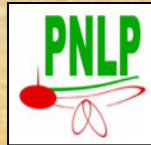
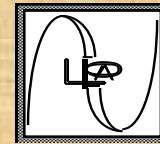
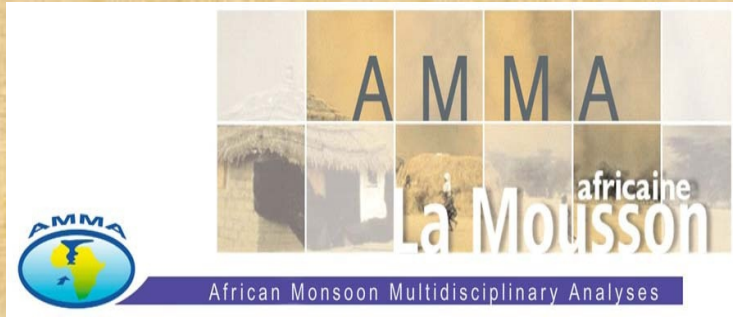


4th AMMA International Conference 2–6 July 2012, Toulouse, France



Climate and health : observation and modeling malaria in Ferlo (Senegal): preliminary results

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Outline

- **Introduction**
- **Climate and malaria link**
- **Data and methods**
- **Preliminary results**
- **Conclusion et perspectives**



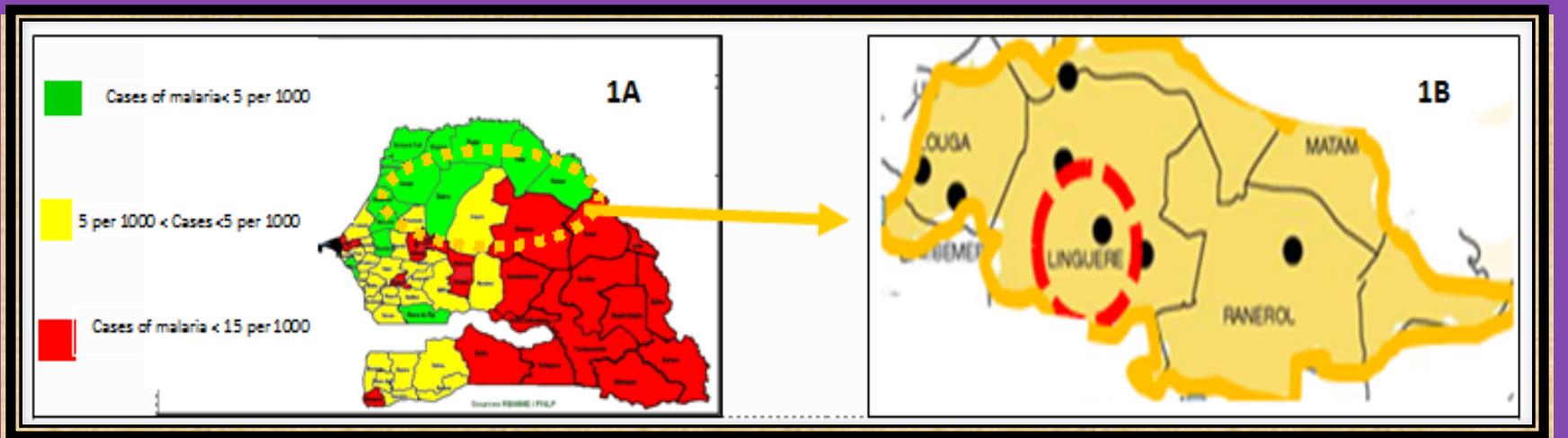
Climate and malaria link

☐ Climate-malaria

- ✓ Climate → effect to malaria transmission risk (Freeman et al., 1996; Lindsay, 1996; OMS, 1999; Ndiaye et al, 2001; etc.)
- ✓ Climate influences geographical repartition and malaria epidemiology thanks to 3 mechanisms:
 - distribution and abundance of mosquitoes;
 - possibility and success of sporogonic cycle of the parasite;
 - modulation of human-vector contact.

☐ Research undertaken in the framework of the QWeCI project

Presentation of area Study



mapping malaria in Senegal by PNLIP (2009)

Ferlo with his stations (Sarr, 2008)

Lat: 16°15'-14°30'N
 Long: 12°50'-16°O

The study area is: FERLO.

The Ferlo is a sylvopastoral region, with a sahelian climate.

