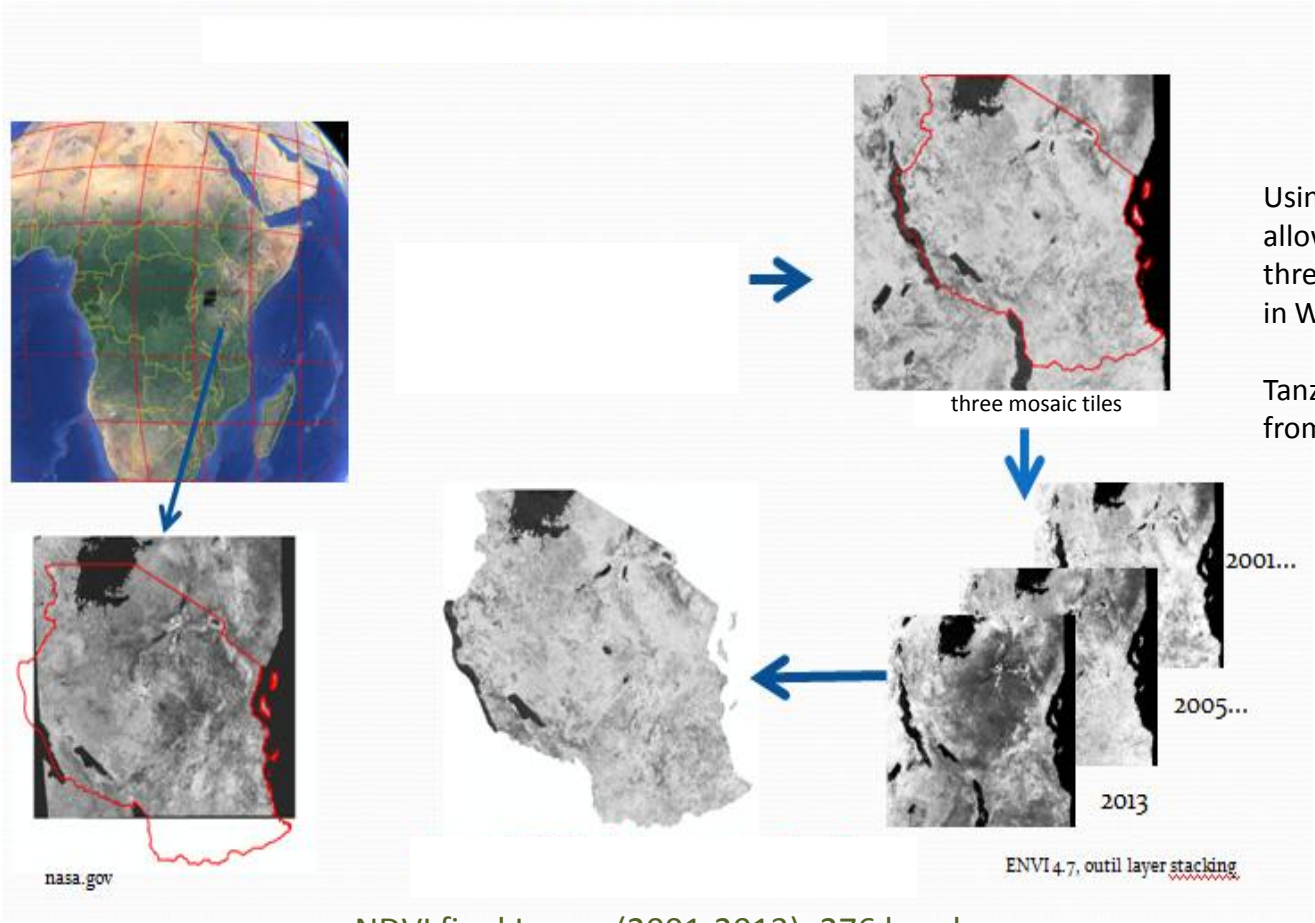
APPENDIX 1

Creating time series of NDVI



NDVI final Image (2001-2013), 276 bands

Using a script under R, allowed to download the three tiles to a mosaic project in WGS 84, UTM 37 S

