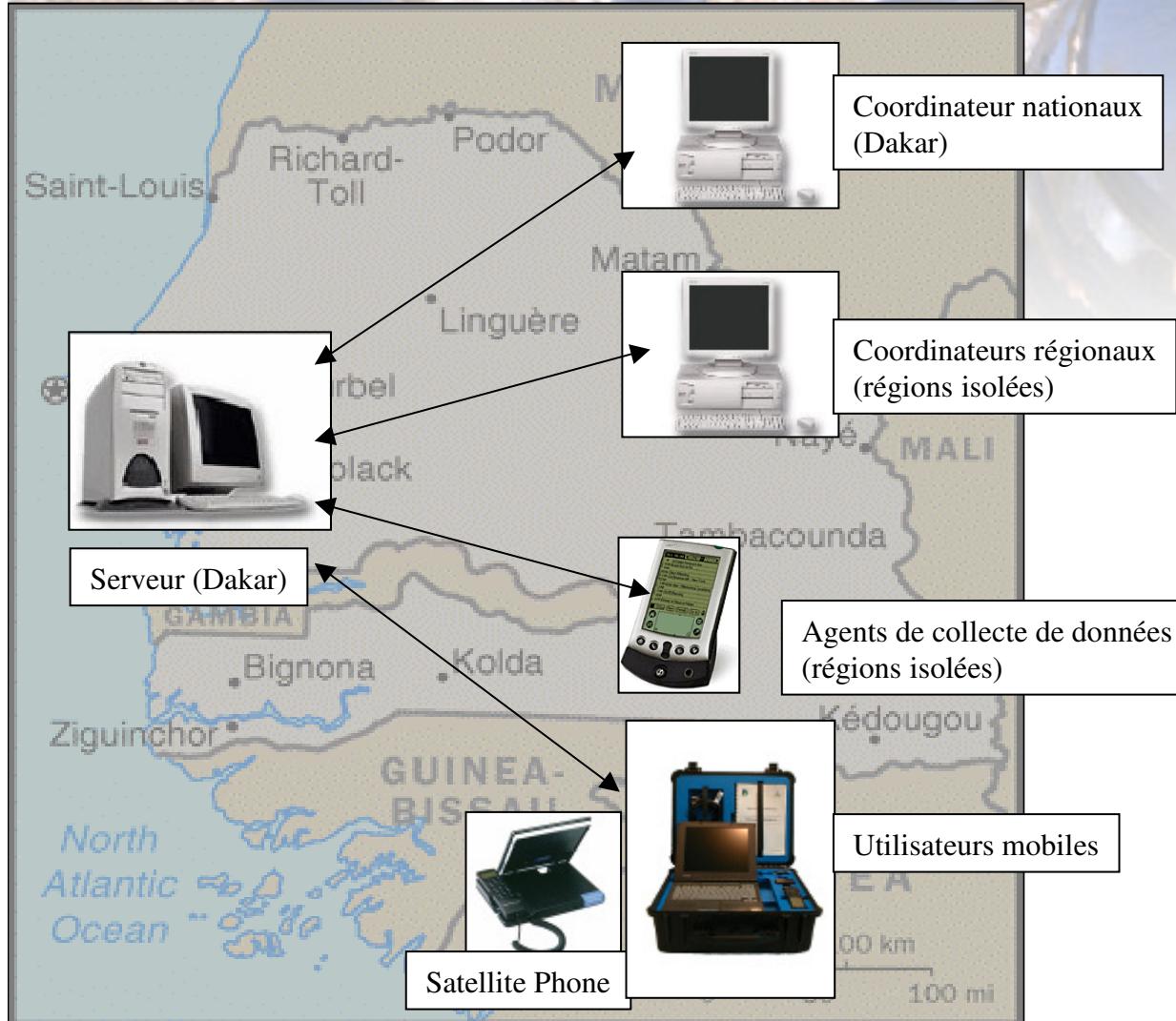
## Telemedicine network, Senegal



- Mother and child care ,
- Echography in isolated areas ,
- High risk pregnancy ( HTA) ,
- High mother-child mortality ,
- Collaboration with the Ministry of Health of Senegal



