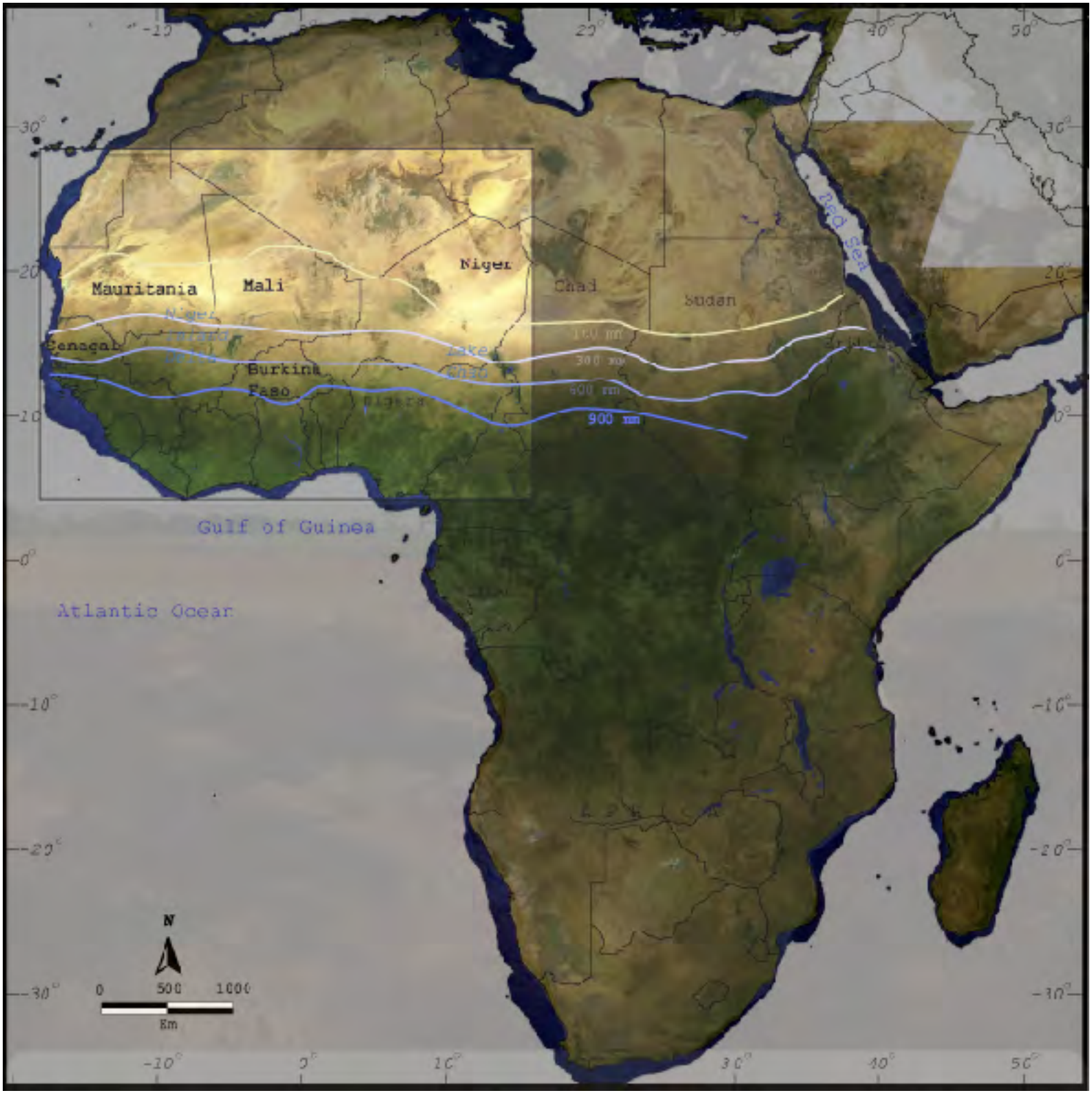
West Africa Sahel
Changing landscapes

The West Africa
Drylands Project by
UNEP and ICRAF

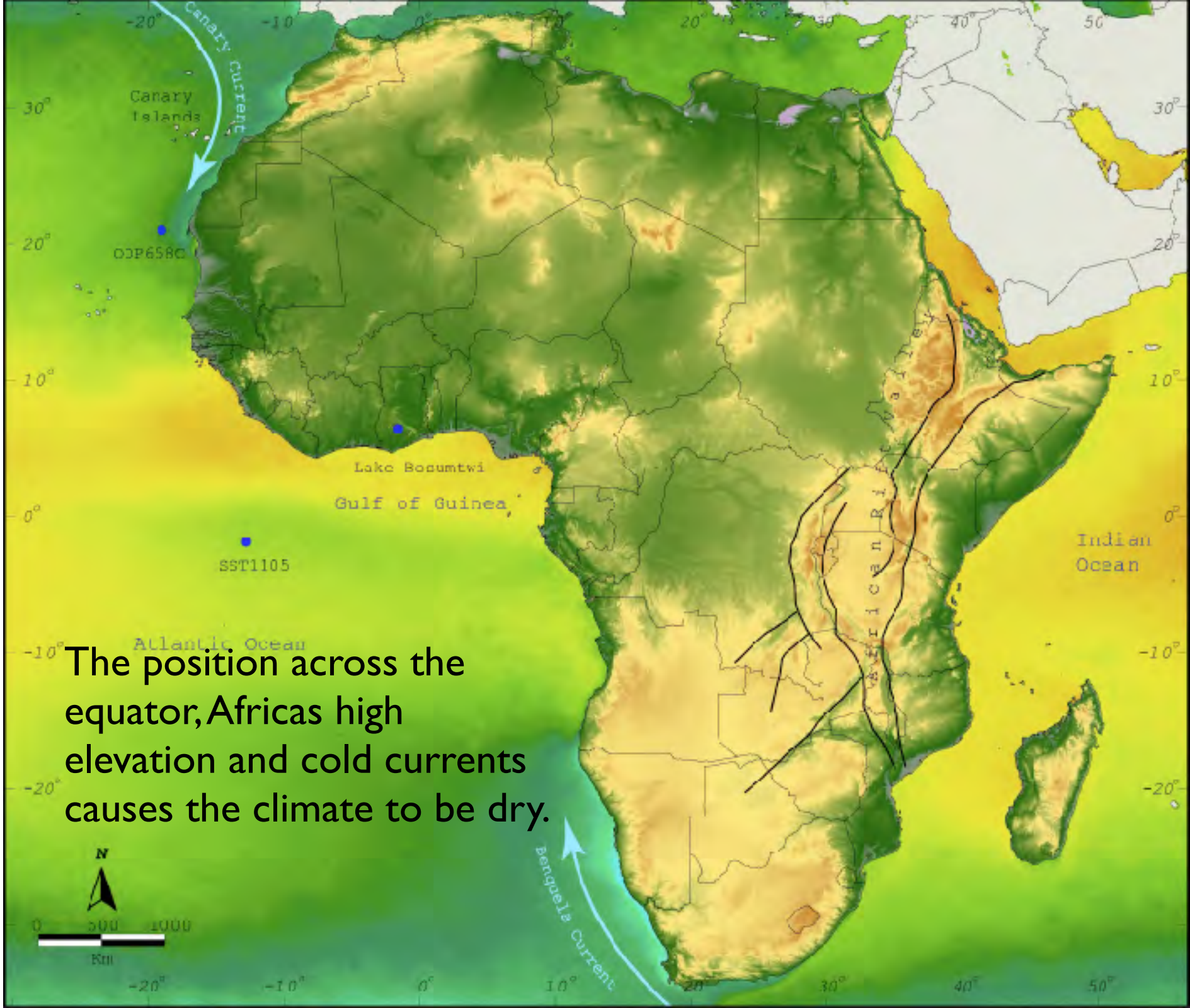
Thomas Gumbricht, 2008

Sahel is the transition region between woodlands in the south and the Sahara Desert in the North. It is bounded by rainfall limits of approximately 100 to 800 mm per year

