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**Centre for  
Ecology & Hydrology**

NATURAL ENVIRONMENT RESEARCH COUNCIL

# **PC-IHACRES v1.02**

**Catchment-scale rainfall - streamflow modelling**

**Release Notes (revised)**

**October 2003**



These Release Notes for the downloadable version of PC-IHACRES v1.02 were produced by the Centre for Ecology and Hydrology, Wallingford, UK

**PC-IHACRES v1.02 is an upgrade to v1.0. For the full 94-page User Guide to v1.0 please see the following document.**

Littlewood, I.G, Down, K., Parker, J.R and Post, D.A. (1997). IHACRES v1.0 User Guide. Centre for Ecology and Hydrology, Wallingford, UK & Integrated Catchment Assessment and Management Centre, Australian National University, Canberra, 94pp. (Revised September 2003 for downloadable v1.02.)

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PC-IHACRES v1.02 was developed jointly by the Centre for Ecology and Hydrology, Wallingford (a component organisation of NERC) and the Integrated Catchment Assessment and Management Centre (ICAM), Australian National University (ANU), Canberra.

The software, its 94-page User Guide and set-up details are available free of charge via the online Reference Manual of the Hydrological Operational Multipurpose System (HOMS) maintained by the World Meteorological Organization (WMO). PC-IHACRES v1.02 is Component K22.2.11 and can be down-loaded from the HOMS website at <http://www.wmo.ch/web/homs/homshome.html>. It is also downloadable from the CEH website at <http://www.ceh.ac.uk/>.

The HOMS and CEH websites are the only sources of PC-IHACRES v1.02 material recognised by CEH or ICAM. It is recommended that each user downloads the software and its documentation to their PC separately.

From 2003, no person or organization should pay money for obtaining the PC-IHACRES v1.02 software or its documentation. Any payment made or received for results and /or reports involving application(s) of PC-IHACRES v1.02 by parties other than CEH or ICAM is a matter between the parties involved. Neither CEH nor ICAM accept responsibility for the quality of results obtained using PC-IHACRES v1.02, or for how the results are applied, or for any decisions taken on the basis of such results or reports.

Neither CEH nor ICAM operate a Help Desk facility for PC-IHACRES v1.02. However, although user-experience feedback is most welcome neither CEH nor ICAM undertake to respond to queries related to PC-IHACRES v1.02.

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# **1. Introduction**

## **1.1. Introduction to release notes**

These release notes give an outline of the major changes made to upgrade IHACRES from Version 1.0 to Version 1.02. It is assumed that readers of these release notes are experienced users of the package. Any new users are advised to work through the tutorials in the User Guide supplied with Version 1.0 in order to become familiar with the package.

## **1.2. Background to release of Version 1.02**

The main purpose of the upgrade, to Version 1.02, was to remove minor bugs which had been identified since release of Version 1.0 in February 1997. These are mostly in the area of improving validation of user input and usability. The opportunity was also taken to incorporate some minor, but very useful, improvements to selected software features. A practical limitation was set such that any changes made would not lead to substantial changes in the on-screen appearance of the package or to the User Guide, thus causing minimum impact on existing users. The underlying model structure adopted by IHACRES remains, therefore, unaltered from Version 1.0. The User Guide tutorials also remain valid.

## **1.3. Compatibility of Version 1.0 and Version 1.02 of IHACRES**

Any user files created under Version 1.0 of the software are valid for use with Version 1.02 of the software.

With the exception of some minor cosmetic changes to screen layout (see 2.1.1 and 2.2.1 below), the User Guide supplied with Version 1.0 is also applicable to Version 1.02.

## **1.4. Installation instructions**

PC-IHACRES v1.02 is Component K22.2.11 of the World Meteorological Organization's Hydrological Operational Multipurpose System (HOMS), and can be downloaded free of charge from the HOMS website at <http://www.wmo.ch/web/homs/homshome.html>. It is also downloadable from the CEH website at <http://www.ceh.ac.uk/>.

Please follow instructions given at either website.

## **1.5. Support contact**

Please see *read\_me.pdf* downloaded with PC-IHACRES v1.02 material from either the HOMS or CEH websites

## **1.6. IHACRES - the future**

Based on experience gained from research applications of the IHACRES methodology, we are aware of several areas in which the package could be enhanced hydrologically. IHACRES Classic Plus software is currently being developed at ANU.

# **2. Changes included in Version 1.02**

The changes included in Version 1.02 are documented below. Each change is documented under one of the following headings according to its impact:

- setting up the model run,
- running the model,
- model output.

## **2.1. Setting up the model run**

### ***2.1.1. Configure-Setup-Data description***



In Version 1.0 the following difficulties had been encountered with start dates of the rain/flow and temperature files.

With **Filter using temperature** selected, and **Time base (Temperature)** set to **Monthly**, it is possible (in both Version 1.0 and Version 1.02) to have an earlier **Start date in temperature file** than **Start date in rain/flow file**. However, in Version 1.0 a **Start date in temperature file** later than **Start date in rain/flow file** led to the wrong temperature data being used for analysis. In Version 1.02 a warning message appears if the user tries to specify a later **Start date in temperature file**. (The user may wish to delete rows from the start of the rain/flow file accordingly).

In Version 1.0, with **Time base (Temperature)** set to **Same as rain**, it was possible to enter separate (and conflicting) start dates for the temperature and rain/flow files. This has been changed in Version 1.02 so that when **Time base (Temperature)** is set to **Same as rain**, the dialogue box in **Data description** changes format to require entry of a single date for the start of both the rain/flow and temperature data files, i.e. the rain/flow and temperature data files must start at the same time.

