# REDD-COMIFAC Meeting

## 10-12 March 2008, Paris

Reducing Emissions from
Deforestation and Degradation

# REDD Pilot Project COMIFAC: Cameroon

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Consortium led by: GAFAG

Project supported by: esa, gtz Partner for the Future. Worldwide., kfw ENTWICKLUNGSBANK

Project Part of gmes SERVICES

# Overall objective of presentation

- **Technological developments for REDD process (application of EO and in-situ for monitoring and management) have to be embedded in:**

  **- existing national and regional forest-policy frameworks,**
  **- institutional arrangements and capacities.**

- **REDD Pilot for COMIFAC: methods are developed in Cameroon and support REDD process in region.**

# Background: GMES supports REDD developments

- The **G**lobal **M**onitoring for **E**nvironmental and **S**ecurity (**GMES**) is a joint **EU/ESA** initiative which aims at establishing a capacity in operational information services for global monitoring of environment
- The ESA supported **G**MES **S**ervice **E**lement **F**orest **M**onitoring (**GSE FM**) supports UNFCCC/KP
- **GSE FM became involved in REDD process since 2006 via SBSTA meetings etc.**
- REDD pilot projects were developed with user requests and commitments: Bolivia and Cameroon

# Objectives of the REDD Pilot Project

- Develop tools to account for national DD emissions
    - Facilitate the regional and international exchange on learning experiences
        - Identify opportunities for national incentive schemes and strengthend forest governance

# Key development issues

- **Definitions for Deforestation/Degradation on national but also on regional scale (COMIFAC)**
- **Application of EO in combination with in-situ/field data has several steps:**
  - Processing chain: image processing, cloud cover problem, land cover/use classification, accuracy assessments (to meet UNFCCC requirements)
- **C accounting requires field information-via NFIs**