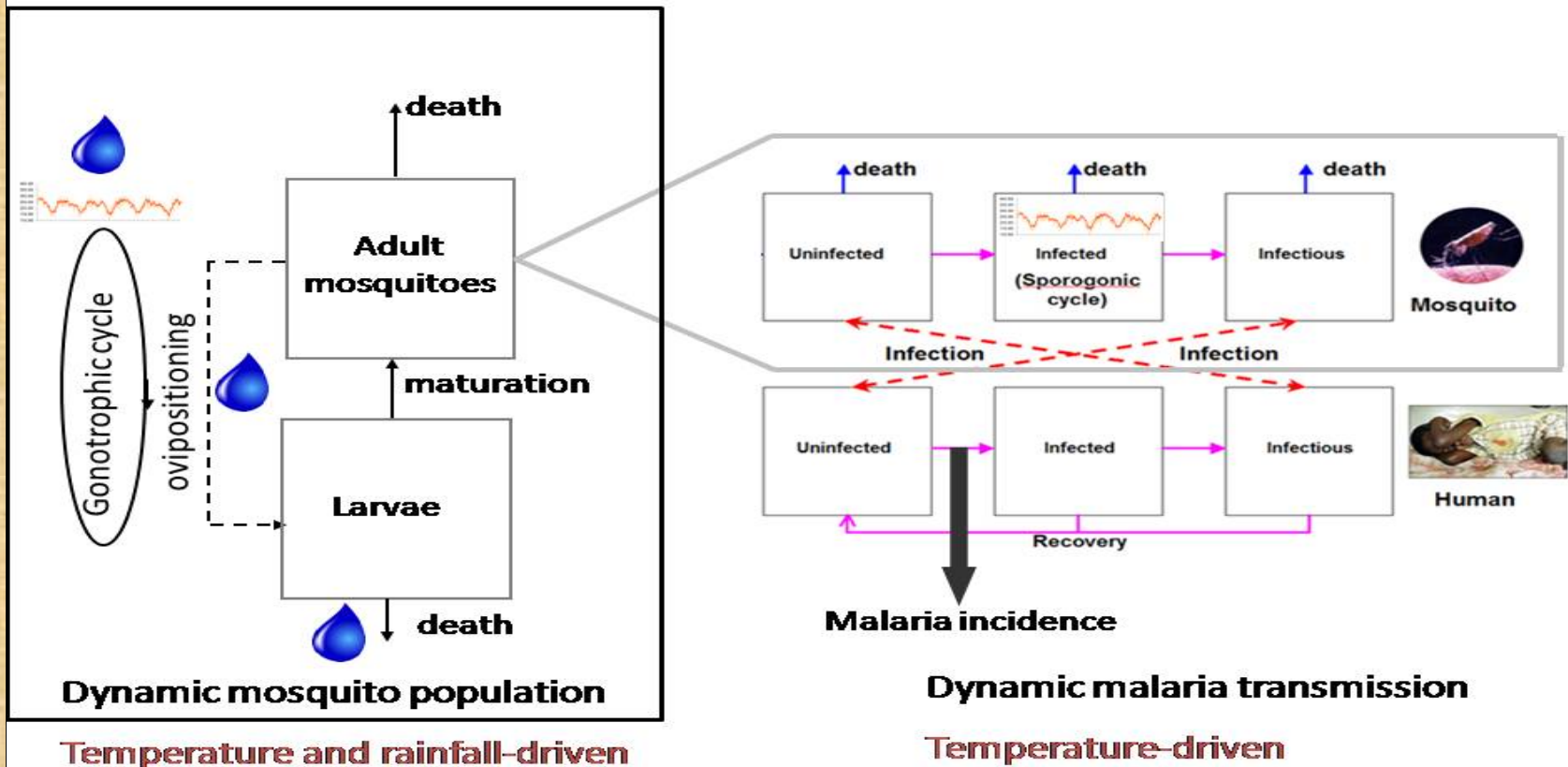


Data and methods

- ✓ **climate (daily and monthly):** rainfall, temperature (maximum and minimum), relative humidity (maximum et minimum), wind speed and direction;
- ✓ **simulated climate models:** NCEP, Era-interim;
- ✓ **others observation data:** CRU, TRMM (satellite data), GPCP;
- ✓ **clinical:** malaria incidence, specific morbidity;

