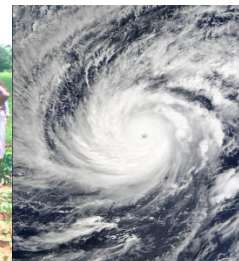


Climate of the Meningitis Belt

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Lisa Goddard¹, M. Ben Mohammed²**

¹ *The International Research Institute for Climate and Society, Columbia, University,
Palisades, NY USA*

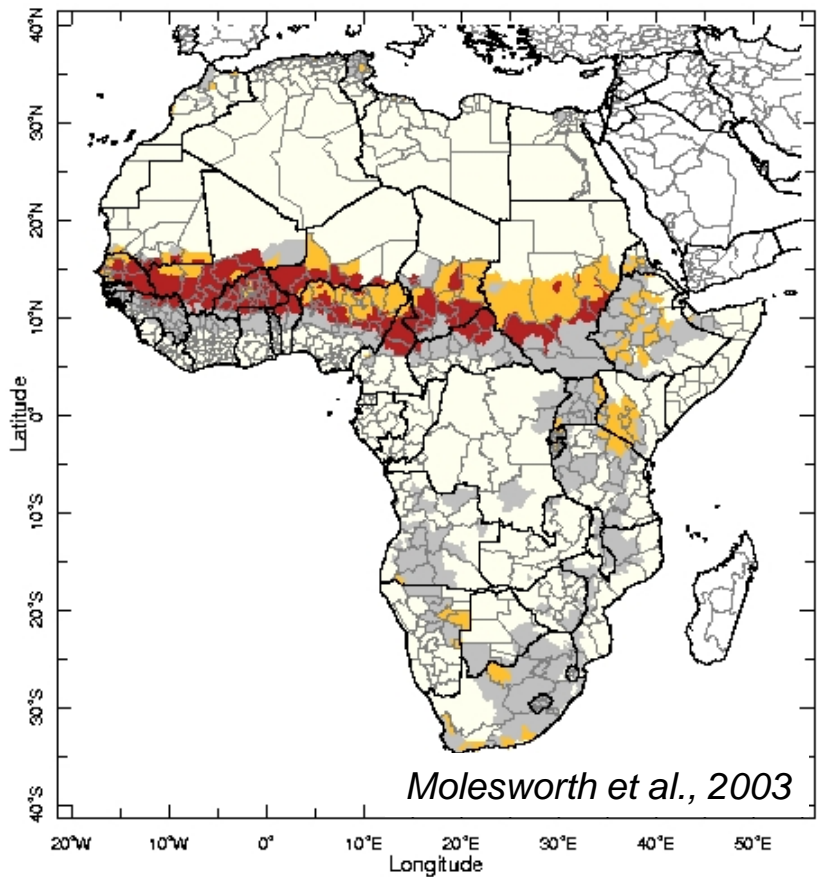
² *Université de Niamey, Niger*



Meningitis and Climate