Reference: Section 4.3.6.1 of the User Guide.

### *2.1.2. Configure-Setup-Subperiods & content of the <filename.sum> file*

In Version 1.0, the user had to exit and re-enter the **Subperiods** step before some changes made in **As file offsets** were registered as dates. However, in Version 1.02, any change made in the **As file offset** fields is now registered immediately in the date fields after simply clicking elsewhere in the dialogue box. Similarly, any change made to the dates fields will be reflected in the **As file offsets** fields.

Version 1.0 labelled the first record in the rain/flow file as **Start position 0** (zero) rather than 1. This has now been changed such that, in Version 1.02, the first record in the rain/flow file is now labelled as row (item) 1; (zero and negative labels are not allowed). A corresponding change has been made to the **Range** in the <filename.sum> file.

Reference: Section 4.3.6.3 of the User Guide.

### *2.1.3. Missing flow data indicators*

Previously in IHACRES, no protocol had been established whereby missing values in the data file could be clearly indicated. Version 1.02 offers the facility, that when infilling or hindcasting flows using the simulation facility, missing flows can be specified using one of the values from the set (-9.9, -9.9, -99.9, -999.9). This range of values permits some control over the y-axis scaling of plots which show the observed values (including missing values) and modelled values of streamflow.

Reference: Section 7.2.9 of the User Guide.

## **2.2. Running the model**

### *2.2.1. Abort facility*

There was no facility in Version 1.0 to curtail a mis-specified or unwanted long calibration run (other than using Ctrl + Alt + Delete keys to reload the computer and then

restarting the package). Version 1.02 now offers an **Abort** button (in both calibration and simulation modes) which allows the user to exit the current run and leaves the package standing in the current case-analysis.

Reference: Sections 4.4.1 and 4.4.2 of the User Guide.

### *2.2.2. Simulation mode*

When a range of the loss module parameter space is searched in calibration mode the **<filename.sim>** file produced contains a set of unit hydrograph module parameters (and the parameter C) for each model successfully calibrated. When running a model in simulation mode using Version 1.0 only the first set of parameters in the **<filename.sim>** file was used, but the presence of multiple parameter sets may have led to uncertainty about what the results represented. In Version 1.02 simulation is not allowed if the **<filename.sim>** file contains more than one set of parameters (or if there are none), thereby removing any lack of clarity. The user must, therefore, perform a single calibration mode run, i.e. using one set of loss module parameters, before invoking a simulation mode run (which may, of course, be performed on a different part of the available hydrometric record).

Reference: Section 4.4.2 of the User Guide.

### *2.2.3. Display of run-time progress*

Minor cosmetic improvements have been made to this dialog box. Also, the X1 and U1 fields are now cleared at the start of each calibration.

Reference: Sections 4.4.1 and 4.4.2 of the User Guide.

## **2.3. Model output**

### *2.3.1. Display of <filename.sum> file*

In version 1.0 the **<filename.sum>** file was not always automatically displayed upon completion of every

calibration or simulation run (although it was always created and could be viewed manually).

In Version 1.02, this file consistently appears on-screen after each run.

Reference: Section 4.4.1 of the User Guide.

### *2.3.2. Graphics*

In Version 1.0, **Plot - Model results - Modelled & observed streamflow** showed modelled streamflow in blue. This has been changed to red in Version 1.02, thus giving clearer on-screen visualisation of model-fit.

In Version 1.0, automatic scaling and labelling of the y-axis of plots worked correctly. However, it has been improved in Version 1.02 such that the numbers shown against the y-axis are now integers. This makes the plots easier to read and use.

In Version 1.0, **Plot - Observed data - Both** worked correctly, but produced separate plots for rainfall and observed streamflow. Version 1.02 gives improved visualisation of rainfall and observed streamflow by displaying both on the same plot (using 2 y-axes).

Version 1.02 offers an enhancement such that, when **Configure - Setup - Linear structure** is set to either **Single store** or **2 stores in series**, it is now possible to plot the modelled streamflow and the corresponding unit hydrograph using **Plot - Hydrographs** (Version 1.0 only allowed this – and other plots – for **2 stores in parallel**).

Reference: Sections 4.5 to 4.5.3 of the User Guide.

### *2.3.3. Data export*

In Version 1.0, only the modelled streamflow data could be exported. In Version 1.02, there are two options under **Export**, i.e. **Rainfall & streamflows** and **Unit Hydrographs**. The first option creates a <filename.exp> file containing a columnar layout showing rainfall, effective

rainfall, streamflow and modelled streamflow. If the **2 stores in parallel** option is selected, the file also contains modelled quick flow and slow flow. The second **Export** option creates a **<filename.exh>** file containing the ordinates of the total unit hydrograph and, when appropriate, the quick and slow sub-unit hydrographs.

Also, in Version 1.0, the last value appeared twice in the file of exported modelled flows. This has been remedied in the enhanced data export facility of Version 1.02.

Reference: Section 4.6 of the User Guide.

### 3. Year 2000 compliance

Version 1.02 (and Version 1.0) of IHACRES are able to handle dates at and beyond the Year 2000. However, these release notes present an opportunity to document a restriction in IHACRES' date handling whereby users should not attempt to select dates either before 1800 or after 2099. Examples of this restriction include:

- the **Data description** dialogue box will not accept dates earlier than 1800 (daily rain/flow & monthly temperature data).
- In the **Subperiod selection** box, dates later than 2099 are not correctly registered under **Start date** and/or **End date** – but the **As file offset** area in **Subperiod selection** remains operational and the program will still work satisfactorily.

It is planned to address this restriction in a future version of IHACRES.