Long Term Trends in African Vegetation Productivity and Human Induced Erossion Risk

According to the United Nations Convention to Combat Desertification, desertification is:

Land degradation in arid, semiarid and subhumid tropics caused by a combination of climatic factors and human activities

And ... land degradation means reduction or loss, in arid, semi-arid and dry subhumid areas, of the **biological or economic productivity** [. . .] arising from human activities and habitation patterns such as [. . .] long-term loss of natural vegetation. (UNCCD, 1994: Part I, Article 1, F)

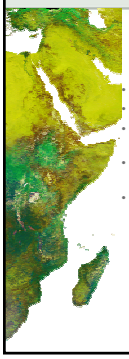
Monitoring biological productivity using satellites

Normalized Difference Vegetaion Index (NDVI)

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

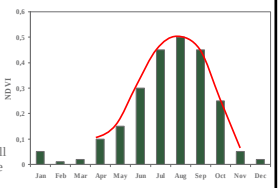
Net Primary Production (NPP)

$$NPP \approx iNDVI = \int_{t=0}^{t=n} NDVI$$



NOAA AVHRR PathFinder

- Global continuous data coverage
- 8 km data resolution
- Normalized Difference Vegetation Index
- 10 day maximum value NDVI composites
- Time integral of NDVI (iNDVI) correlates well to Net Primary Production (NPP) and iNDVI will be used as a proxy for NPP in the following

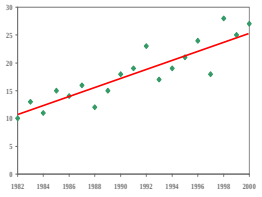


Inter-annual trends in vegetation productivity

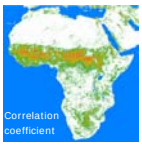
A simple linear regression is performed for each pixel in the image. Results show respectively:

- The inclination (a) of the curve
- The intercept (b) of the curve and
- From which the double time can be calculated
- The goodness of the fit (r2 value)

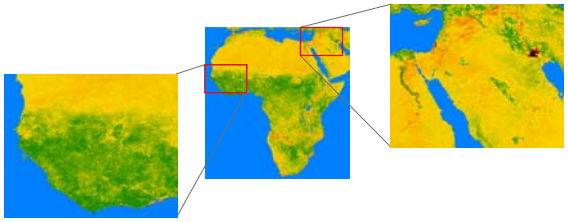
Data from 1982 to 2000 are used, except 1994 which was not covered to the end of the season



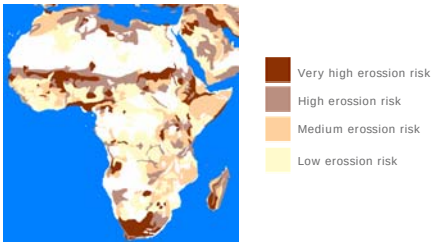
Trends in vegetation productivity 1982-2000



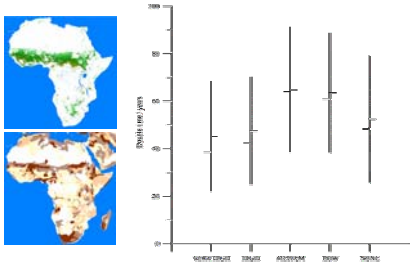
Human impact or "natural" development in productivity



GLASOD map of human induced erossion risk



GLASOD and vegetation productivity trends



Conclusions

- Recovery from 70's and early 80's big droughts
  - Since the starting point is the early 80's this could cause the results to be significant, but showing nothing else than a gradual recovery from extreme stress. This would be in line with the dis-equillibrium theory.
- Conflicting scales of measurements
  - Changes in vegetation productivity are not necessarily measured best at the same scale of observation as human induced erossion risk.
- Comparing apples and bananas
  - Can we expect the two parameters to be compatible in the first place?
- No indication of usefullness of vegetation
  - Even though the analyses show an increase in vegetation productivity, it could in principle be production of poissonous, vegetation with no usefullness for animals or peolpe.