# Epidemiological Data Collecting Network in Senegal



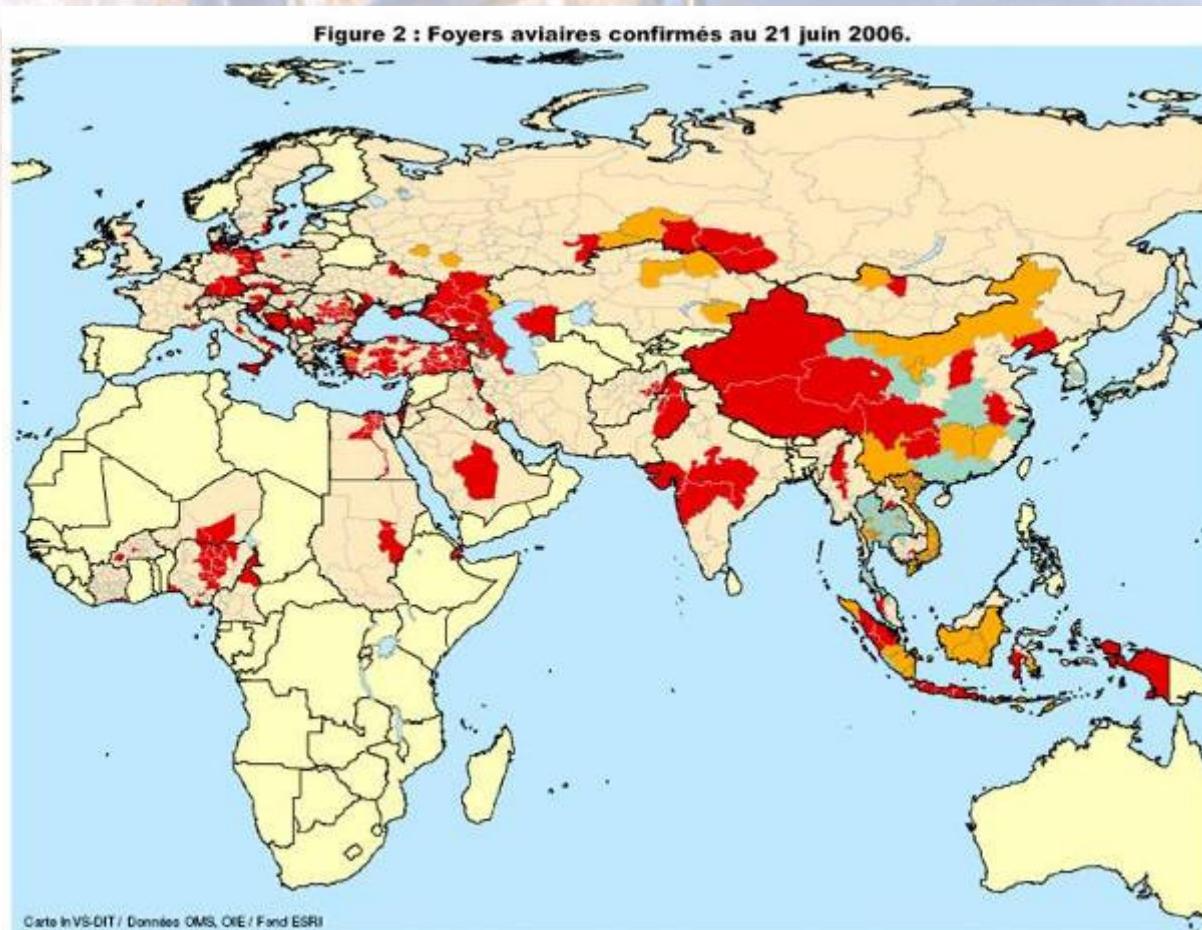
- Utilisateurs (~ 30) utilisant des équipements variés : PDAs, PCs, portables
- E-mails de données épidémiologiques (~ 200 par mois)
- Relations entre les sites isolés et la capitale (Dakar) via satellites et/ou liaisons filaires
- Nombre de rapports épidémiologiques en 2001 : ~ 500
- Extension du réseau Emercase à partir de 2003



