Applying quality control to modelled streamflow data for publication via SEED

Guidelines for modellers: August 2023

Background

Before we upload modelled daily streamflow time series data to the Sharing and Enabling Environmental Data (SEED) portal, we apply quality control to ensure no errors have been inadvertently introduced by the modelling process.

Our quality control process consists of high-level checks to confirm that:

- each streamflow time series has been assigned to the correct gauge
- there are no major anomalies in the modelled data that suggest otherwise.

The quality control process described here does not verify whether model calibration for rainfall-runoff model and river system models used to generate streamflow at selected locations is accurate. We assess calibration accuracy at various stages of model development via other processes.

Overview

Our streamflow data quality control process can have up to 2 stages.

The first stage of our quality control process involves comparing modelled and recorded daily time series (DTS) of streamflow data for each gauge location:

- statistically
- graphically
- visually (by comparing streamflow statistics and data plots).

If the results of these comparisons are satisfactory, no further checks are performed.

If the comparisons show anomalies for any location, we undertake a second stage of checks.

Stage 1 process

We use gauged streamflow data rather than rainfall data for the first stage of checks, as gauged streamflow data necessarily reflects observed rainfall during the high-flow periods this process addresses.

The first stage check is an automated process, which allows us to rapidly assess many sites. The results are easily interpreted.

1. Calculate the modelled average annual flow (ML/yr) across the full simulation period.
2. Calculate the modelled average annual flow (ML/yr) across the period of available gauged data.
3. Calculate the observed average annual runoff (ML/yr and mm/yr) for available catchment areas.
4. Plot the daily flow duration curve (FDC) of modelled data across the period of available records.
5. Plot the daily FDC of recorded data across the period of available records.
6. Plot the daily FDC of the modelled data across the full simulation period.
7. Plot the DTS of observed and modelled data for the first 2 years of observed data.
8. Plot the DTS of observed and modelled flow for 4 independent representative wet/wetter years.
9. Visually compare the average flow statistics and plots:
    i) are modelled data FDCs similar to observed data FDCs at high flow ranges?
    ii) are differences in FDCs at low flow ranges consistent with the degree of river regulation?
    iii) do modelled sample-year DTS replicate recorded flow (event timing and size) well?
    iv) are modelled DTS at low flow ranges consistent with the degree of river regulation?

See examples of plots for comparison.