Presentation of the LMM

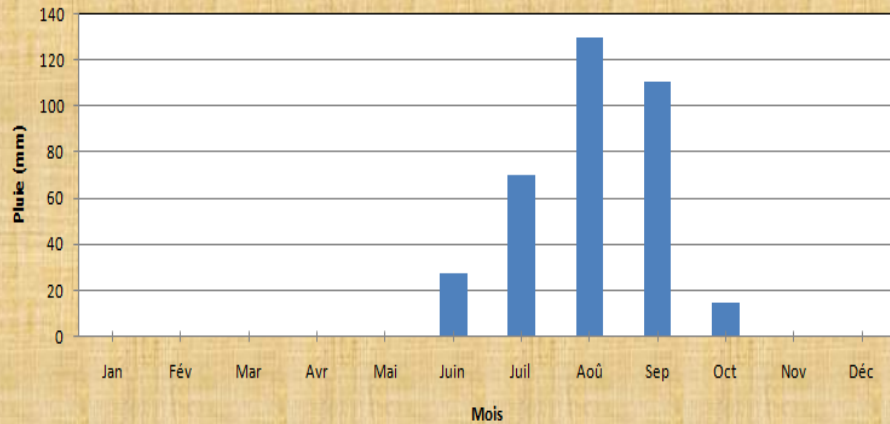
The Liverpool Malaria Model (Hoshen and Morse, 2004)



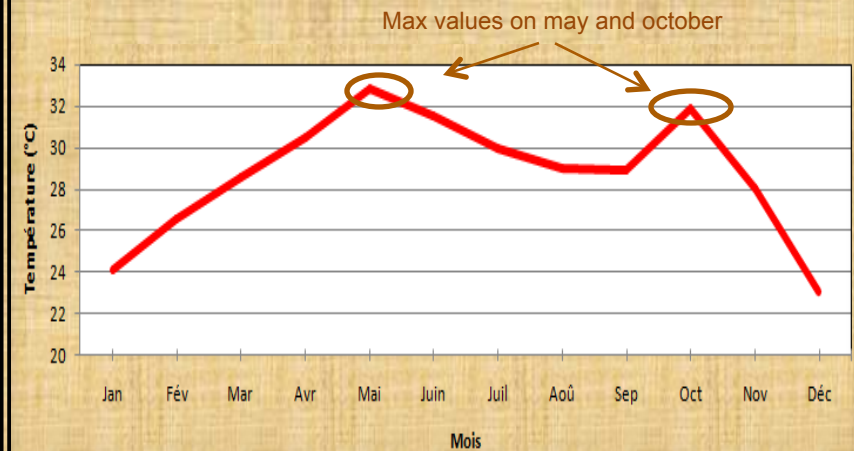
**Structure of the Liverpool Malaria Model (LMM),
University of Liverpool (Hoshen and Morse, 2004)**



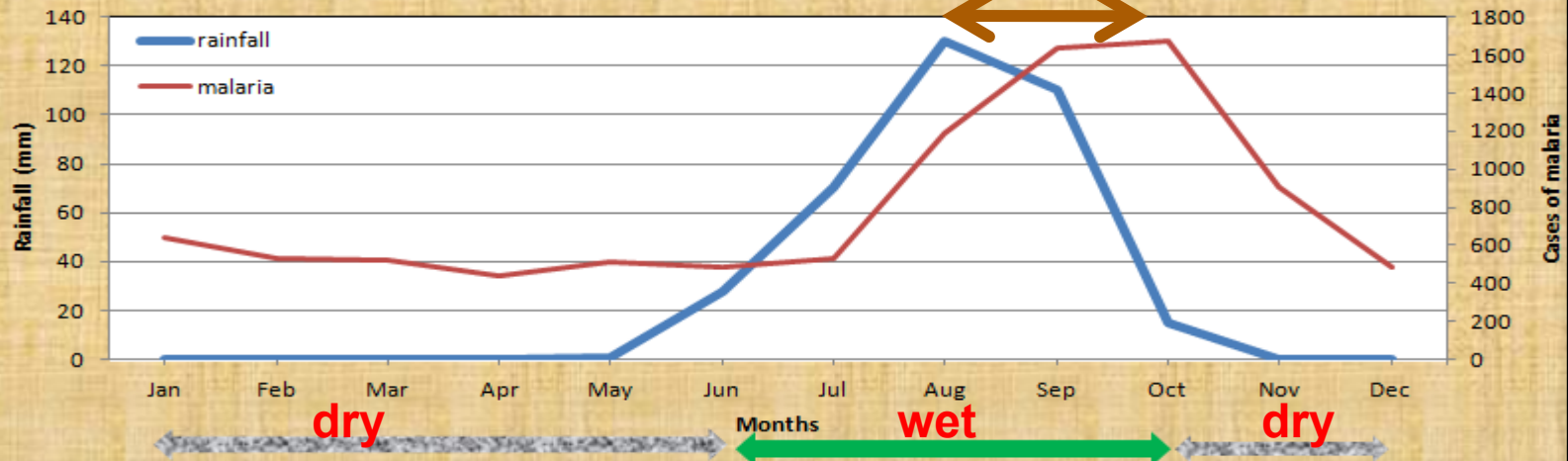
Observation results (1/2)



