



Monitoring of Chlorophyll a and Toxic Algal Blooms in the Volta Basin – Preliminary regarding potentials of CHRIS-Proba hyperspectral imagery

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1.1 GLOWA Volta Project/ Graduation

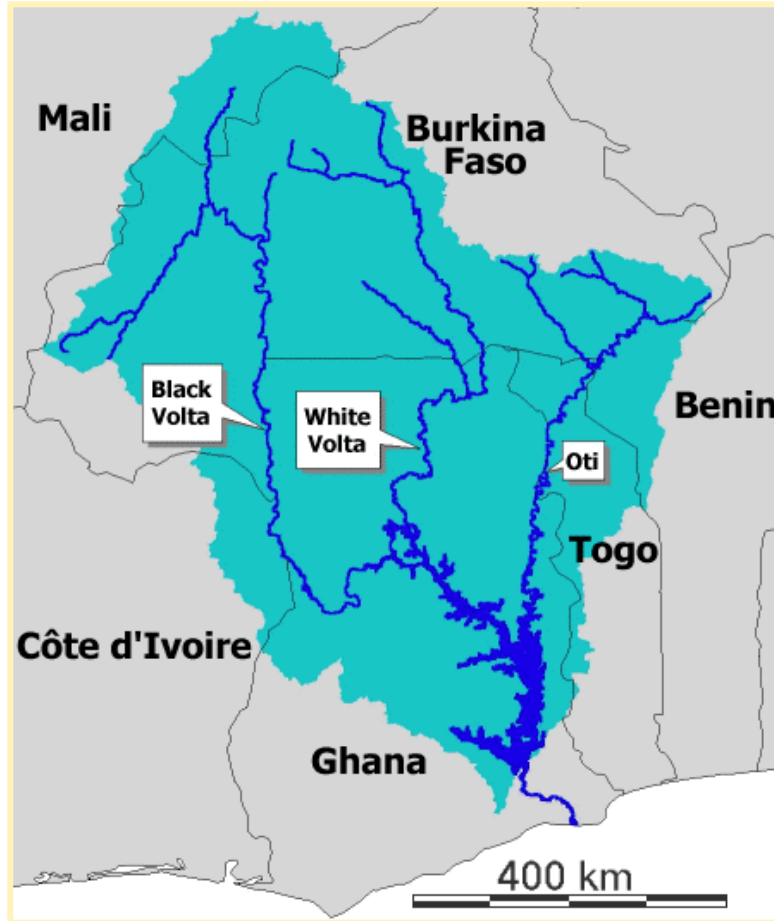
Goals of the GLOWA Volta Project:

Integrated Analysis of biophysical and socio-economic determinants of the hydrological Cycle

Development of Decision Support System (DSS) to support sustainable use of water resources in the Volta Basin

Building human capacities through training and education, cooperative research, involving stakeholders and building of a research network

1.1 GLOWA Volta Project/ Graduation



The Volta Basin

- 400.000 km² area
- 6 riparian owning countries
- 15-20 Mio. inhabitants
- precipitation 1000 mm/Jahr
- Volta Lake, with 8.482 km² largest mm. Lake

Diploma (Master) Thesis related to CHRIS-Proba Cat-1 EOID 3339:

Monitoring of Water Quality in the Volta Basin

Graduation with the German Aerospacecenter
Institute of Methodology of Remote Sensing –
Section Water Remote Sensing

1.2 Activities in 2005/06

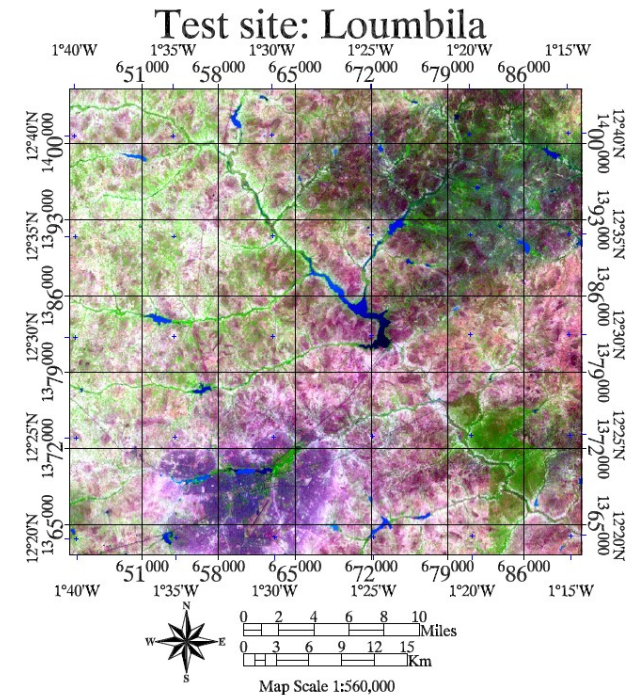


Fieldwork 2005:
Loubila Site near
Ouagadougou,
Burkina Faso

27th of July – 20th of August

Goals:

