Economic Shocks and Civil Conflict:
An Instrumental Variables Approach
African Rainfall Data Set

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1. OVERVIEW

This document is intended to accompany the mss_africa_rainfall.dta stata data file. It is more limited than the general mss_repdata data manual in that it restricts itself to a description of the rainfall data collected for "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," only.

The mss_africa_rainfall file differs further from the more general mss_repdata file in that it provides all of the rainfall data that was collected for Africa. More specifically, first, while the mss_repdata file provides rainfall observations for the years 1981 to 1999, i.e. the years used in "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," the mss_africa_rainfall file provides rainfall data for the years 1979 to 2001 for the three satellite-based measures, GPCP, NCEP, and NDVI. And, for FAOCLIM2, rainfall data is provided from the first year of independence of each country until the early 1990's, the exact end year varying by country.

Second, rainfall data for Equatorial Guinea is not contained in the more general mss_repdata file, as control data were missing for Equatorial Guinea and thus this country was not part of the sample of countries examined in "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." The rainfall data for Equatorial Guinea, however, is available and that data is provided with the mss_africa_rainfall file.

This manual is organized as follows. In section 2, we provide a description of our four rainfall measures and an explanation of the methodology used to construct each. In section 3, we provide a detailed description of each variable in the set. And, in appendix A, we list all latitude and longitude points used to generate two of the four rainfall measures, the GPCP and NCEP measures.

2. RAINFALL DATA & CONSTRUCTION OF THE RAINFALL MEASURES

We employ four rainfall data sets:

    A. Global Precipitation Climatology Project (GPCP)

       http://cics.umd.edu/GPCP

    B. National Centers for Environment Prediction (NCEP)

       http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.Merged
       _Analysis/.monthly/

    C. U.N. Food and Agricultural Organization Climatic (FAOCLIM2) Data

       CD-ROM: World-Wide Agroclimatic Database.

       FAO-Agrometeorology Group, Rome 2000.

    D. Normalized Difference Vegetation Index (NDVI)

       http://edcw2ks21.cr.usgs.gov/adds/

A. Global Precipitation Climatology Project (GPCP) Data Set

       The Global Precipitation Climatology Project (GPCP) database of rainfall estimates stretches back to 1979. The GPCP data rely on a combination of actual weather station rainfall gauge measures and satellite information on the density of cold cloud cover, which is closely related to actual precipitation. The GPCP uses the Huffman et al. (1995, 1997) method of data selection and merging.

       Estimates are made at 2.5 latitude and longitude degree intervals. The units of measurement are in millimeters of rainfall per day and are the average

per month. We multiply each monthly average by the number of days in a given

month, which gives us an estimate of total monthly rainfall.[1] We then add up all

of the total monthly estimates in a given year to generate an estimate of total

yearly rainfall for each 2.5 latitude / longitude degree node. For example, the

yearly rainfall estimate for any 2.5 latitude / longitude degree node in 1999 was

calculated as follows:

y1999 = a9901*31 + a9902*28 + a9903*31 + a9904*30 + a9905*31 + a9906*30 + a9907*31 +

a9908*31 + a9909*30 + a9910*31 + a9911*30 + a9912*31

where aYYMM is the average daily rainfall in millimeters for month MM and year YY taken from

the GPCP data set

Next, each yearly rainfall estimate per 2.5 latitude / longitude degree node

is averaged over all nodes in a given country to produce an estimate of total

yearly rainfall per country. For example, our estimate of total yearly rainfall for

Kenya is the average of the yearly rainfall estimates for the eight 2.5 latitude /

longitude degree nodes in Kenya. See Appendix A for a listing of all nodes used

in the calculation of the each country's rainfall estimates.

(Note: No degree grid node fell within the national boundaries for five small

African countries – Burundi, Djibouti, Gambia, Guinea-Bissau, and Rwanda. In

these cases, we assigned the rainfall measures from the nearest node(s) to their

borders. See Appendix A.)

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[1] Note that the following years contained a leap year: 1980, 1984, 1988, 1992, 1996, and 2000. For these
years, we multiplied the average daily rainfall for February by 29 days instead of 28 days.

B. National Centers for Environment Prediction (NCEP) Data Set

This data set is essentially similar to the GPCP data set presented above. It differs in that it uses the Xie and Arkin (1997) method of data selection and merging. The construction of the total yearly estimates per country is identical to the one used with the GPCP.