# Tasks of the REDD Pilot: Cameroon/COMIFAC

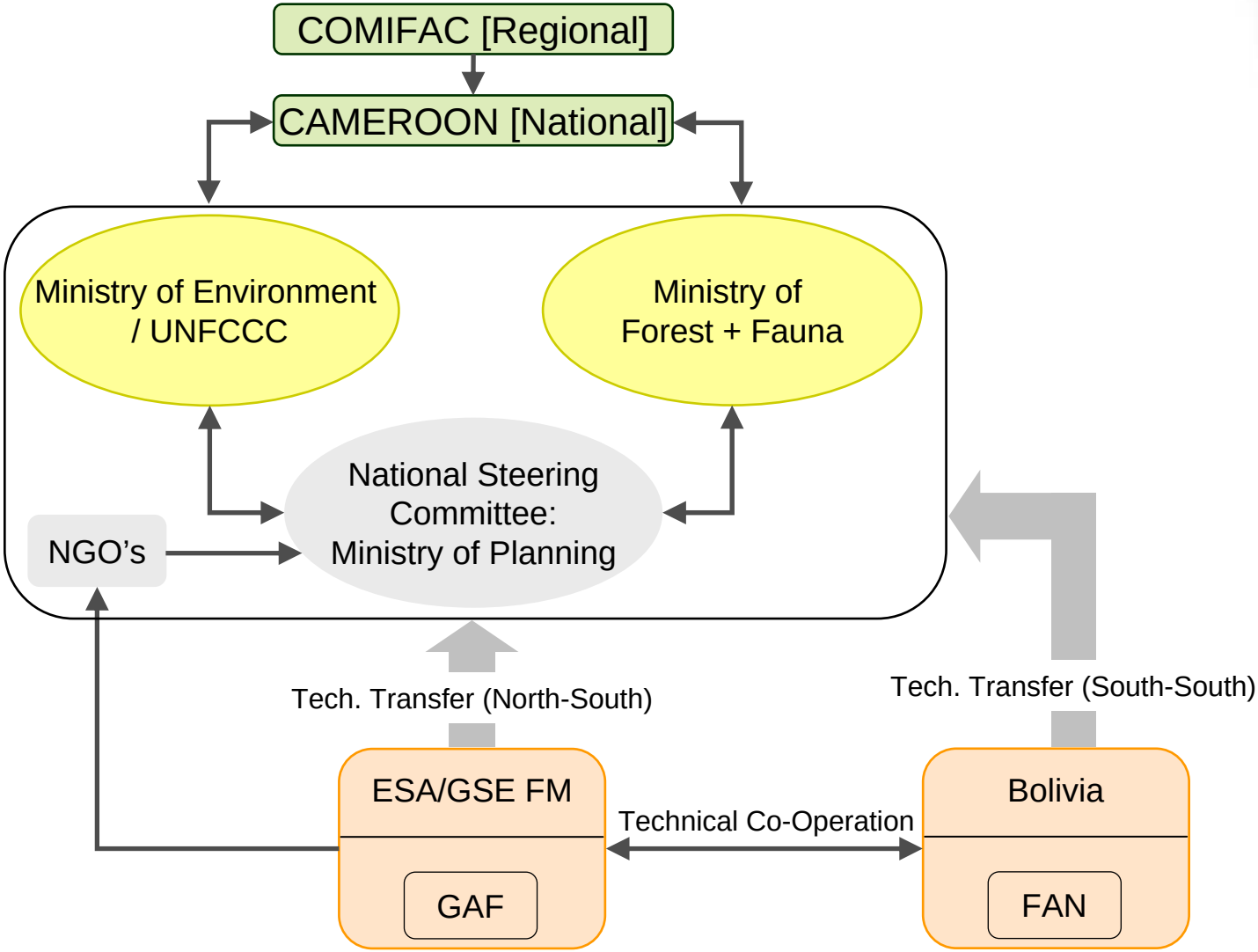
**Main Tasks:**

- **User Requirement Analysis and relevant institutional arrangements**
- **Application of EO for obtaining deforestation/degradation rates and spatial information on deforestation over a historical period**
- **Land use change modelling and biomass accounting**
- **Capacity building and technology transfer**

# Task1: User requirements/institutional arrangements

- **Feasibility Study Conducted with stakeholders in Feb. 2007**
- **National Steering Committee Planned for REDD:**
  - Ministry of Planning will Chair
  - Key Ministries: Ministry of Environment (MINEP) and Ministry of Flora and Forest (MINFOF) will drive process