Seasonal variability of average rainfall in Linguere (1950-2008)



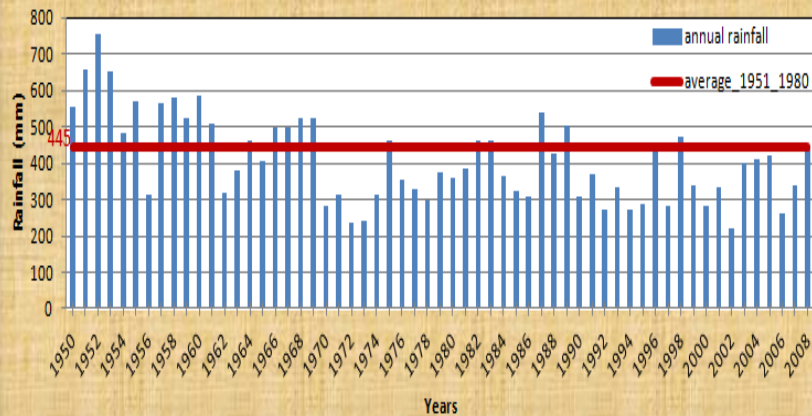
Seasonal variability of average temperature in Linguere (1951-1998)



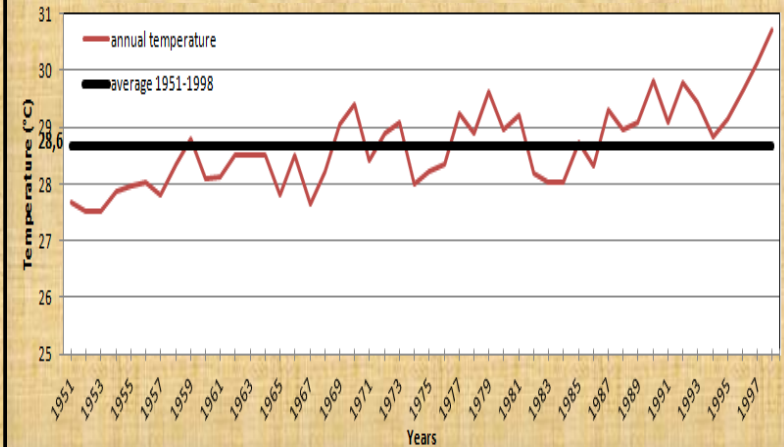
Seasonal variation of rainfall and malaria in Linguere (2001-2009)



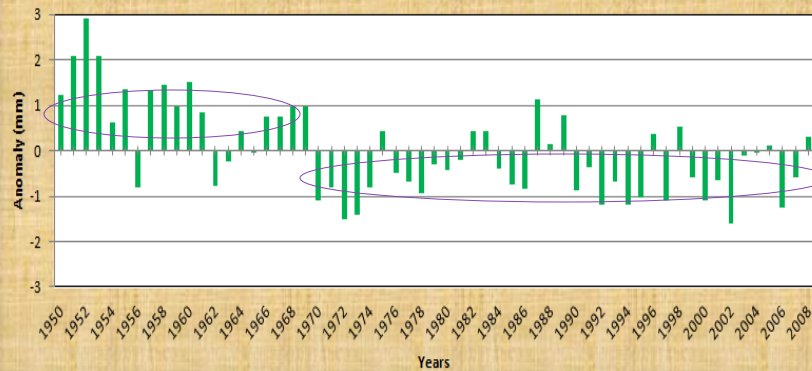
Observations results (2/2)