Predicted Probability of Meningitis Epidemics

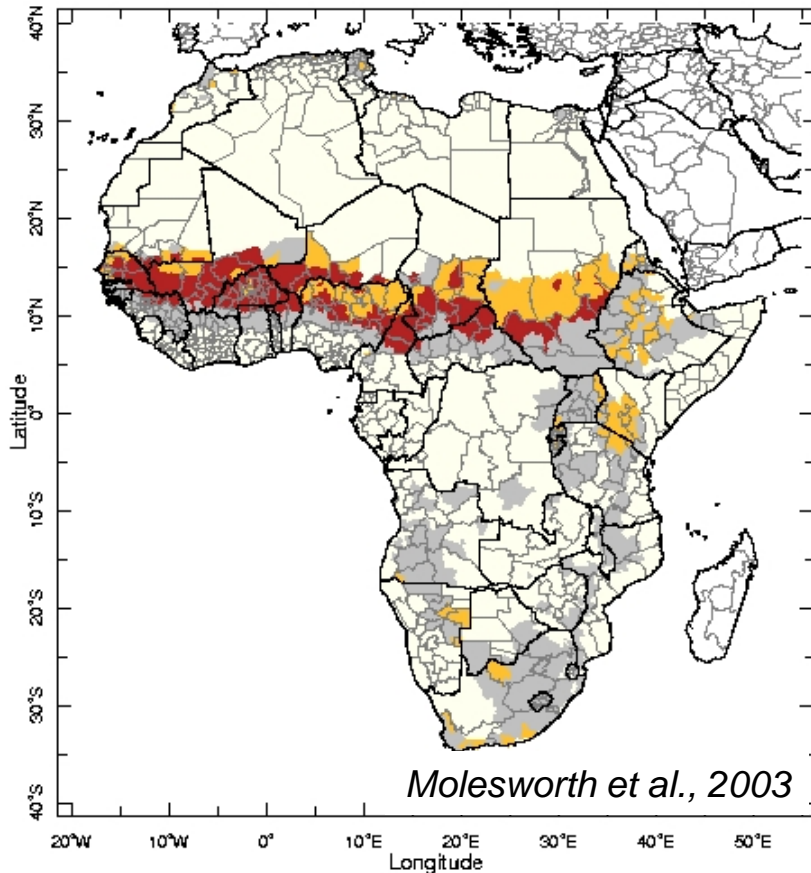
Dry, dusty environment



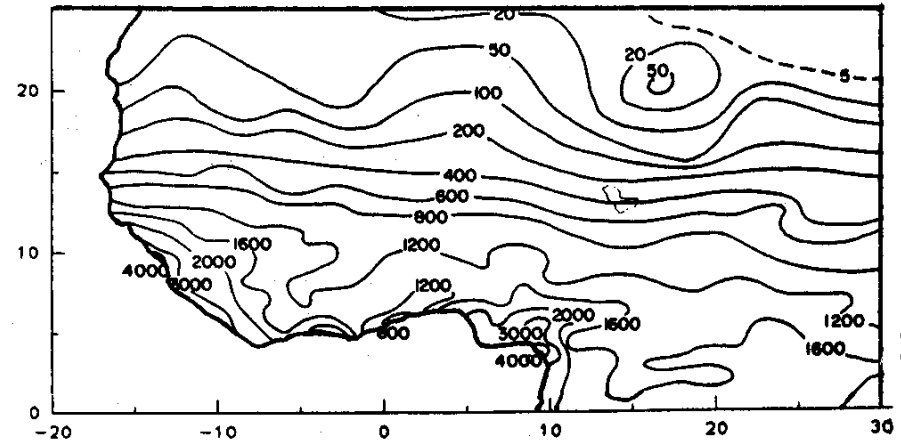
Meningitis and Climate

Predicted Probability of Meningitis Epidemics

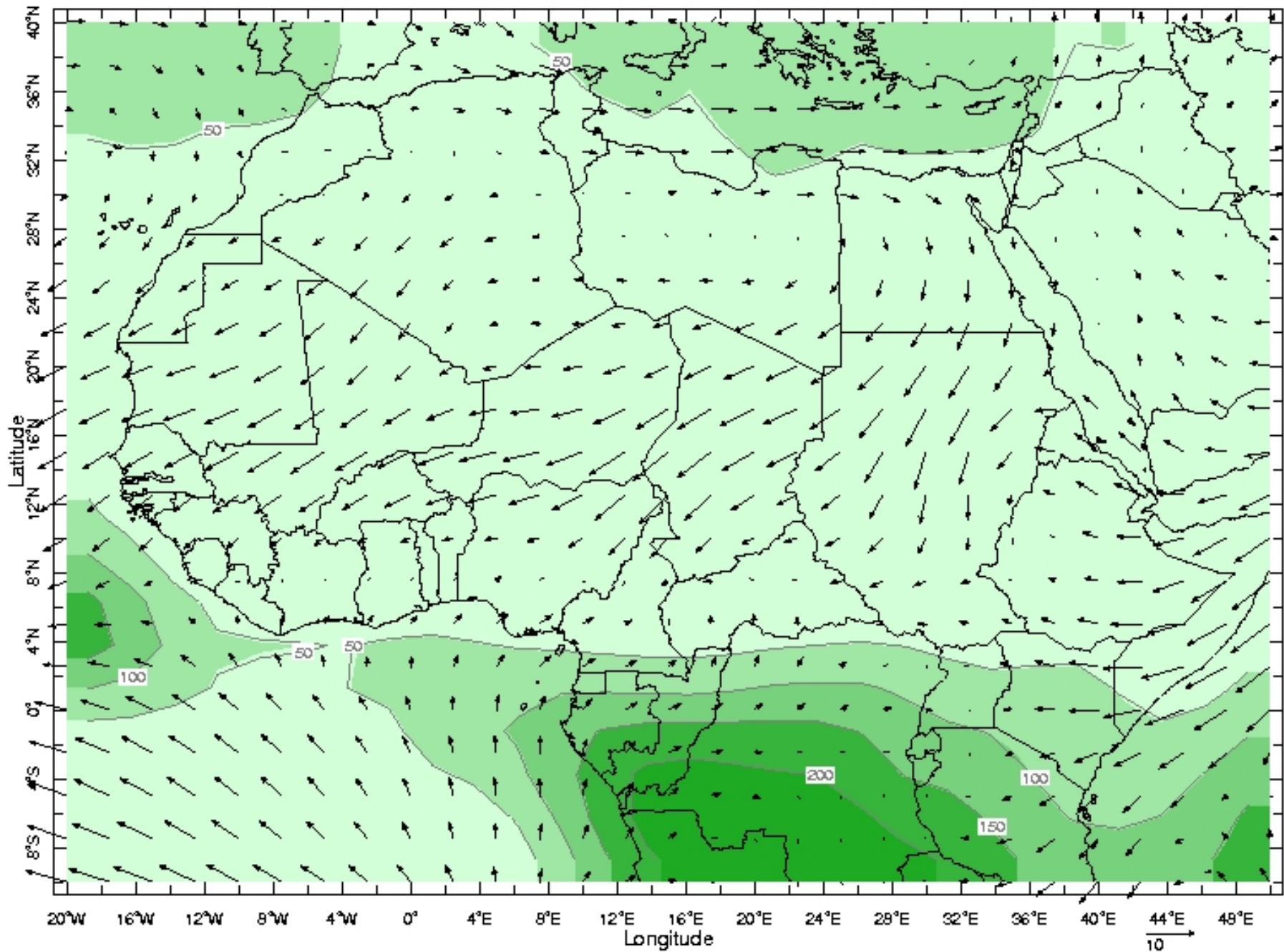
Mean rainfall



Molesworth et al., 2003

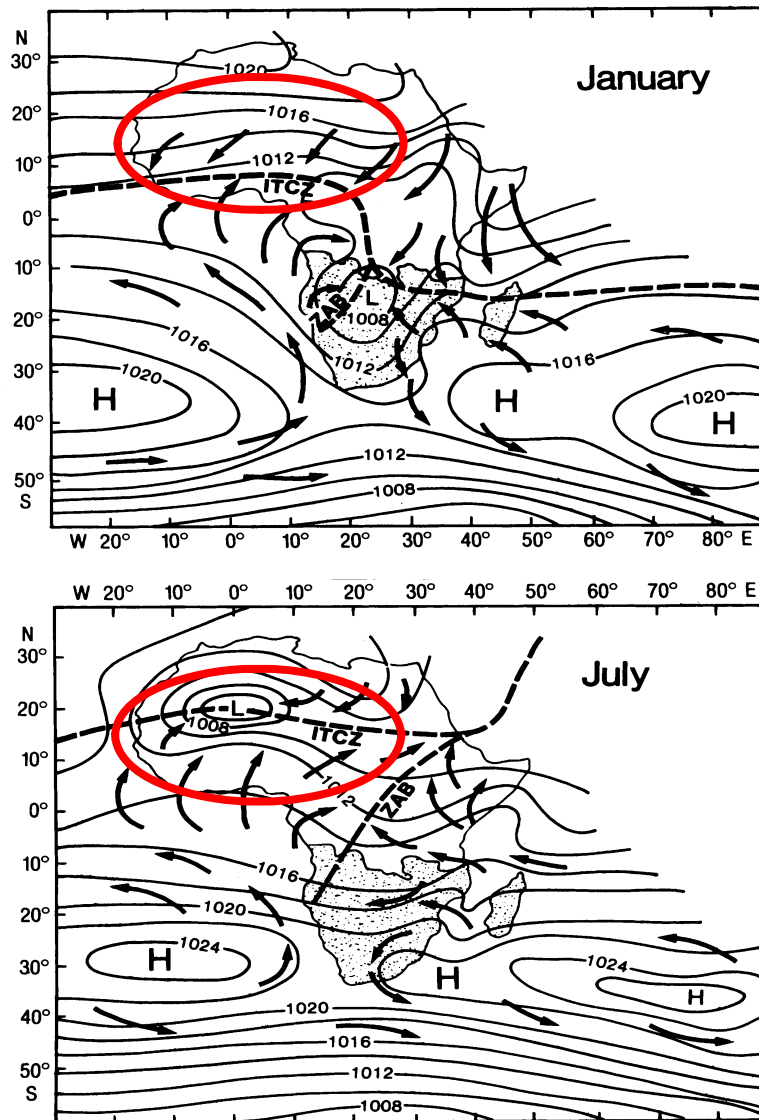