# Institutional arrangements/user commitment



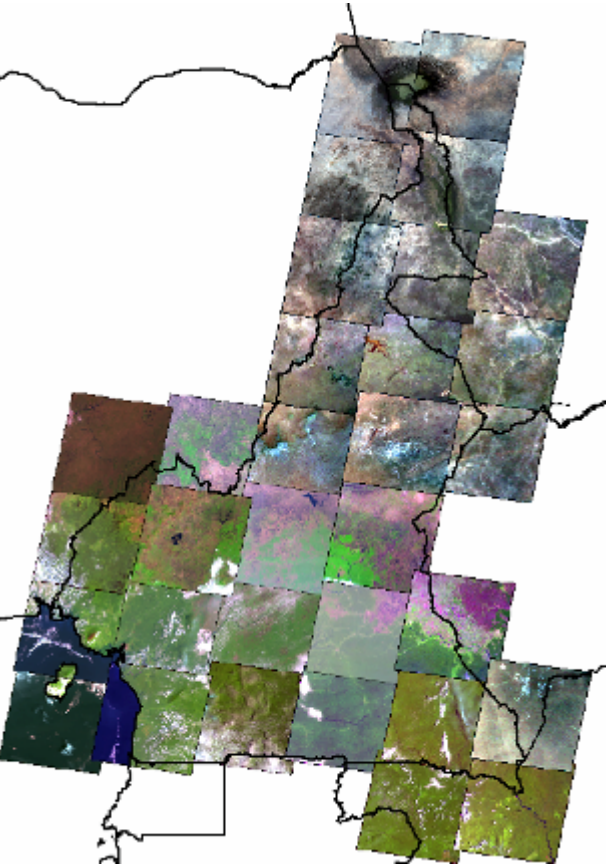
# Task 2: EO application

- **EO data acquired-Landsat data and DMC data, 1990, 2000 and 2005**

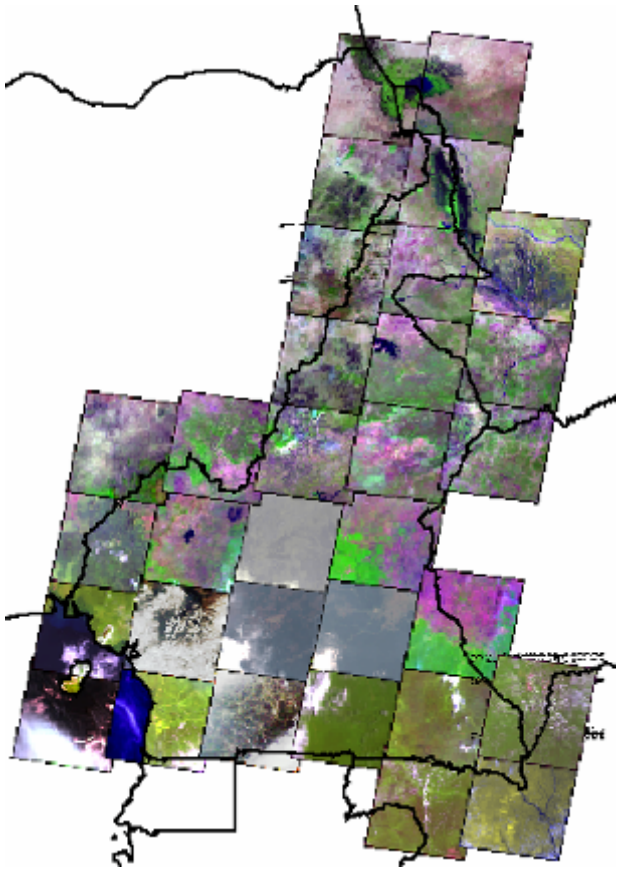
- **Prototyping of processing chain in progress**
  - Image processing completed
  - Forest Mask completed
  - Field Mission organised. IUCN/GFW-Cameroon implemented fieldwork, with technical support from Joanneum Research and GAF
  - Validation of Forest Map underway