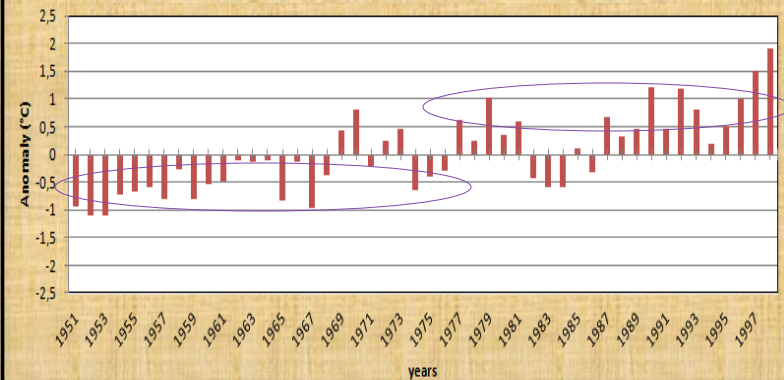
Inter-annual variability of rainfall in Linguere (1950-2008)



Inter-annual variability of temperature in Linguere (1951-1998)



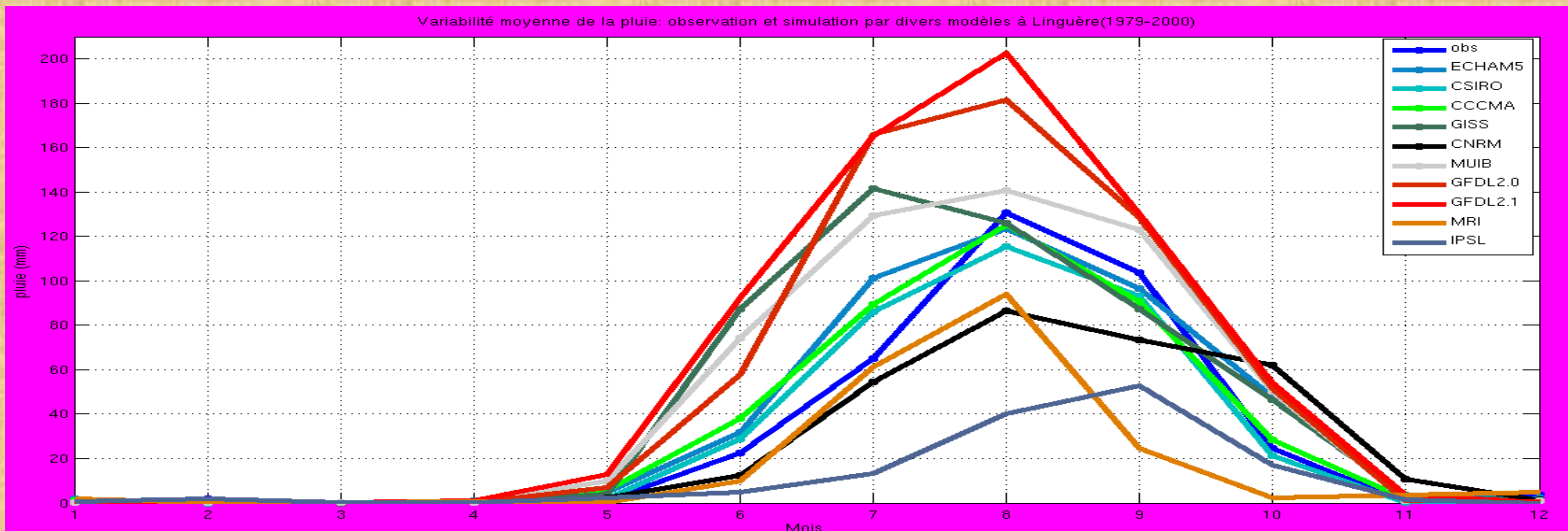
Lamb index of rainfall in Linguere (1950-2008)



