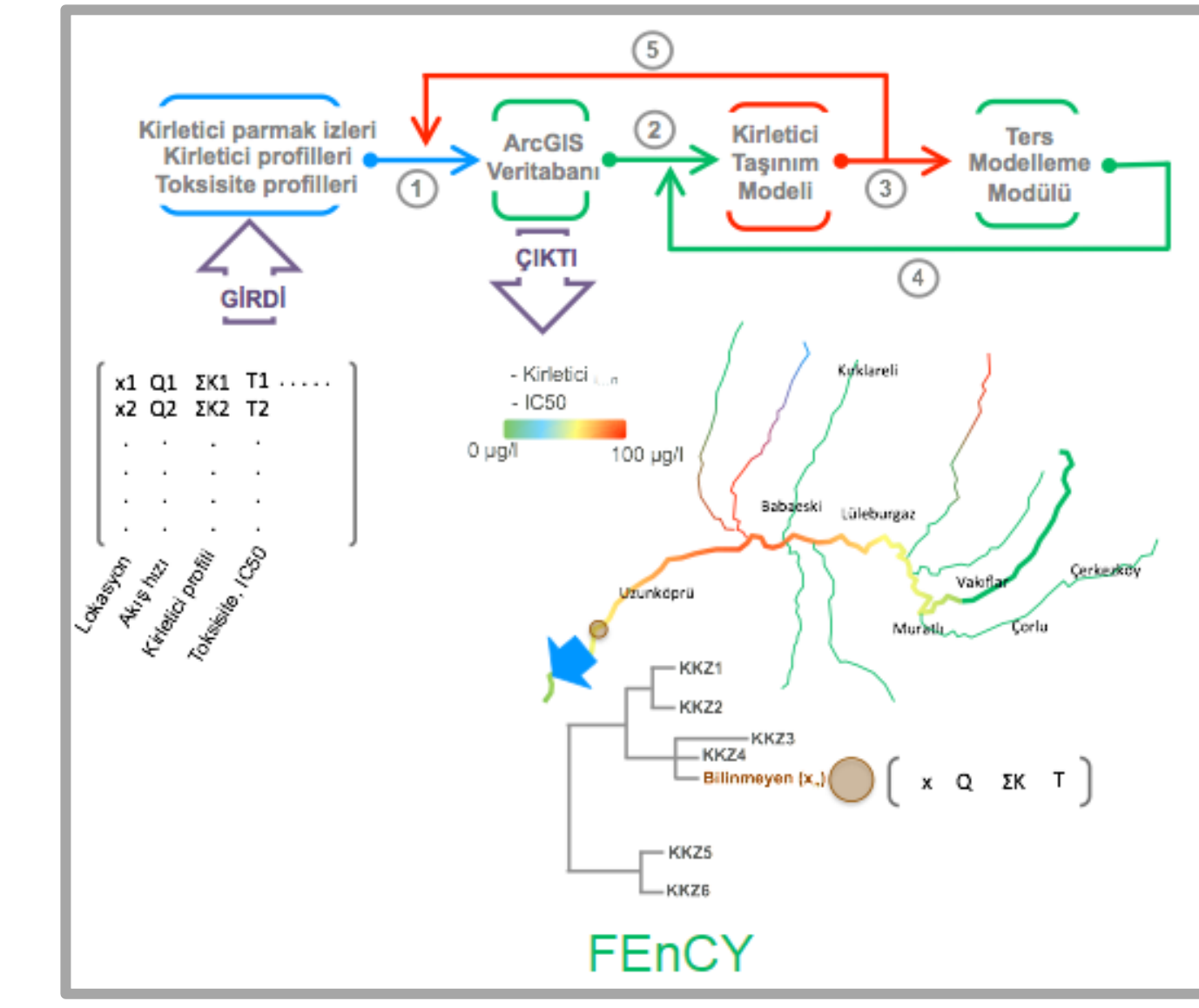




# Effect of Extreme Years in Hydrological Model Calibration Performance

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## ABSTRACT

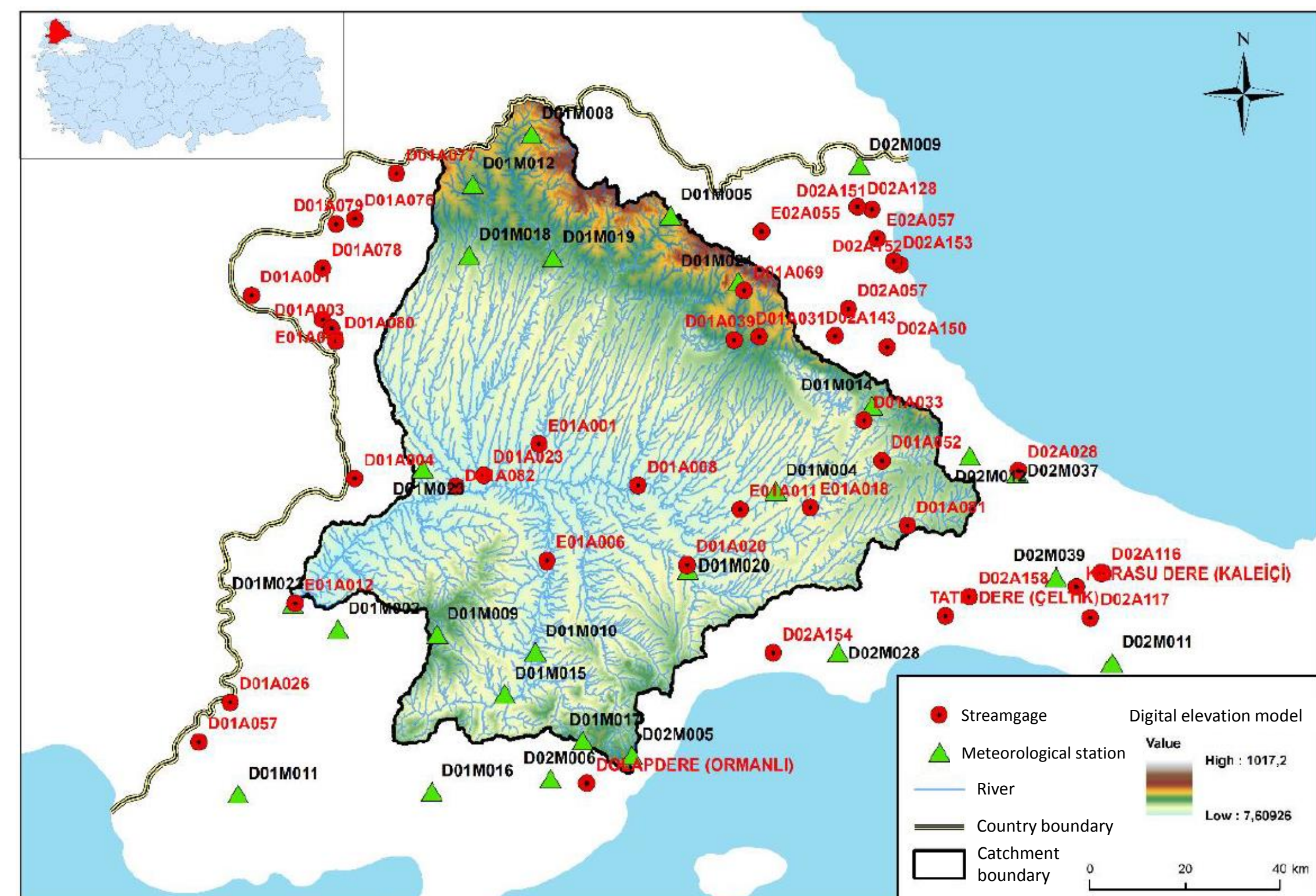
Hydrological models are useful in predicting and developing management strategies for controlling the system behavior. Specifically they can be used for evaluating streamflow at ungaged catchments, effect of climate change, best management practices on water resources, or identification of pollution 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 is 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 ones and the performance of calibration is evaluated using Nash-Sutcliffe Efficiency (NSE), correlation coefficient, percent bias (PBIAS) and root mean square error (RMSE). It is observed that calibration period affects the model performance, and the main purpose of the development of the hydrological model should guide calibration period selection.

