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Data Article

Dataset on the current state of air pollution in Bussau-Guinea Bussau: A diagnostic approach

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ABSTRACT

Recent UN report shows that over 100,000 people die from air pollution. The general anthropoenic pollution from Sahara desert, fossil-fuel engines and bush-burning needs to be reduced to avoid natural accidents, regional climate change etc. A fifteen years dataset was obtained from the Multi-angle Imaging Spectro-Radiometer (MISR). The dataset generated from the primary dataset would assist to understand the state of air pollution over Bussau. It also serves as a reference to guide the choice of ground measuring equipments in the area. The aerosol constant and tunning constant over Bussau is 0.6694 and 0.1354 respectively. The maximum percentage aerosol loading is given as 14.8%.

Specifications table

Subject area	Air Pollution
More specific subject area	Aerosol loading and Retention
Type of data	Table and figure
How data was acquired	Multi-angle Imaging Spectro-Radiometer (MISR).
Data format	Raw and analyzed

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Experimental factors	Aerosol Optical Depth
Experimental features	Measurement at 550 nm
Data source location	Bussau
Data accessibility	Multi-angle Imaging Spectro-Radiometer

Value of the data

- The data gives a good background for further study on aerosol loading.
- The data provides technician necessary insight towards configurating sun-photometer over Bussau.
- The data helps to quantify the extent of air pollution.
- The data provides modeller necessary insight on aerosol loading and retention challenges over Bussau.

1. Data

The unique distribution of aerosols over the West African region in the last decade is evident in its diverse effects on life forms, regional meteorology [1] and the ozone layer. The satellite imagery of aerosols loading over West Africa from 2000 to 2015 show the implication of the impact of anthropogenic air pollution on human health, agricultural produce, thermal comfort and climate perturbations. Massive aerosols deposition into the atmosphere can contribute to the anthropogenic radiative forcing of climate [2,3]. Moreover, the residence time of emitted aerosols show how significant the climatic influences of aerosols are most important in the immediate vicinity of the source regions [4,5]. The current danger in most parts of West Africa is the non-availability of ground station to monitor aerosols properties and air pollution. Most research in the West African region is based on satellite observations.

The primary data was obtained from Multi-angle Imaging Spectro-Radiometer (MISR) i.e. found in Table 1. The tunning and atmospheric constants for fifteen was obtained using the West African regional scale dispersion model (WASDM) from the AOD dataset (Figs. 2 and 3). The tunning and

Table 1
Statistical analysis of AOD over research site.

	2000	2001	2002	2003	2004	2005	2006
Number of values	8	10	10	10	10	9	11
Minimum	0.26	0.25	0.29	0.1	0.23	0.23	0.28
Maximum	1.89	0.92	1.16	1.21	1.35	1.1	0.81
Mean	0.67	0.59	0.69	0.6	0.61	0.68	0.52
Standard error	0.18	0.08	0.11	0.11	0.11	0.09	0.06
Standard deviation	0.52	0.25	0.36	0.36	0.35	0.28	0.2
Coefficient of variation	0.77	0.43	0.52	0.6	0.57	0.41	0.38
	2007	2008	2009	2010	2011	2012	2013
Number of values	10	8	11	10	11	10	10
Minimum	0.29	0.47	0.25	0.21	0.25	0.3	0.28
Maximum	1.38	1.26	1.17	0.82	0.93	1.44	1.01
Mean	0.64	0.85	0.64	0.5	0.58	0.59	0.58
Standard error	0.13	0.1	0.09	0.07	0.06	0.11	0.07
Standard deviation	0.4	0.28	0.28	0.21	0.2	0.36	0.21
Coefficient of variation	0.62	0.33	0.45	0.41	0.34	0.6	0.36

Fig. 1. Geographical map of Bussau.