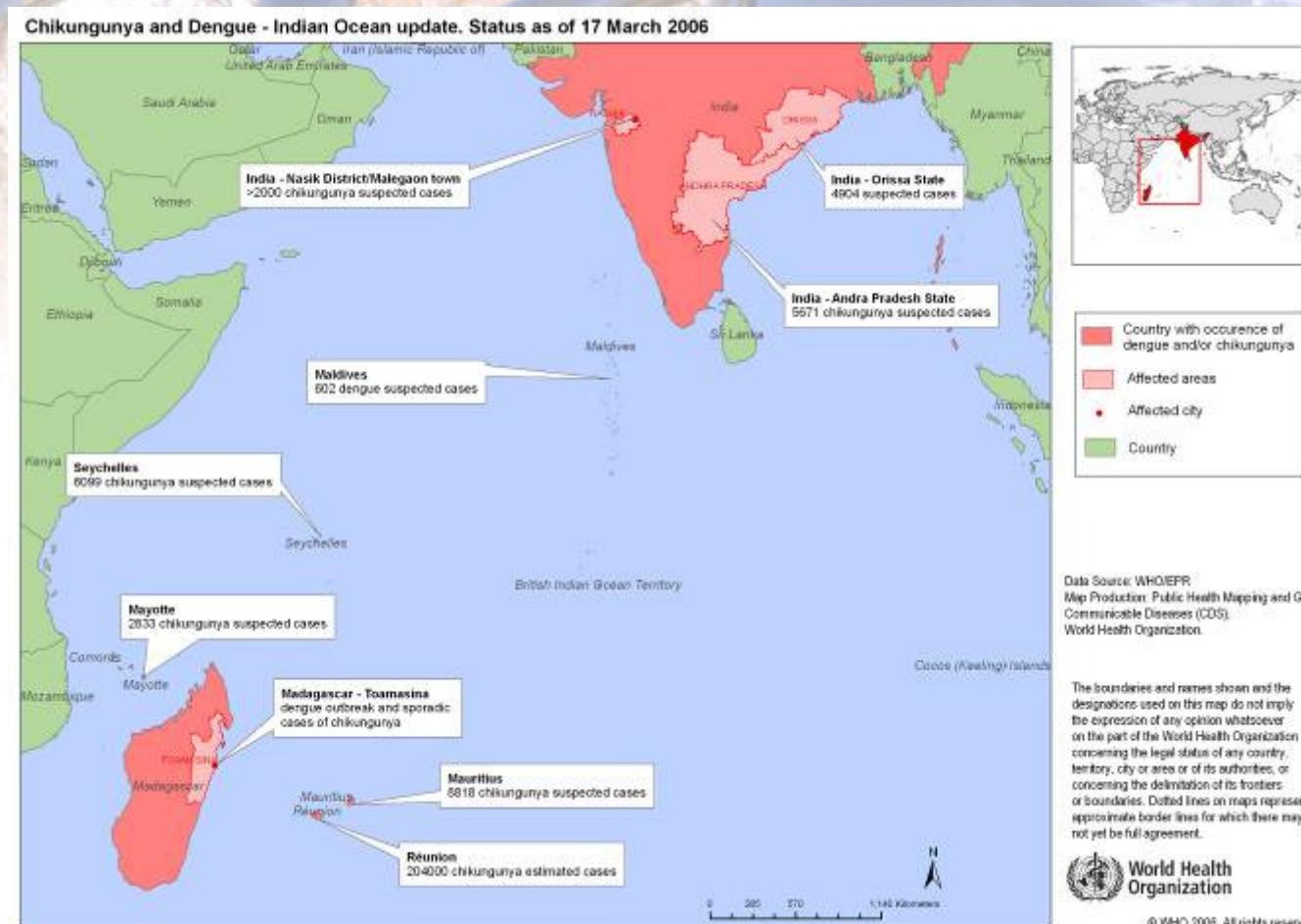
DIREL/DSV



# Health and the Environment – The context



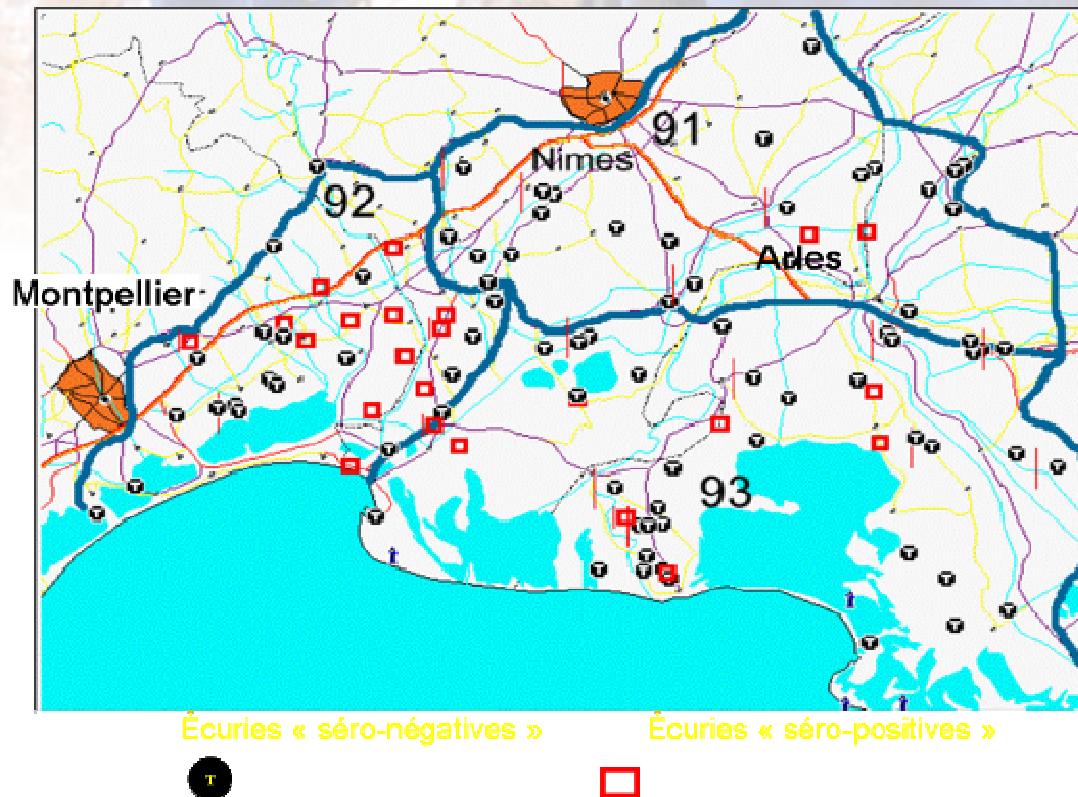
# Health and the Environment – The context



# Health and the Environment – The context

## Contexte National

Localisation des écuries « séro-positives » (West Nile) en Camargue



# Tele-epidemiology – The concept

- Infectious transmissible diseases
- Water borne
- Air borne
- Vector borne (mosquitoes, rats, birds, flies, ...)

4 types of parameters are necessary for modeling



- Understanding the « mechanism »...on the ground
- Identifying key parameters.....and space contribution
- Developing « adapted products » ...with and for users
- End to end system, integrating space component

