

# Texas A & M University and U.S. Bureau of Reclamation

Hydrologic Modeling Inventory

Model Description Form

July 18, 2007

Name of Model: CEQUEAU

Model Type: Distributed deterministic

Model Objective(s): Stream flow simulation; Short and mid-term forecasting with various updating options

Agency and Office: INRS-ETE Québec University

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Model Structure or Mathematical Basis:

Water balance with interconnected reservoirs

Model Parameters:

Parameters for snowmelt and for different transfers of interconnected reservoirs

Spatial Scale Employed in the Model:

The model was used for watershed of 1 km<sup>2</sup> to 100,000 km<sup>2</sup> with square of 0.1km  
To 30 km.

Temporal Scale Employed in the Model:

1, 2, 3, 4, 6, 8, 12 hours steps or daily

Input Data Requirements:

The meteorological data required at each step are:

Maximum and minimum air temperature

Liquid end solid (optional) precipitation

Hydrometric data at each step are:

Stream flows for natural watershed and

Water levels and dam evacuation for artificial watershed

Please see the HMI web page: <http://www.usbr.gov/hmi>

Forms are available in Text file, HTML, MS Word and WordPerfect formats

This effort is being conducted by River Systems & Meteorology Group: <http://www.usbr.gov/rsmg>

Computer Requirements:  
Windows 95 and up.

Model Output:  
Stream flows at any points of the watershed and many estimate data on the watershed

Parameter Estimation / Model Calibration:

The adjustment of the parameters of the model is done by trials and errors or by optimization

Model Testing and Verification:

The verification of the adjustment of the model is done by analysis of numerical criteria and the analysis of the results presented on graphs. The model computes some numerical criteria and can produce several types of graph showing the observed and calculated stream flows.

Model Sensitivity: Model Reliability:

The accuracy of CEQUEAU model was tested in comparison with other well known hydrological models in the world in the framework of two (2) inter-comparisons of hydrological models fostered by the World Meteorological Organisation (WMO). At the occasion of the first inter-comparison (WMO, 1986) dealing with the simulation of flow rates including snow melt, CEQUEAU model was one of the eleven (11) models originating from eight (8) countries which was tested on six (6) rivers from six (6) different countries.

More recently, at the occasion of a second inter-comparison fostered by the World Meteorological Organisation (WMO, 1992) related to forecasting of flow rate in real time, CEQUEAU was one of the fourteen (14) models coming from eleven (11) countries and tested on three (3) rivers from three (3) different countries.

Model Application / Case Studies:

In the last decades, CEQUEAU model was used for many watersheds in the Province of Quebec, in Canada and elsewhere in North and South America. It is also used in Europe and Africa. In the Province of Quebec, it was applied in some sixty (60) rivers/watersheds and used to determine probable maximal floods (PMF) in many watersheds of northern Quebec.

CEQUEAU model is presently used on a regular basis by some institutions in the Province of Quebec to forecast flow rates in real time

Documentation:

Chapter 13 of Mathematical Models of Large Watershed  
Abstract in English (95 pages) CEQO-RA.PDF  
Abstract in French (89 pages) CEQO-RF.PDF  
Manual in French (458 pages) MANUEL-CEQUEAU.PDF

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**Other Comments:**

Choice of language for windows and printed graphs. The languages presently available are: English, Spanish, French, Polish and Portuguese

**Site Web**

<http://www.ete.inrs.ca/activites/modeles/cequeau/aindex.html>