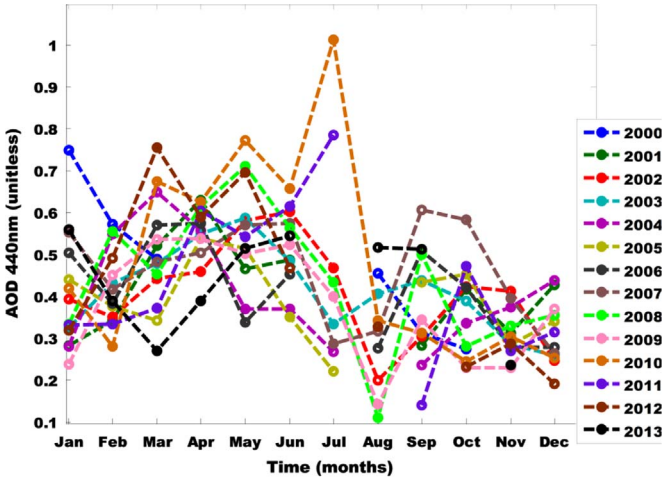

Fig. 2. AOD pattern for Bussau 2000–2013.

atmospheric constants are factors that determines the accuracy of ground instruments e.g. sun photometer [6,7] and they are presented in Table 2. The secondary dataset i.e. aerosol loading was generated using the extended WASDM are presented in Table 3.

2. Experimental design, materials and methods

Guinea Bissau is located on latitude 11°N to 12°N and longitude 14°W to 15°W. It is bounded within an approximate total area of 36,125 km^2. Guinea Bissau geographical structure includes low coastal plain, Guinean mangroves and forest. Its climate is hot, dry, dusty harmattan haze in the dry

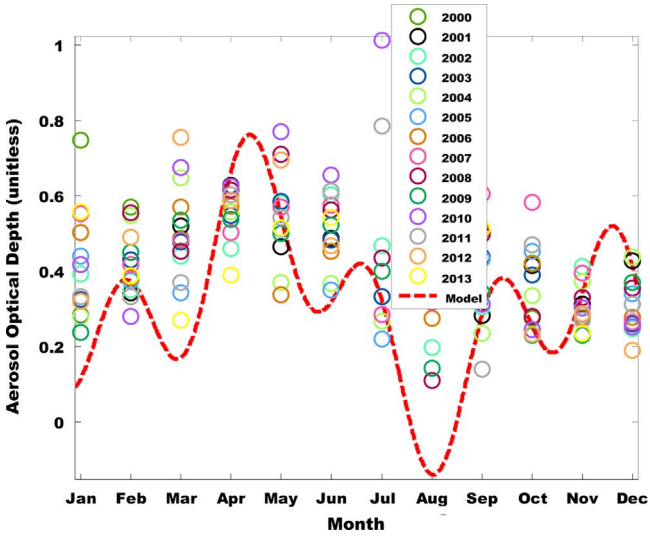

Fig. 3. AOD for new model and MISR (Bussau, 2000–2013).

Table 2
Atmospheric constants over Bussua.

Location	a_1	a_2	n_1	n_2	α	B
Bussau	0.6135	0.6694	0.1354	0.347	$\frac{\pi}{4}$	$\frac{\pi}{4}$

season, and warm and humid in the wet season. Its wet season is from June to early October, and the dry season is from December to April. Bussua is located on longitude and latitude of -15.6° and 11.87° (Fig. 1).

The West African regional scale dispersion model (WASDM) for calculating aerosol loading over a region:.

$$\psi(\lambda) = {a_1}^2 \cos\left(\frac{n_1 \pi \tau(\lambda)}{2} x\right) \cos\left(\frac{n_1 \pi \tau(\lambda)}{2} y\right) + \ldots\ldots {a_n}^2 \cos\left(\frac{n_n \pi \tau(\lambda)}{2} x\right) \cos\left(\frac{n_n \pi \tau(\lambda)}{2} y\right) \quad (1)$$

a is atmospheric constant gotten from the fifteen years aerosol optical depth (AOD) dataset from MISR, n is the tunning constant, $\tau(\lambda)$ is the AOD of the area and $\psi(\lambda)$ is the aerosol loading. The analysis of Eq. (1) was done using the C++ codes.

