

Urban hydro-meteorological observation data 2016-2018 – Ouagadougou, Burkina Faso

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Summary

This dataset represents the hydro-meteorological monitoring activities undertaken in Ouagadougou, Burkina Faso, during 2016-2018, as part of the DFID funded AMMA-2050 (African Monsoon Multidisciplinary Analysis) project (amma2050.org). The data comprises time series of rainfall, water level and river flow recorded at locations across Ouagadougou city for the purposes of building an understanding of hydrological function and hydrological model development. In-situ data were collected using tipping bucket raingauges and pressure level sensors, with spot gauging of river flows used to develop rating curves used to derive flow from level measurements in channels. The hydro-met network was designed and set-up by the UK Centre for Ecology and Hydrology (UKCEH) with the Burkina Faso Institut International d'Ingenierie de l'Eau et de l'Environnement (2IE) and processing was undertaken by UKCEH. There are a number of data gaps due to equipment malfunction and periods between dry seasons when PLS were withdrawn.

Experimental design and sampling regime

An overview of the experimental design and sampling regime is provided in Table 1 which cover the in-situ monitoring equipment. The pressure level sensor used was a HOBO MX2001 Bluetooth enabled logger, which enabled download of data using Bluetooth and an associated mobile application. The tipping bucket gages were Casella model with a 0.2mm capability. Spot gauging of flow utilised an MFPro with 5m rod.

Table 1: AMMA-2050 hydro-meteorological meta-data – derived values and units are in brackets.

Site	Equipment	Type	Lat	Lon	Elevation (mASL)	Data start	Data end	Time step	Units
Dam3	PLS	Level	12.390	-1.501	295	01/06/2016	24/11/2018	1 hour	m
Zie	Tipping bucket	Rainfall	12.379	-1.502	277	13/07/2016	25/09/2018	15min	mm
Saaba	PLS	Level (flow)	12.313	-1.438	291	01/06/2016	24/11/2018	5 min	m (m ³ /s)
Rimkieta south	PLS	Level (flow)	12.370	-1.578	299	31/05/2016	24/11/2018	5 min	m (m ³ /s)
Rimkieta north	PLS	Level (flow)	12.382	-1.585	296	31/05/2016	03/10/2017	5 min	m (m ³ /s)
Kamboince	Tipping bucket	Rainfall	12.454	-1.558	300	12/08/2016	10/10/2017	15min	mm

A summary of each site is provided:

Dam3 – PLS sensor mounted to pumping station at outlet for dam 3, which represents the most downstream of the central dam systems in central Ouagadougou. Set to measure change in water level relative to bed level at location – which is likely less deep than Dam centre depth. Sampling of depth hourly with monthly inspection of equipment and continuous throughout year. Significant gaps in data due to equipment malfunction – especially level rise in 2017, only QC'd data included.

Zie – Tipping bucket raingauge measuring rainfall throughout the year at 15min timestep. Located in grounds of Zie HQ in Ouagadougou, providing a secure city centre location near to the central dam system with no local obstructions to rainfall.

Saaba – Located in Saaba area, south of Ouagadougou centre, and in tributary of Massili river. PLS mounted at concrete road crossing culvert measuring 12.7m wide by 2m height and with three vertical supports across span. PLS mounted in perforated PVC tube on downstream side of central pillar, located 10cm above bed sediment. Upstream area of 77km² is dominated by mix of low density urban development and bare earth.

Rimkieta South – Located on southern of two major contributing tributaries to west of Ouagadougou centre in Rimkieta area of city. PLS mounted at culvert measuring 12.7m wide by 2.15m height with three vertical supports across span. PLS mounted in perforated PVC tube on downstream side of central pillar, located 10cm above bed sediment. Upstream area of 73km² is dominated by mix of low density urban development near monitoring and bare earth in upper reaches, with notable dam named Boulimougou that causes some minor attenuation.

Rimkieta North - Located on northern of two major contributing tributaries to west of Ouagadougou centre in Rimkieta area of city. PLS mounted at culvert measuring 27.3m wide and 2.5m height with nine vertical supports across span. PLS mounted in perforated PVC tube on downstream side of central pillar, located 10cm above bed sediment. Upstream area of 192km² is dominated by minor low density urban development and bare earth.

Kamboince - Tipping bucket raingauge measuring rainfall throughout the year at 15min time step. Located in grounds of 2ie grounds in Kamboince Ouagadougou, providing a secure northern city location with no local obstructions to rainfall.

Transformation and quality control methods

A rating for the three level-flow sites was obtained for each location by intermittent spot gauging of storm flows using a flow meter to measure velocity and depth across the transects. Flow was derived from monitored depths during storm events using the derived ratings for each location, whereby flow is a function of depth and velocity. Depth was converted to flow across the gauged location by using cross sectional measurements to determine the area of flow and by multiplying this area by the velocity measurement obtained from spot gauging during storms that occurred in the wet seasons over 2016-2017. Erroneous measurements were removed after visual inspection of the rating curve. Final rating curves linking depth to flow were derived for each site and applied to time series depth data in an Oracle database to derive a time series of flow.

Rainfall and dam level data were visually inspected to remove erroneous values.

Data structure and recorded values

Monitoring data comprise 6 csv files with time series of data. A meta data csv file is also provided with a summary of sites.

The three flow files contain three columns: date_time, flow in cubic metres per second, and a missing data index. The minimum flow is zero cubic metres per second. M denotes missing values due to equipment malfunction or QC.

The dam level file contains three columns: date_time, level (mAOD), and a missing data index. The minimum depth is zero metres, but due to siting of the instrument at the dam periphery it is possible the dam draws down lower than the zero level used here. M denotes missing values due to equipment malfunction or QC.

The two rainfall files contain three columns: date_time, rainfall (mm), and a missing data index. The minimum rainfall is 0.2mm in 15 minutes and periods with no rainfall are zero values. M denotes missing values due to equipment malfunction or QC.