# Tele-epiemiology - Satellites and Health

- Air borne diseases

**Atmospheric chemistry / Air pollution / meteorology instruments**

**To detect and quantify pollutants and particles, pollens, aerosols**

- Water borne diseases

**Water color / coastal measurement / meteorology instruments**

**To detect water surface temperature, chlorophyl, sediments, yellow matter, algal bloom, tides, ...**

- Vector borne diseases

**Remote sensing (optic and radar) / altimetry / meteorology instruments**

**To detect bridging sites, environmental changes, vulnerability**

- Epidemiological Data collecting

**Data collecting systems**

**To strengthen public sanitary systems**

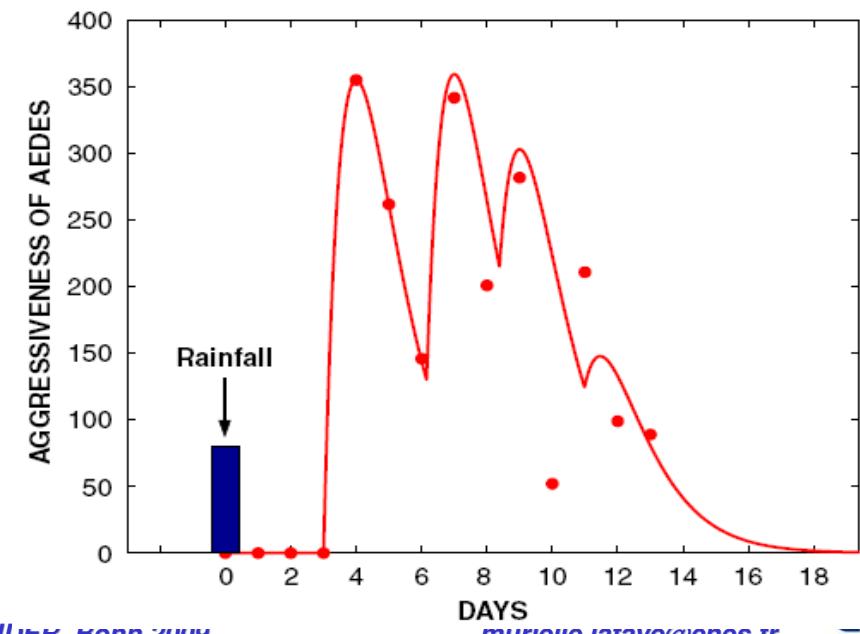
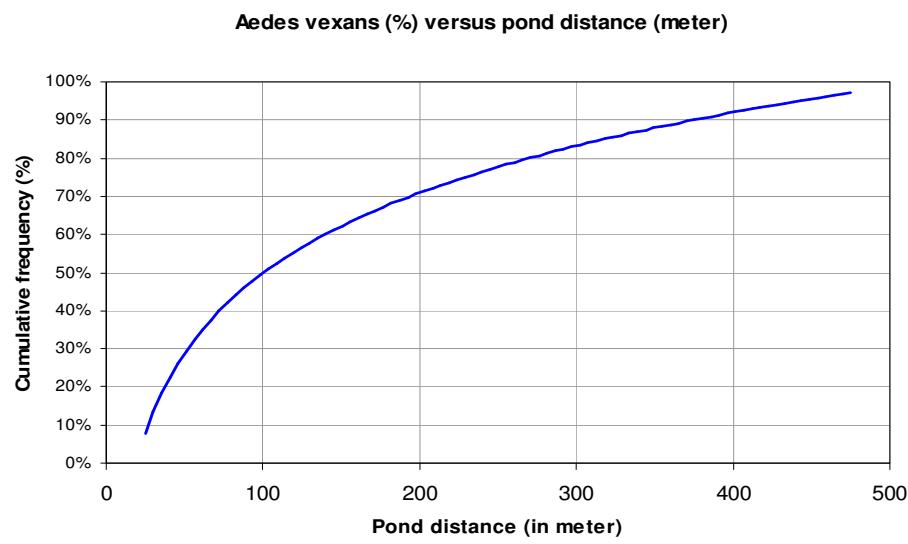
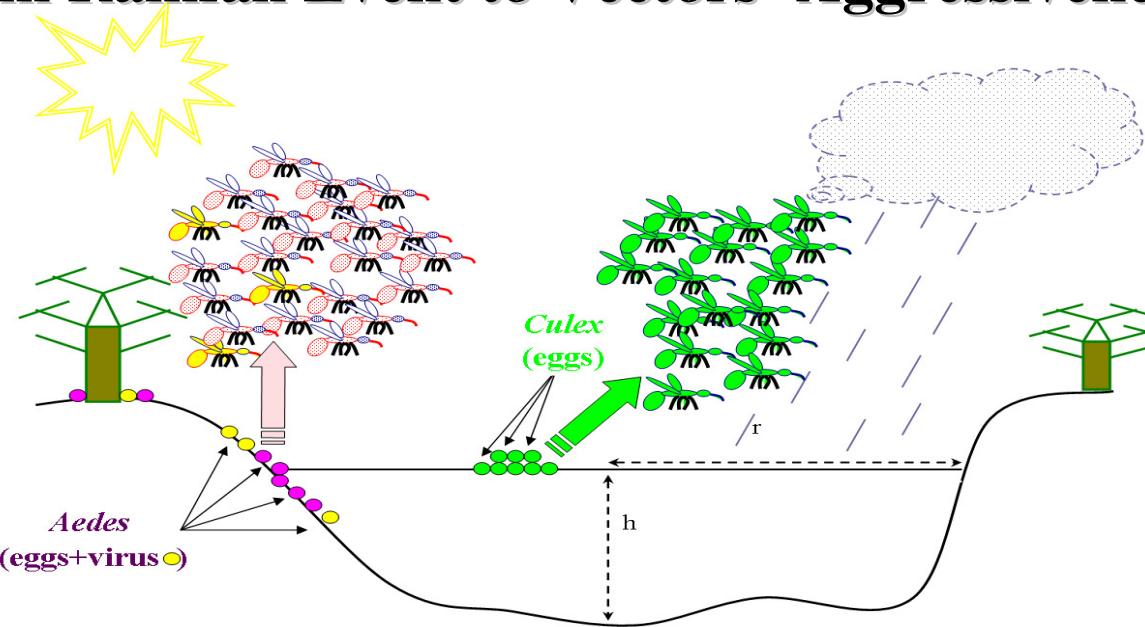
## Tele-epidemiology - Towards EWS (early warning systems)