The value of the atmospheric and tuning constant for fifteen years was determine using Eq. (1) over fifteen years data (Figs. 1 and 2). The statistical analysis of the AOD over the research area is shown in Table 1. The value atmospheric and tuning constant i.e. obtained from the comprehensive dataset is shown in Table 2 and the curve fitting technique is shown in Figs. 1 and 2. The secondary dataset i.e. aerosol loading was generated using the extended WASDM (shown in Eq. (1)) are presented in Table 3. The percentage of the highest aerosol loading is shown in Table 4. It is calculated by finding the percentage increase between two consecutive years.

Table 3
Aerosol loading over Bussua.

Month	2000	2001	2002	2003	2004
Jan	0,734765985	0,867898608	0,841672788	0,856936364	0,869979572
Feb	0,80061927	0,86106121	0,850215591	0,833213223	0,798162243
Mar	0,827337404	0,809448697	0,82978118	0,814640664	0,758743056
Apr	0,89151364	0,774691358	0,829408069	0,800100507	0,807725806
May	0,89151364	0,840826496	0,796684202	0,787968924	0,856541712
Jun	0,89151364	0,823492533	0,824463389	0,811697549	0,864515229
Jul	0,89151364	0,89151364	0,827337404	0,867173139	0,877992029
Aug	0,831692315	0,89151364	0,883890793	0,831997952	0,89151364
Sep	0,866823132	0,869126523	0,871091816	0,835806237	0,881344544
Oct	0,874451401	0,850792057	0,830873735	0,843068365	0,865140445
Nov	0,89151364	0,865036736	0,846072742	0,86848423	0,848068955
Dec	0,89151364	0,852435706	0,878141098	0,874086438	0,836935581
Month	**2005**	**2006**	**2007**	**2008**	**2009**
Jan	0,834177041	0,82836097	0,790230852	0,858029946	0,876456644
Feb	0,844627417	0,858662629	0,837228415	0,795550012	0,827574285
Mar	0,855945708	0,787314931	0,818206985	0,824463389	0,808941199
Apr	0,803922839	0,796054829	0,825363734	0,768009384	0,818877544
May	0,816405132	0,866126012	0,799803484	0,729674845	0,823654787
Jun	0,864094476	0,828282503	0,815325887	0,780408196	0,820099605
Jul	0,875087824	0,89151364	0,862813336	0,832150497	0,846475382
Aug	0,89151364	0,871907092	0,865963016	0,888964075	0,886629993
Sep	0,839973512	0,833816485	0,797562242	0,814812231	0,860838673
Oct	0,833011487	0,845938152	0,807993282	0,873660625	0,878141098
Nov	0,87177234	0,872441588	0,855103199	0,860950039	0,877501938
Dec	0,866973432	0,870779603	0,870631879	0,853245413	0,857874754
Month	**2010**	**2011**	**2012**	**2013**	
Jan	0,839802114	0,862867282	0,861680155	0,817982841	
Feb	0,870755018	0,856841843	0,807279162	0,848305643	
Mar	0,748394685	0,848942503	0,705785374	0,871456164	
Apr	0,76688054	0,785540241	0,793773947	0,853678054	
May	0,728384275	0,813088767	0,745509595	0,820210232	
Jun	0,759873159	0,76289584	0,837179661	0,80656232	
Jul	0,616767219	0,718531231	0,89151364	0,89151364	
Aug	0,862597063	0,89151364	0,861282966	0,819378621	
Sep	0,877387621	0,888342508	0,89151364	0,802387938	
Oct	0,875224606	0,830307971	0,876925784	0,89151364	
Nov	0,866772933	0,87208606	0,870353517	0,874339508	
Dec	0,873703433	0,863723734	0,881344544	0,89151364	

Table 4
Percentage of increase of aerosols loading over Nouakchott.

Year	2001	2008	2009	2011
Percentage (%)	10.9	8.1	2.0	14.8

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Transparency document. Supporting information

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