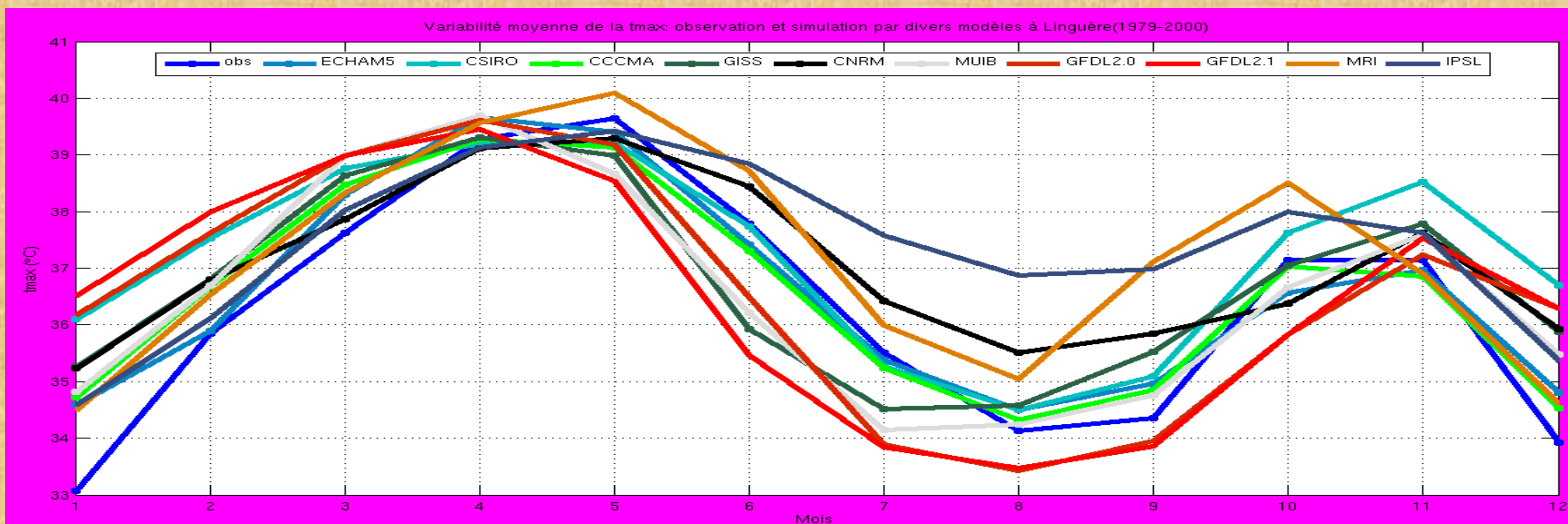
Anomalies of temperatures in Linguere (1951-1998)



Results(observation/simulation)



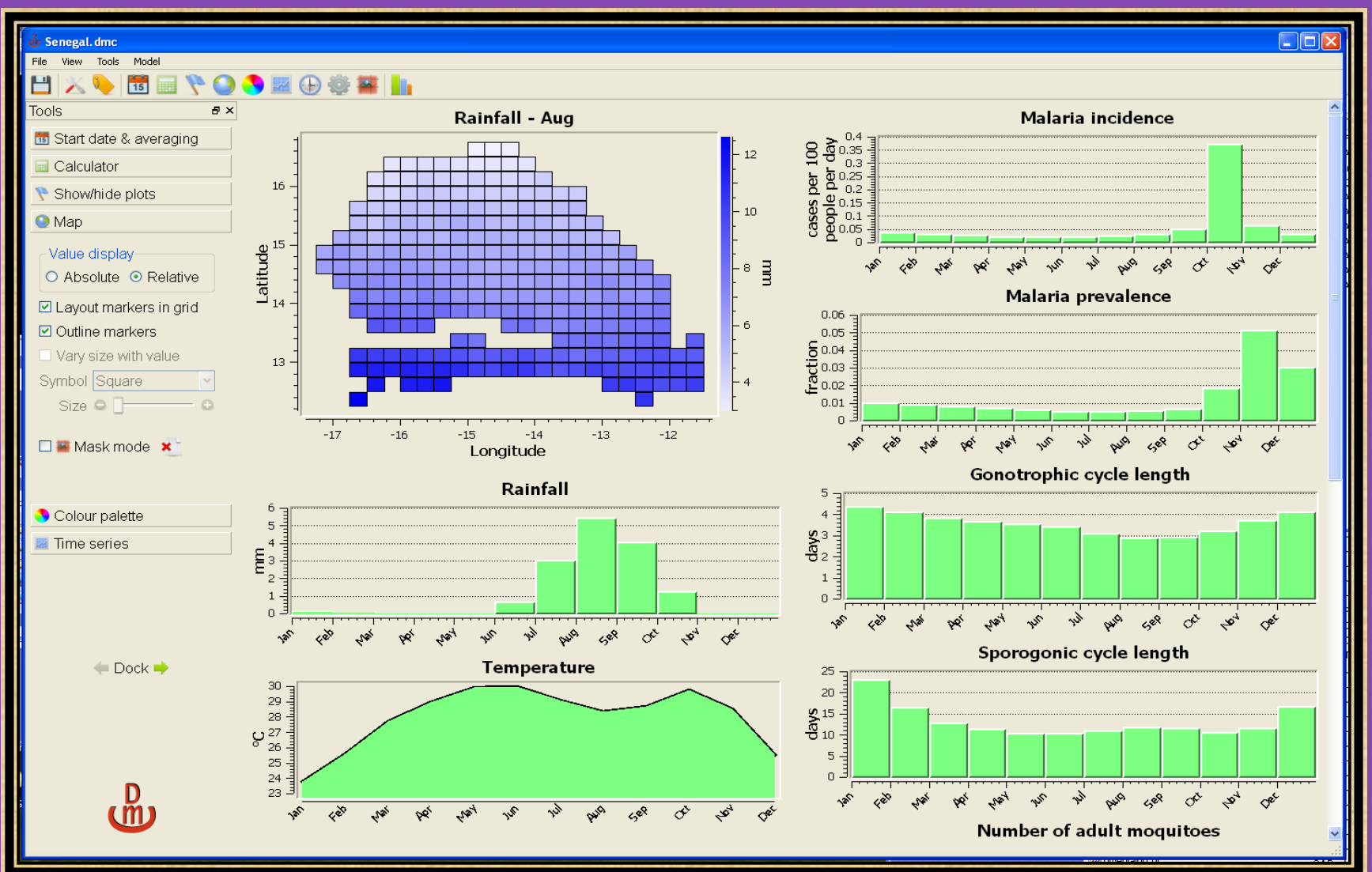
Average variability of rainfall: observation and simulation by different climate models in Linguere (1979-2000)