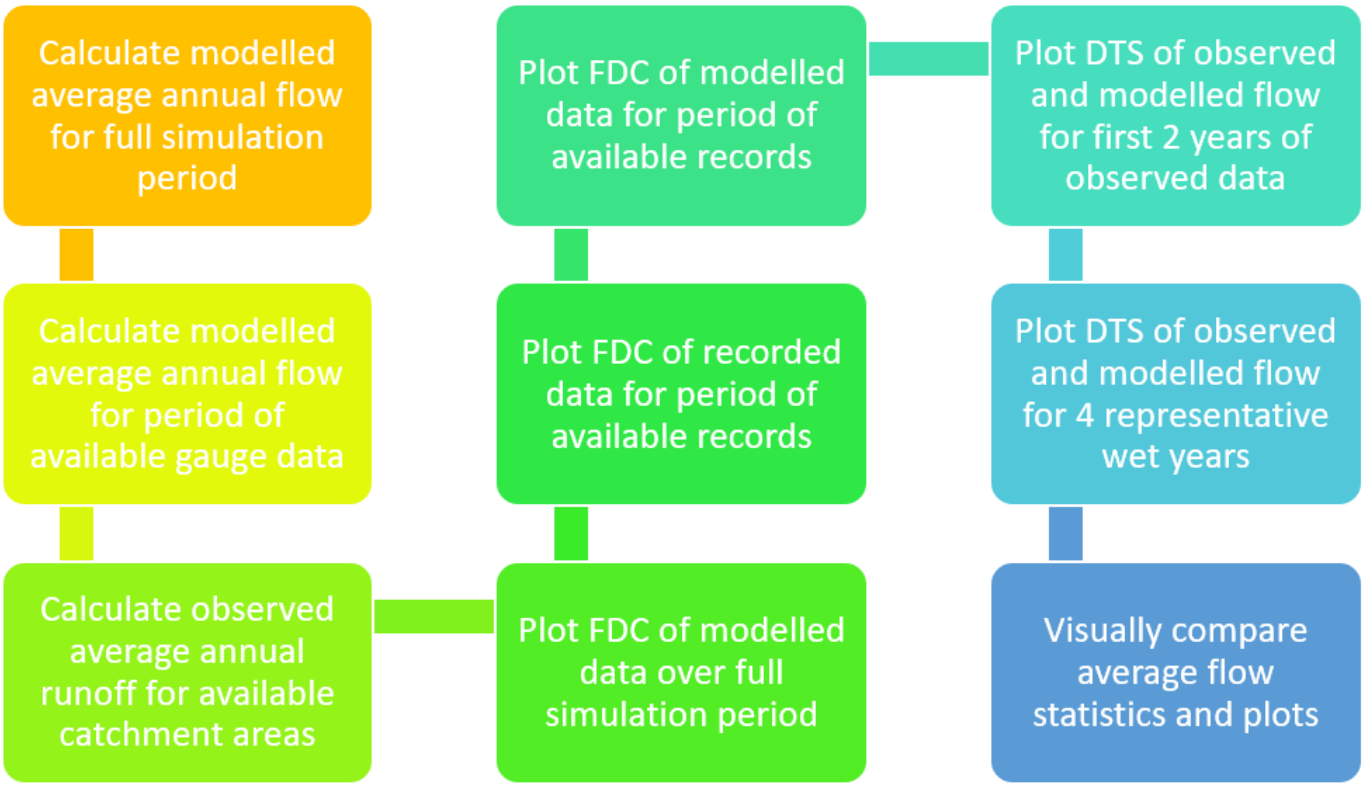

Figure 1: Summary of Stage 1 quality control process

Stage 1 example plots for comparison

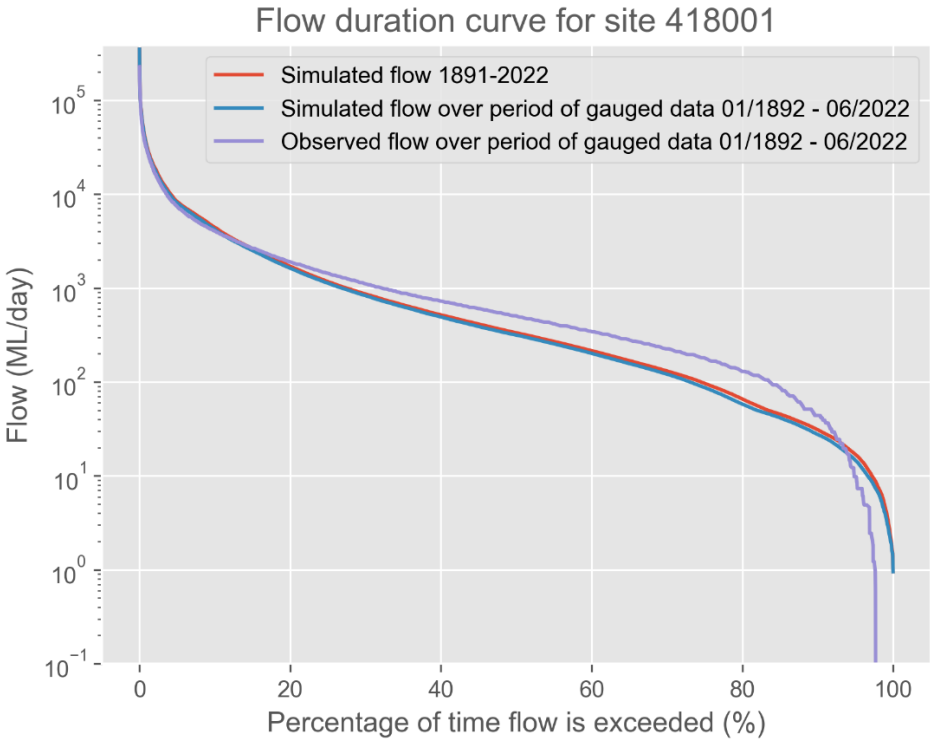

Figure 2: Example of daily FDCs for Stage 1 quality control process

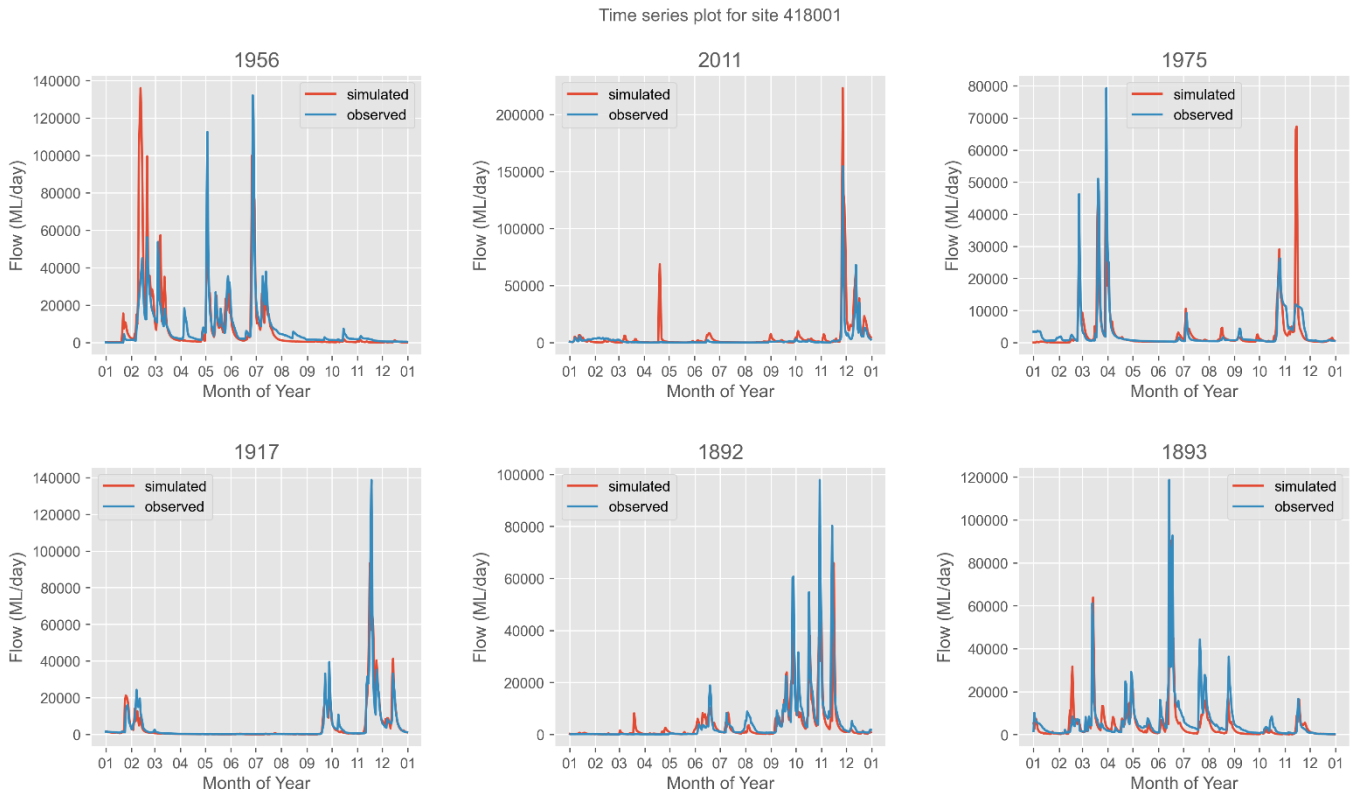

Figure 3: Example of streamflow DTS for Stage 1 quality control checks

Stage 2 process

Stage 2 quality control checks are only required if data anomalies are identified in Stage 1.

We use daily time series rainfall data for Stage 2 checks.

1. To allow like-for-like comparison between observed and modelled data, identify the dates flow regulation commenced.
2. Inspect the time series of observed and estimated flows for years other than the sample years used for Stage 1 analysis.
3. Compare the modelled and observed streamflow DTS by calculating bias, R and R2 for the pre-development period (prior to dam/regulator construction).
   Note, streamflow data quality for a development scenario (for example, annual permitted take long-term average extraction limit (APT LTAAEL), or current conditions) can be checked using this comparison across a regulated period (that is, after dam or regulator construction).
4. Selecting a representative rainfall gauge, plot annual rainfall against annual streamflow and examine plot correlation.