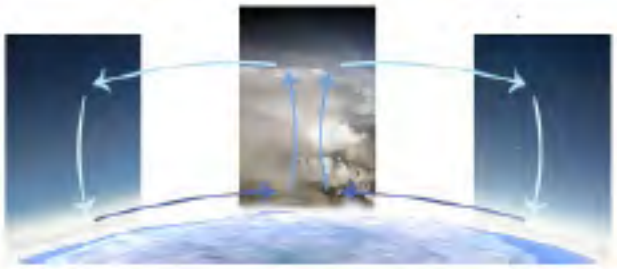


Rainfall over West Africa in February 2004, the orange arrows indicate the hot and dry Harmattan trade wind dominating the climate of West Africa in the dry season.

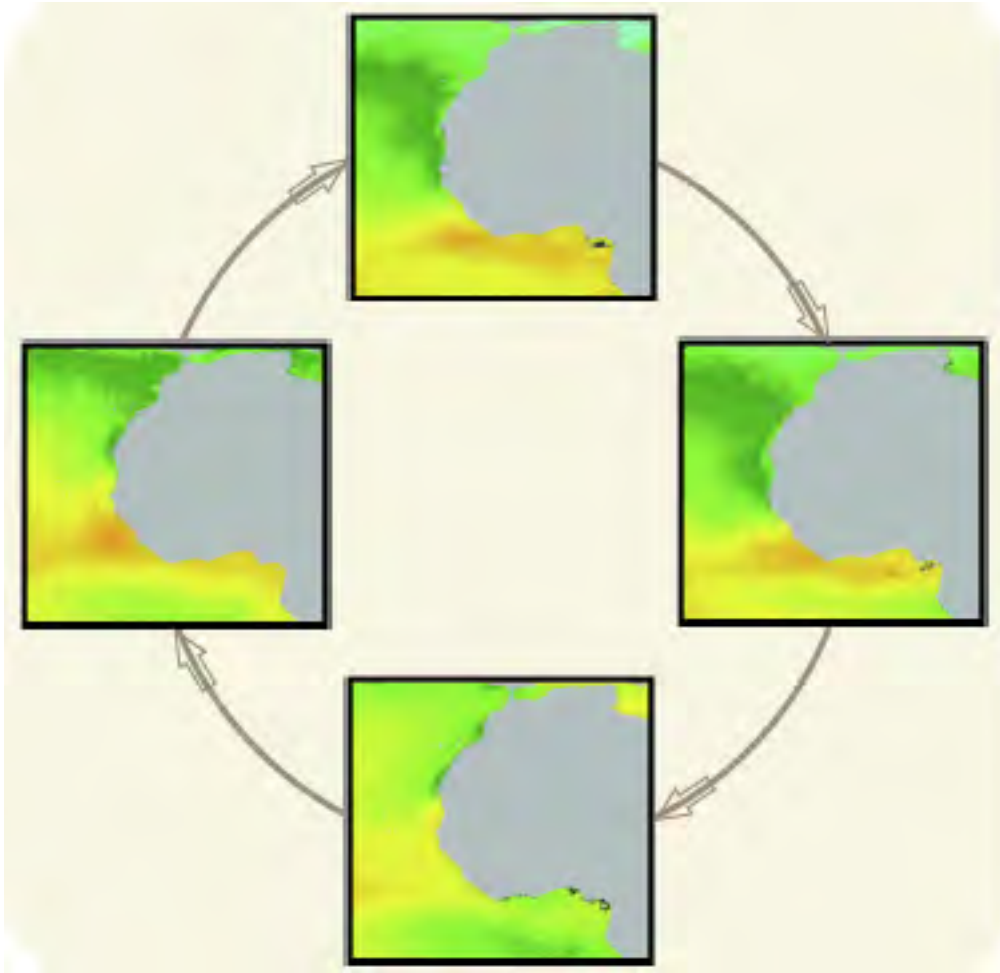
Rainfall over West Africa in August 2004, the blue arrows indicate the wet monsoon bringing rainfall to the Sahel in the wet season.


Canary Current
Canary Islands
ODP658C
Lake Bosumtwi
Gulf of Guinea
SST1105
Atlantic Ocean
African Rift Valley
Indian Ocean
Benguela Current
The position across the equator, Africas high elevation and cold currents causes the climate to be dry.
N
0
500
1000
Km

Climate variations in Africa are forces externally by the changes in sea surface temperature



Hadley cells with the doldrums (ITCZ) at the equator

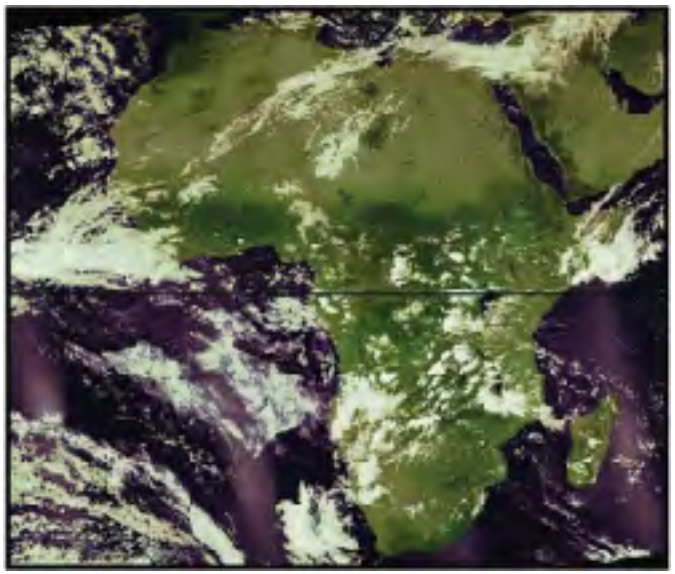


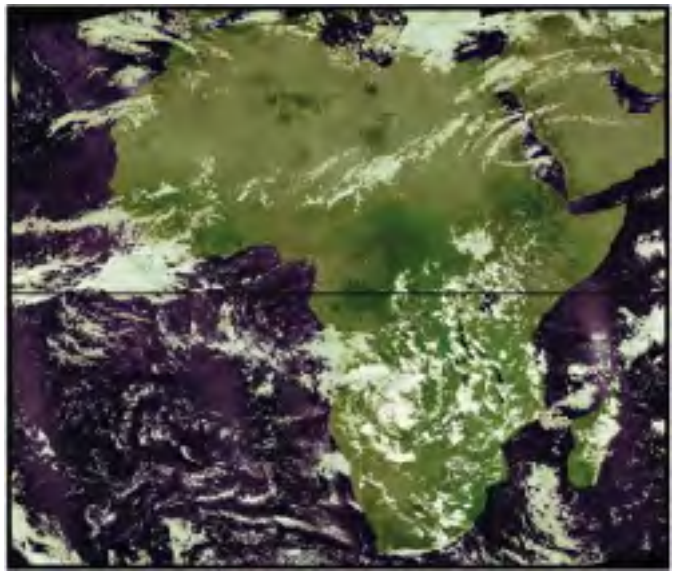
The annual sea surface temperature cycle in the Atlantic Ocean outside West Africa