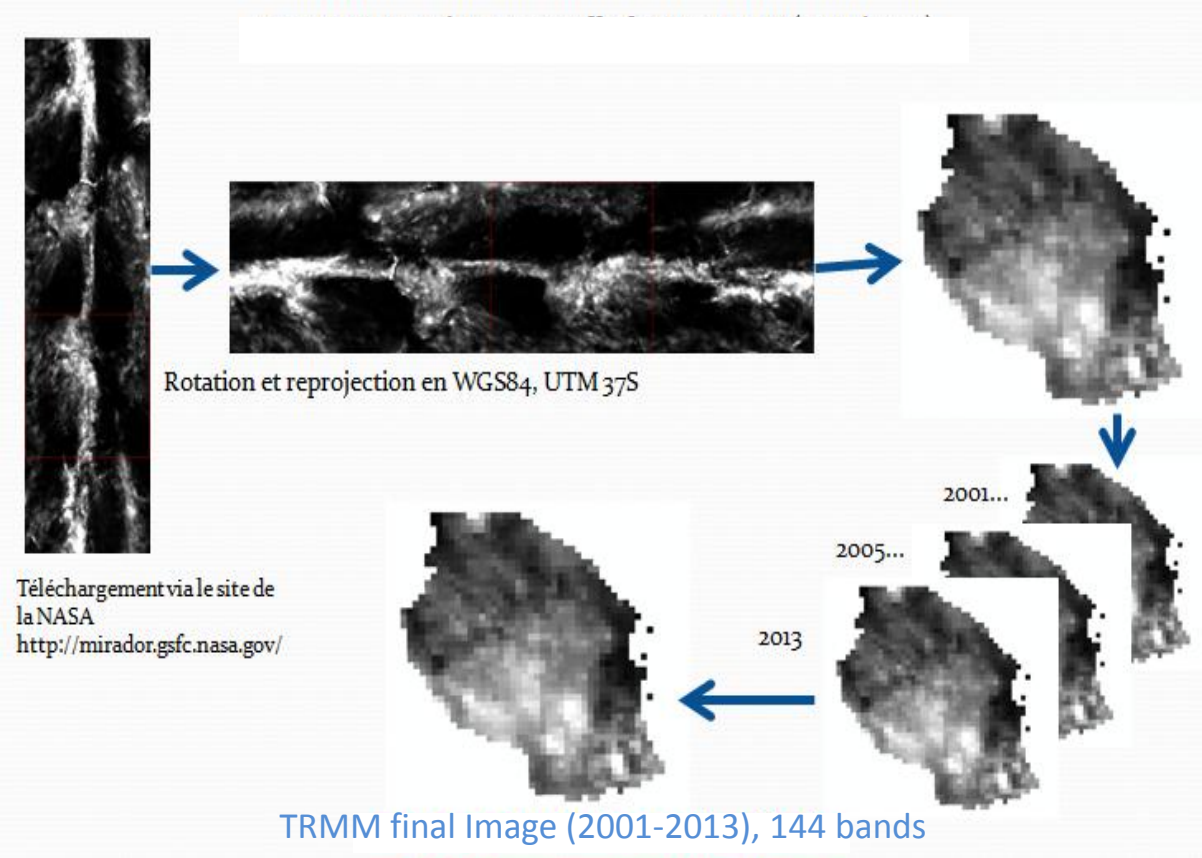
Tanzania was then extracted from the shapefile contours

Uploader slab on the site of NASA, to cover all of Tanzania, it takes 3 tiles

Download time of NDVI-MODIS Image (MOD13Q1) = 1 day in image (NDVI, EVI, 4 multispectral bands)

APPENDIX 2

Creating time series TRMM



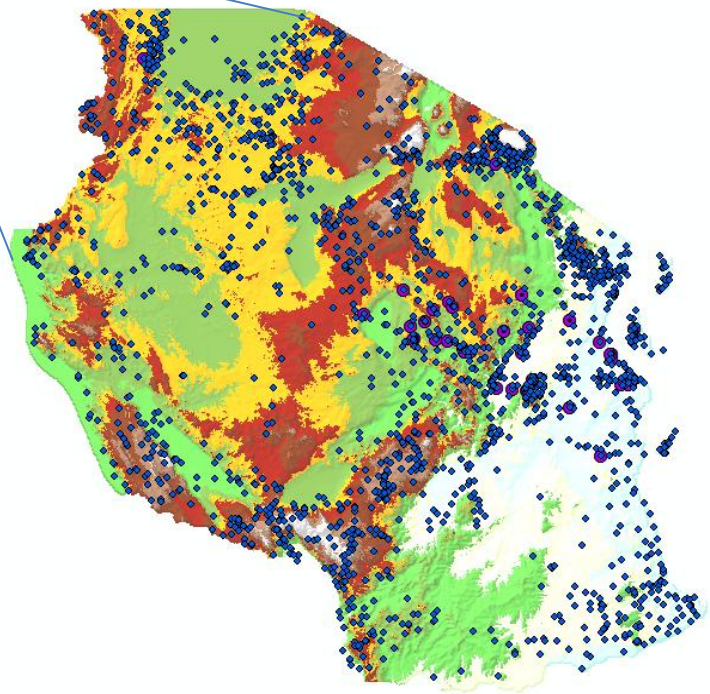
TRMM final Image (2001-2013), 144 bands

Tanzania was then extracted from the shapefile contours

Download all the subtropical belt, -90 ° rotation, reprojection in WGS84, UTM 37 S