C. U.N. Food and Agricultural Organization Climatic (FAOCLIM2) Data

The FAOCLIM2 data set relies solely on gauge measures. Data are available starting in the early 1800's for some countries. Unfortunately, rain gauge coverage becomes increasingly limited after 1990, and especially after 1996, leading to missing observations.

The units of measurement are in millimeters of rainfall per month per gauge station. We first calculate the average rainfall per month for the entire country by taking the average of the rainfall per month measurements across gauge stations. We then add up all of the country monthly averages in a given year to generate our measure of total yearly rainfall per country.

(Note: It is often the case that data are not available for many gauge stations. That is, the total number of gauge stations used to calculate the average rainfall per month is not constant. Therefore, we include an additional variable in our data set, sm_obs, the total number of station-month FAOCLIM2 observations per

year per country, to provide an estimate of the degree of precision of the total yearly rainfall per country measure.)

D. Normalized Difference Vegetation Index (NDVI) Data Set

The Normalized Difference Vegetation Index (NDVI) database of rainfall estimates also stretches back to 1979. NDVI provides a measure of the living green plant biomass on the surface of the Earth. It differs, therefore, from the other measures that employ satellite imaging, GPCP and NCEP, in that it estimates vegetation on the Earth and not the density of cold cloud cover. Nevertheless, NDVI is closely related to rainfall, with a correlation of 0.9. We do not actively employ this measure in our paper, however, as vegetation levels may be a function of crop choices made in response to civil conflict, and thus could be endogenous to the conflict.

The methodology used to construct the total yearly estimates per country is similar to the one used with GPCP and NCEP. The major difference is, with NDVI, we use latitude and longitude intervals of 1 degree and estimates are made per dekad (roughly 10 days), whereas, with GPCP and NCEP, we use latitude and longitude intervals of 2.5 degrees and estimates are made per month.

Like before, first, we add up all of the total dekad estimates in a given year to generate an estimate of total yearly rainfall for each 1 degree latitude / longitude node. And, next, each yearly rainfall estimate per 1 degree latitude /

longitude node is averaged over all nodes in a given country to produce an estimate of total yearly rainfall per country.

Finally, note, in our paper we focus on the GPCP dataset over the other four. First, as mentioned above, NDVI may suffer from endogenity.   Second, of the three remaining sources, GPCP is the only one that at the same time: includes both gauge and satellite data; corrects for systematic errors in gauge measures; and rejects gauge measures thought to be unreliable (Rudolf 2000).

3. THE MSS Civil War Data Set – Variable Descriptions

0. Identification Variables

CCODE
Correlates of War (COW) Country Code

YEAR
From 1981 or the first year of independence of the country

COUNTRY_NAME
Country Name

COUNTRY_CODE
Secondary Country Code. Often but not always the same as the World Bank Country Code

1. Rainfall Variables

A. Global Precipitation Climatology Project (GPCP) and Derived

GPCP
Global Precipitation Climatology Project estimate of average precipitation in millimeters per year. The exact source was NASA GPCP V2. It uses the Huffman et al. (1995, 1997) method of data selection and merging. See section 2 for an explanation of the methodology used to construct this measure.
Source: Global Precipitation Climatology Project (GPCP)

GPCP_L
GPCP lagged one year

GPCP_L2
GPCP lagged two years

GPCP_G
GPCP growth: (GPCP - GPCP_l) / (GPCP_l)

GPCP_G_L
GPCP growth lagged one year: (GPCP_l - GPCP_l2) / (GPCP_l2)

GPCP_G_FL
GPCP growth lagged forward one year:

GPCP_g_fl = GPCP_g[_n+1] if ccode==ccode[_n+1]

GPCP_D
GPCP first difference: (GPCP – GPCP_l)

GPCP_D_L
GPCP first difference lagged one year: (GPCP_l – GPCP_l2) / (GPCP_l2)

GPCP_DF_MEAN
GPCP difference from the mean (of the 1979 to 2001 observations)

GPCP_DF_MEAN_1
GPCP_df_mean lagged one year

GPCP_DF_MEAN_2
GPCP_df_mean lagged two years

B. National Centers for Environment Prediction (NCEP) and Derived

NCEP
National Centers for Environment Prediction (NCEP) estimate of average precipitation in millimeters per year. The exact source was NOAA NCEP CPC Merged Analysis. It uses the Xie and Arkin (1997) method of data selection and merging. See section 2 for an explanation of the methodology used to construct this measure.
Source: National Centers for Environment Prediction (NCEP)