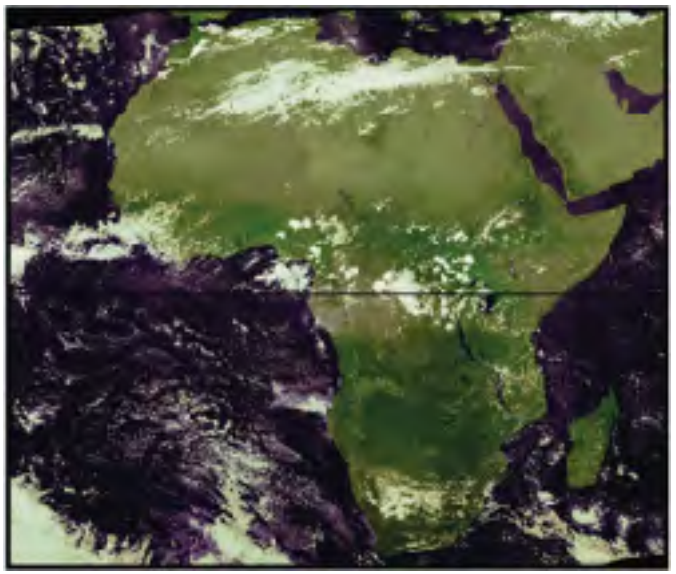
The seasonal changes in rainfall are driven by the oscillation of the ITCZ