- Anticipate / Alea (ex: anticipate mosquito production)
- Anticipate / Disease Transmission Risk  
(alea+vulnerability => risk)
- Optimize public sanitary system response / epidemic
- Reduce epidemic impacts  
sanitary impact (mortality, sickness)  
economical impact

# Tele-epidemiology – Vector borne disease



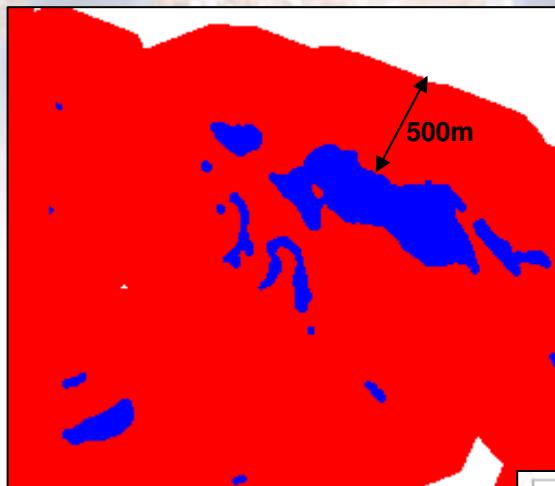
# From Rainfall Event to Vectors' Aggressiveness



# Tele-epidemiology – Vector borne disease

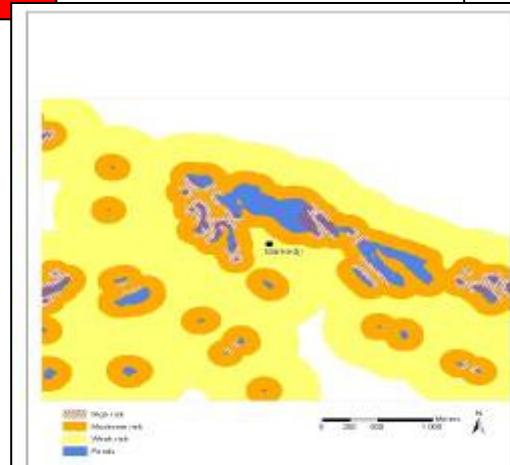
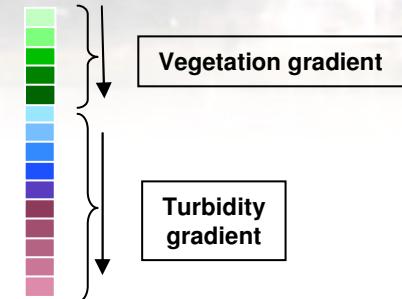
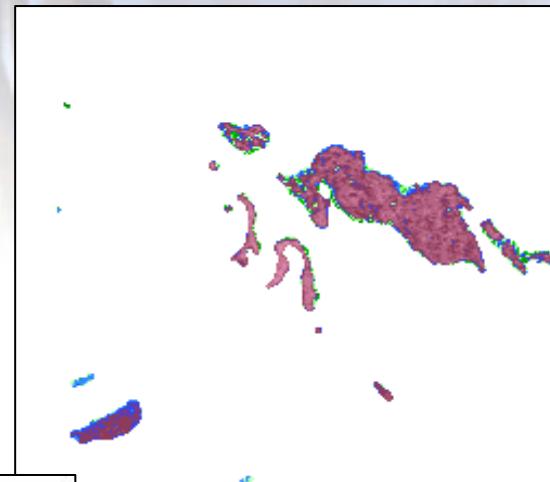
## Barkedji Turbid Pond

ZPOM 08/26/03



- [Blue square] Ponds
- [Red square] 1 – 500m

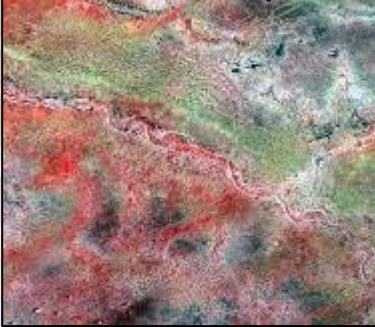
NDTI



**ZPOM: zone potentially occupied  
By mosquitoes**

# Tele-epidemiology – Vector borne disease

False color composite 2003

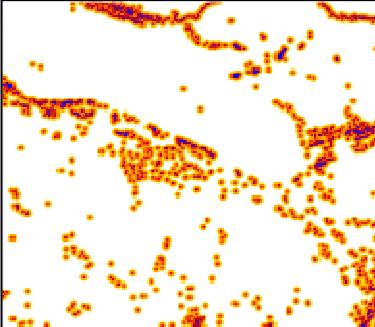


False color composite 2006



© CNES 2006, Distribution Spot Image SA

ZPOM min 2003



40239ha  
20.3% of area  
© Médias France product, CNES 2006, Distribution Spot Image SA