# National EO data coverage - Cameroon

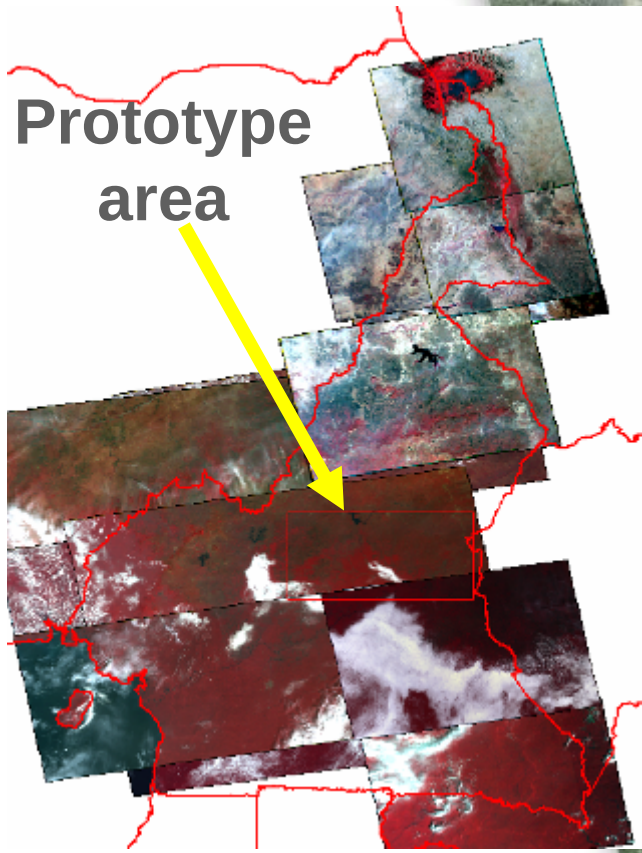
**1990 Landsat data**



**2000 Landsat data**

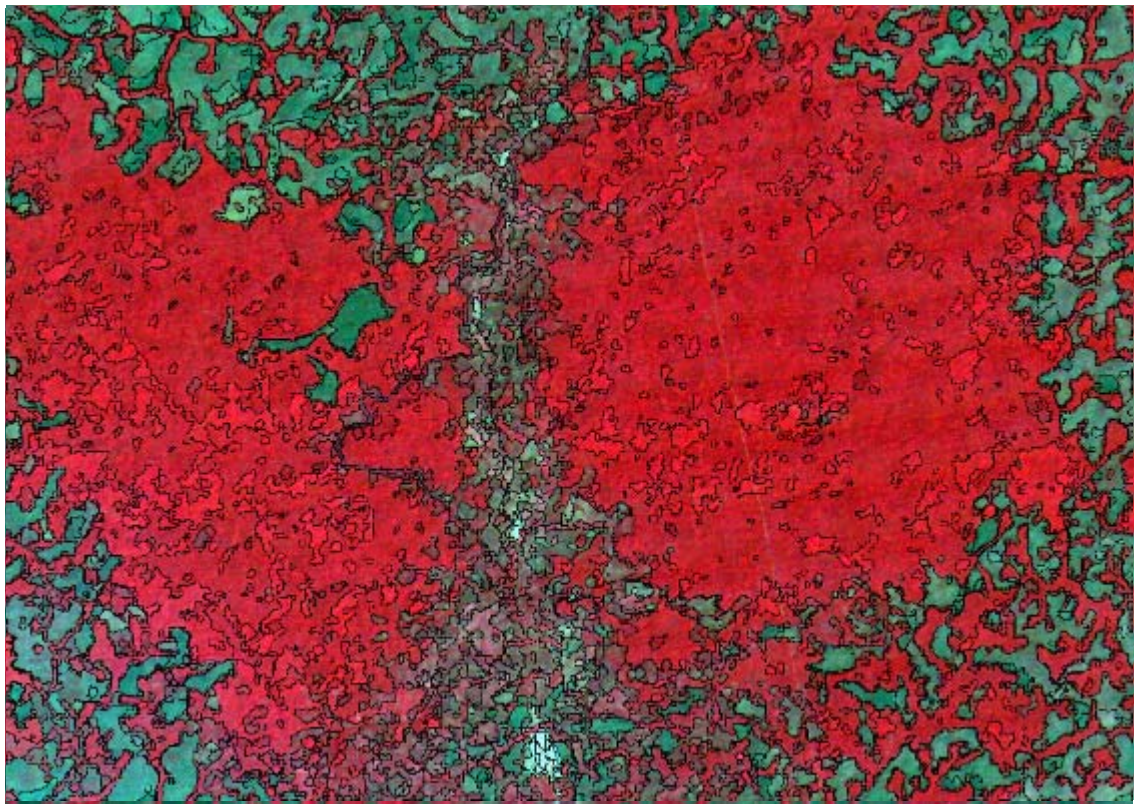


**2005 DMC data**



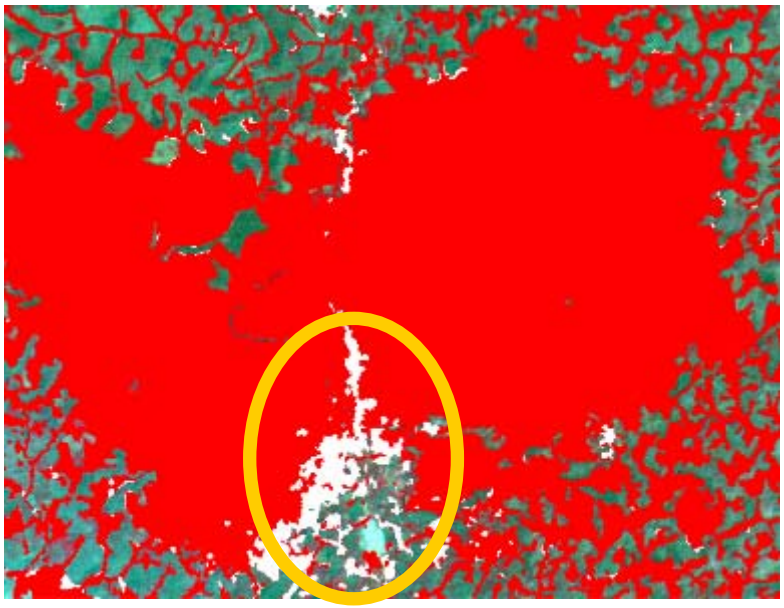
# Multi-temporal forest masks

**1990 2000 2005 Layerstack, filtering and segmentation**

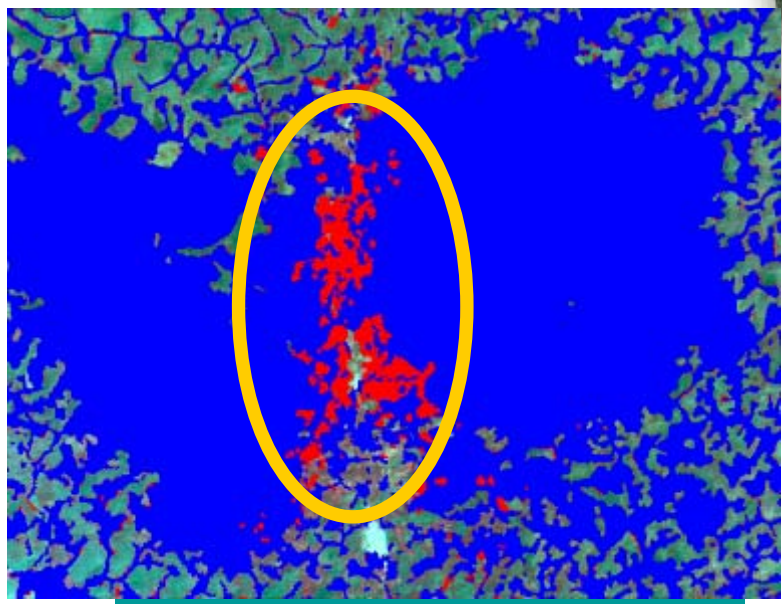


