RainfallArchive

Rain gauge archive – in-browser app • Hydrogeological Repository

What it does

RainfallArchive compiles every available South African rain gauge record into one monthly database and puts it behind a map. **4 034 gauges and 2.85 million monthly values**, drawn from the DWS and SAWS daily archives and the WR2012 patched series, spanning **1874 to 2014**. Find a gauge by number, by quaternary catchment, or by distance from a town or a coordinate, then compare up to ten at once – record length, seasonality, variability and how much of each record is actually measured.

The three archives do not agree on what a gauge is called. The same gauge appears as **0020780**, **0020780 W** and **0020780W**, and a gauge on a catchment boundary appears twice more under two neighbouring water management areas. Reconciling those names is most of what turns three archives into one database, and it is why 3 084 gauges here carry more than one spelling.

Where the data comes from

Source	Gauges	Period	What it holds
SAWS	1 648	1882–2012	Daily rainfall from the South African Weather Service network, aggregated here to monthly totals. 813 071 gauge-months, 98.3 % of them with no missing day.
DWS	131	1904–2014	Daily rainfall recorded at Department of Water and Sanitation stations, in the same HYDSTRA export format. 70 463 gauge-months, 99.6 % complete.
WR2012	2 956	1874–2011	The WR2012 study's patched monthly rainfall files, in tenths of a millimetre on an October–September year. 1.97 million gauge-months.

WR2012 is the *Water Resources of South Africa 2012* study, at waterresourceswr2012.co.za. The app reports these archives and does not modify or reinterpret them.

Three conversions the numbers depend on

Gauge names are normalised to one canonical number. Upper-cased, with non-alphanumerics removed and a trailing **W** dropped from the seven-digit SAWS numbers – that letter is a record-type marker, not part of the gauge number. So 0020780, 0020780 W and 0020780W are one gauge. A letter that is genuinely part of the number is kept: 0158087A stays distinct from 0158087. Searching by any spelling finds the gauge.

WR2012 values are tenths of a millimetre on an October–September year. The files hold twelve columns per row running October to September, labelled by the starting calendar year, in units of 0.1 mm. They are divided by ten and unwrapped back to calendar months here. Read straight out of the file the values are ten times too large and three months out of place.

A padded zero is not a dry day. The daily files pad periods with no record using 0.00 under quality code 130 – gauge 0020780 is padded that way from 1920 to 1998, sixty-nine years before its record actually starts. Those days are treated as missing, not as dry. Any day whose quality code is 100 or above is dropped, which is what the codes 130, 151, 170, 173 and 255 all mean.

Choosing a source

The three archives overlap, and they are not the same kind of number. Every chart and statistic in the app is computed under one of three modes:

Mode	What it reads
Best available	A complete observed month where one exists, the WR2012 patched value where it does not, and an incomplete observed month only as a last resort. The default.
Observed only	SAWS and DWS daily records aggregated to months, with gaps left as gaps. Nothing modelled or infilled.
WR2012 patched	The WR2012 series alone – continuous over each gauge's record period, but gap-filled and extended rather than measured throughout.

The distinction is not cosmetic. Of four gauges within 50 km of Bloemfontein, the share of months WR2012 flags as patched runs from 1.2 % to 37.8 %. A continuous series from a patched product is a weaker claim than a continuous series of measurements, and the app reports the patched share for every gauge so the difference is visible before the statistics are read.

What you get

Output	Detail
Map	Every mapped gauge over the quaternary catchments, on a street, aerial or hybrid base map, optionally shaded by mean annual precipitation. The symbol says which archive the record comes from. Click to select; Ctrl+click to add; click again to remove; click the map itself to filter to that catchment.
Search	By station number – any spelling – by quaternary catchment, or within 10 to 200 km of one of 1 943 towns or of a coordinate typed in decimal degrees or degrees minutes seconds.
Statistics	Record period, months present, months with no missing day, patched share, complete hydrological years, mean, median, standard deviation, coefficient of variation, the 10th to 90th percentiles, and the driest and wettest years.
Charts	Annual or monthly rainfall, optionally as a cumulative departure from the mean; the long-term monthly means; a box plot of the annual totals; and a coverage chart of how much of each year exists.
Report	A standalone report of the selection – the map, the gauge details, the statistics, every chart and the monthly means – opened in its own tab with Print / Save as PDF and Download HTML buttons. It records which source mode the figures came from and whether any faulty daily readings were counted, since neither is visible in the numbers themselves.
Exports	CSV of the monthly values with their quality columns, the annual totals, the statistics, the monthly means, the search results or the whole gauge catalogue; PNG of the map and of every chart.