Average variability of maximum temperature observation and simulation by different climate models in Linguere (1979-2000)



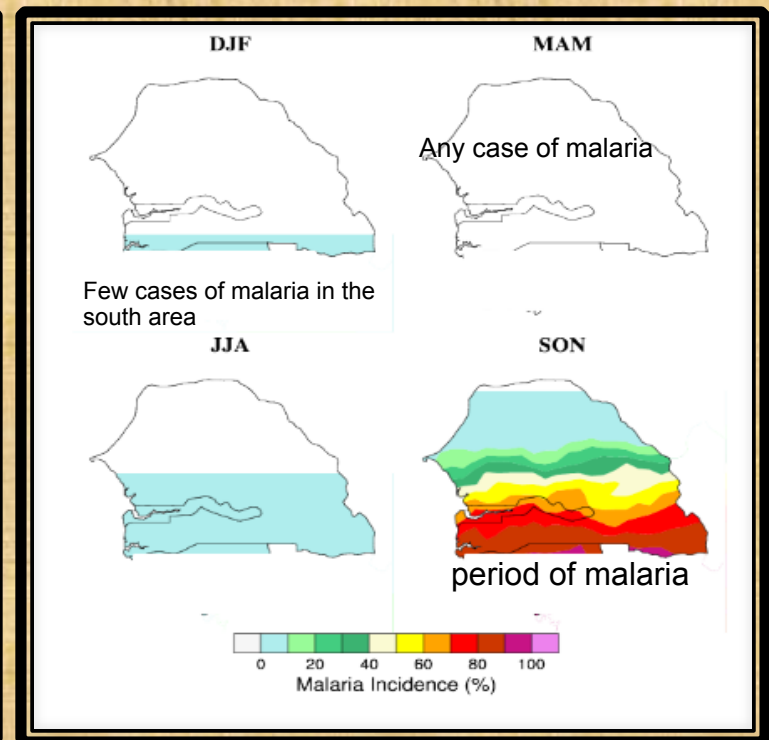
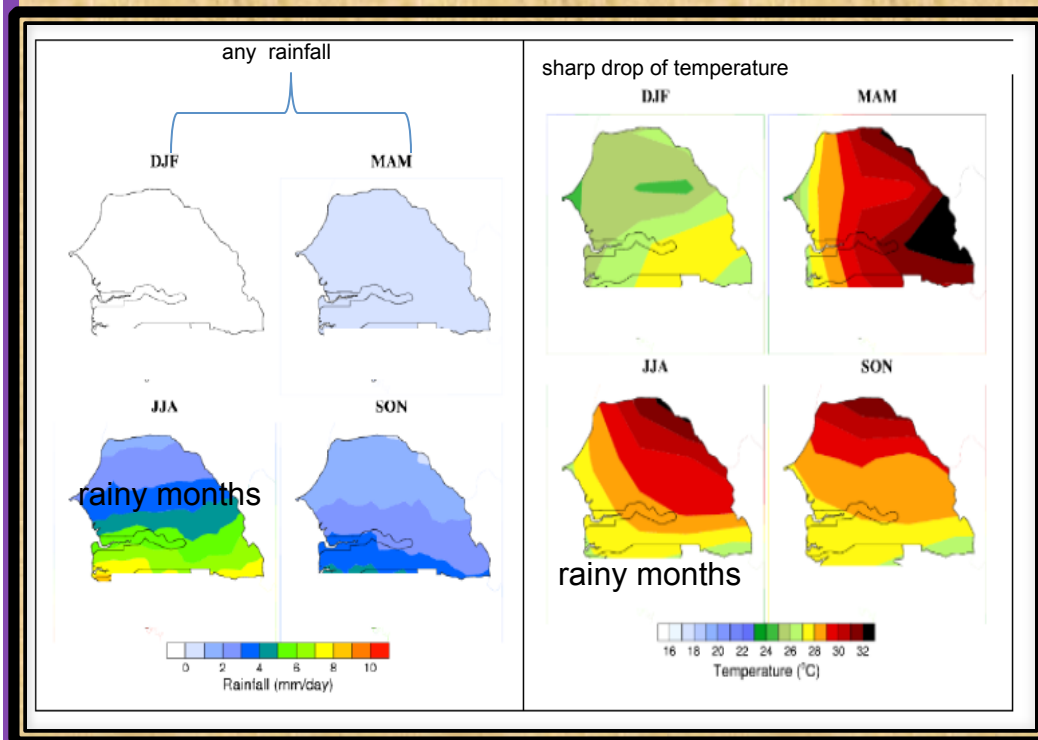
Results (DMC simulation _{1/3})