**Rainfall seasonal!!!
July-September**



Dec 925 mb

Seasonal cycle of Atmospheric circulation

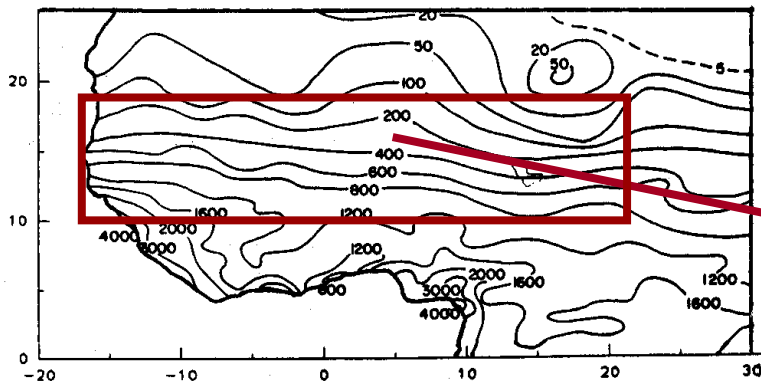


□ Mean Low level wind

- *Seasonal reversal of winds*
- *In summer, southwesterly flows bring moisture inland*
- *Atlantic Ocean – main source of moisture*

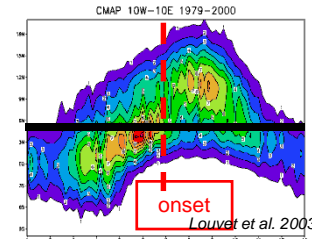
West African Monsoon - in brief...

