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# **OH Auto Statistical**

***Release 0.8.0+0.g780c8de.dirty***

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Version 0.8

Fully automated flood estimation for UK catchments using the latest revisions to the Flood Estimation Handbook.



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## 1.1 Installation

### 1.1.1 Windows

To install OH Auto Statistical, simply download and run the installer. An internet connection is required during the installation process.

Download OH Auto Statistical for Windows:

OH Auto Statistical is completely stand-alone software: it does not require Python to be installed first and it does not interfere with any existing Python installation.

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**Note:** During the installation process, a complete set of gauged catchment data will be downloaded from the [National River Flow Archive \(NRFA\)](#) for pooled analyses. This may take some time! NRFA data are subject to [terms and conditions](#).

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### 1.1.2 Mac OS and Linux

OH Auto Statistical can be installed on Mac OS and Linux operating systems from [anaconda.org](#) using the [Conda package manager](#):

```
conda install -c https://conda.anaconda.org/openhydrology autostatistical
```

It is recommended to install OH Auto Statistical in its own Conda environment. See the [Conda documentation](#) for details.

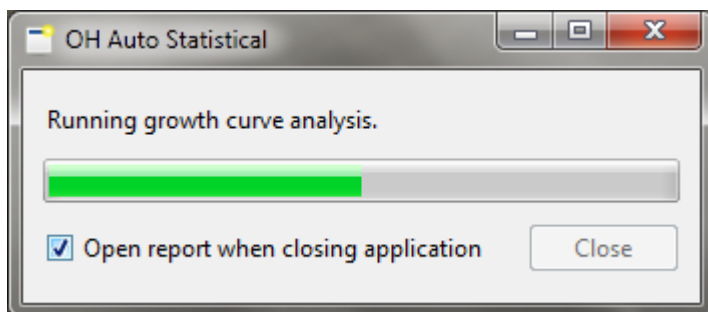
## 1.2 Usage

OH Auto Statistical takes a **catchment descriptors (.CD3 or .xml) file as input data**. The analyses are undertaken without any further user input and a report file is generated containing the calculation details and results.

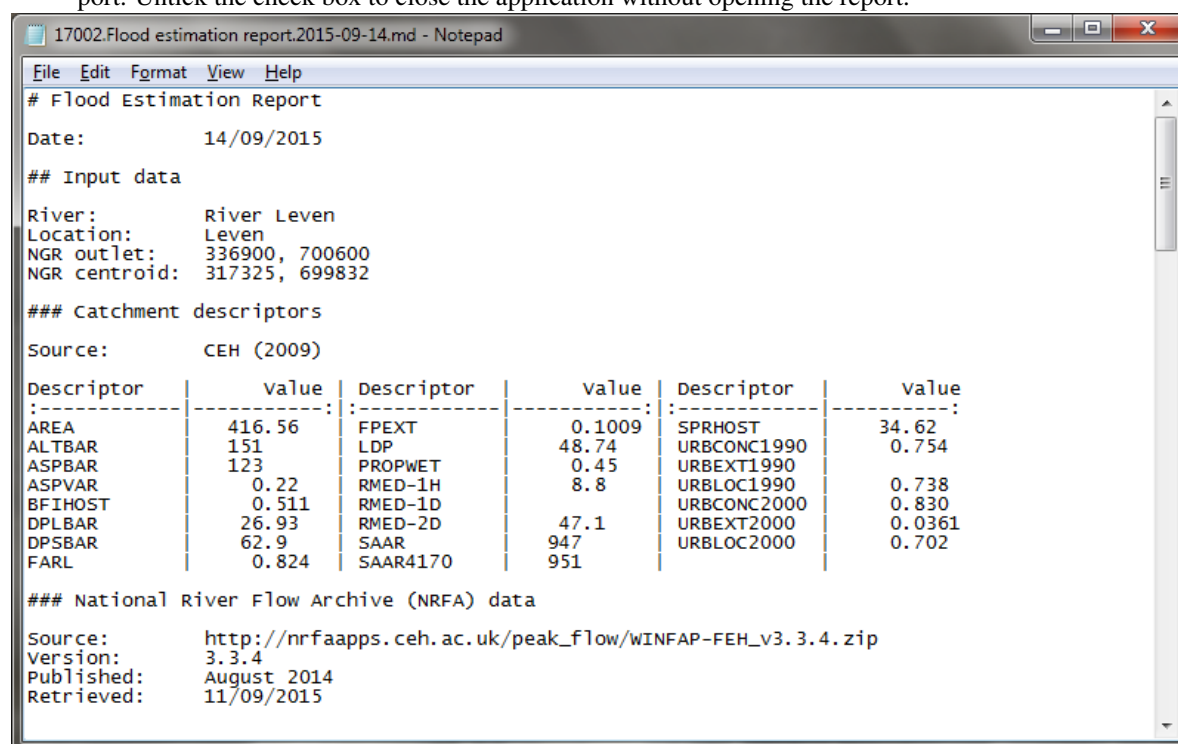
### 1.2.1 Ungauged catchments flood estimation

To undertake an analysis:

1. Export a .CD3 or .xml-file from the [FEH CD-ROM](#) and save it somewhere.
2. Start OH Auto Statistical from the Windows Start Menu.
3. Browse to and select the catchment file to run the analysis.