NCEP_L
NCEP lagged one year

NCEP_L2
NCEP lagged two years

NCEP_G
NCEP growth: (NCEP - NCEP_l) / (NCEP_l)

NCEP_G_L
NCEP growth lagged one year: (NCEP_l - NCEP_l2) / (NCEP_l2)

NCEP_G_FL
NCEP growth lagged forward one year:
NCEP_g_fl = NCEP_g[_n+1] if ccode==ccode[_n+1]

NCEP_D
NCEP first difference: (NCEP – NCEP_l)

NCEP_D_L
NCEP first difference lagged one year: (NCEP_l – NCEP_l2) / (NCEP_l2)

NCEP_DF_MEAN
NCEP difference from the mean (of the 1979 to 2001 observations)

NCEP_DF_MEAN_1
NCEP_df_mean lagged one year

NCEP_DF_MEAN_2
NCEP_df_mean lagged two years

C. U.N. FAO Climatic (FAOCLIM2) Database and Derived

SM_OBS
Number of Station-Month observations used in the calculation of the FAO
average precipitation in millimeters per year index.
Source: FAOCLIM2

FAO
FAO Climatic (FAOCLIM2) Database estimate of average precipitation in
millimeters per year. See section 2 for an explanation of the methodology used
to construct this measure.
Source: FAOCLIM2

FAO_L
FAO lagged one year

FAO_L2
FAO lagged two years

FAO_G
FAO growth: (FAO - FAO_l) / (FAO_l)

FAO_G_L
FAO growth lagged one year: (FAO_l - FAO_l2) / (FAO_l2)

FAO_G_FL
FAO growth lagged forward one year:
FAO_g_fl = FAO_g[_n+1] if ccode==ccode[_n+1]

FAO_D
FAO first difference: (FAO – FAO_l)

FAO_D_L
FAO first difference lagged one year: (FAO_l – FAO_l2) / (FAO_l2)

FAO_DF_MEAN
FAO difference from the mean (of the 1960 to the latest available observations)

FAO_DF_MEAN_1
FAO_df_mean lagged one year

FAO_DF_MEAN_2
FAO_df_mean lagged two years

D. Normalized Difference Vegetation Index (NDVI) and Derived

NDVI
Normalized Difference Vegetation Index (NDVI) estimate of the density of plant life, closely related to rainfall in Africa. See section 2 for an explanation of the methodology used to construct this measure.
Source: Normalized Difference Vegetation Index (NDVI)

NDVI_L
NDVI lagged one year

NDVI_L2
NDVI lagged two years

NDVI_G
NDVI growth: (NDVI - NDVI_l) / (NDVI_l)

NDVI_G_L
NDVI growth lagged one year: (NDVI_l - NDVI_l2) / (NDVI_l2)

NDVI_G_FL
NDVI growth lagged forward one year:
NDVI_g_fl = NDVI_g[_n+1] if ccode==ccode[_n+1]

NDVI_D
NDVI first difference: (NDVI – NDVI_l)

NDVI_D_L
NDVI first difference lagged one year: (NDVI_l – NDVI_l2) / (NDVI_l2)

NDVI_DF_MEAN
NDVI difference from the mean (of the 1982 to 2001 observations)

NDVI_DF_MEAN_1
NDVI_df_mean lagged one year

NDVI_DF_MEAN_2
NDVI_df_mean lagged two years

4. References

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Appendix A: Longitude and latitude points used in the calculation of the GPCP and NCEP yearly rainfall estimates

Country	Node	Longitude Point	Latitude Point
1. Angola	1	13.75 E	16.25 S
	2	13.75 E	13.75 S
	3	13.75 E	8.75 S
	4	13.75 E	6.25 S
	5	16.25 E	16.25 S
	6	16.25 E	13.75 S
	7	16.25 E	11.25 S
	8	16.25 E	8.75 S
	9	16.25 E	6.25 S
	10	18.75 E	16.25 S
	11	18.75 E	13.75 S
	12	18.75 E	11.25 S
	13	18.75 E	8.75 S
	14	21.25 E	16.25 S
	15	21.25 E	13.75 S
	16	21.25 E	11.25 S
	17	21.25 E	8.75 S
	18	23.75 E	11.25 S
2. Benin	1	1.25 E	11.25 N
3. Botswana	1	21.25 E	26.25 S
	2	21.25 E	23.75 S
	3	21.25 E	21.25 S
	4	21.25 E	18.75 S
	5	23.75 E	23.75 S
	6	23.75 E	21.25 S
	7	23.75 E	18.75 S
	8	26.25 E	23.75 S
	9	26.25 E	21.25 S
4. Burkina Faso	1	3.75 W	11.25 N
	2	1.25 W	11.25 N
	3	1.25 W	13.75 N
5. Burundi	1	28.75 E	3.75 S
	2	31.25 E	3.75 S
6. Cameroon	1	11.25 E	3.75 N
	2	11.25 E	6.25 N
	3	13.75 E	3.75 N
	4	13.75 E	6.25 N
	5	13.75 E	8.75 N
7. Central African Republic	1	16.25 E	3.75 N
	2	16.25 E	6.25 N
	3	18.75 E	6.25 N
	4	21.25 E	6.25 N
	5	21.25 E	8.75 N
	6	23.75 E	6.25 N
	7	26.25 E	6.25 N