Sub-regional scale

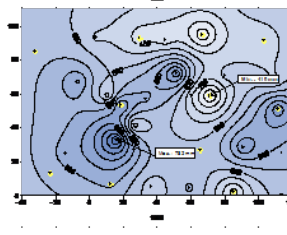


strong precipitation gradients

Finer scales

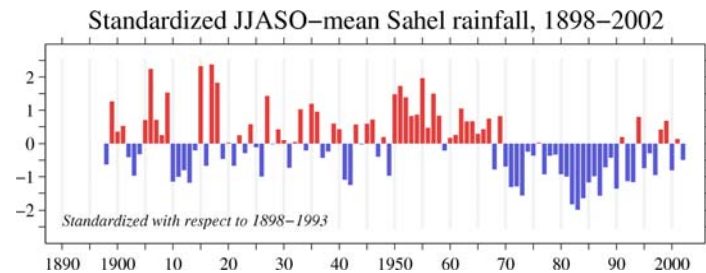


Time :
Northward shift then retreat



Space :
Complex structures

Regional scale

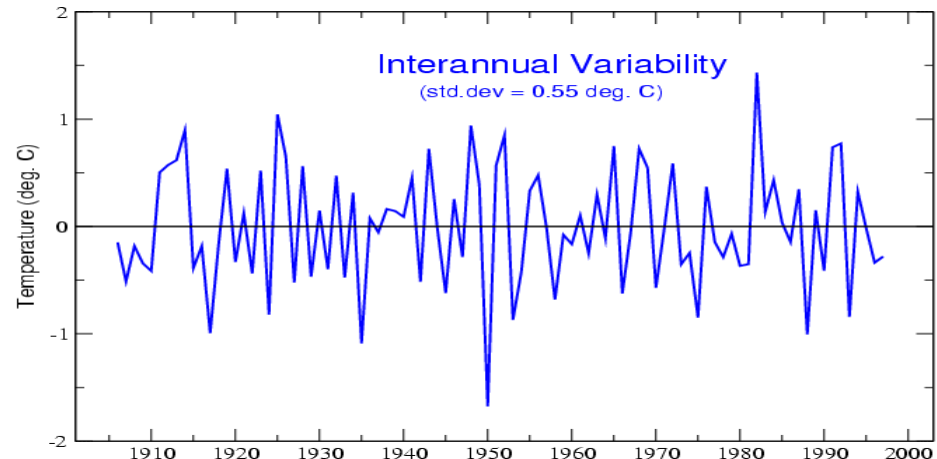
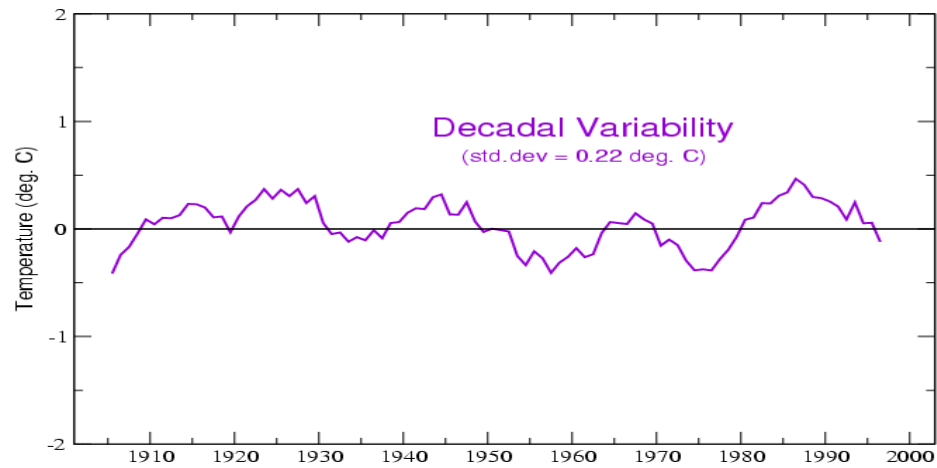
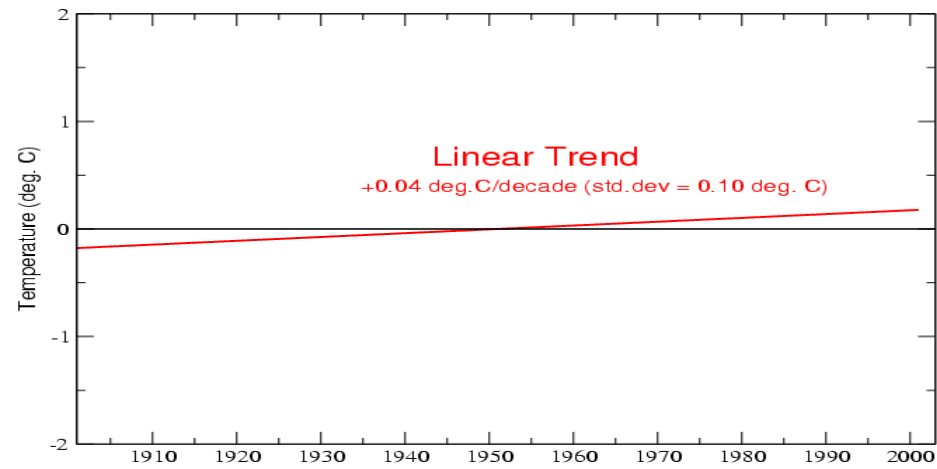
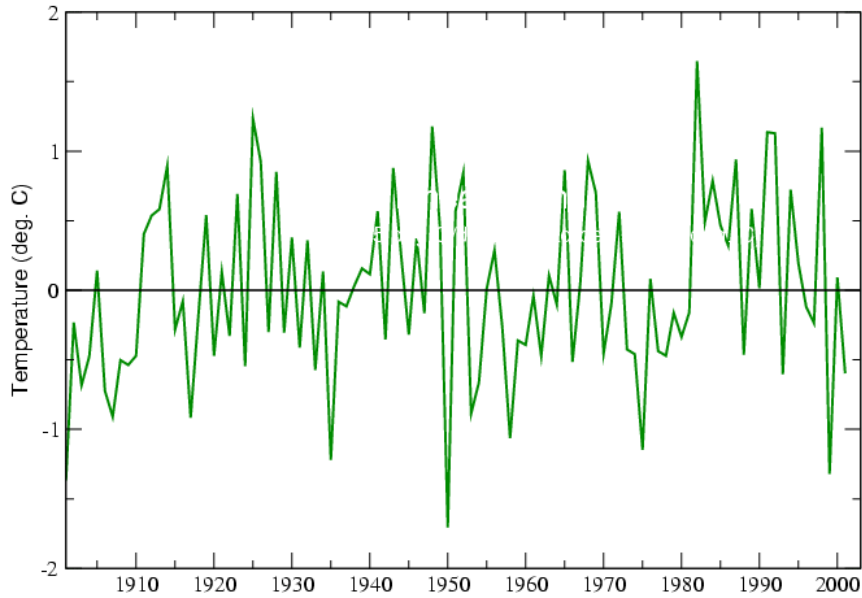