February

November

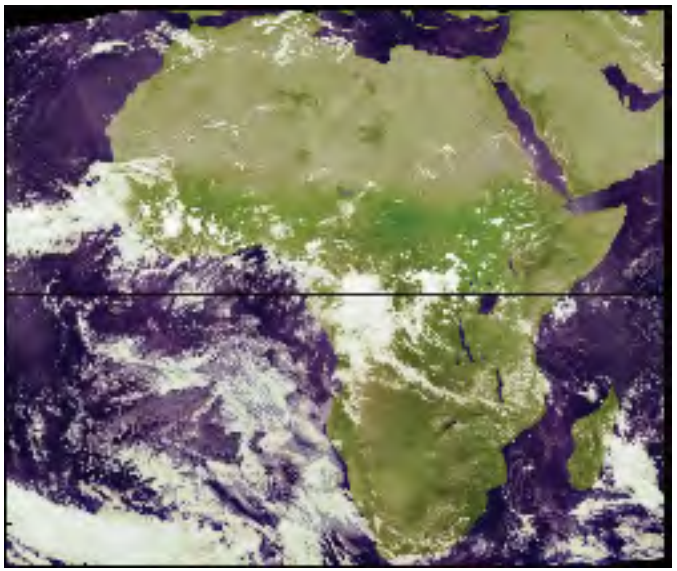






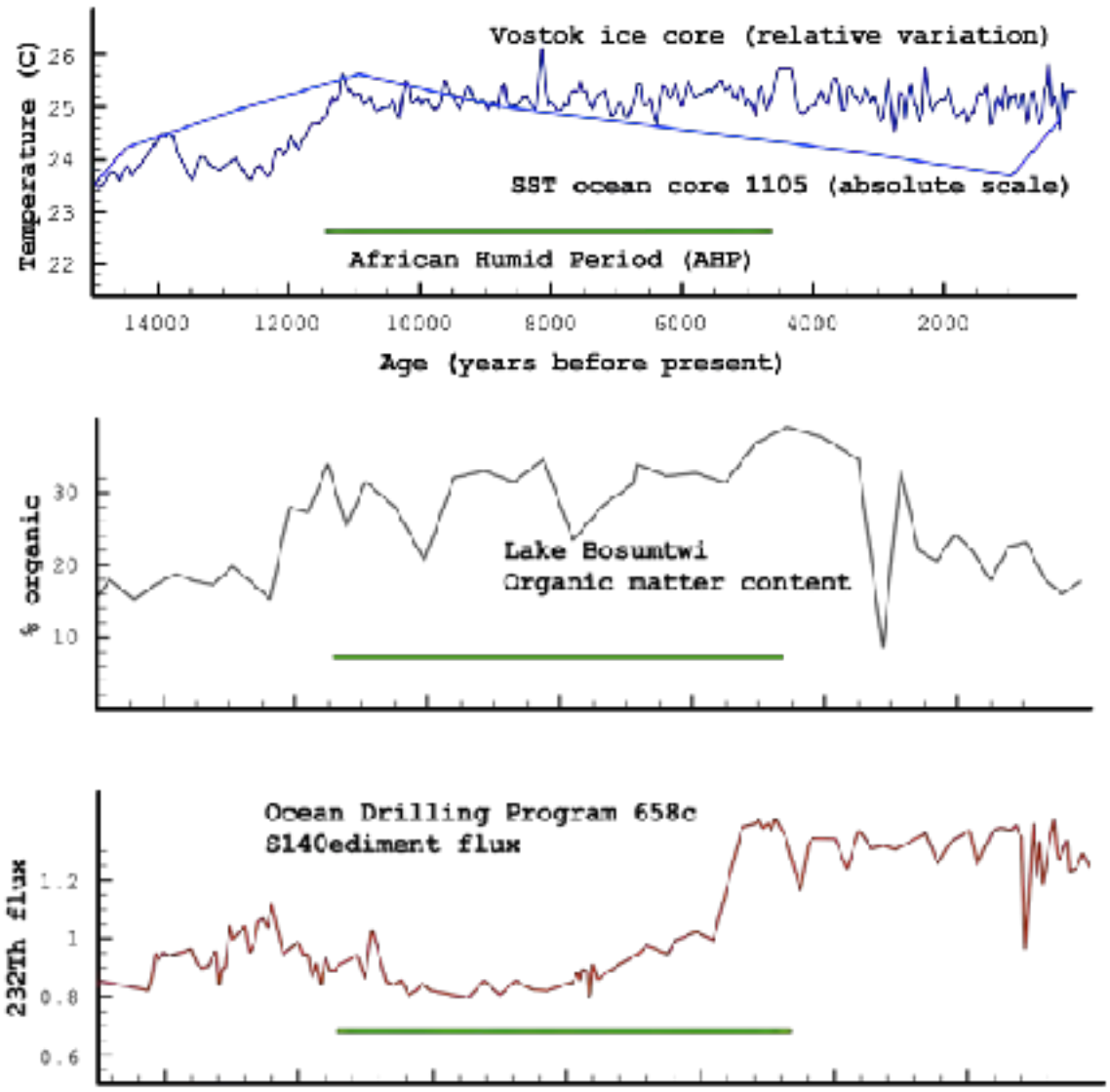
May

August

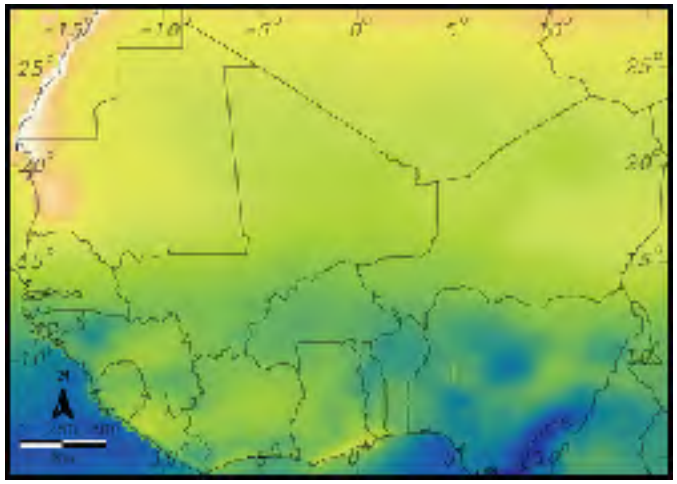


The Sahel has a long history of flip-flop climate

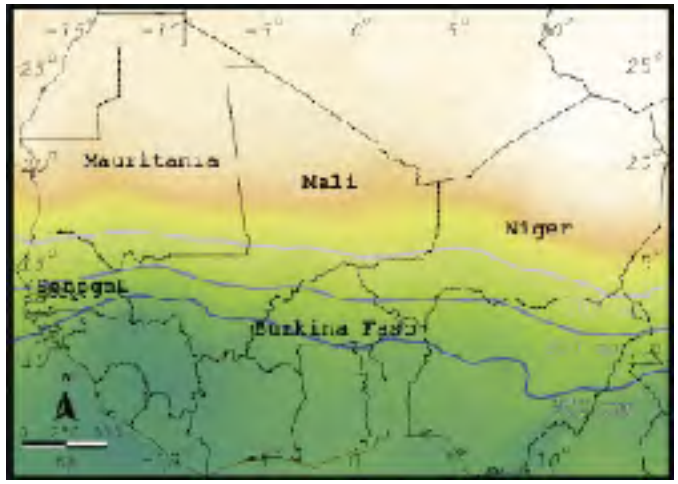
The ice age was followed by the African Humid Period that came to an end about 5000 years ago