Country	Node	Longitude Point	Latitude Point
8. Chad	1	13.75 E	13.75 N
	2	16.25 E	8.75 N
	3	16.25 E	11.25 N
	4	16.25 E	13.75 N
	5	16.25 E	16.25 N
	6	16.25 E	18.75 N
	7	16.25 E	21.25 N
	8	18.75 E	8.75 N
	9	18.75 E	11.25 N
	10	18.75 E	13.75 N
	11	18.75 E	16.25 N
	12	18.75 E	18.75 N
	13	18.75 E	21.25 N
	14	21.25 E	11.25 N
	15	21.25 E	13.75 N
	16	21.25 E	16.25 N
	17	21.25 E	18.75 N
	18	23.75 E	16.25 N
	19	23.75 E	18.75 N
9. Congo, Brazzaville	1	11.25 E	3.75 S
	2	13.75 E	3.75 S
	3	16.25 E	1.25 S
	4	16.25 E	1.25 N
10. Congo, Kinshasa	1	16.25 E	3.75 S
	2	18.75 E	6.25 S
	3	18.75 E	3.75 S
	4	18.75 E	1.25 S
	5	18.75 E	1.25 N
	6	18.75 E	3.75 N
	7	21.25 E	6.25 S
	8	21.25 E	3.75 S
	9	21.25 E	1.25 S
	10	21.25 E	1.25 N
	11	21.25 E	3.75 N
	12	23.75 E	8.75 S
	13	23.75 E	6.25 S
	14	23.75 E	3.75 S
	15	23.75 E	1.25 S
	16	23.75 E	1.25 N
	17	23.75 E	3.75 N
	18	26.25 E	11.25 S
	19	26.25 E	8.75 S
	20	26.25 E	6.25 S
	21	26.25 E	3.75 S
	22	26.25 E	1.25 S
	23	26.25 E	1.25 N
	24	26.25 E	3.75 N
	25	28.75 E	8.75 S
	26	28.75 E	6.25 S

Country	Node	Longitude Point	Latitude Point
10. Congo, Kinshasa (cont.)	27	28.75 E	3.75 S
	28	28.75 E	1.25 S
	29	28.75 E	1.25 N
	30	28.75 E	3.75 N
11. Cote d'Ivoire	1	6.25 W	6.25 N
	2	6.25 W	8.75 N
	3	3.75 W	6.25 N
	4	3.75 W	8.75 N
12. Djibouti	1	41.25 E	11.25 N
	2	43.75 E	11.25 N
13. Equatorial Guinea	1	8.75 E	3.75 N
	2	11.25 E	1.25 N
14. Eritrea	1	38.75 E	16.25 N
	2	41.25 E	13.75 N
15. Ethiopia, pre 1993	1	38.75 E	16.25 N
	2	41.25 E	13.75 N
	3	36.25 E	6.25 N
	4	36.25 E	8.75 N
	5	36.25 E	11.25 N
	6	38.75 E	3.75 N
	7	38.75 E	6.25 N
	8	38.75 E	8.75 N
	9	38.75 E	11.25 N
	10	38.75 E	13.75 N
	11	41.25 E	6.25 N
	12	41.25 E	8.75 N
	13	41.25 E	11.25 N
	14	43.75 E	6.25 N
	15	43.75 E	8.75 N
15a. Ethiopia, post 1993	1	36.25 E	6.25 N
	2	36.25 E	8.75 N
	3	36.25 E	11.25 N
	4	38.75 E	3.75 N
	5	38.75 E	6.25 N
	6	38.75 E	8.75 N
	7	38.75 E	11.25 N
	8	38.75 E	13.75 N
	9	41.25 E	6.25 N
	10	41.25 E	8.75 N
	11	41.25 E	11.25 N
	12	43.75 E	6.25 N
	13	43.75 E	8.75 N
16. Gabon	1	11.25 E	1.25 S
	2	13.75 E	1.25 S
	3	13.75 E	1.25 N
17. Gambia	1	16.25 W	13.75 N
	2	13.75 W	13.75 N
18. Ghana	1	1.25 W	6.25 N
	2	1.25 W	8.75 N