strong decadal variability

Time Scales of Variability

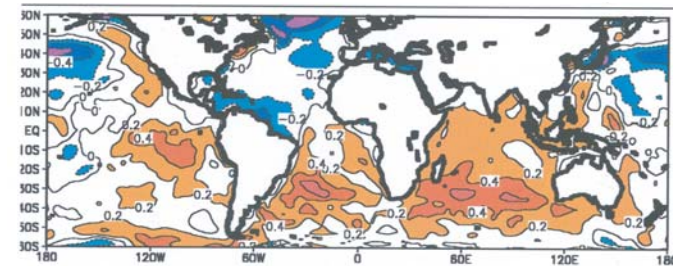
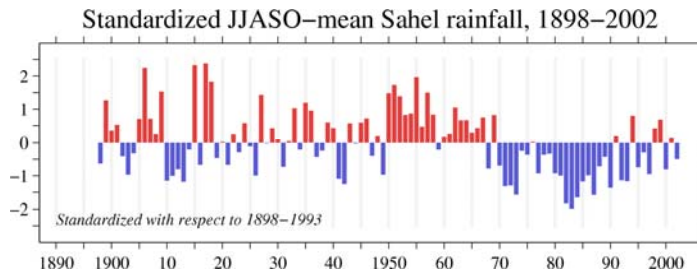
2m Air Temperature: South Africa

DJF Season



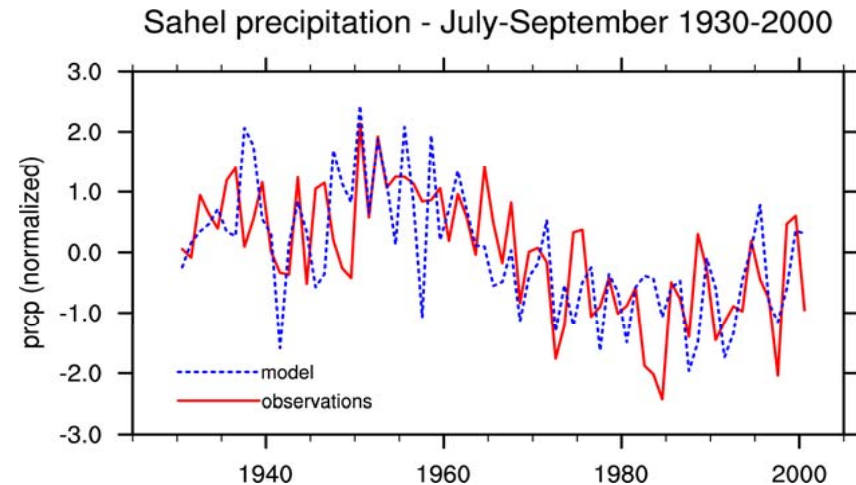
West African Monsoon - Impact of Sea Surface Temperatures

- SST – principal cause of inter-annual and decadal-scale variability



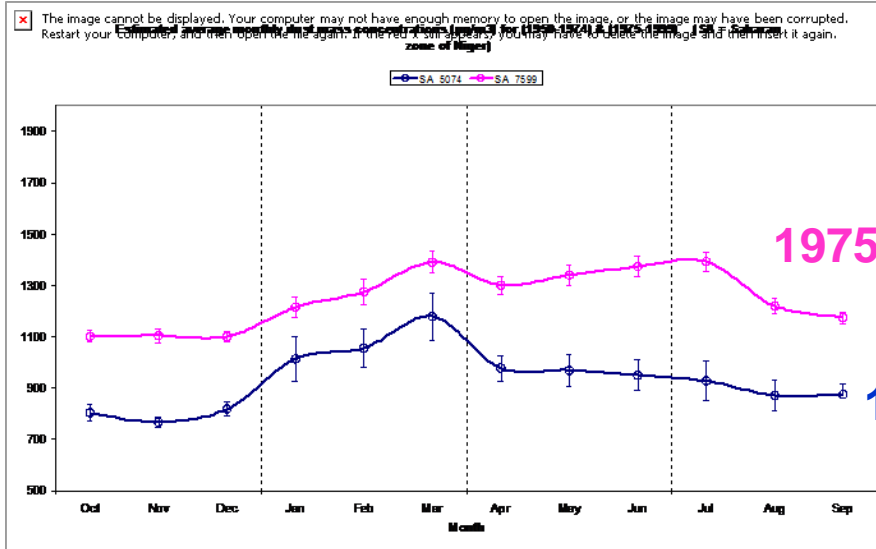
Temp. Surf. Mer : (1970-1997) - (1950-1969)