Map and temporal series of climate and malaria different parameters by DMC simulation in Senegal



Simulation results



Rainfall and temperature variability by TRMM and Era-interim respectively (Caminade and al., 2010)

Malaria simulated by the LMM (Caminade and al., 2010)



Conclusion and perspectives

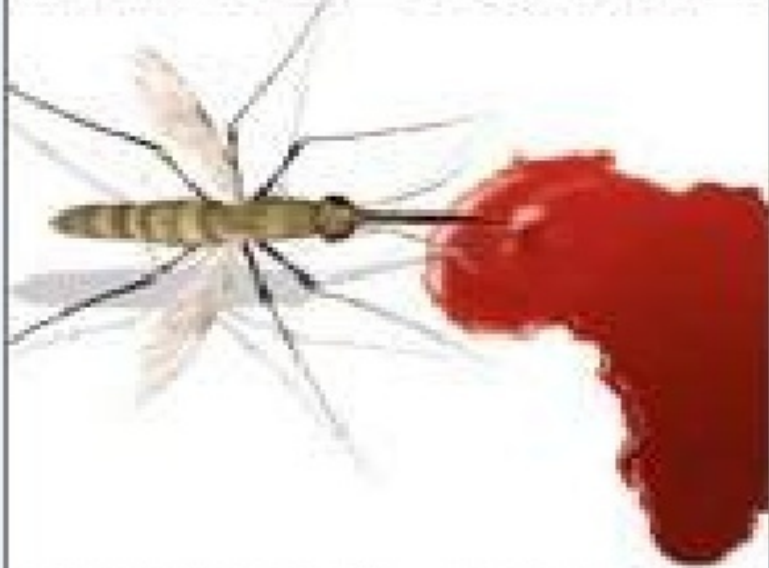
❑ Our observations in the Ferlo area show:

- seasonal dynamic of malaria;
- relation between the variability of rainfall in august , and the incidence of malaria over the coming months;
- lag of one to two months of malaria incidence peak compared to maximum rainfall.

❑ Preliminary results of the LMM in Senegal :

- encourage the idea of modeling malaria hence using climatic parameters however with a need for improvement ;
- idea of application of the LMM to other vector-borne diseases.

PALUDISME



**VOILA UNE ARME DE
DESTRUCTION
MASSIVE** QUI
N'INTERESSE PERSONNE

**MERCI DE
VOTRE
ATTENTION**