The Abdus Salam
International Centre for Theoretical Physics

The International Union of Geodesy and Geophysics

United Nations
Educational, Scientific and
Cultural Organization

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2339-13

Workshop on Atmospheric Deposition: Processesand Environmental Impacts

21 - 25 May 2012

THE EQUATORIAL AFRICAN DEPOSITION NETWORK EADN

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OUTLINE

✓ PART 1 EQUATORIAL AFRICAN DEPOSITION NETWORK (EADN)

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- EMISSION
- DEPOSITION
- CLIMATIC IMPACTS

THE EQUATORIAL AFRICAN DEPOSITION NETWORK

EADN

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A. Konare, E. Odada, H. Boostma, D. Olago and E. Toure

ICTP, Trieste, 22 may 2012,

RATIONALE

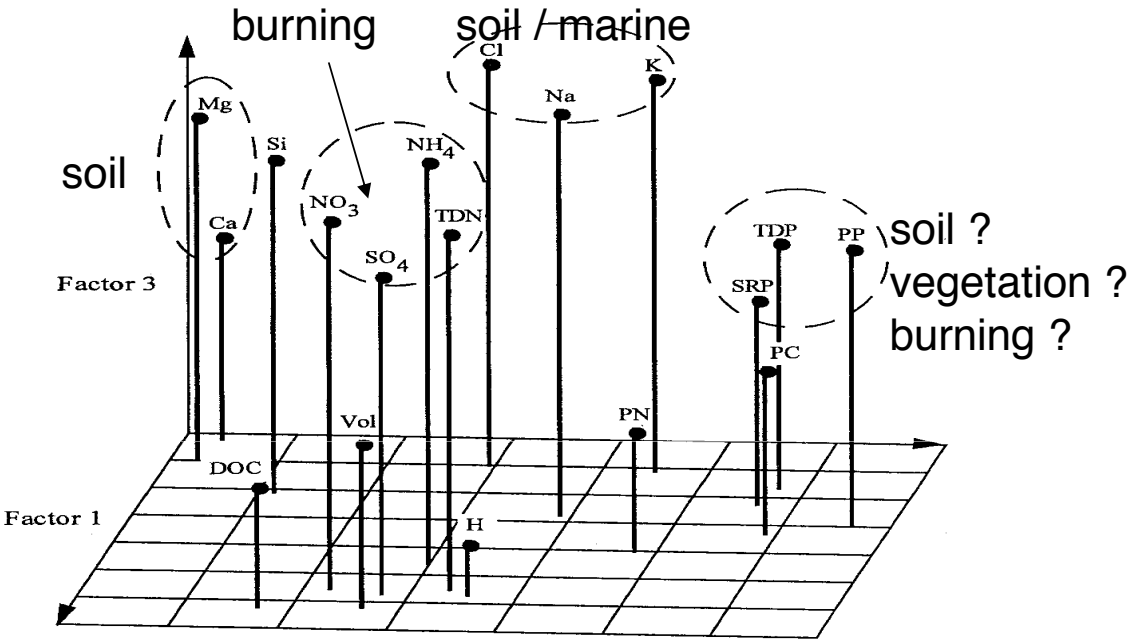
- Biomass burning, soil dust and biogenic particles from exposed tilled, fields have been invoked as likely emission sources for gases and particulate loading rates to the atmosphere being higher in the tropics and resulting in elevated deposition rates.

- A comparison of atmospheric deposition rates of P near Lakes Malawi/Nyasa and Victoria indicates that deposition rates on these two lakes are among the highest recorded in the literature for any part of the world.

- Data available to date indicate that atmospheric deposition is a major component of nutrient budgets for the African Great Lakes. Historic data and sediment cores show that nutrient loading to theses lakes is increasing and linkages with eutrophication has been clear identified from previous GEF projects.