APPENDIX 3

Number of station available before independence and now in Tanzania



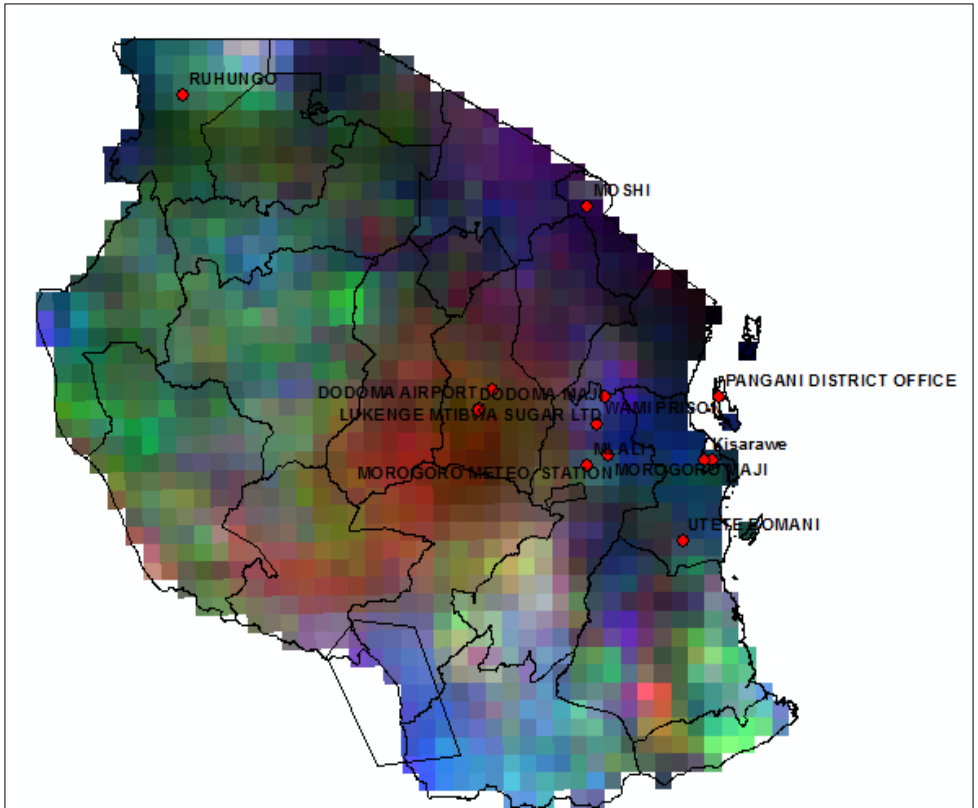
-more 2000 on existing stations before becoming independent in 1975, 500 are still operational, but do not necessarily have specific qualities.
-11 Stations in our study with good data series

What types of data for monitoring rain-vegetation relationships?

APPENDIX 4

Statistical criteria for validation of TRMM data, location of stations used

Critère statistique	Equation
Coefficient de corrélation R	$R = \frac{\sum_{i=1}^{n}(v_i - \bar{v})(e_i - \bar{e})}{n\sigma_i\sigma_e}$
Biais	$B = \bar{e} - \bar{v}$
RMSE (Root Mean Square Error)	$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(e_i - v_i)^2}$
Indice de Nash	$I = 1 - \frac{RMSE^2}{\sigma_v^{\,2}}$