- Achieve In Situ Material for Ground Truthing
- Data for geo-referencing



1.2 Activities in 2005/06

Problems:

- weather conditions
- cooperation
- “Malaria”
- technical equipment

**Fieldwork 2005
– Impressions**



Timo Beiermann, Graduant, University of Bonn, GLOWA Volta Project

4th CHRIS-Proba Workshop, ESA-Esrin, Frascati, 19th- 21st of September 2006

1.2 Activities in 2005/06

Fieldwork
2005 –
Impressions



4th CHRIS-Proba Workshop, ESA-Esrin, Frascati, 19th- 21st of September 2006

1.2 Activities in 2005/06

New Acquisition of CHRIS-Proba, planned weekly – results:



Volta Site (preview), acquired 30th of June



Loumbila Site (preview), acquired 26th of May



Atankwide Catchment – out of Range

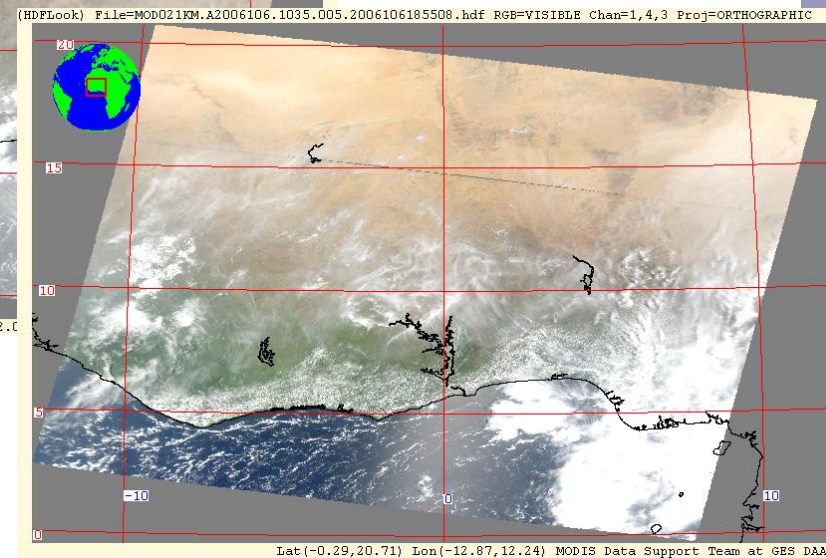
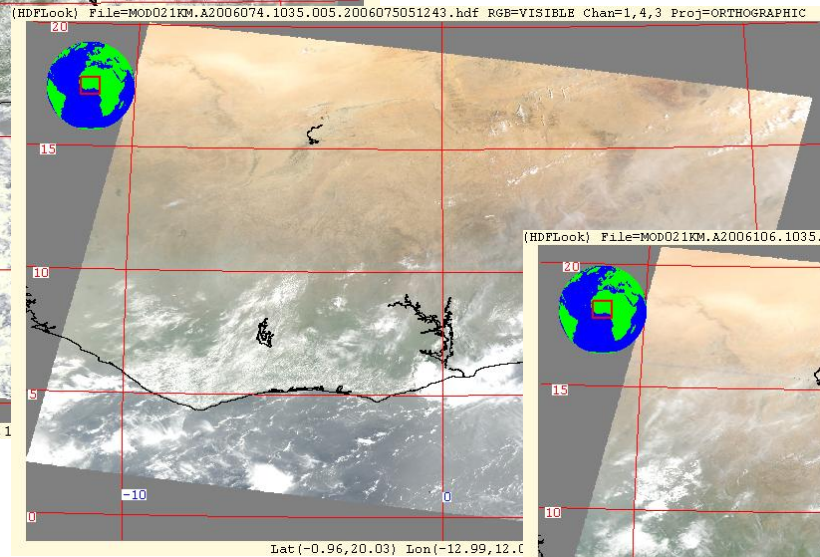
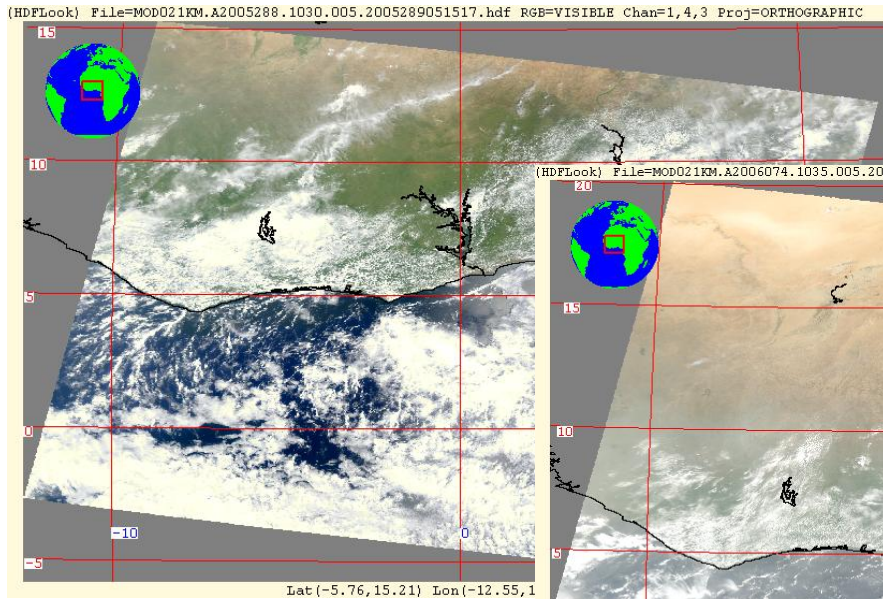
Site	(August 2005)	(November 2005)	April 2006	May 2006	June 2006
Loumbila	10.08.2005	03.11.2005	15.04.2006		30.06.2006
Volta				26.05.2006	
(Atankwidi)			(27.05.2006)		