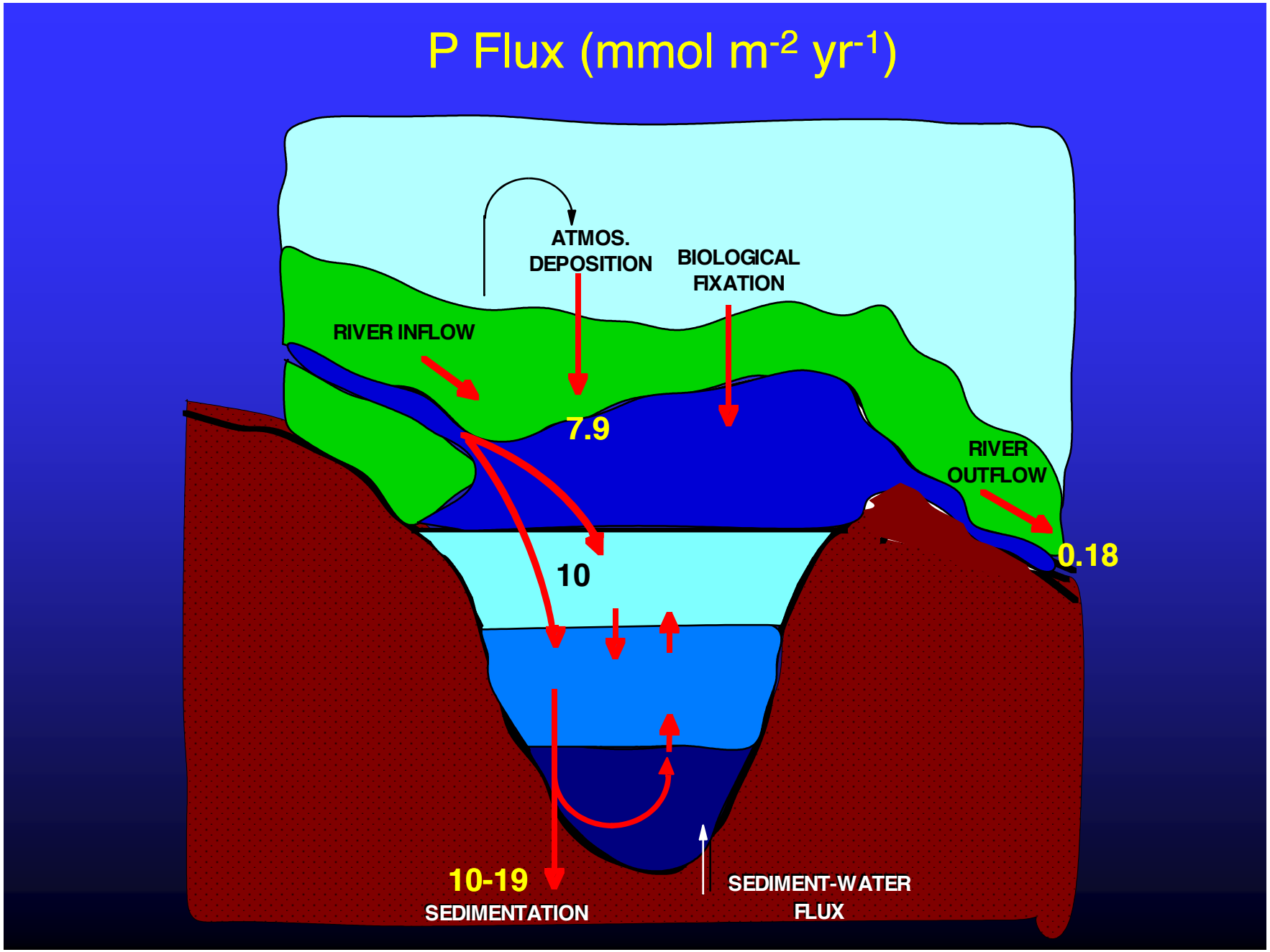
- Unfortunately, there are no estimates of the regional atmospheric transport of P within tropical Africa nor export of N and P from the continent in tropical latitudes.