Country	Node	Longitude Point	Latitude Point
19. Guinea	1	13.75 W	11.25 N
	2	11.25 W	11.25 N
	3	8.75 W	8.75 N
	4	8.75 W	11.25 N
20. Guinea-Bissau	1	16.25 W	11.25 N
21. Kenya	1	36.25 E	1.25 S
	2	36.25 E	1.25 N
	3	36.25 E	3.75 N
	4	38.75 E	3.75 S
	5	38.75 E	1.25 S
	6	38.75 E	1.25 N
	7	41.25 E	1.25 S
	8	41.25 E	3.75 N
22. Lesotho	1	28.75 E	28.75 S
23. Liberia	1	351.25 E	6.25 N
24. Madagascar	1	43.75 E	23.75 S
	2	46.25 E	23.75 S
	3	46.25 E	21.25 S
	4	46.25 E	18.75 S
	5	46.25 E	16.25 S
	6	48.75 E	18.75 S
	7	48.75 E	16.25 S
	8	48.75 E	13.75 S
25. Malawi	1	33.75 E	13.75 S
	2	33.75 E	11.25 S
26. Mali	1	1.25 E	16.25 N
	2	1.25 E	18.75 N
	3	3.75 E	16.25 N
	4	3.75 E	18.75 N
	5	11.25 W	13.75 N
	6	8.75 W	13.75 N
	7	6.25 W	11.25 N
	8	6.25 W	13.75 N
	9	6.25 W	23.75 N
	10	3.75 W	13.75 N
	11	3.75 W	16.25 N
	12	3.75 W	18.75 N
	13	3.75 W	21.25 N
	14	3.75 W	23.75 N
	15	1.25 W	16.25 N
	16	1.25 W	18.75 N
	17	1.25 W	21.25 N
27. Mauritania	1	16.25 W	21.25 N
	2	13.75 W	16.25 N
	3	13.75 W	18.75 N
	4	13.75 W	21.25 N
	5	11.25 W	16.25 N
	6	11.25 W	18.75 N
	7	11.25 W	21.25 N

Country	Node	Longitude Point	Latitude Point
27. Mauritania (cont.)	8	348.75	23.75 N
	9	351.25	16.25 N
	10	351.25	18.75 N
	11	351.25	21.25 N
	12	351.25	23.75 N
	13	353.75	16.25 N
	14	353.75	18.75 N
	15	353.75	21.25 N
28. Mozambique	1	33.75 E	23.75 S
	2	33.75 E	21.25 S
	3	33.75 E	18.75 S
	4	33.75 E	16.25 S
	5	36.25 E	18.75 S
	6	36.25 E	16.25 S
	7	36.25 E	13.75 S
	8	38.75 E	16.25 S
	9	38.75 E	13.75 S
	10	38.75 E	11.25 S
29. Namibia	1	13.75 E	21.25 S
	2	13.75 E	18.75 S
	3	16.25 E	26.25 S
	4	16.25 E	23.75 S
	5	16.25 E	21.25 S
	6	16.25 E	18.75 S
	7	18.75 E	28.75 S
	8	18.75 E	26.25 S
	9	18.75 E	23.75 S
	10	18.75 E	21.25 S
	11	18.75 E	18.75 S
30. Niger	1	1.25 E	13.75 N
	2	3.75 E	13.75 N
	3	6.25 E	13.75 N
	4	6.25 E	16.25 N
	5	6.25 E	18.75 N
	6	8.75 E	13.75 N
	7	8.75 E	16.25 N
	8	8.75 E	18.75 N
	9	8.75 E	21.25 N
	10	11.25 E	13.75 N
	11	11.25 E	16.25 N
	12	11.25 E	18.75 N
	13	11.25 E	21.25 N
	14	13.75 E	16.25 N
	15	13.75 E	18.75 N
	16	13.75 E	21.25 N
31. Nigeria	1	3.75 E	8.75 N
	2	3.75 E	11.25 N
	3	6.25 E	6.25 N
	4	6.25 E	8.75 N