4. A report is generated and is saved in the same folder as the catchment file with a file name ending with ...Flood estimation report.yyyy-mm-dd.md<sup>1</sup>. Closing OH Auto Statistical will open the report. Untick the check box to close the application without opening the report.



## 1.2.2 Gauged catchments flood estimation

A statistical flood estimation for gauged catchments (“enhanced single site analysis”) is undertaken when an .AM file is saved alongside the catchment file. The files should have the same name (except for the file extension) and be located in the same folder. The process is otherwise exactly the same as for ungauged catchments.

**Tip:** .CD3 and .AM files for gauged catchments (as downloaded from the NRFA (National River Flow Archive )) can be found in the cache folder C:\Users\username\AppData\Local\Open Hydrology\fehdata\Cache on Windows and equivalent locations on other operating systems.

<sup>1</sup> This is a [Markdown \(\\*.md\)](#) file or more precisely a [GitHub Flavoured Markdown file](#). Markdown files are plain text files that can be easily rendered as web pages or other formats.



### 1.2.3 Updating NRFA data

NRFA data are automatically downloaded during the installation of OH Auto Statistical. Before undertaking an analysis, OH Auto Statistical checks whether an NRFA update is available and will download this if necessary. All existing data will be removed before downloading a complete new dataset. This may take a while.

### 1.2.4 Customising the report template

The report template can be customised by placing a file `normal.md` in the folder `C:\Users\<username>\AppData\Local\Open Hydrology\OH Auto Statistical\templates`.

## 1.3 WINFAP-FEH comparison

The table below provides an overview and comparison of features included in OH Auto Statistical vs WINFAP-FEH.

Aspect	OH Auto Statistical	WINFAP-FEH
Input file type	.cd3 and .xml	.cd3
Selection of best method	automatic	manual
Single site analyses	no (no longer a recommended method)	yes
Enhanced single site analyses	yes	yes
Pooling group analyses	yes	yes
Donor and urban adjustment	automatic	manual
Multiple QMED donors	yes	no
Download of NRFA data	automatic	no
Separation of user/NRFA data	yes	no
Create reports	yes	no
Source code	open	closed
Actively developed	yes	no
API available	yes (Python 3.x)	no
Price	free	£ 2,490 excl. VAT
Support	community	6 months

## 1.4 Scientific background

### 1.4.1 Flood Estimation Handbook

The methodologies used by OH Auto Statistical are directly based on the Flood Estimation Handbook (FEH), *the* standard in the United Kingdom for flood flow estimation. The statistical methods for estimating flood flows in the FEH were first revised in 2008 and additional improvements were subsequently published between 2010 and 2014. These latest revisions to the FEH statistical methods are fully incorporated into OH Auto Statistical.

The revisions to the FEH statistical methods are described in the following papers:

- Kjeldsen, T. R., Jones, D. A. & Bayliss, A. C. (2008). *Improving the FEH statistical procedures for flood frequency estimation* (No. SC050050). Bristol: [Environment Agency](#)

- Kjeldsen, T. R. (2010). *Modelling the impact of urbanization on flood frequency relationships in the UK*. Hydrology Research, 41 (5). pp. 391405 doi:10.2166/nh.2010.056
- Kjeldsen, T. R., Jones, D. A. & Morris, D. G. (2014). *Using multiple donor sites for enhanced flood estimation in ungauged catchments*. Water Resour. Res., 50, pp. 66466657 doi:10.1002/2013WR015203.

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**Note:** Why a fully automated implementation?

The FEH recommends and other publications recommend that hydrologist should use expert judgement to improve flood estimates where possible. For example, the most suitable QMED or growth curve donor catchment should be decided based on catchment similarity, local knowledge, other datasets etc. However, as practitioners, hydrologist often do not have access to other data or information not already included in the National River Flow Archive (NRFA). In absence of any additional data, there is a danger that subjective decisions are made which could potentially render the estimates less accurate than purely based on the calibrated national methodologies.

OH Auto Statistical purely follows FEH methodologies taking into account the latest NRFA datasets.

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## 1.4.2 Assumptions

The following assumptions are made by OH Auto Statistical:

- NRFA catchment data are assumed correct, including their indicated suitability for QMED estimation and growth curve pooling.
- QMED adjustment using donors always includes the *URBEXT* parameter (known as “urban adjustment”) to estimate QMED from catchment descriptors. Both for the donor (may include urban catchments) and the subject location.
- QMED donor requirements:
  - Suitable for QMED estimation
  - Same country (as in: UK mainland versus Northern Ireland).
  - At least 10 years of data
  - Not more than 500 km from the subject location.
- Growth curve donor requirements:
  - Suitable for pooling
  - *URBEXT2000* less than 0.03, if provided.
  - At least 10 year of data
- Pooled growth curve donors have at least 500 years of data in total.
- For gauged catchments analysis, the catchment is always used to estimate QMED and is always used in the pooling group regardless whether the catchment is flagged as being suitable for QMED or growth curve donor analyses.
- The Generalised Logistic statistical distribution is used to create a frequency curve. Future versions of OH Auto Statistical will choose the best fitting distribution.

OH Auto Statistical is open source software. [Review the code on GitHub](#).