Factor Analysis of Malawi Rain Components

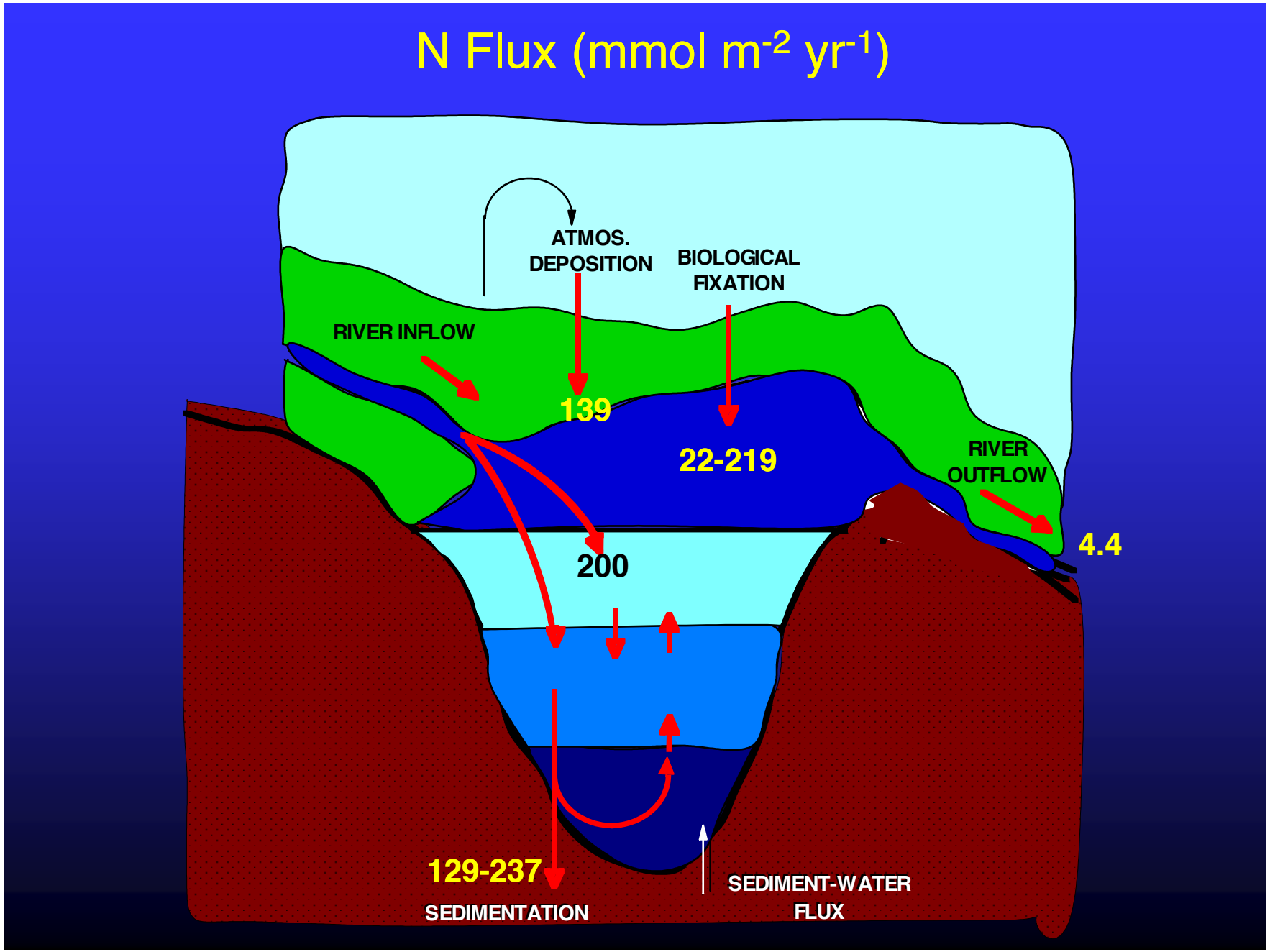


Bootsma et al. 1996

P Flux (mmol m^{-2} yr^{-1})



N Flux (mmol m^{-2} yr^{-1})



OBJECTIVES

The objective of EADN project is to provide regional input into government interventions targeting rural development, and particularly those targeting land use management, soil fertility, livestock and agricultural productivity, that would allow the estimation of their offsite impacts associated inflow of macronutrients (and particularly phosphorous) on terrestrial and aquatic ecosystems in Africa.

It is proposed to establish an Equatorial Africa Atmospheric Deposition Network (EADN) initially with a minimum of 12 participating countries in western, eastern, central and southern Africa to test hypotheses about the importance of atmospheric nutrient deposition and transport to aquatic and terrestrial resources In intertropical Africa.

The large geographic scope is necessary to address uncertainties about source areas, seasonality and cultural practices on atmospheric transport.

The establishment of such a network will not only test hypotheses concerning nutrients but will demonstrate the feasibility of such a network to eventually address POP's and toxic metal.