# Change masks

**Forest Mask 1990** **Forest Mask 2000** **Forest Mask 2005**



**change mask 1990/2000 (white)**



**change mask 2000/2005 (red)**

# Example of field mission

Shrubby savanna

Degraded forest

Cropland

Cropland

2a

896000 898000 900000 902000 904000 906000 908000 910000 912000 914000 916000 918000 920000

716000 708000 706000 704000 702000 700000 698000 696000 694000

NBATI A2 A6 A14 A1 A15 Makondo Djaoro Ndo A3 A4 A5 Djaoro Bjllo A9 A10 A7a A8 Buénanti A4 Lénin A13 A12 Ndoyo Wandin Béza A11

**Legend**

areas of interest
road
populated places
areasofinter point

Data Source:
DMC Satellite Image 18/01/2006
Layers: 1, 2, 3

0 1.005 2.010 4.020 6.030 Meters

# Field reference data collection

**Specific technical expertise is required to validate forest mask and land cover classes:**

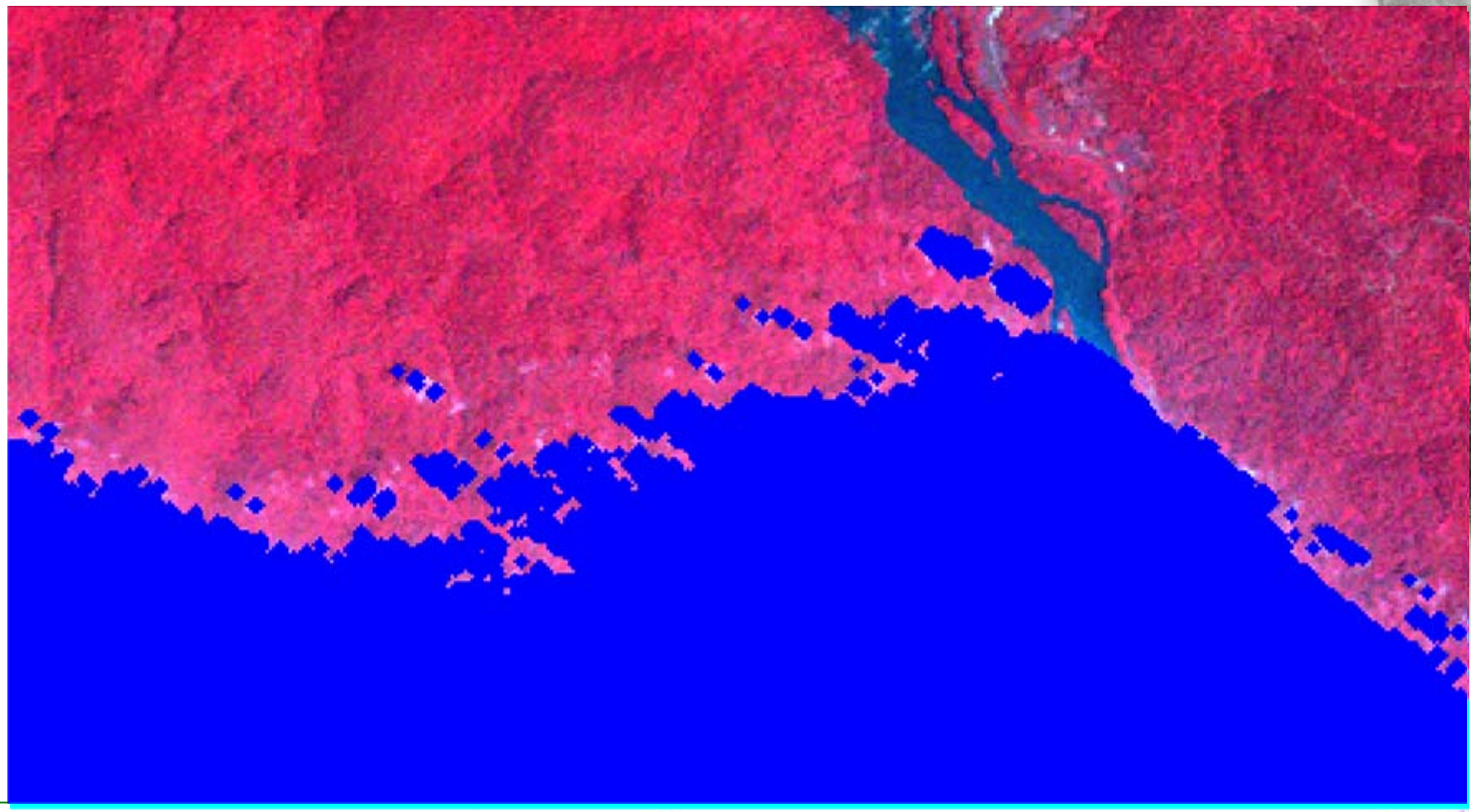
- **Remote sensing**
- **Local geo-botanical knowledge**