Reading the map symbols

Four combinations of source occur among the mapped gauges, and each has a shape of its own. Shape rather than colour, so it survives a greyscale print and leaves colour free to carry mean annual precipitation.

Symbol	Sources	What it means
Circle	SAWS + WR2012	An observed daily record and a patched WR2012 series for the same gauge – 642 gauges.
Diamond	SAWS only	An observed daily record with no WR2012 counterpart – 10 gauges.
Square	DWS only	An observed daily record from a Department of Water and Sanitation station – 131 gauges.
Triangle	WR2012 only	A patched monthly series and no daily record at all – 1 693 gauges, two thirds of what is on the map.

How a run works

Step	What happens
1. Find gauges	Search by number, catchment, town or coordinate, then select on the map or from the list – up to ten at a time.
2. Statistics	Choose the source mode; the record and the annual statistics are tabulated side by side.
3. Rainfall over time	Annual or monthly, raw or as a cumulative departure.
4. Seasonality	The long-term mean of each month, October first.
5. Spread and coverage	The distribution of annual totals, and how much of each year actually exists.
6. Report	Everything above for the current selection, in one printable page.
7. Export	CSV of any part of the selection, or of the whole catalogue.

Why this one is not entirely in your browser

Most apps in this collection download their dataset and compute everything on your machine. This one cannot: the database behind it is 476 MB. The gauge catalogue and the catchment boundaries are downloaded once, and the map, the charts and the statistics are all computed in the browser, but the monthly values for a selection are queried from the server as you select. Nothing about your selection is stored.

What says the compilation is sound

WR2012 and observed values agree to about 1 mm a month. Across the 523 914 months where a gauge has both a complete observed month and a WR2012 value, the mean absolute difference is 1.01 mm and 97.7 % agree within 1 mm. That single comparison confirms the gauge-name matching, the tenths-of-a-millimetre conversion and the October–September unwrapping all at once, because an error in any one of the three would show up as tens of millimetres.

Two further checks: the mean annual precipitation recomputed from the database matches the figure in the WR2012 gauge shapefile to a median of 0.3 mm across 2 335 gauges; and all 8 235 SAWS files were compared by content

hash, confirming that the five batch folders hold five byte-identical copies of 1 648 distinct records rather than five different vintages.

Limitations worth knowing

- 1 558 gauges have no coordinates and cannot be drawn on the map. The cover file lists 3 031 gauges; the rainfall files cover 4 034. Those gauges are found by station number only, and the app labels them as having no position rather than hiding them. The WR2012 gauge shapefile does not fill the gap – it holds the same positions the cover file already has.
- Some daily readings are impossible. 65 months across the database contain a single day above 600 mm, which exceeds the South African daily record; the worst is a DWS station logging 2 723 mm on one day in December 2011. These are kept exactly as recorded and flagged, with a tick box to exclude them. At that gauge, excluding three faulty months moves the mean annual rainfall from 697 mm to 559 mm and the coefficient of variation from 0.97 to 0.23.
- A genuinely wet gauge is not a fault. Gauge 0022030 in the Hottentots-Holland averages 2 600 mm a year legitimately, and eight gauges average under 10 mm because they recorded zeros for years on end.
- The records do not overlap fully. SAWS runs to 2012, DWS to 2014 and WR2012 to the 2009 hydrological year, so a statistic from one is not a like-for-like comparison with another unless the period is matched.
- An annual total is only reported where all twelve months of the hydrological year are present, so a part-year at either end of a record cannot masquerade as a dry year. This is why a gauge with 1 216 months has 99 complete years rather than 101.
- Ten gauges is the limit for one selection. More makes the charts unreadable before it makes them slow.
- The Map (OpenStreetMap) base map may be dropped from an exported PNG by the browser. Aerial and Hybrid export cleanly.

Credit

The records are the work of the South African Weather Service, the Department of Water and Sanitation, and the WR2012 study team. This app compiles and presents their published archives and claims no authorship of them.

Beta. RainfallArchive is published for evaluation and feedback. Check any figure you rely on against the original record before using it in an assessment.