Participating countries

Burundi,
Democratic Republic of Congo,
Mozambique,
Malawi,
Tanzania,
Rwanda,
Uganda,
Kenya,
Nigeria,
Ghana,
Cote d'Ivoire,
Senegal,

There maybe change in sites locations

Initial proposed EADN sites

PROJECT COMPONENTS

1- Quality Control and Quality Assurance

An important consideration in establishing EADN to achieve its objective is a well-designed QA/QC program

- network design, including development of appropriate criteria to establish regionally representative sites,
- selection of appropriate methods of sampling and analysis,
- developing detailed Standard Operating Procedures (SOPs) for all stages of measurement
- implementing appropriate QA/QC protocols including documentation of sampling at all stages of sample processing (collection, storage, transport, analysis and reporting),
- developing of flagging systems for data qualification for users;
- developing appropriate database systems to allow users assess to the qualified results.

PROJECT COMPONENTS

2- Capacity Building/Training

EADN will require capacity building in technical skills, scientific skills (research and data analysis / interpretation), and policy writing. Capacity building with regard to monitoring station operation, data management and analyses, chemical analyses, and QA/QC.

- Field instruments and sample collection, including QA/QC and documentation:,
- Laboratory analysis, QA/QC, and database development.
- Auditing.
- Introductory courses in atmospheric chemistry and physics.

PROJECT COMPONENTS

3- Establishment and monitoring of stations

. EADN will be establish, with defined spatial density and frequency of monitoring to provide information on geographic and temporal trends (e.g., diurnal, daily, weekly, monthly, seasonal and annual trends) required for linkage with terrestial and acquatic phenomena.

- **Precipitation monitoring**
- **Air sampling of dry constituents (particles and particle-bound compounds)**
- **Meteorological parameters**
- In addition to major ions,
  - OC and BC
  - Al, Si, Fe, Cu, Hg
  - Stable isotopes (C, N, S)
  - Levoglucosan
  - Organophosphates
  - Other heavy metals (Pb, Cd, As, Cr, Mn, Cu, Co, Ni, Va)
  - Radioisotopes
  - Persistent Organic Pollutants / Polycyclic Aromatic Hydrocarbons

PROJECT COMPONENTS

4- Data Management, Analysis and modeling

The output of EADN, in the form of raw data, information, models, scientific publications, and management recommendations, will need to be made available to multiple users, both within and outside of the community of EADN partners. Therefore there is a need for tools that will facilitate efficient data management and data / information distribution for policy actions in the region.

- The current challenge is to establish an operating network delivering reliable data, but at the same time some resources should be devoted to investigate appropriate models to meet the objectives of the current program

- The modeling objectives are to use the network information to develop concentration and deposition fields for the target parameters.

GOVERNANCE

Management Structure

The management structure of the network comprises of the Secretariat, a Regional Steering Committee and a Regional Technical Committee.

- The Secretariat will oversee the project at regional and country levels as outlined in the project document and its financial structure.

- The Technical Committee provides technical and methodological expertise to the project.

- In addition to the structures provided for in the project document, it was agreed that there is a need to set up an Advisory Board to incorporate international scientists and experts.

Total project budget is USD 7.865 million over a span of 4 years, with 36% coming from GEF and the remainder being provided as co-finance. The remaining 64% will come from Operating Agencies and Project Partners.

CONCLUSION

Road map for EADN implementation:

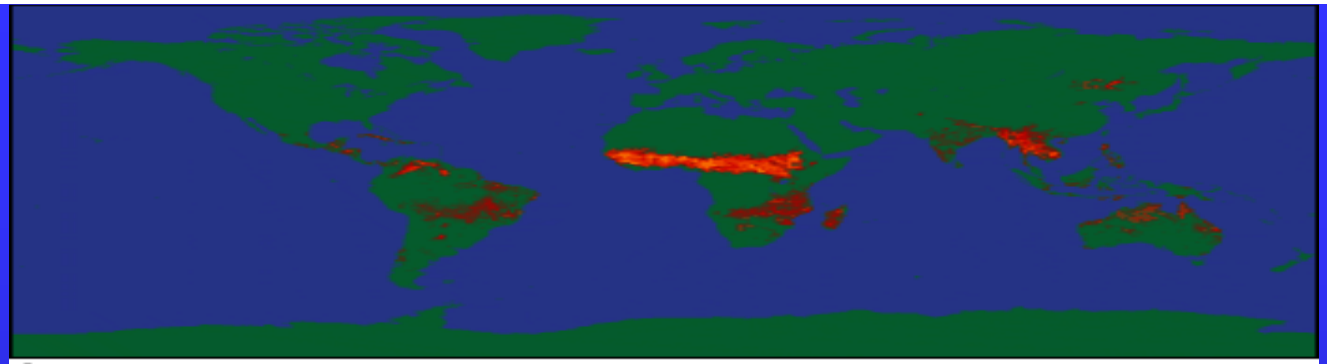
During this inaugural workshop for EADN, we hope to review both the Science and the Implementation Strategy. More specifically, modeling and measuring atmospheric deposition for application in policy. We will discuss what is required to give reasonable estimates of deposition in African lakes and other water bodies in the equatorial region. We will also discuss where atmospheric deposition comes from and where does it go? We will learn more about quantifying atmospheric deposition through measurements and modeling as well as the policy context.