**IUCN/GFW-Cameroon supported field mission and collected field data in October 2007**

# Preparation of data for classification

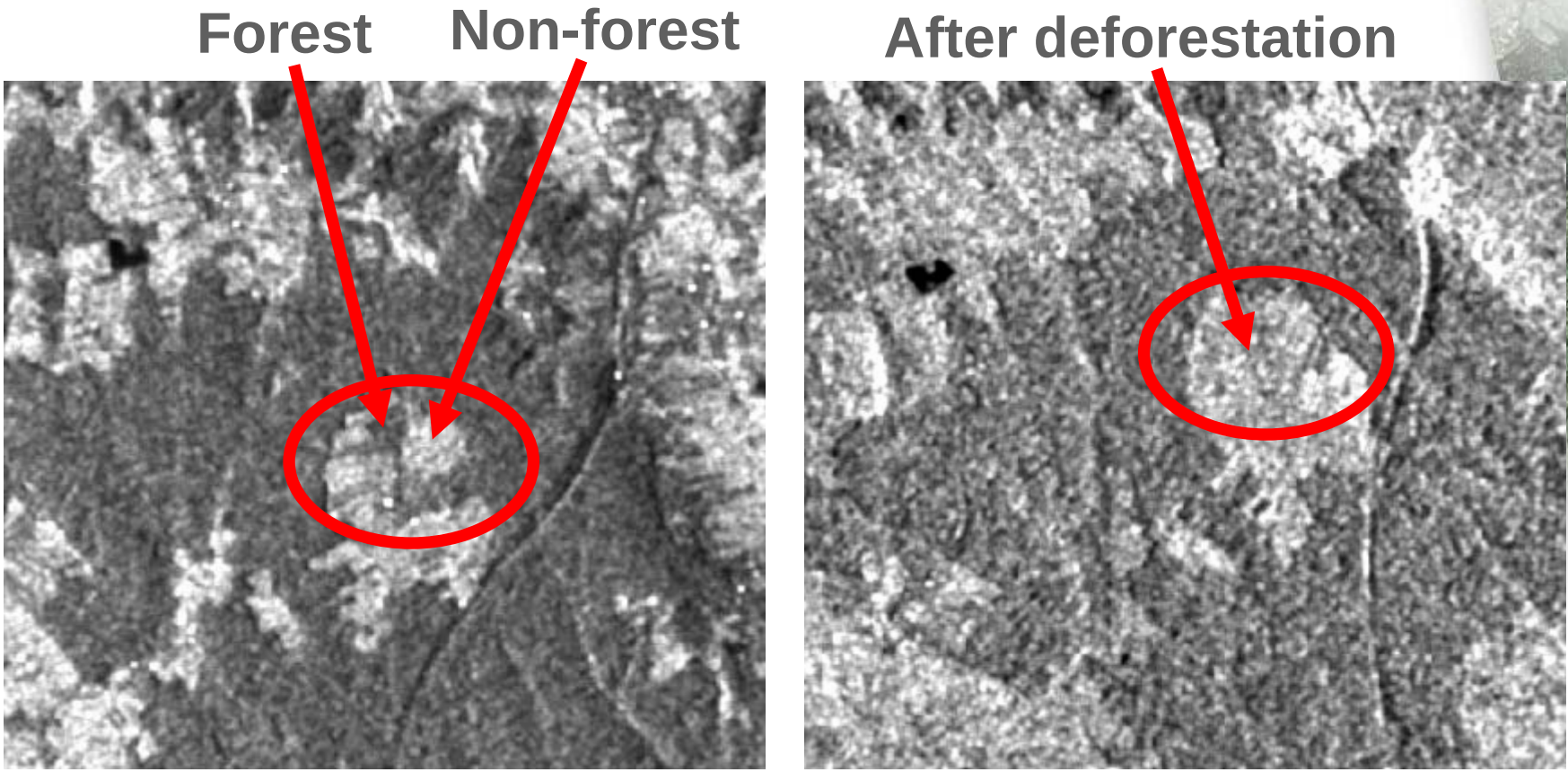
# Cloud masking

**Cloud shadow masking – semiautomatically (morphological operation & manual correction)**



# Substitution of cloudy areas with other data

## Option : Radar data




+ independant from clouds and haze
- classification of deforested areas difficult

# Biomass and emission modelling: Deforestation

## *Inputs*

**Detected deforestation and patterns 1990 - 2000 -2005**

**Spatially explicit drivers: e.g. roads, soils, settlements, forest edge, rivers**

## *Wall to Wall Processing in GEOMOD*

**Calibration: Statistical evaluation of different driver combinations**

**Spatial allocation of future deforestation**

**Statistical validation of model results**

## *Link areas to biomass measurements*

# Detecting degradation patterns using Spectral Mixture Analysis (Carlos Souza 2005)

## Basic Idea

Degraded forests have lower proportion of green vegetation and a higher proportion of no-photosynthetic vegetation and soil relative to intact forests.

## Degradation detection

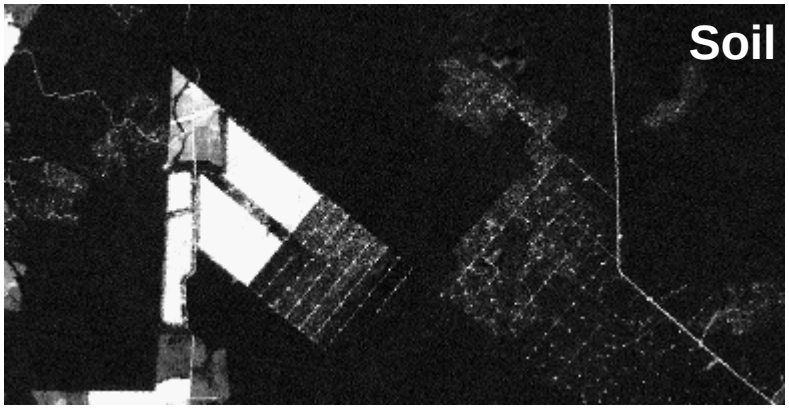
Decompose reflectance into fractions of 4 types of pure spectra: *green Vegetation (GV)*, *no-photosynthetic Vegetation (NPV)*, *soil (S)*, and *Shade*

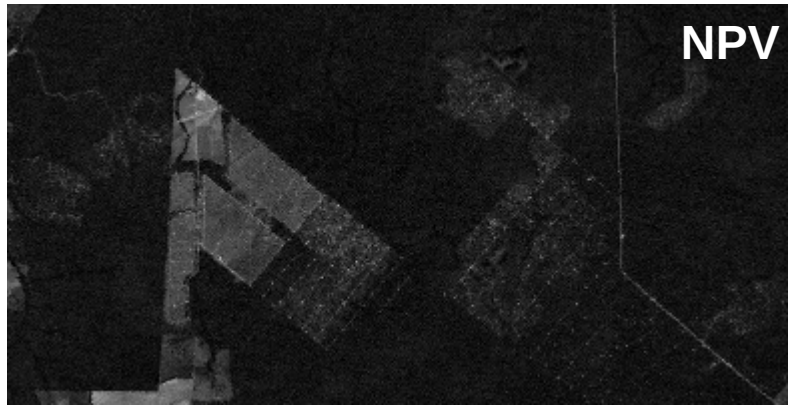
## Normalized Difference Fraction Index (NDFI)