- Interannual and decadal variability captured by General Circulation Models



Giannini, A, R Saravanan, P Chang, 2003. Science, 320, 1027-1030

Atmospheric dust production on Seasonal, Interannual and multidecadal Time Scales in the West African Sahel

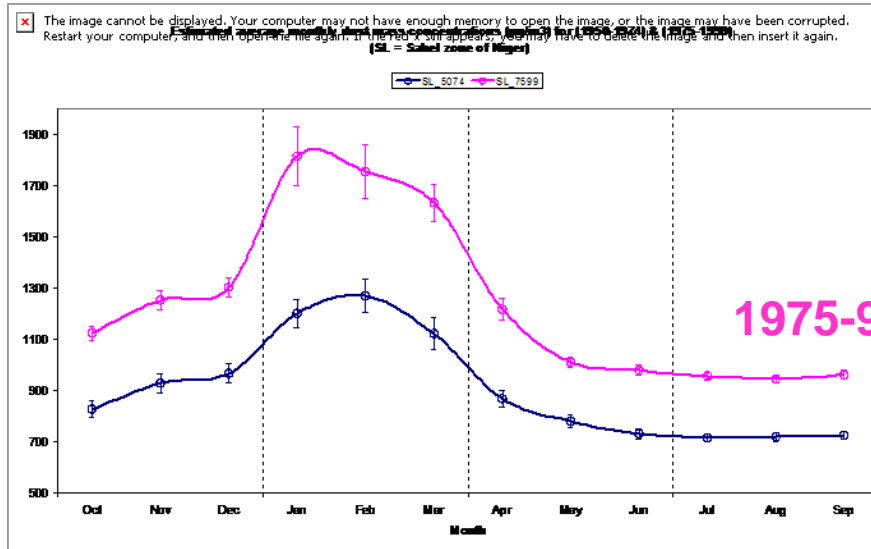


1950-74

1975-99

time series of estimated average monthly dust mass concentrations for

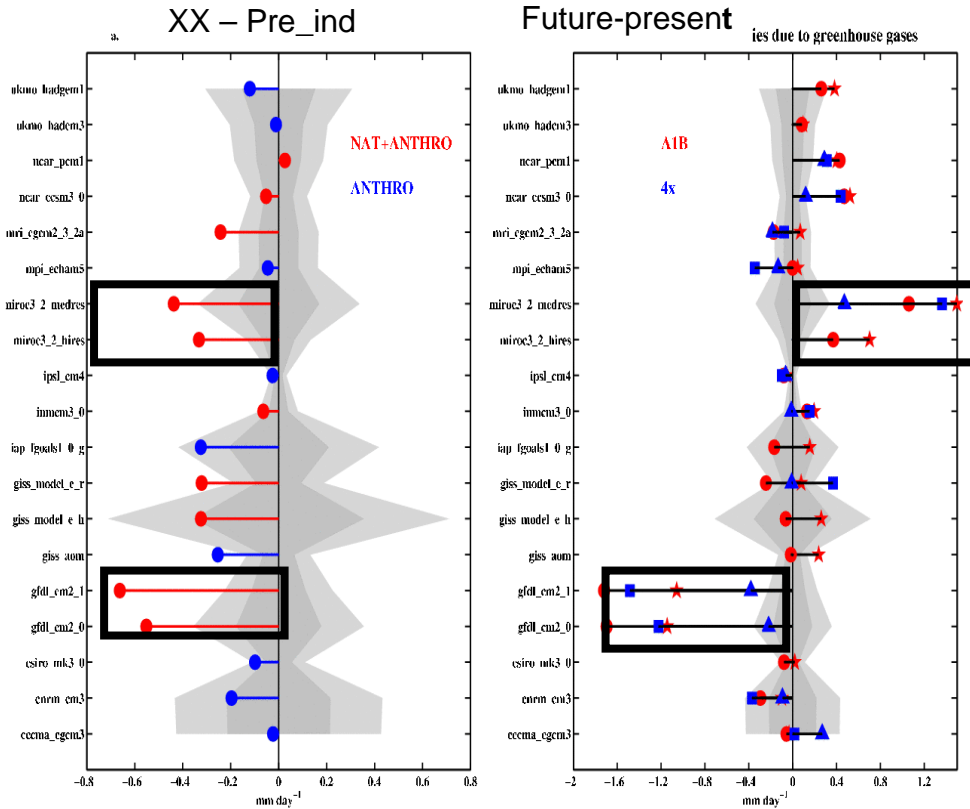
- Sahara (top)
- Sahel (bottom) zones of Niger