(Eric Odada, EADN inaugural workshop, kisumu)

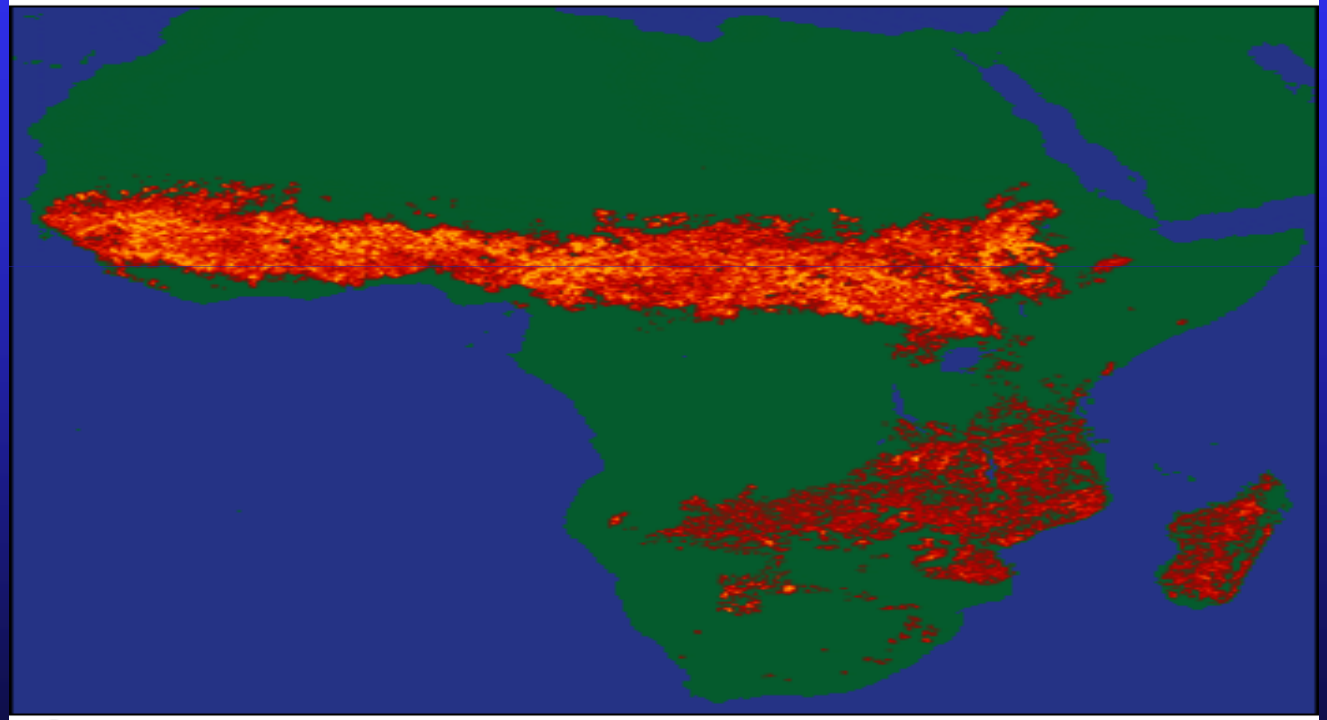
BIOMASS BURNING IN NORTHEN EQUATORIAL AFRICA EMISSIONS, TRANSPORT DEPOSITION AND IMPACTS