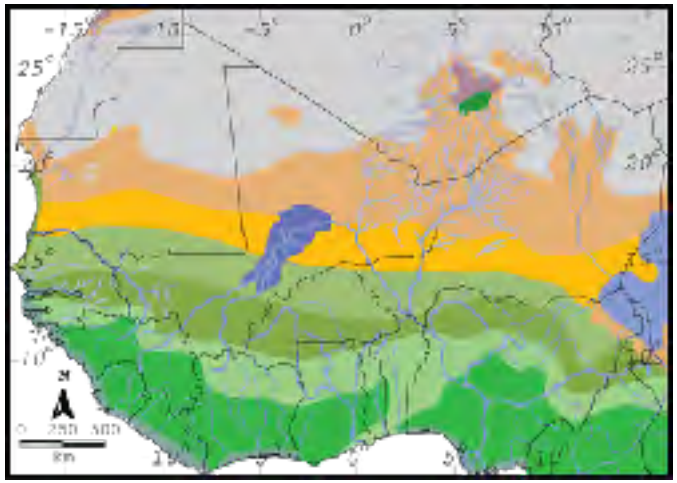


The Sahel has a long history of flip-flop climate

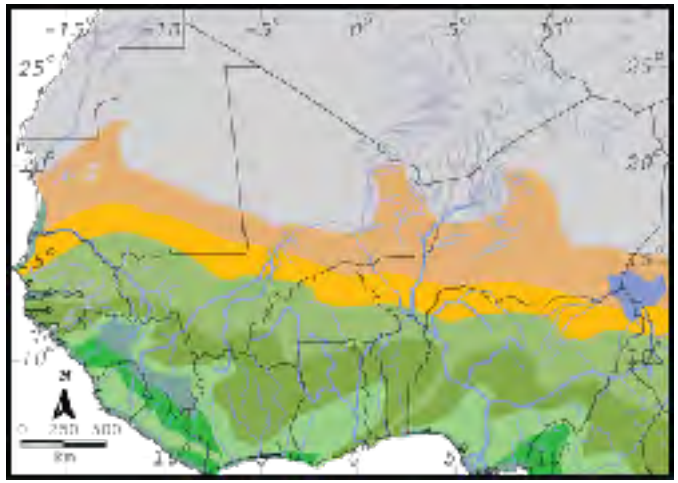


Rainfall



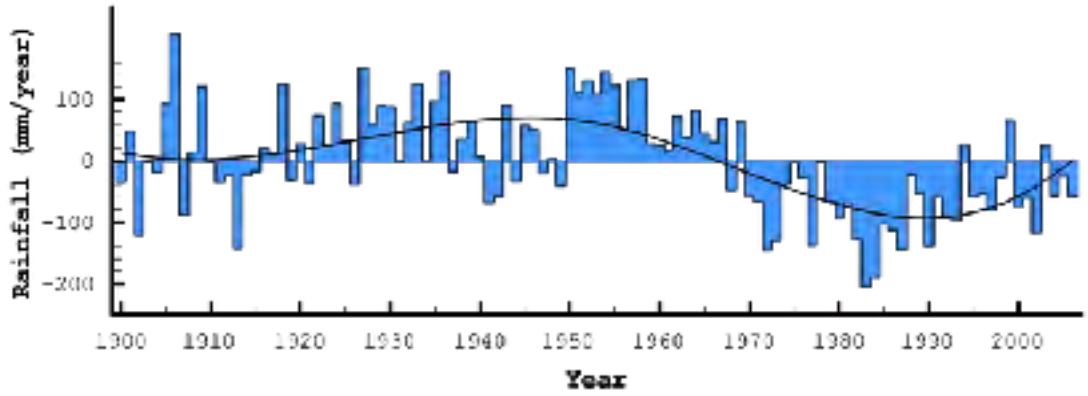


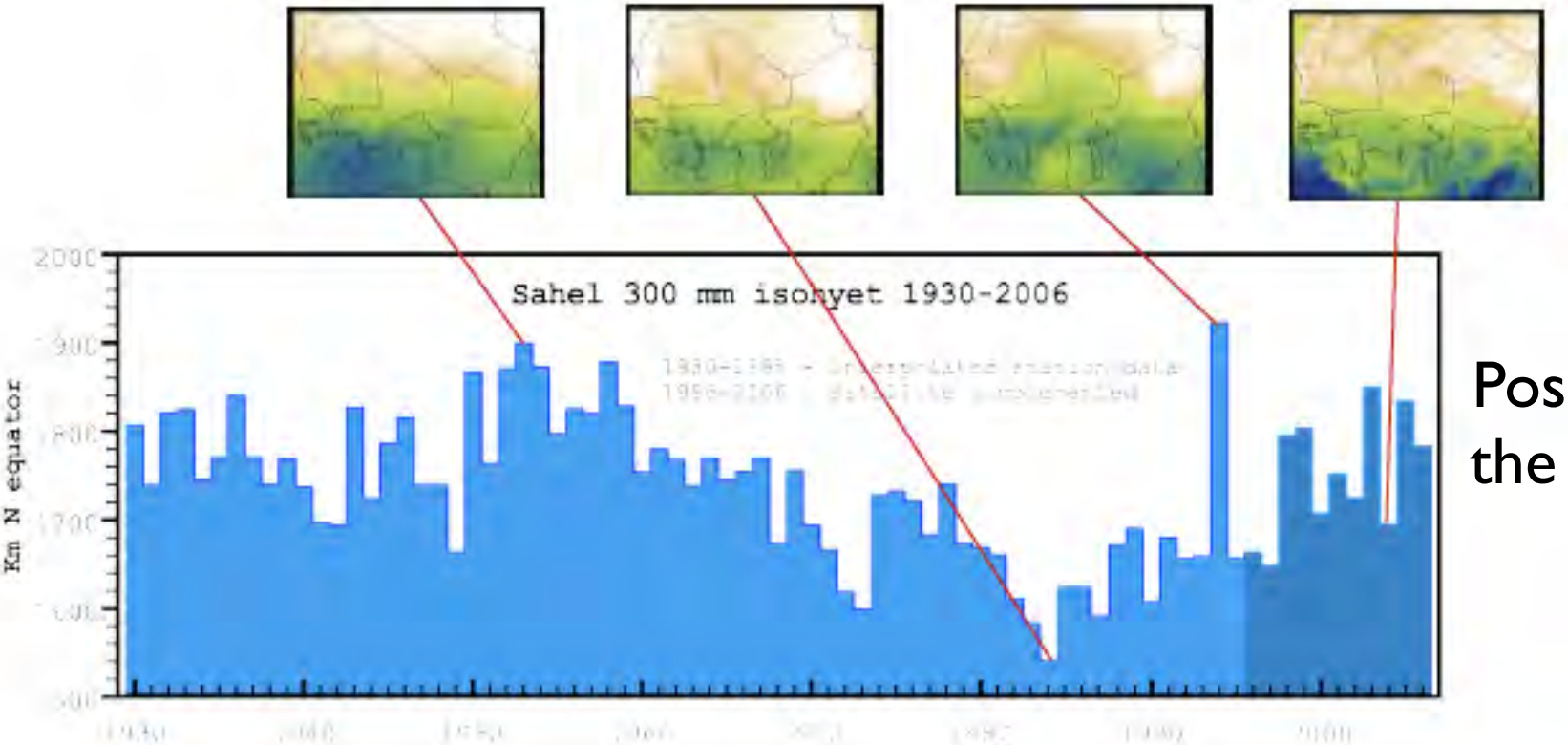
Vegetation classes



Climate variations in the Sahel over the last century

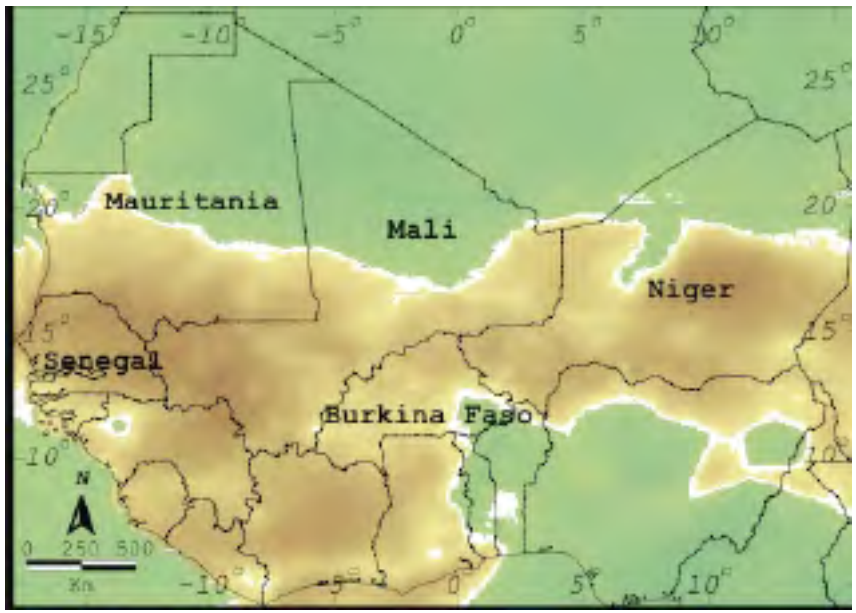
Rainfall record data and spline trend



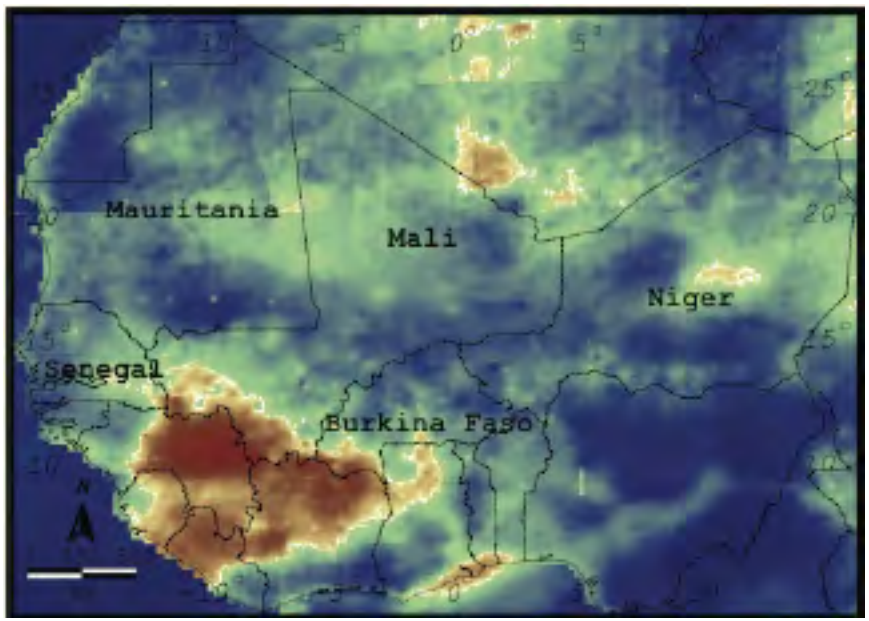


Positional change in the 300 mm isohyet

Climate variations in the Sahel over the last century