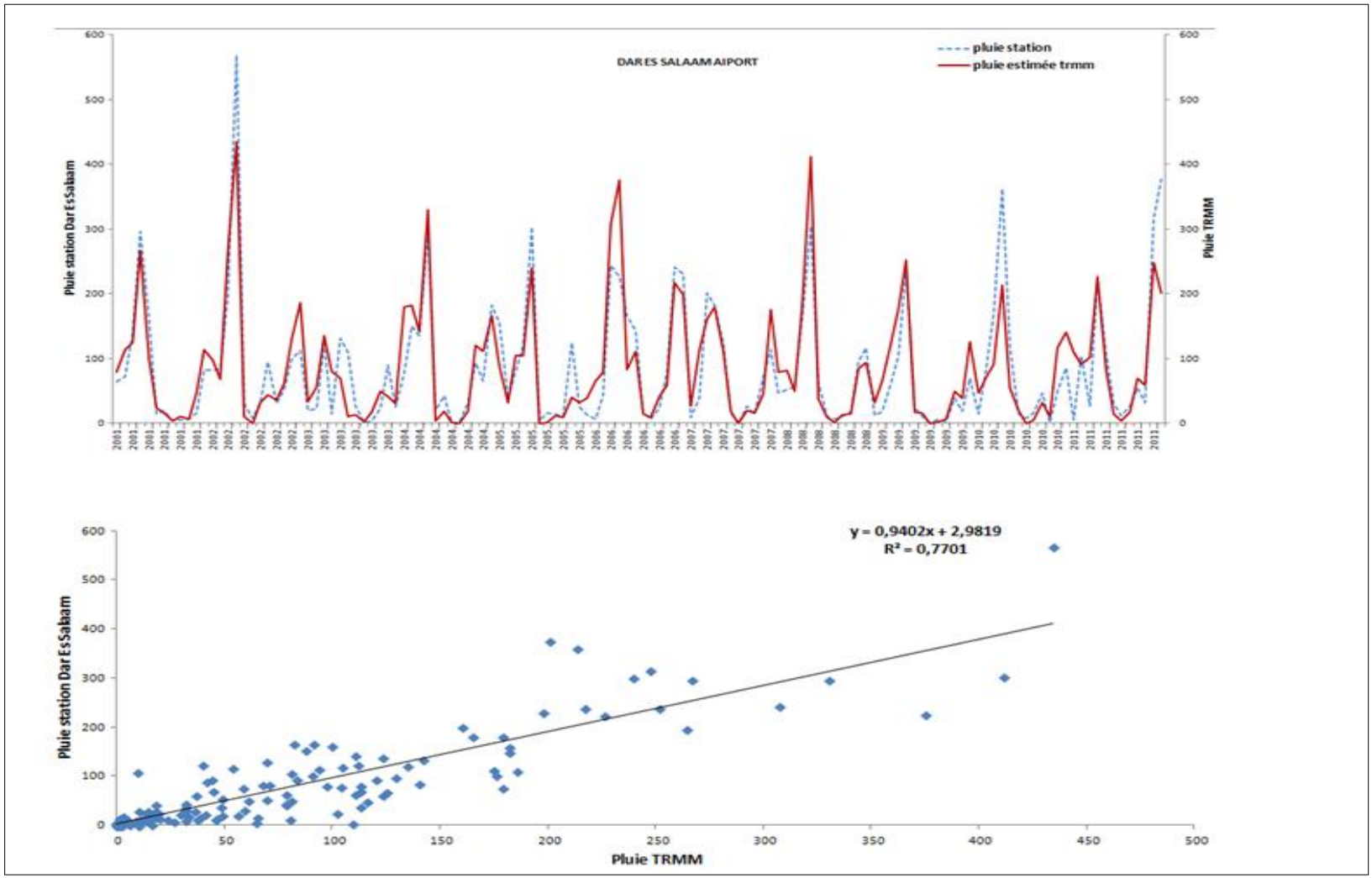
APPENDIX 5

Results of the validation statistical calculations for 11 stations

Stations	statistical criteria			
	Correlation coefficient	Biais	RSME	Indice de Nash
Wami prison	0,82	-5,28	0,51	0,72
Utete Bonami	0,83	-58	5,61	0,55
Morogo meteo	0,80	-35	3,19	0,63
Hombolo agromet	0,89	-58	14,92	0,72
Lukenge mtibwa	0,65	-37	15,34	0,60
Mlali	0,69	-55,74	14,21	0,68
Kisarawe	0,85	-6	0,59	0,70
Dar Es Salaam	0,91	-33,24	2,89	0,68
Moshi aiport	0,67	2,29	0,22	0,70
Ruhungo	0,61	-26,27	2,41	0,64
Pangani office	0,60	0	0,03	0,80

