

WATFLOOD began life at the at the Ontario Ministry of Natural Resources in 1972 in the Office of Mr. Don McMullen. Don was the "HYDROMETEOROLOGIST" for the Province at the time and was responsible for flood forecasting in for the whole Province with the exception of the Grand River Conservation Authority, which was the only Authority with it's own flood forecasting capability at the time. At that time, RADAR facimilies were just becoming available. These where analog pictures transmitted by teletype. Don said: "Wouldn't it be nice if we could just take these pictures and calculate flows!"

I had just finished my PhD on the topic of grassed channels and knew little about hydrology. I was on eight months leave from the University of Waterloo "to get some practical experience". I knew about Unit Hydrographs, SCS Curve numbers and of course open channel flow. Also, I loved programming. My reply was "no problem".

It is now 35 years later and the program that was initially called "SIMPLICITY" later became "SIMPLE" and then "SPL". Along the way several front ends were written: first in QuickBasic™ , then in C++, and finally in Visual Basic™ . There are a number of pre & post processing programs and the whole package is called WATFLOOD™ . Finally, in 2006 it looked like VB™ would not be supported in the future, the VB front end was abandoned. The good news is that ENSIM-HYDROLOGIC now has the pre- and post-processor function that is so needed for hydrological modelling.

Along the way, many changes and additions were made. Before starting the project, we looked at which programs were available and we found the Stanford Watershed Model and HYMO. We found the SWM to complicated and HYMO to restrictive. So we started with a new program. Having been exposed to Shully Solomon's "Square Grid Method" and seeing the need to directly interface with RADAR (we did not know about Numerical Weather Models at the time and GIS was yet to appear), I decided it should be a square grid model. Huggins & Monke had published such an approach for very small watersheds and I added river routing to the mix. By the end of my eight months, there was a working square grid model using the SCS Curve number method to calculate runoff and storage routing for overland, river and reservoir routing. The basic structure of the program has never changed and most - if not all - of the original code survives except the SCS Curve number method, which went soon enough.

Alex Harington was hired to write a new infiltration module. We started off with the Darcy formula and derived a "new and original" infiltration formula. Not long after we found we were not that original after all. Green and Ampt had beaten us to it in 1911. Not only that, G & A did a much better job of it and turned our exercise into a good learning experience.

Jack Gorry in 1975 wrote the code to use RADAR data directly in the program and we learned how difficult it is to interpret RADAR rainfall data. This was followed by an effort by Nick Dalazio. It never materialized into a useful operational method to forecast flows. More recently, we have been involved in a CFCAS project [Enhanced Nowcasting of Extreme Weather](#)

In 1985 a major change was made to the program by way of the introduction of the Grouped Response Unit (GRU) as the basic computational unit. This removed the serious non-linearity problems that result from averaging parameters instead of weighting the hydrological response according to the area of hydrologically unique areas. The initial sensitivity study was carried out by Tao Tao in 1988-89.

To the best of my knowledge, WATFLOOD is the first hydrological model to be based on the GRU!

Several other graduate students have created major portions of the WATFLOOD™ code. John Donald wrote the snow accumulation and ablation code and Frank Seglenieks enhanced it. Todd Neff wrote the evapo-transpiration code and Luis Leon wrote the original adaptation of the AGNEPS water quality model in WATFLOOD™. Much of the work by jD, FS and TN was supervised by Ric Soulis who contributed many ideas to the snow and evaporation modules. More recently, Trish Stadnyk added the wetland and tracer code and she is currently coding the Craig and Gordon Isotope Fractionation Model.

During the past 15 years WATFLOOD™ has been used for many hydrological studies. Some of these are found at <http://www.civil.uwaterloo.ca/watflood/Studies/current.htm>