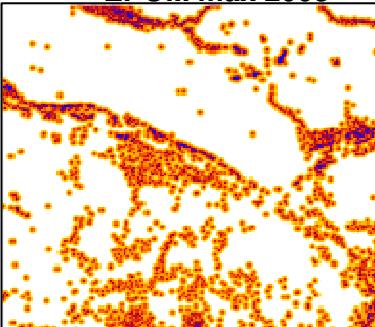
ZPOM min 2006



9569ha  
4.8% of area

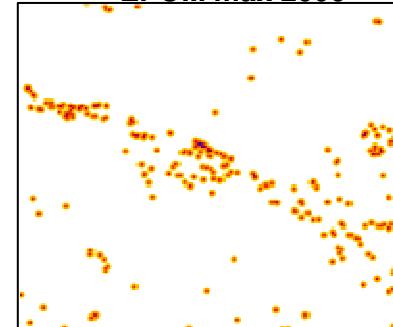
**ZPOM interannual variability**

ZPOM max 2003



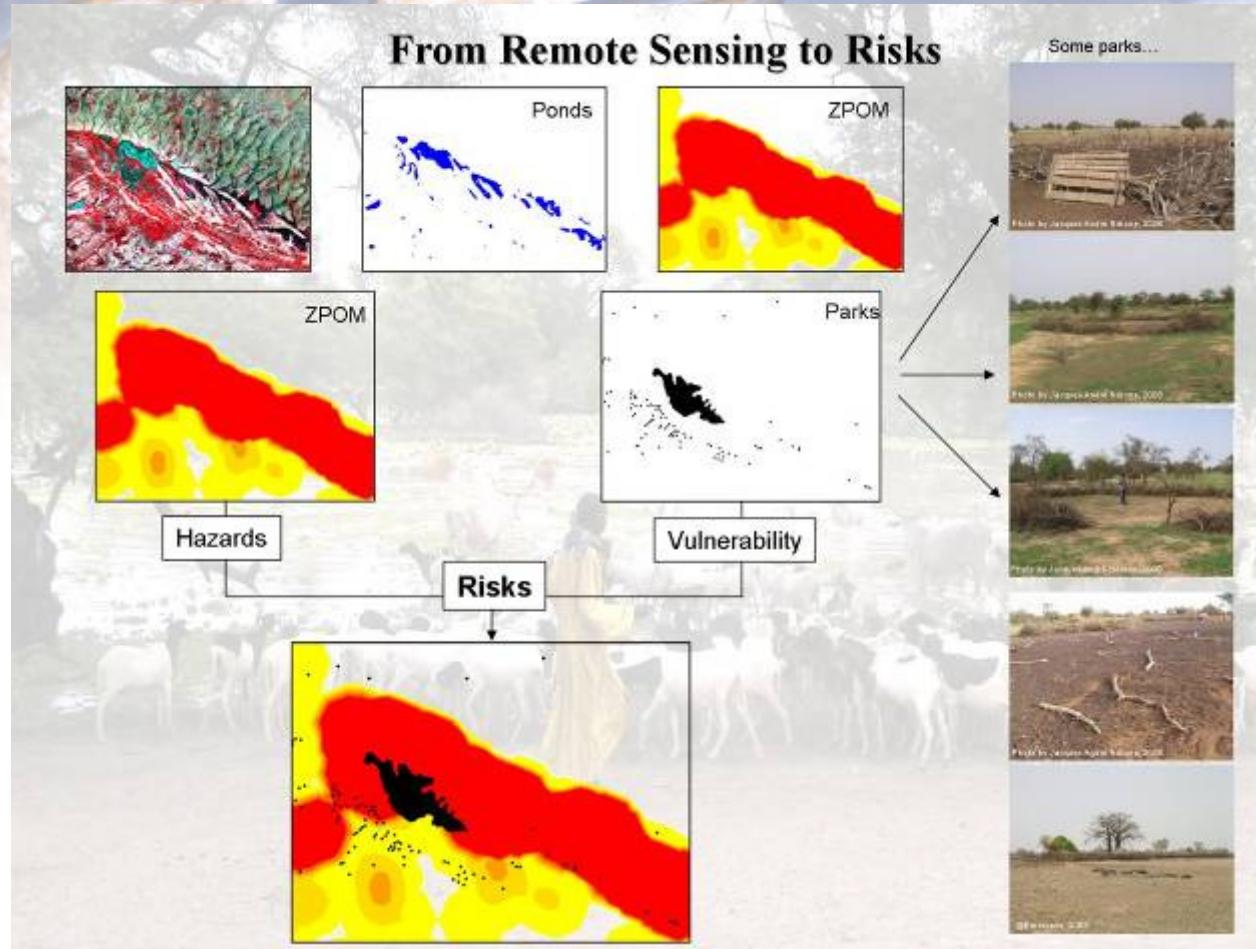
67572ha  
34.1% of area  
© Médias France product, CNES 2006, Distribution Spot Image SA