1950-74

1975-99

Climate Change - lots of uncertainties



Biasutti and Giannini, GRL 2006

- The models that were successful in reproducing the late 20th century drought in Sahel disagree as to future projections in Sahel
- Do not reproduce correctly the main modes of variability and teleconnections (Joly et al. 2006)

Conclusions



❑ Mean Rainfall

- Strong gradients
- Seasonality of rain and circulations
 - northward – southward movement of rainy belt and wind convergence

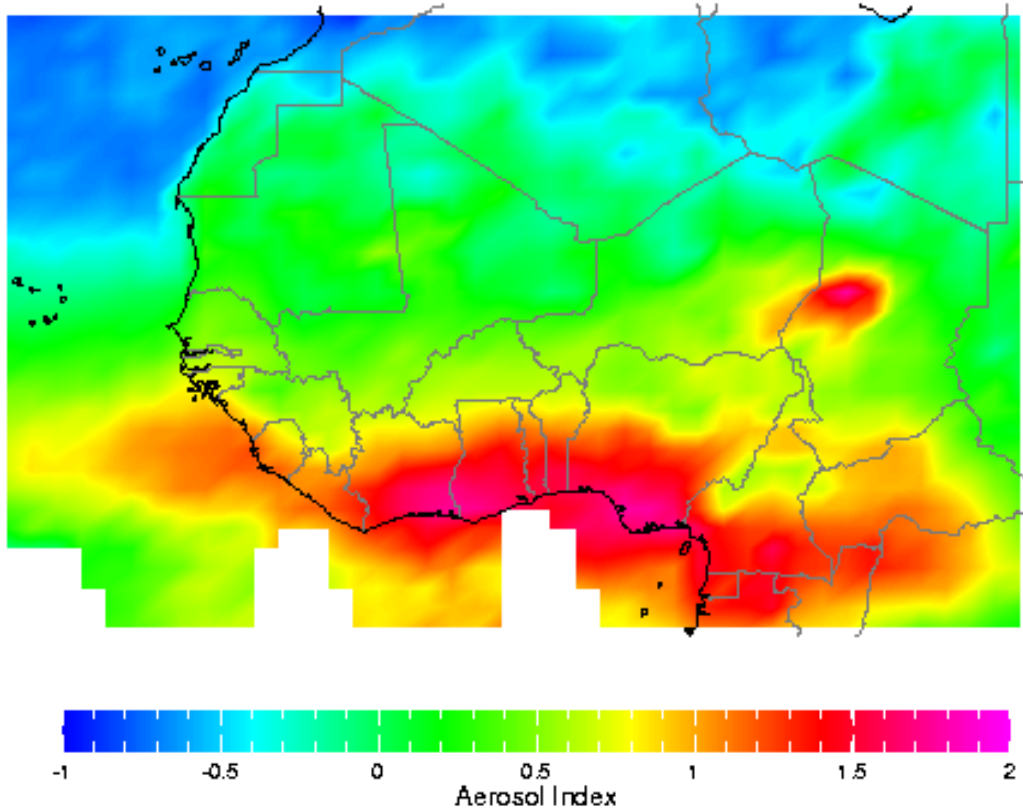
❑ Rainfall variability

- Different scales
 - Strong Interannual/Decadal variability linked to SST, reproduced in GCM
 - Climate Change – models disagreement

Environmental Factors



E.g. *TOMS w 1-20*



- Northward **progression** of Meningitis linked to highest temperatures, in the region of convergence between Harmattan and southwesterlies
- Highest dustiness (not shown)
- NOT lowest humidity
- **Termination** linked to arrival of moister, cooler and cleaner air