2. Planned Data processing and interpretation

- Monitoring the whole Basin with MODIS using Standard techniques
 - resolution 250 m (proposed by the NASA in July – still 1000 m)
 - daily overpass
 - spatial extend suits better monitoring purposes
- Using MODIS data for „Ground Thruthing“ of CHRIS Proba data
- Combining of spectral information (limited, only two images)

2.1 Monitoring approach with MODIS

- Biweekly monitoring of Chlorophyll a for the period from 1st of April – 30th of June 2006



- Using a maximum Likelihood classifier to determine inland water reservoirs (ground truth: water bodies)
- Application of ATBD 19 chl a, for shallow waters

2.2 Analysis and Integration of CHRIS-Proba Imagery

Destriping:

- dielmo 3D/ HDFcleany SSTL

Athmospheric Correction:

- Dielmo 3D/ MODTRAN 4

Georeferencing:

- Delineation with MODIS data

2.2 Analysis and Integration of CHRIS-Proba Imagery

Estimation of Chlorophyll a

- Application of an easy Band – Ratio algorithm at CEDEX, Spain

Adapted algorithm developed for MERIS and empirical validated at Rosarito Reservoir, Spain. Using Ratios of CHRIS-Proba Bands 14/12

Accuracy R_yielded: 0.8

Riuz-Verdu, A. et. al. (2005), p. 5

Cyano_Faso 2004 : répartition des principaux groupes algaux

cryptophycées
diatomées / dinoflagellés
cyanobactéries
chlorophycées

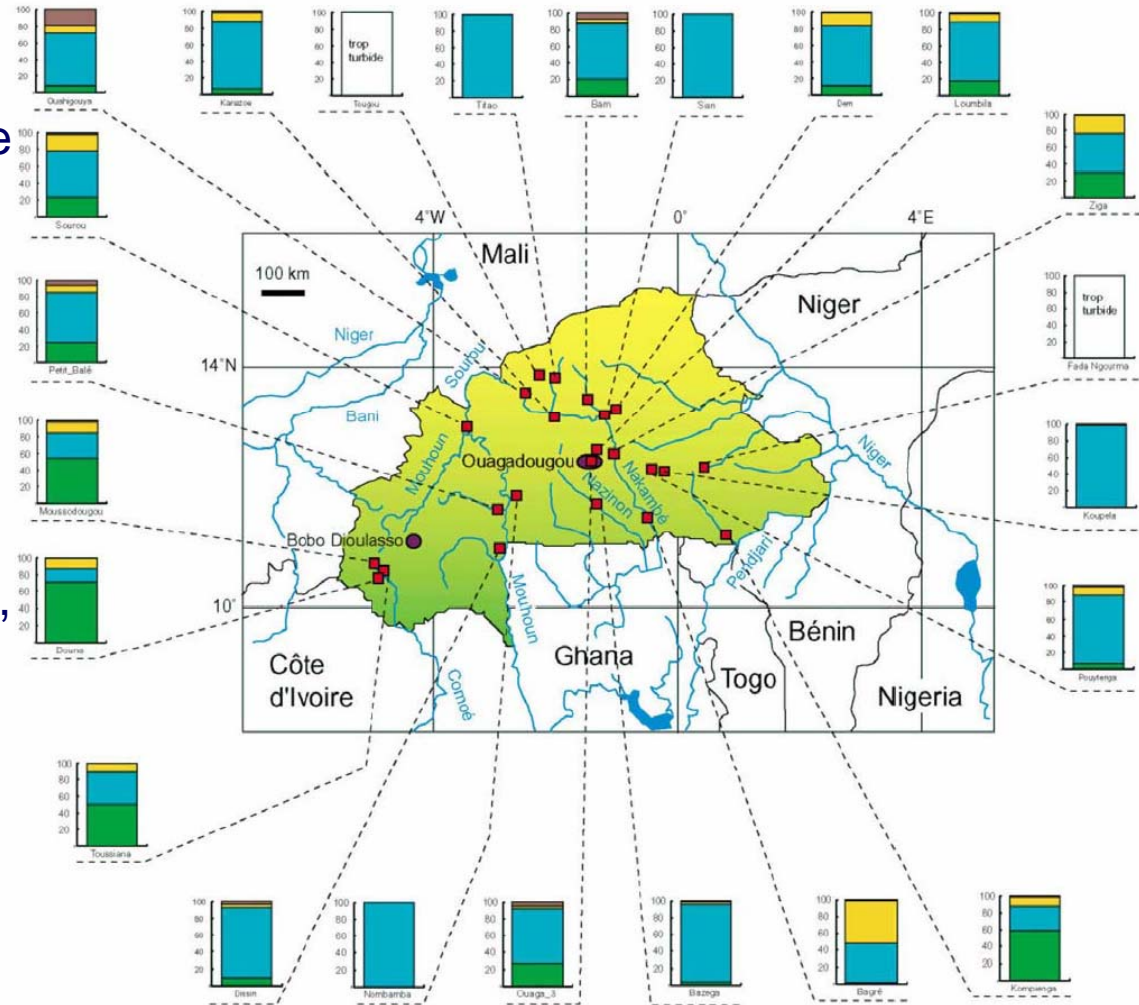
Excursion – Cyanobacteria:

- Could harm health of people
- People are exposed:
irrigation water ...

Map:

- high cyanobacteria
concentrations

Campaign of the IRD in 2004,
(April till Mai)



2.2 Analysis and Integration of CHRIS-Proba Imagery

Estimation of Toxic Algal Blooms

Application of an easy Band – Ratio algorithm at CEDEX, Spain

Adapted algorithm developed for MERIS and empirical validated at Rosarito Reservoir, Spain. Using Ratios of CHRIS-Proba Bands 14/9

Accuracy: 0.79

Riuz-Verdu, A. et. al. (2005), p. 6

3. Outlook

- Processing in a Diploma Thesis/ Supervision alternative: Processing during an internship at the DLR
- Results in the first quarter of 2007: mapping spatial distribution of Chlorophyll a, development at different scales
- Limitations of acquired Imagery,
 - MODIS – different spectral bands
 - Scientific mode of CHRIS-Proba

References:

- Mannheim, S. et. al. (2004): Monitoring of Lake Water Quality using Hyperspectral CHRIS Proba Data. In: Proceedings of the 2nd ESA CHRIS/Proba Workshop, 2123 March, ESRIN, Frascati, Italy, (ESA SP578, June 2004)
- Riuz-Verdu, A. et. al. (2005): Use of CHRIS for monitoring water quality in Rosarito reservoir. In: Proceedings of the 3rd ESA CHRIS/Proba Workshop, 2123 March, ESRIN, Frascati, Italy, (ESA SP593, June 2005)
- RSMAS, University of Miami, COAS, Oregon State University (ed.) (2003): MODIS Ocean Data Processing – Version 1.1.