ZPOM max 2006



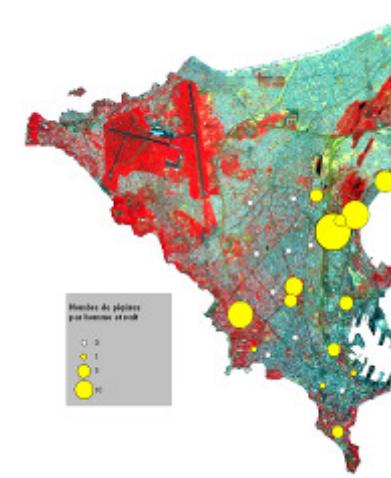
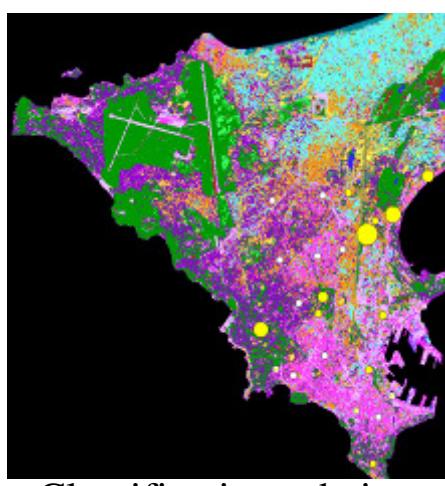
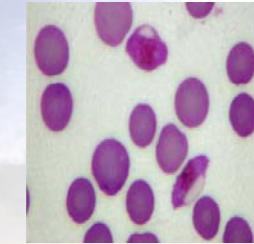
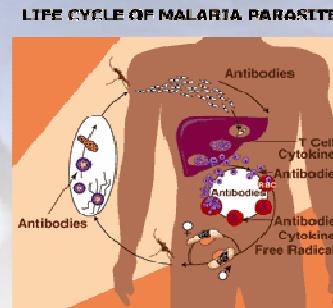
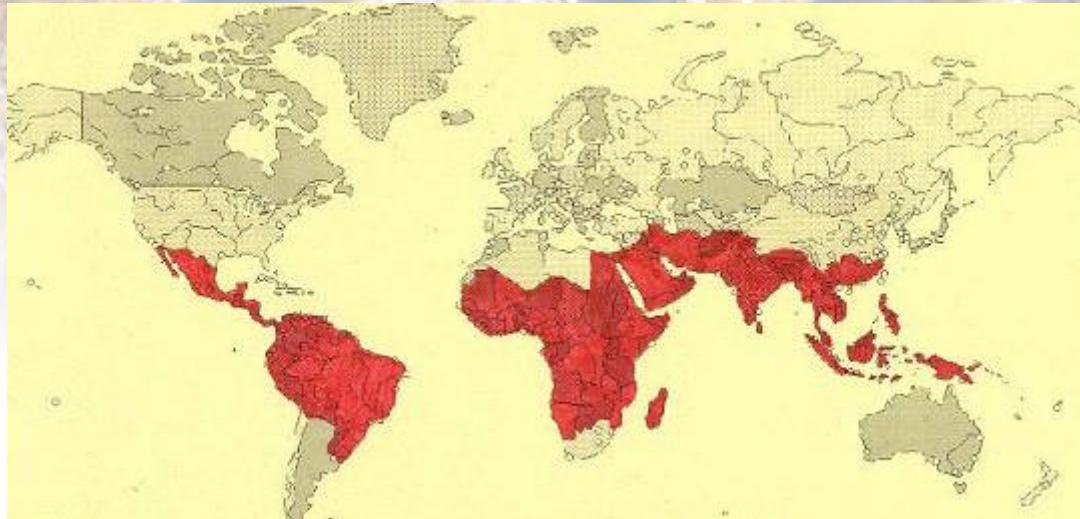
12864ha  
6.5% of area  
**UN-SPIDER, Bonn 2009**

# Tele-epidemiology – Vector borne disease



# Projet Paludisme à Dakar

## IMTSSA, (thèse Vanessa Machault)



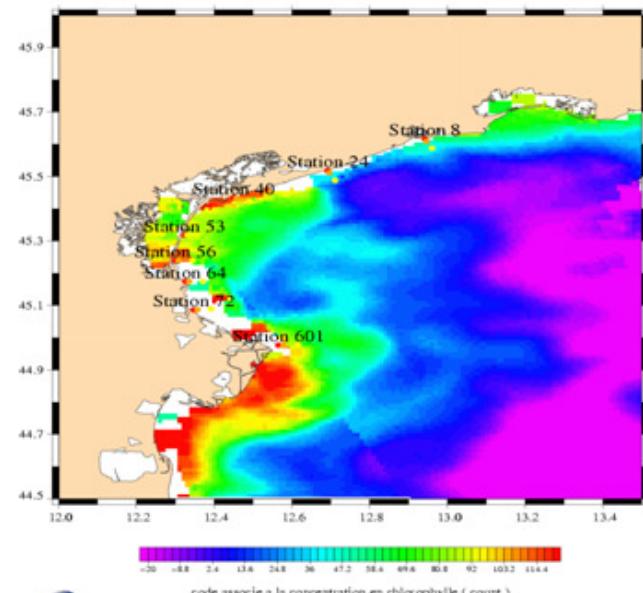
# Tele-epidemiology – Water borne disease



**Cholera  
Projet  
VIBRIOSea**

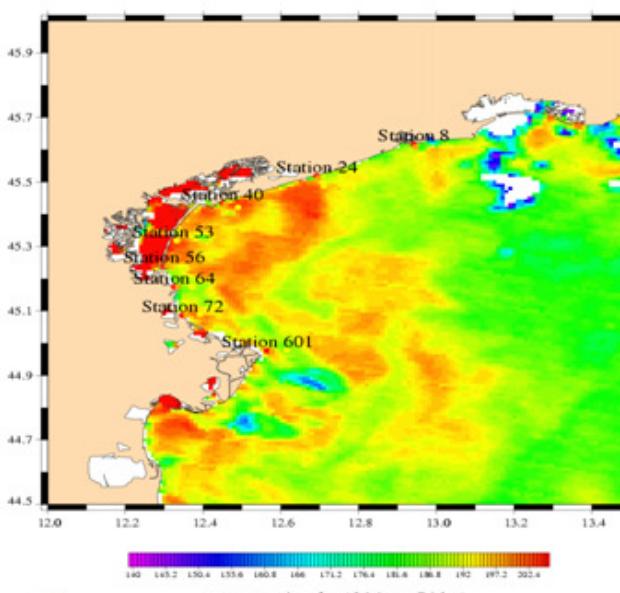


Concentration en  
Chlorophylle (84 Log C)