## STUDY AREA

### Yenigoruce Subbasin of Ergene Catchment

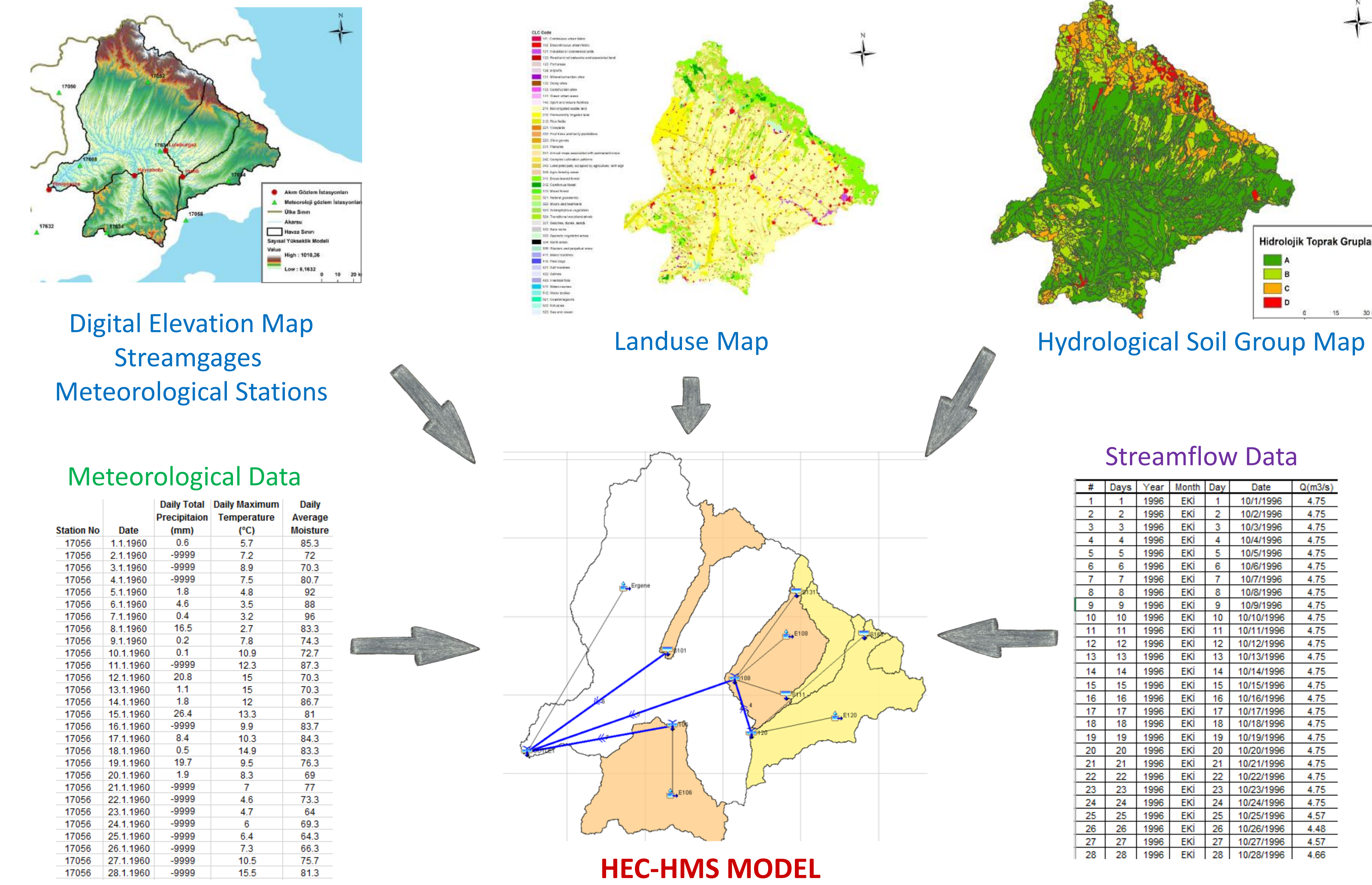
Located in the Trakya Region of Turkey

- Maximum river length = 231.59 km
- Elevation = 9 m
- Average catchment slope = 0.0524
- Drainage area = 10,508 km<sup>2</sup>
- Mean annual flow (1996-2005) = 30.8 m<sup>3</sup>/s