EVELYNE TOURE AND ABDOURAHAMANE KONARE
University of Cocody, Abidjan, Cote d'Ivoire

Biomass burning



Global Fire Distribution

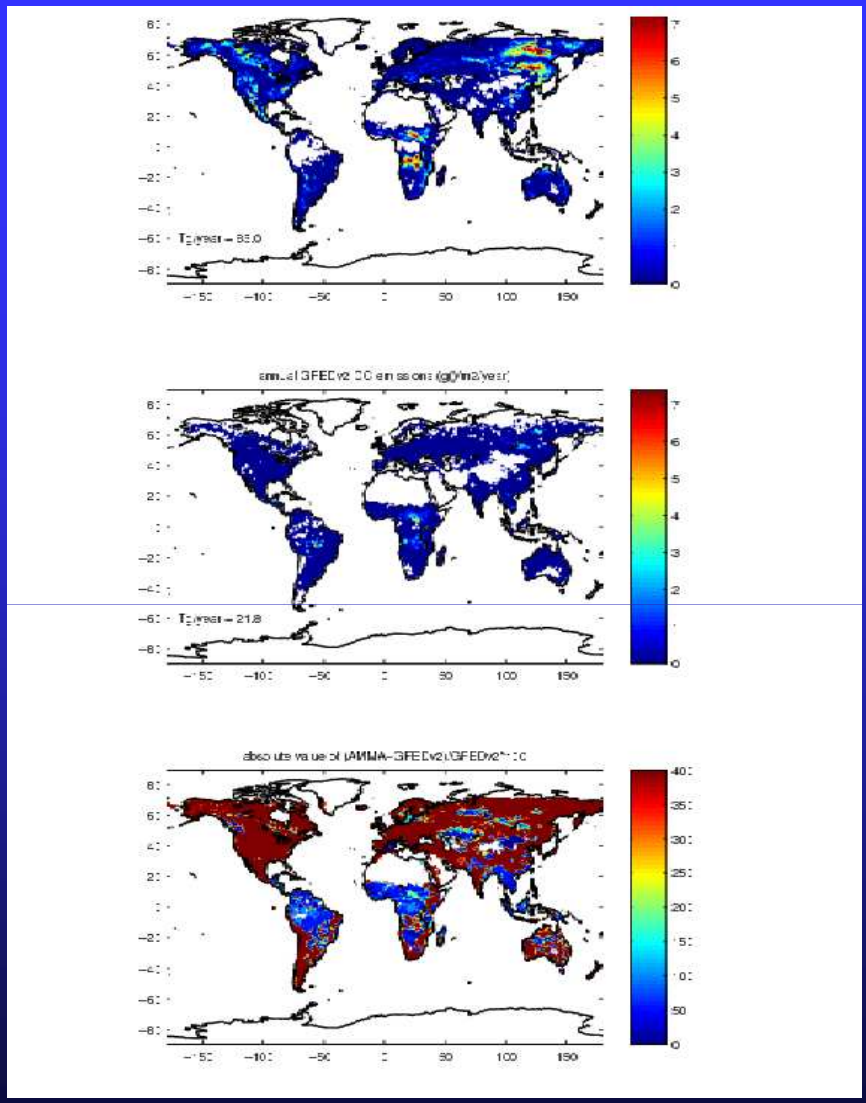


African Fire Distribution