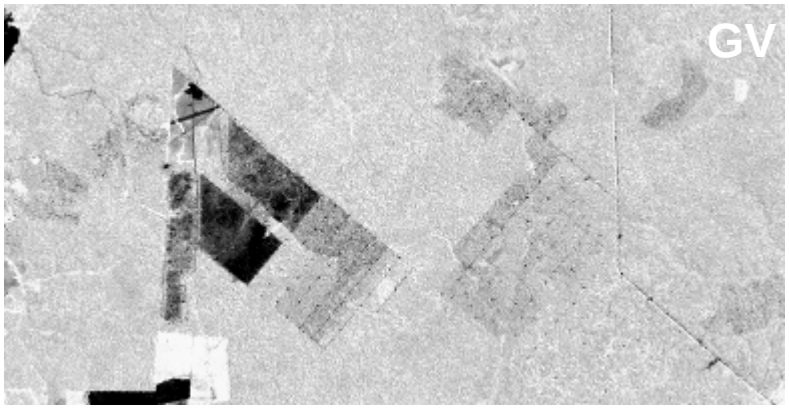
$$NDFI = \frac{GV_{Shade} - (NPV + Soil)}{GV_{Shade} + NPV + Soil} \quad \text{with} \quad GV_{Shade} = \frac{GV}{100 - Shade}$$

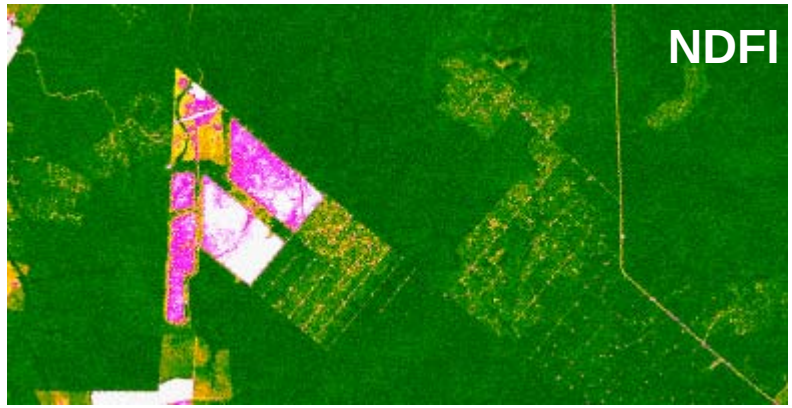
# Detecting degradation patterns using Spectral Mixture Analysis (Carlos Souza 2005)

**C. Souza 2005: Pará State - 223/62**

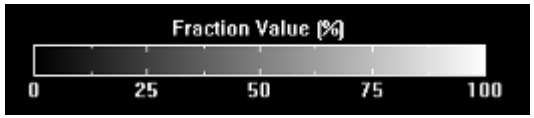


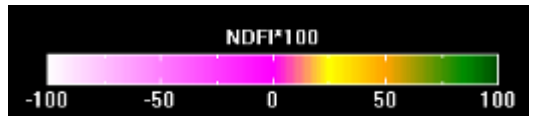







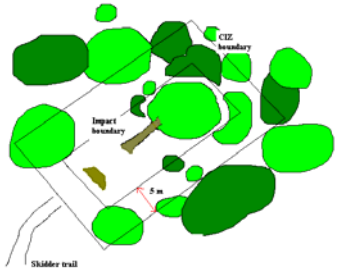



# Key inputs of a national degradation emission scenario

Forest inventories, annual reports

Remote sensing

Plot measurements

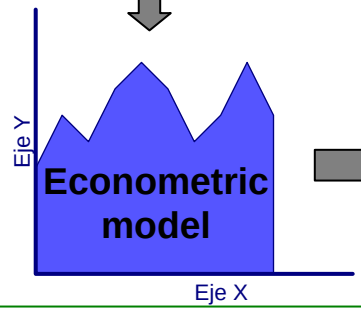



**Area change** [actor]

**Intensity: NDFI** [actor]

**Harvesting intensity** [actor]

Current timber harvests [$m^3$/yr]




Future timber harvests [$m^3$/yr]

Future emissions [$tCO_2$/yr]

# Next technical steps

- **EO and in-situ based degradation detection and emission accounting seems feasible in Bolivia and will be tested in Cameroon in combination with biomass measurements!**

- **Capacity Building**
  - **Training in remote sensing based DD detection and biomass inventory design**
  - **South-South cooperation and regional policy dialogue**

# Collaborative effort: REDD

GTZ-COMIFAC programme supports REDD pilot in Cameroon for the region

GSE FM provides standards, technical design, in dialogue with User, optimised processing chains, Quality assurance, Uncertainty assessment

ESA Supports GSE FM and the EO Task of the REDD Pilot

KfW will fund REDD Pilot in Cameroon

Fan and SF have experience from Noel Kempff Mercator Park Project and support biomass measurements, landuse change scenarios and deforestation emissions projection

# Contacts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