*Données  
Spatiales*

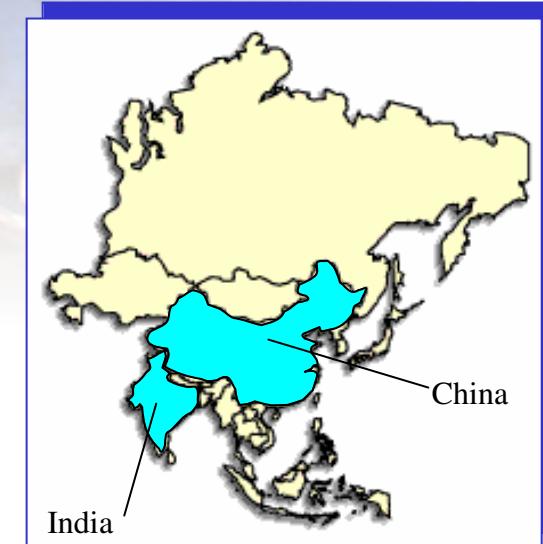
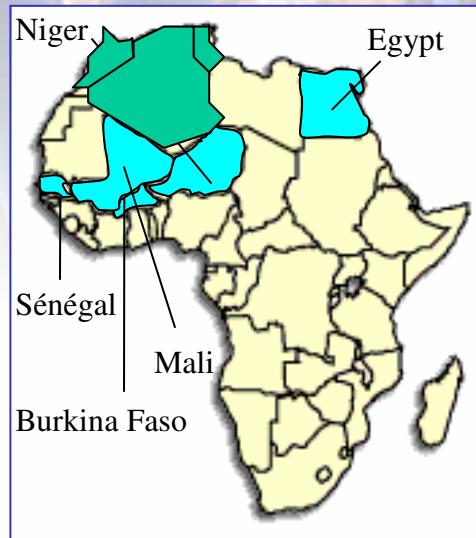
Températures



# CNES Health and the Environment Cooperations



Marocco, Algérie, Tunisia



Countries involved in projects

# CNES Health and the Environment Cooperations

At      **Thematic level**

**Scientific**

**Capacity building**

**Application development**

Thanks to      **National programme (call for innovative projects)**

**Bilateral Cooperations between space agencies**

**International programmes: GEO, CEOS, UN-SPIDER**

# GEO workplan 2009-2011

## HE-09-01 : Information Systems for Health

Imrpove in-situ environmental and health data collection for the utilization and valiation of remotely-sensed data

Explore how GEOSS will support the collection & distribution of information and meet the diverse needs of the health community

Develop a global public health information network database to improve health decision-making  
At the international, regional, country and districts levels

Priority / WHO's Openhealth information tool and other enviromental and health information systems to the GEO portal and GEOSS Common Infrastructure (GCI)

# GEO workplan 2009-2011

## HE-09-02 : Monitoring and Predicting Systems for Health

Support the development of operational health-related applications

Connect established and emerging cross-cutting observing systems to monitoring and predicting systems for health

Include and consolidate contributions from different, not yet coordinated systems

- a) Aerosols impacts on health and environment
- b) Air quality observations, forecasting and public information
- c) Global monitoring plan for persistent organic pollutants
- d) Global monitoring plan for atmospheric mercury

# GEO workplan 2009-2011

## HE-09-03 : End to end Projects for Health

Develop and implement end-to-end health-environment projects to advance the application of observation, monitoring and forecasting systems to health decision-making processes

Initiate efforts to establish a global health-climate Community of Practice in response to the 61st World Health assembly's resolution on 'climate change and health'

- a) Implement a meningitis decision-support tool
- b) Implementation of a Malaria early Warning System
- c) Ecosystems, biodiversity and health: decision-support tool and research

# GEO Task for Health and CEOS-GEO actions

## HE-09-01 : Information Systems for Health

CEOS-GEO HE-09-01\_1      Critical space-based imagery for health monitoring, forecasting and modeling of health issues

CEOS-GEO HE-09-01\_2      Global smoke plumes and dust forecasting product

## HE-09-02: Monitoring and Prediction Systems for Health

CEOS-GEO HE-09-02b\_3      Air quality observations forecasting and public information

## HE-09-03: End to End Projects for Health

CEOS-GEO HE-09-03a\_5      Implementation of a Meningitis decision-support tool

CEOS-GEO HE-09-03b\_1      Towards a global coordinated Malaria Warning system

CEOS-GEO HE-09-03b\_2      Malaria risks in Thailand

CEOS-GEO HE-09-03b\_4      Plan to integrate in situ vegetation health data to improve global VHI products in affected countries

## Main ideas

- **Applications Development Programme is USER driven**
- **Supporting scientific applied developments**
- **Transferring science into operational services**
- **Sustainable services (the users should be able to pay)**