

# VIC Hydrology Model Training Workshop – Part V: Routing VIC Runoff

Ed Maurer, Civil Engineering Department, Santa Clara  
University

11-12 Oct 2011  
Centro de Cambio Global  
Pontificia Universidad Católica de Chile

Introduction:

In this section of the workshop, VIC runoff (and base flow) are routed using the standard routing code typically coupled to the VIC model. It should be emphasized that the routing code is distinct from VIC, and serves the sole purpose of taking gridded daily runoff and computing streamflow at a specific point.

## 1) Compiling the routing code

While there has been work to update the routing model code, the official code remains the fortran code available for download from:

<http://www.hydro.washington.edu/Lettenmaier/Models/VIC/Documentation/Routing/RunRouting.shtml>

There are some specific instructions on the above page that you should refer to. In particular, note that the routing code expects to find the runoff and baseflow in columns 6 and 7 of the VIC output (fluxes) files. If any other format is used for the VIC output files you will need to edit the `make_convolution.f` file and recompile the code.

Move to the directory where the routing code is saved:

```
vic_taller/vic_model/run$ cd ../route/code/
```

The files in this directory will be (the 'rout' file may not be there yet):

```
init_routines.f  
make_convolution.f
```

Makefile  
README  
read\_routines.f  
rout  
rout.f  
unit\_hyd\_routines.f  
write\_routines.f

Type 'make' to compile the code. This will produce the 'rout' executable file.

## 2) Running the routing code

The difficult part of the routing model is not compiling or running the model, but in preparing the input files. Follow the two documents supplied as part of this workshop to help in developing all of the input files required by the code.

Once the input files are completed, the main input file should be prepared according to the required format, described at

<http://www.hydro.washington.edu/Lettenmaier/Models/VIC/Documentation/Routing/InputSetup.shtml>

The flow can then be routed using a command like the following:

```
vic_taller/vic_model/route$ code/rout mataquito_outlet_rout.input
```

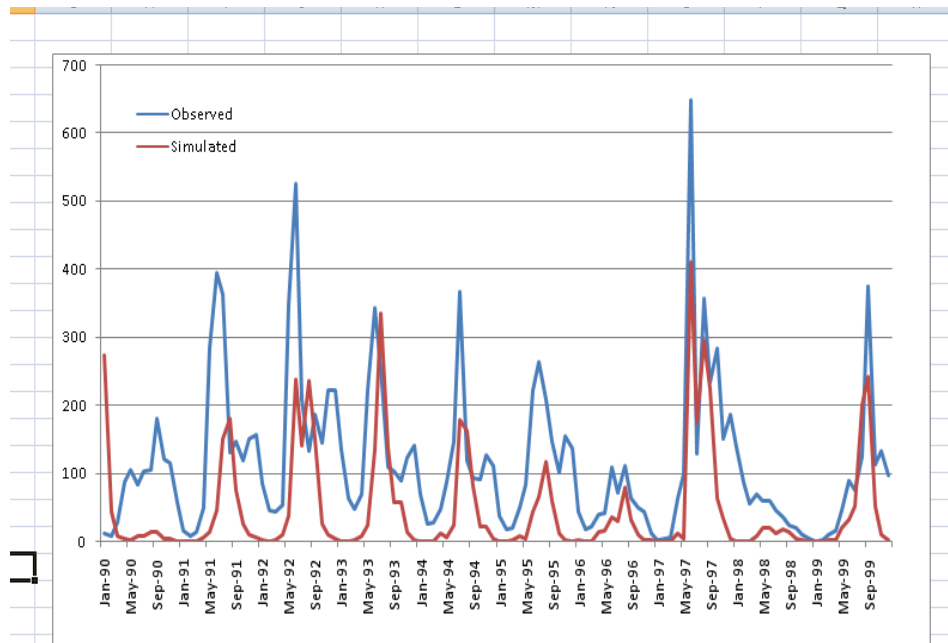
The first time you run a basin, a uh\_s file will be created in the default directory (in this case, MAT01.uh\_s). This can either 1) be deleted, in which case it will just be recreated next time you run the code, or 2) moved to another location (like a uh\_s directory), and then replace the word NONE with the path to the file (directory and file name). For large basins saving this file can result in faster run times for the routing code, which is especially important if running the code many times like in automated calibration.

## 3) Looking at the output of the routing model

There are many files created by the routing code. For each defined station, there are multiple files, aggregated by time (daily, monthly, annual), and whether they are in units of flow (cubic feet per second – sorry about neglecting SI units! Divide by 35.3 to convert to m<sup>3</sup>/s.) and mm averaged over the catchment. For this example, there should be files: MAT01.day, MAT01.end\_of\_month (an empty file), MAT01.month\_mm, MAT01.year\_mm, MAT01.day\_mm, MAT01.month, MAT01.year.

Courtesy of Dr. Jorge Gironas, there is a set of monthly streamflows for the Mataquito basin outlet (Lincanten), which are in the spreadsheet mataquito\_lincantenrun1.xls. You can import

your routed VIC output (MAT01.month) into that spreadsheet. Remember that MAT01.month has flows in cfs, so convert these to  $\text{m}^3/\text{s}$  for plotting. You may end up with a plot that looks something like this:



From this a true diagnosis of how well the model captures the basin hydrology can begin.

#### 4) Calibrating the VIC model using routed streamflow