Effect of Extreme Years in Hydrological Model Calibration Performance

Recep Kaya Goktas\(^1\), Ulas Tezel\(^2\), Tamer Ayvaz\(^3\), Pinar Gokce Kargi\(^3\), Elcin Kentel\(^4\), Bukef Mesta\(^5\) and Ipek Tezyapar\(^1\)

\(^1\) Kocaeli University, Department of Environmental Engineering, Kocaeli, Turkey; \(^2\) Bogazici University, Institute of Environmental Sciences, Istanbul, Turkey; \(^3\) Pamukkale University, Department of Civil Engineering, Denizli, Turkey; \(^4\) Middle East Technical University, Department of Civil Engineering, Ankara, Turkey; \(^5\) Middle East Technical University, Department of Earth System Science, Ankara, Turkey.

ABSTRACT

Hydrological models are useful in predicting and developing management strategies for controlling the system behavior. Specifically, they can be used for evaluating streamflow at ungauged catchments, effects of climate change, catchment practices on water resources, or identification of pollution sources in a watershed. This study is part of a TUBITAK project named "Development of a geographical information system-based decision-making tool for water quality management of Ergene Watershed using pollutant fingerprints". Within the scope of this project, first water resources in Ergene Watershed are studied. Streamgages found in the basin are identified, and daily streamflow measurements are obtained from State Hydraulic Works of Turkey. Streamflow data is analyzed using box-whisker plots, hydrographs, and flow-duration curves focusing on identification of extreme periods, dry or wet. Then a hydrological model is developed for Ergene Watershed using HEC-HMS in the Watershed Modeling System (WMS) environment. The model is calibrated for various time periods including dry and wet years. The parameter selection process is performed using Nash-Sutcliffe Efficiency (NSE), correlation coefficient, percent bias (PBIAS), and root mean square error (RMSE). This model is used for the main purpose of the development of the hydrological model should guide calibration period selection.

STUDY AREA

Yenigoruce Subbasin of Ergene Catchment

- Located in the Trakya Region of Turkey
- Maximum river length = 231.59 km
- Elevation = 9 m
- Average catchment slope = 0.0524
- Drainage area = 10,508 km\(^2\)
- Mean annual flow (1996-2005) = 30.8 m\(^3\)/s

HEC-HMS MODEL

Digital Elevation Map
Streamgages
Meteorological Stations
Landuse Map
Hydrological Soil Group Map

STREAMFLOW ANALYSIS

- 1997-2000
- Low flow period
- 2000-2001
- Medium flow period
- 2002

RESULTS

- Low & Medium Flow period is used for calibration & validation
- Medium Flow period is used
- Medium & High Flow period is used for calibration & validation

CONCLUSIONS

- Calibration with low & medium flow periods resulted in acceptable success for medium flow periods in validation.
- It is observed that calibration period affects the model performance. However, inclusion of all types of flow (low, medium & high) does not necessarily improve the model performance.

ACKNOWLEDGEMENT

- This study was funded by The Scientific and Research Projects Coordination Unit (TUBITAK) under Project Number 115Y064.
- The authors would like to thank the managers of the Environmental Research and Training Center (TUBITAK UME) and the management of the country and regional authorities for their support.

This study is part of a TUBITAK project named "Development of a geographical information system-based decision-making tool for water quality management of Ergene Watershed using pollutant fingerprints".