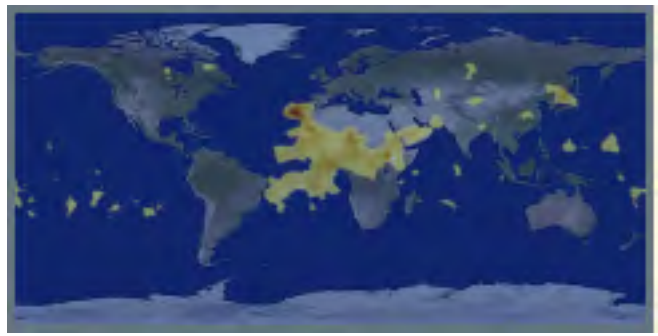
Rainfall trend
1930-2006

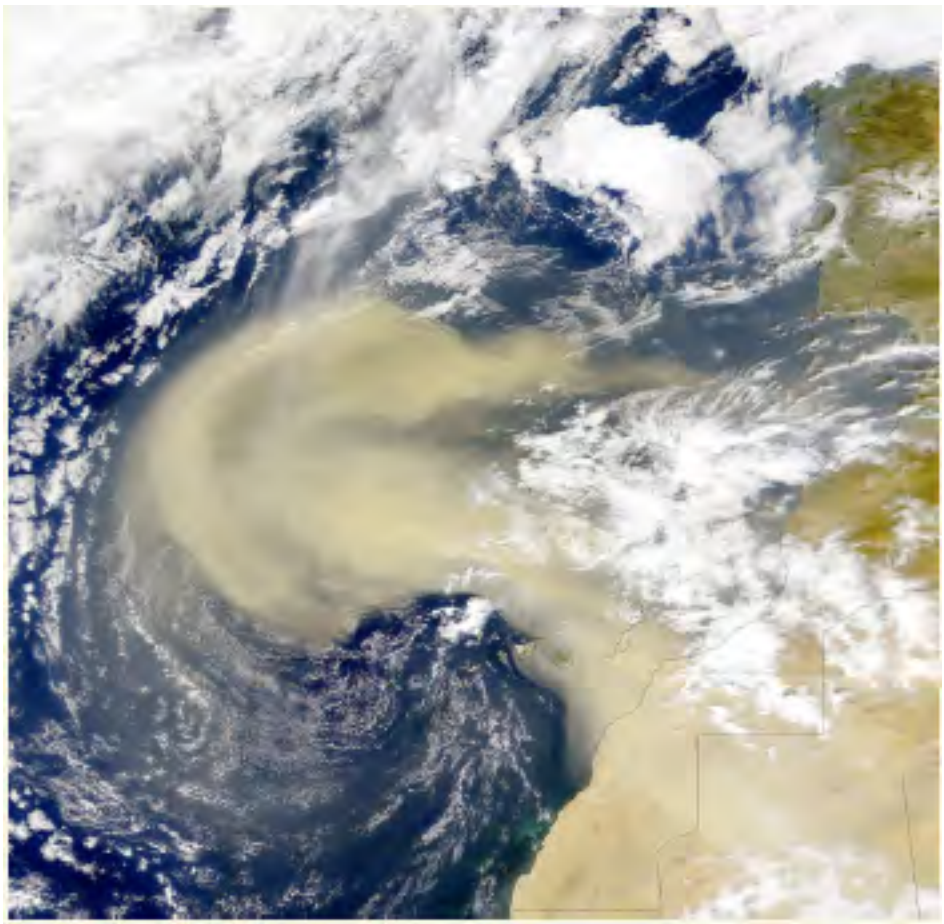


Rainfall trend
1982-2006

Internal feedback in climate variations?

Toms data showing aerosol depth in February 2000

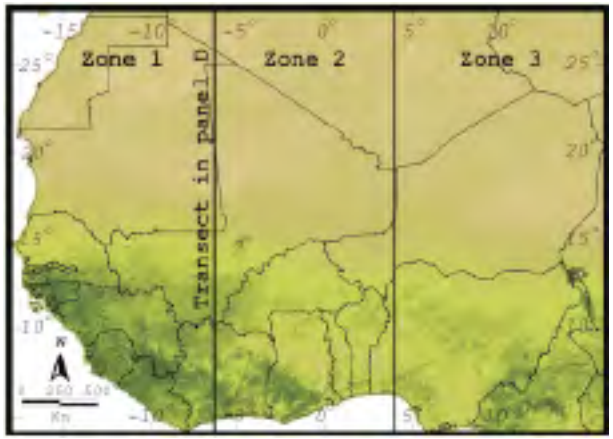




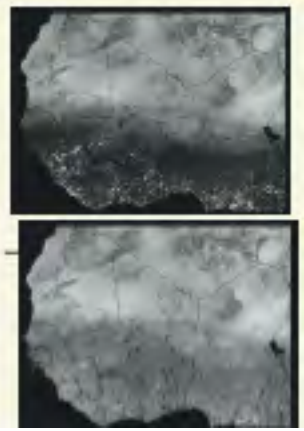
SeaWifs image showing dust storm from the Sahara reaching out over the Atlantic Ocean

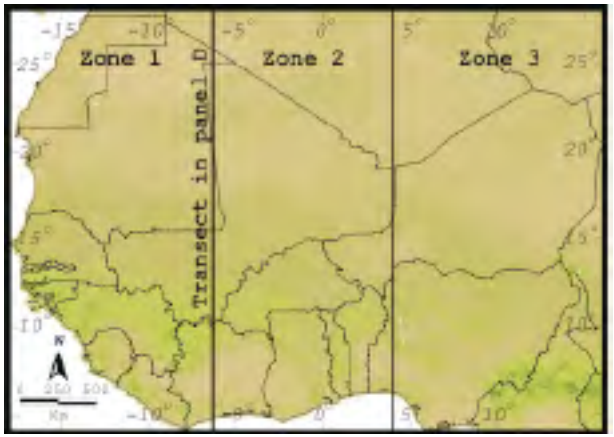
Using satellite vegetation data to trace land degradation