Yenigoruce Subbasin (E01A012) of Ergene Catchment

## HEC-HMS MODEL



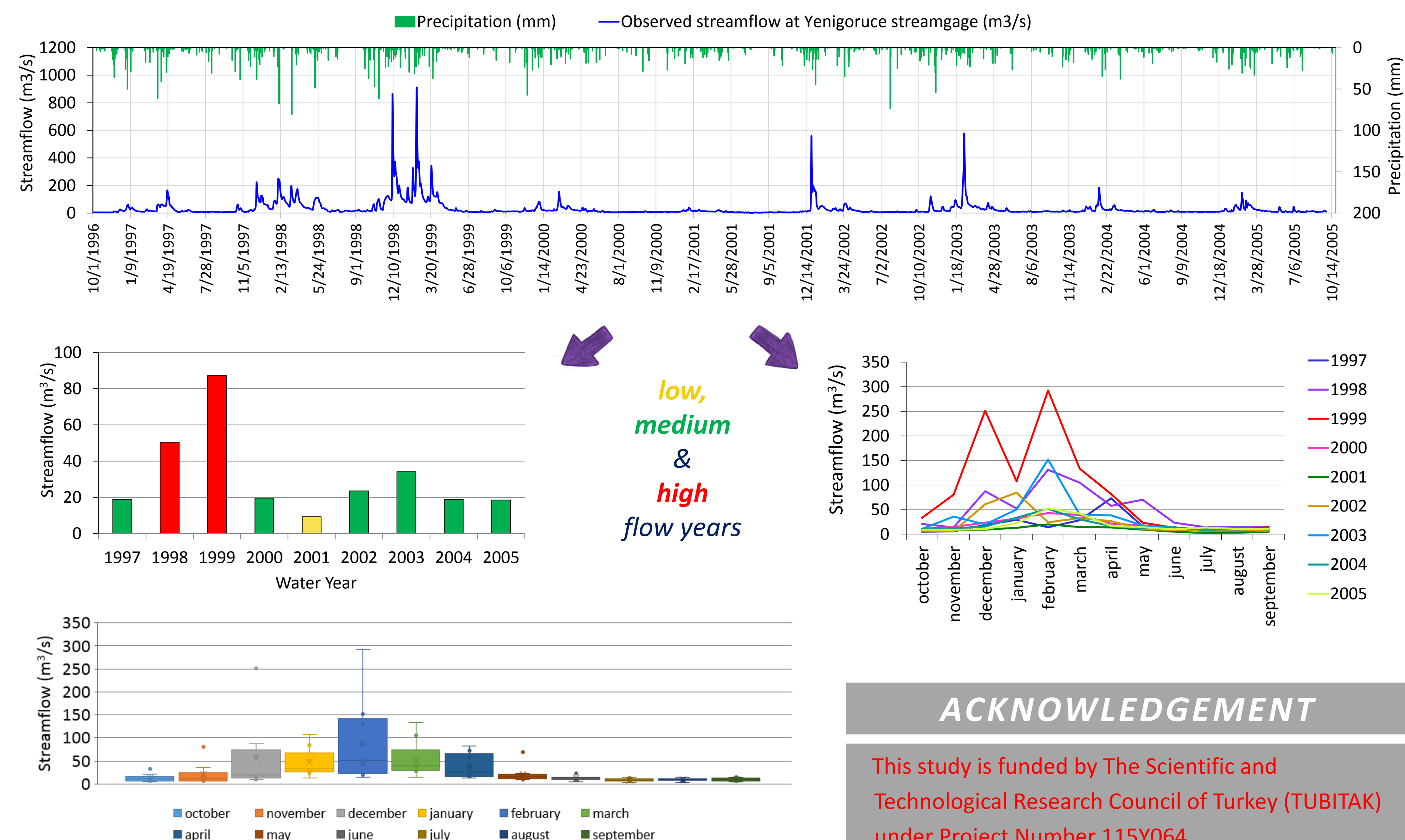
Meteorological Data

Station No	Date	Daily Total Precipitation (mm)	Daily Maximum Temperature (°C)	Average Moisture
17056	1.1.1990	0.6	5.7	85.3
17056	2.1.1990	-9999	7.2	72
17056	3.1.1990	-9999	8.8	70.3
17056	4.1.1990	-9999	7.5	80.7
17056	5.1.1990	1.8	4.8	92
17056	6.1.1990	4.6	3.2	88
17056	7.1.1990	0.4	3.2	96
17056	8.1.1990	19.5	2.7	83.3
17056	9.1.1990	0.2	7.8	74.3
17056	10.1.1990	0.1	10.9	72.7
17056	11.1.1990	-9999	5.3	87.3
17056	12.1.1990	20.8	15	70.3
17056	13.1.1990	1.1	15	70.3
17056	14.1.1990	1.8	12	86.7
17056	15.1.1990	29.4	13.3	81
17056	16.1.1990	-9999	9.8	83.7
17056	17.1.1990	8.4	10.3	84.3
17056	18.1.1990	0.5	14.9	83.3
17056	19.1.1990	19.7	9.5	76.3
17056	20.1.1990	1.9	8.3	69
17056	21.1.1990	-9999	7	77
17056	22.1.1990	-9999	4.6	73.3
17056	23.1.1990	-9999	4.7	64
17056	24.1.1990	-9999	5	69.3
17056	25.1.1990	-9999	6.4	64.3
17056	26.1.1990	-9999	7.3	86.3
17056	27.1.1990	-9999	10.5	75.7