Country	Node	Longitude Point	Latitude Point
31. Nigeria (cont.)	5	6.25 E	11.25 N
	6	8.75 E	6.25 N
	7	8.75 E	8.75 N
	8	8.75 E	11.25 N
	9	11.25 E	8.75 N
	10	11.25 E	11.25 N
	11	13.75 E	11.25 N
32. Rwanda	1	28.75 E	1.25 S
	2	31.25 E	1.25 S
33. Senegal	1	16.25 W	13.75 N
	2	16.25 W	16.25 N
	3	13.75 W	13.75 N
34. Sierra Leone	1	11.25 W	8.75 N
35. Somalia	1	41.25 E	1.25 N
	2	43.75 E	1.25 N
	3	43.75 E	3.75 N
	4	46.25 E	3.75 N
	5	46.25 E	6.25 N
	6	46.25 E	8.75 N
	7	48.75 E	6.25 N
	8	48.75 E	8.75 N
	9	48.75 E	11.25 N
36. South Africa	1	18.75 E	33.75 S
	2	18.75 E	31.25 S
	3	21.25 E	33.75 S
	4	21.25 E	31.25 S
	5	21.25 E	28.75 S
	6	23.75 E	33.75 S
	7	23.75 E	31.25 S
	8	23.75 E	28.75 S
	9	23.75 E	26.25 S
	10	26.25 E	33.75 S
	11	26.25 E	31.25 S
	12	26.25 E	28.75 S
	13	26.25 E	26.25 S
	14	28.75 E	31.25 S
	15	28.75 E	26.25 S
	16	28.75 E	23.75 S
	17	31.25 E	28.75 S
	18	31.25 E	23.75 S
37. Sudan	1	23.75 E	8.75 N
	2	23.75 E	11.25 N
	3	23.75 E	13.75 N
	4	26.25 E	8.75 N
	5	26.25 E	11.25 N
	6	26.25 E	13.75 N
	7	26.25 E	16.25 N
	8	26.25 E	18.75 N
	9	26.25 E	21.25 N

Country	Node	Longitude Point	Latitude Point
37. Sudan (cont.)	10	28.75 E	6.25 N
	11	28.75 E	8.75 N
	12	28.75 E	11.25 N
	13	28.75 E	13.75 N
	14	28.75 E	16.25 N
	15	28.75 E	18.75 N
	16	28.75 E	21.25 N
	17	31.25 E	6.25 N
	18	31.25 E	8.75 N
	19	31.25 E	11.25 N
	20	31.25 E	13.75 N
	21	31.25 E	16.25 N
	22	31.25 E	18.75 N
	23	31.25 E	21.25 N
	24	33.75 E	6.25 N
	25	33.75 E	8.75 N
	26	33.75 E	11.25 N
	27	33.75 E	13.75 N
	28	33.75 E	16.25 N
	29	33.75 E	18.75 N
	30	33.75 E	21.25 N
	31	36.25 E	13.75 N
	32	36.25 E	16.25 N
	33	36.25 E	18.75 N
	34	36.25 E	21.25 N
38. Swaziland	1	31.25 E	26.25 S
39. Tanzania	1	31.25 E	6.25 S
	2	31.25 E	3.75 S
	3	31.25 E	1.25 S
	4	33.75 E	8.75 S
	5	33.75 E	6.25 S
	6	33.75 E	3.75 S
	7	33.75 E	1.25 S
	8	36.25 E	11.25 S
	9	36.25 E	8.75 S
	10	36.25 E	6.25 S
	11	36.25 E	3.75 S
	12	38.75 E	8.75 S
	13	38.75 E	6.25 S
40. Togo	1	1.25 E	6.25 N
	2	1.25 E	8.75 N
41. Uganda	1	31.25 E	1.25 N
	2	31.25 E	3.75 N
	3	33.75 E	1.25 N
	4	33.75 E	3.75 N
42. Zambia	1	23.75 E	16.25 S
	2	23.75 E	13.75 S
	3	26.25 E	16.25 S
	4	26.25 E	13.75 S

Country	Node	Longitude Point	Latitude Point
42. Zambia (cont.)	5	28.75 E	16.25 S
	6	28.75 E	13.75 S
	7	28.75 E	11.25 S
	8	31.25 E	13.75 S
	9	31.25 E	11.25 S
	10	31.25 E	8.75 S
43. Zimbabwe	1	26.25 E	18.75 S
	2	28.75 E	21.25 S
	3	28.75 E	18.75 S
	4	31.25 E	21.25 S
	5	31.25 E	18.75 S
	6	31.25 E	16.25 S