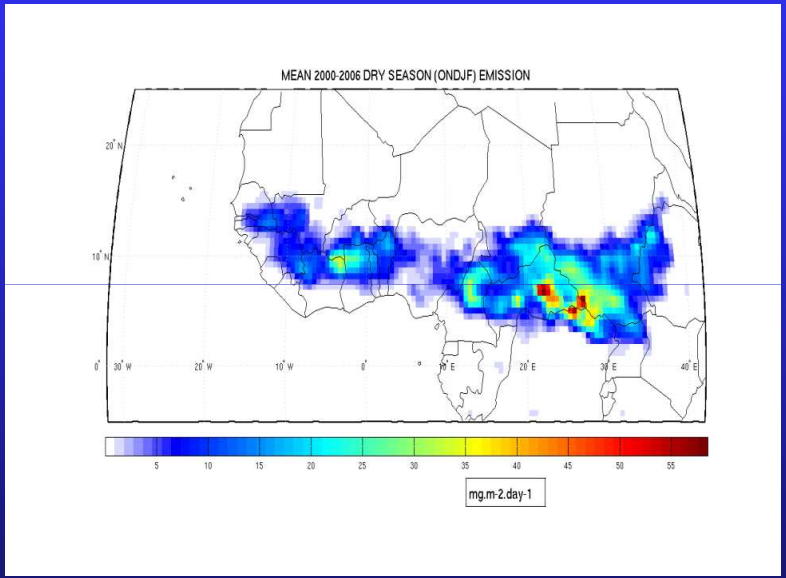
NASA DMSP Operational Linescan System

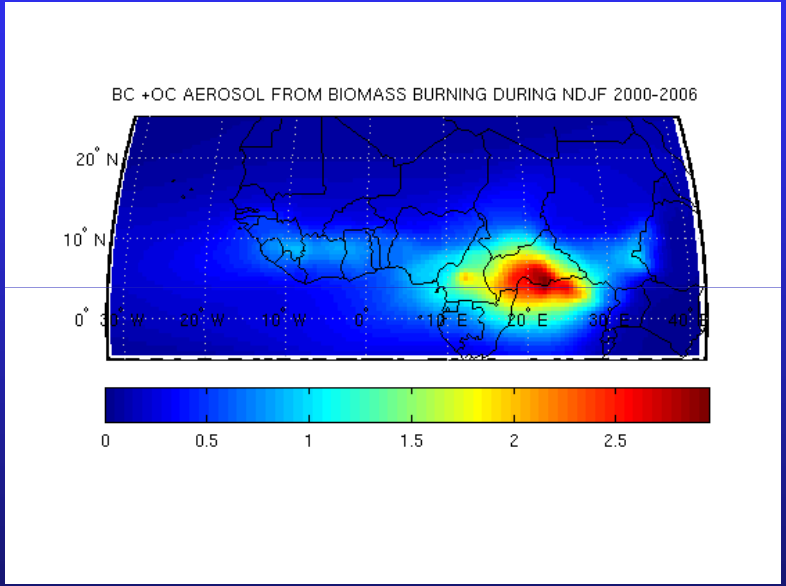
BB emission from AMMA Vs GfedV2

Some important differences especially in Africa on the estimates.