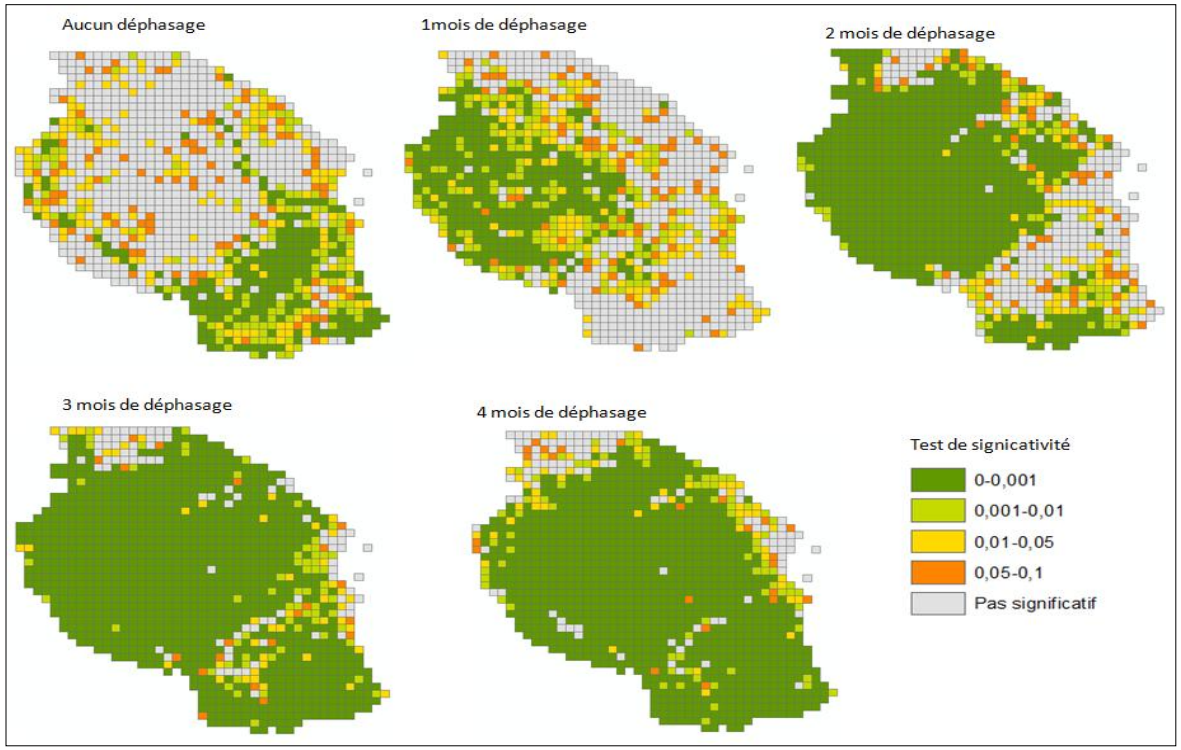
APPENDIX 6

graphic representation of rainfall curves in situ (Dar Es Salaam) and rain estimated by satellite (TRMM)



APPENDIX 7

Test of significativity



To validate the coefficients correlations between vegetation and rainfall, the significance test for each phase is calculated. The purpose is to see if the variables (NDVI and rainfall) are significantly related or not. We calculate the value of each P_Value correlation: The higher the P-value is smaller, it is indisputable that the variables are related or that the means differ. By convention, often sets the threshold of 5% (0.05). So if the P-value is less than 0.05, we can say with not too likely to mislead that the variables are related.

- From zero month phase, the variables are interrelated it in the south and far west.
- 1.2 months of phase: the rain and vegetation are related in the western, northern, central and far south.
- Over 3 months: the variables are very well connected in the whole country, except the part (Lake Victoria) and the far east (Dar Es Salaam)

APPENDIX 8

Rain Use Efficiency: RUE (l'éficacité des pluies)

Another way to study the RAIN-NDVI relationship was implemented by calculating an efficiency index Rainfall: RUE (Rain Use Efficiency) .The RUE was defined by the Houérou (1984) as ratio of Net Primary Production (NPP. Net Primary Production, in English) and the annual rainfall. Two main factors can affect RUE: the types of vegetation and soil types (Prince et al, 1998) spin the reels.If RUE is important, it means that the vegetation is efficient in the use of rain it receives .

$$\mathbf{RUE}=\frac{\boldsymbol{Monthly\ MODIS\ NDVII}}{\boldsymbol{Monthly\ TRMM}}$$

APPENDIX 9

Presentation

Names: Guy BOUSSOUGOU BOUSSOUGOU,
PhD student the third year of geography of University of La Réunion (France)

My thesis deal on the " **Interaction between climate variability, vegetation and agricultural activity in Tanzania by remote sensing**"

The main objective: **Detect and analyze by remote sensing rapid changes in surface states in forest environments in relation to agro-population dynamics and climate variability**

To meet this primary objective, three objective will be followed in the study:

- ❑ **Relations rain and vegetation cover from 2001 to 2013 the whole of Tanzania (large scale) (poster symposium ESA, 2016)**
- ❑ **Land use dynamics and human pressure on forest reserves Pugu and Kazimzumbwi (local scale)**
- ❑ **Risk analysis and future scenarios of vulnerability of forest surfaces faces climate change and the intensification of human activities (local scale)**

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