NOAA-AVHRR

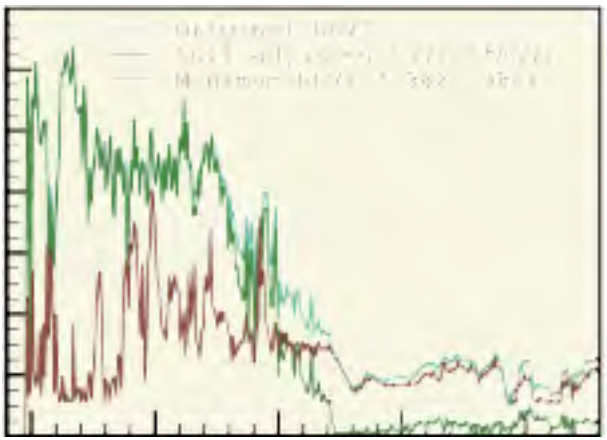


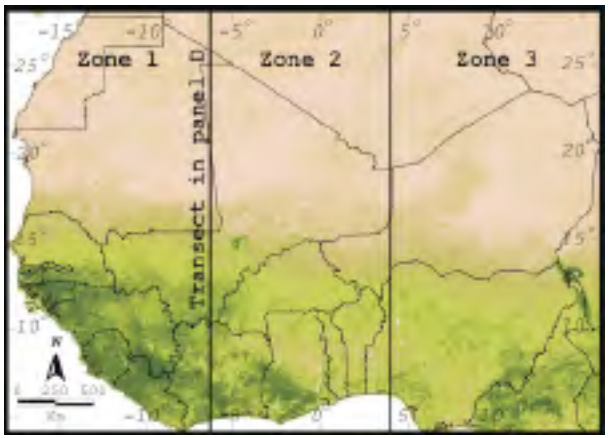
Raw NDVI





Minimum NDVI

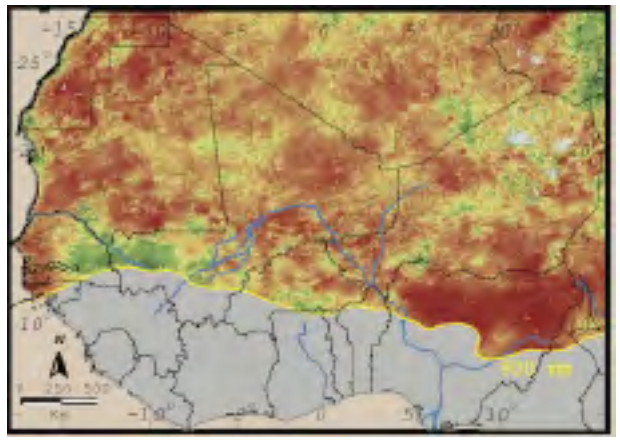




Adjusted NDVI

Using satellite vegetation data to trace land degradation

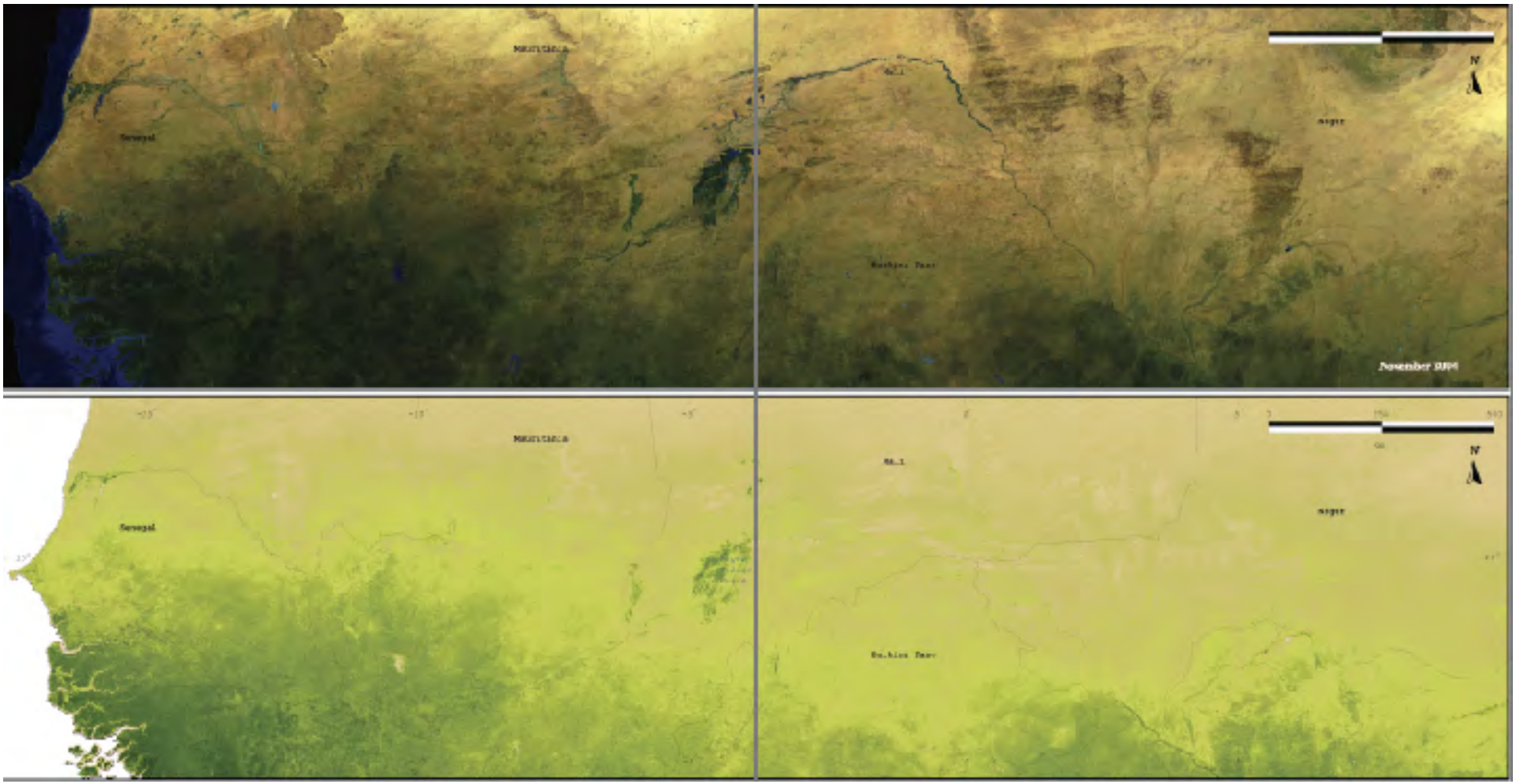
Trend in vegetation growth 1982-2006



Trend in rain normalised vegetation growth 1982-2006

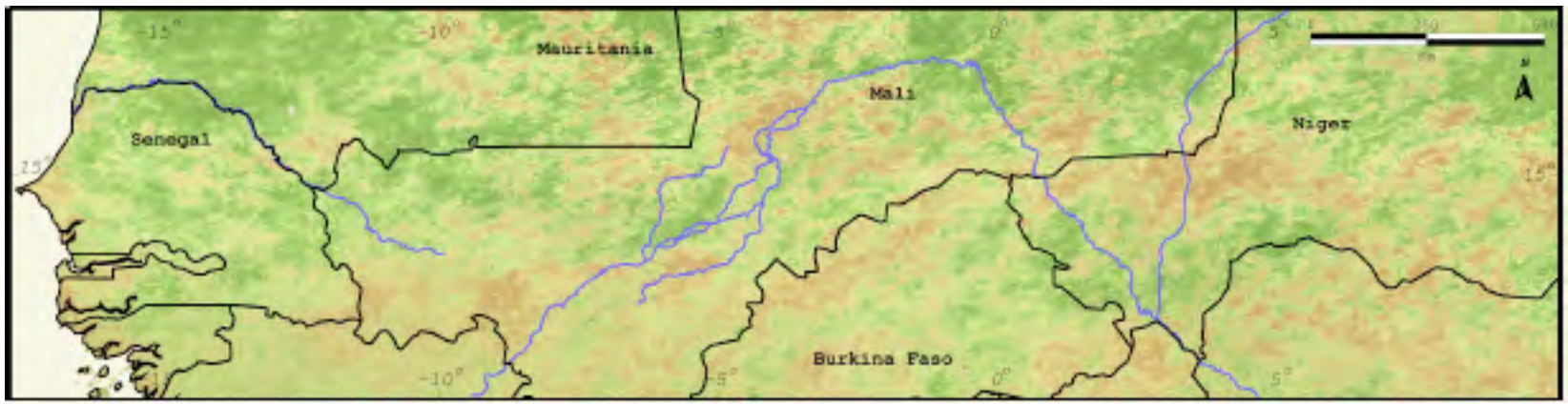
Using satellite vegetation data to trace land degradation