EMISSION

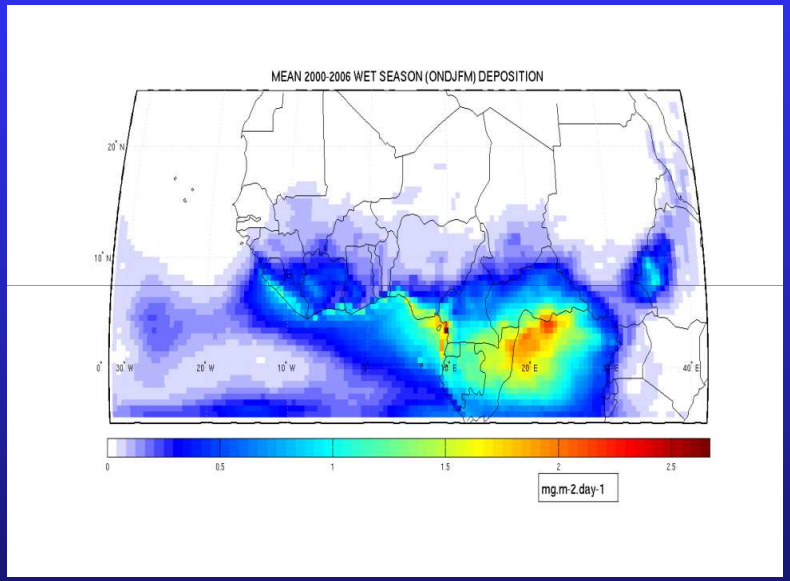


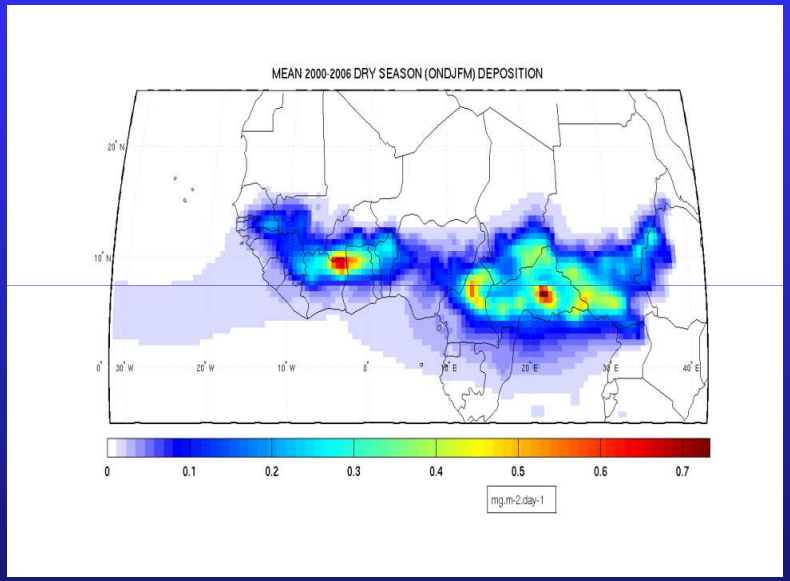


Central Africa (South Sudan-DRCongo) major biomass burning source in the world

High AOD values , especially west to the source: transport westwards of the BB plume

DEPOSITION

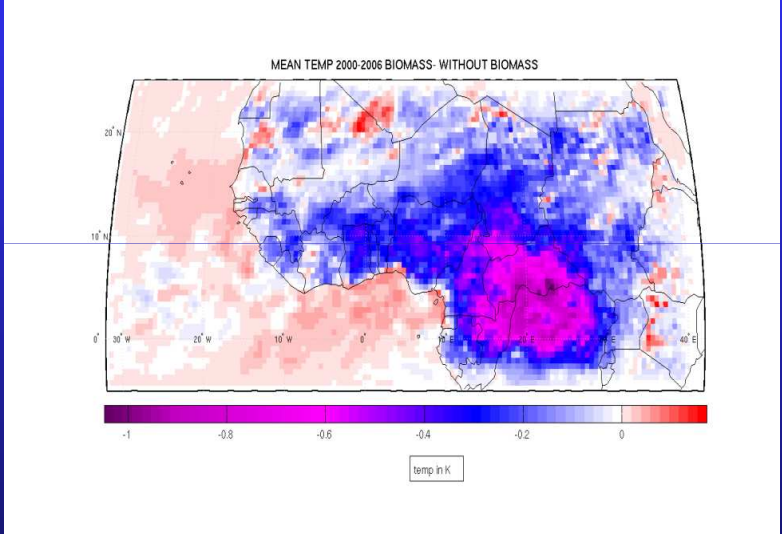


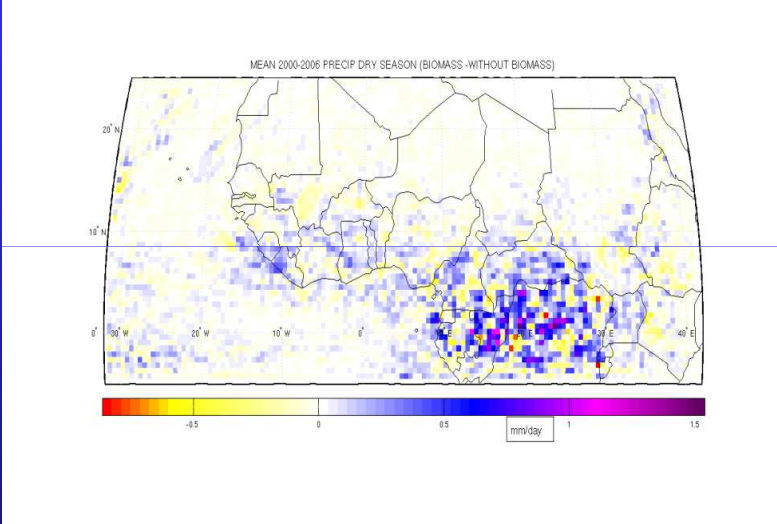


Wet deposition mainly over Congo Basin and Cameroon forest (relation with zoetele high value (IDAF))

Dry deposition of BC in western africa source is as important as in central africa sour

CLIMATICS IMPACTS





General cooling of BC and OC aerosol over the source areas (Congo Basin)

General decrease of precipitation as result

THANK YOU FOR YOUR ATTENTION