MODIS EVI



Using satellite vegetation data to trace land degradation

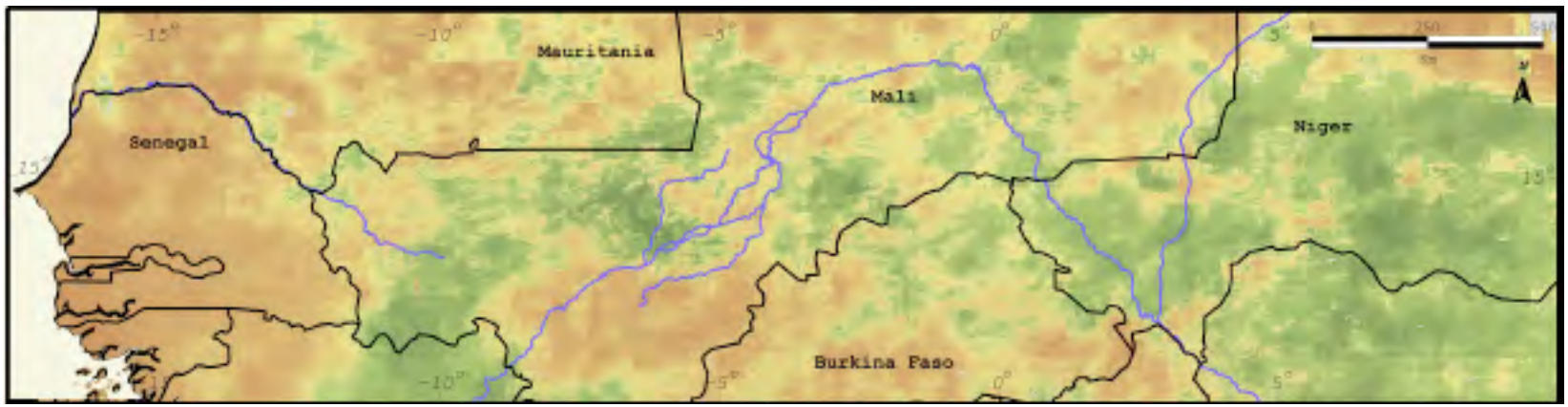
Average EVI 2001-2006



Trend in average EVI 2001-2006

Using satellite vegetation data to trace land degradation

Average rain normalised EVI 2001-2006



Trend in average rain normalised EVI 2001-2006

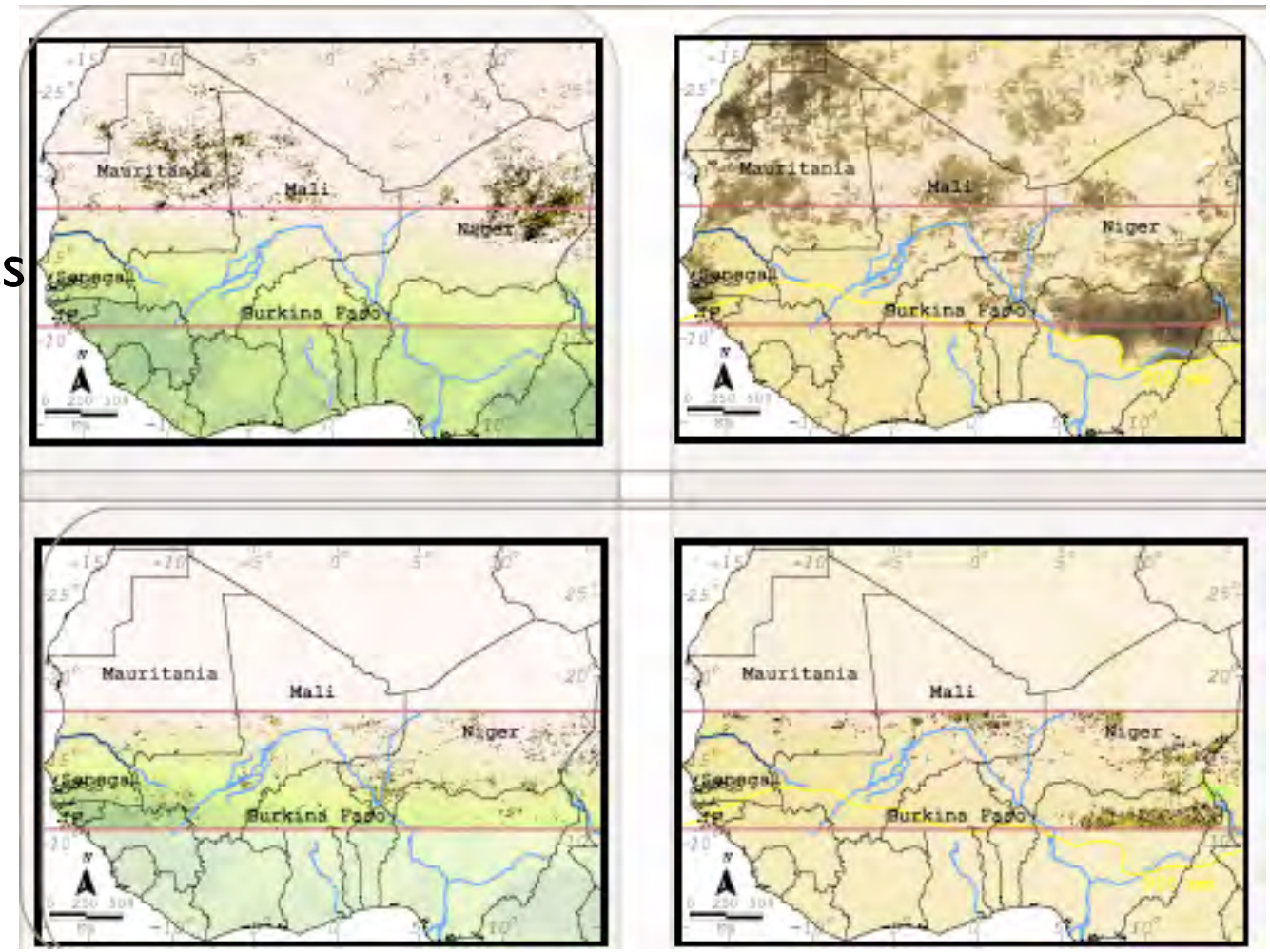
Identifying potential land degradation hotspots

Absolute greening/ browning

Rain normalised

Multi Criteria Evaluation using normalised trends as factors

Trends in spatial ranking



Identifying potential land degradation hotspots

MCE of trends in rain normalised EVI