17056	28.1.1990	-9999	15.5	81.3

Streamflow Data

#	Days	Year	Month	Day	Date	Q(m <sup>3</sup> /s)
1	1	1996	Eki	1	10/1/1996	4.75
2	2	1996	Eki	2	10/2/1996	4.75
3	3	1996	Eki	3	10/3/1996	4.75
4	4	1996	Eki	4	10/4/1996	4.75
5	5	1996	Eki	5	10/5/1996	4.75
6	6	1996	Eki	6	10/6/1996	4.75
7	7	1996	Eki	7	10/7/1996	4.75
8	8	1996	Eki	8	10/8/1996	4.75
9	9	1996	Eki	9	10/9/1996	4.75
10	10	1996	Eki	10	10/10/1996	4.75
11	11	1996	Eki	11	10/11/1996	4.75
12	12	1996	Eki	12	10/12/1996	4.75
13	13	1996	Eki	13	10/13/1996	4.75
14	14	1996	Eki	14	10/14/1996	4.75
15	15	1996	Eki	15	10/15/1996	4.75
16	16	1996	Eki	16	10/16/1996	4.75
17	17	1996	Eki	17	10/17/1996	4.75
18	18	1996	Eki	18	10/18/1996	4.75
19	19	1996	Eki	19	10/19/1996	4.75
20	20	1996	Eki	20	10/20/1996	4.75
21	21	1996	Eki	21	10/21/1996	4.75
22	22	1996	Eki	22	10/22/1996	4.75
23	23	1996	Eki	23	10/23/1996	4.75
24	24	1996	Eki	24	10/24/1996	4.75
25	25	1996	Eki	25	10/25/1996	4.57
26	26	1996	Eki	26	10/26/1996	4.48
27	27	1996	Eki	27	10/27/1996	4.57
28	28	1996	Eki	28	10/28/1996	4.66

## STREAMFLOW ANALYSIS

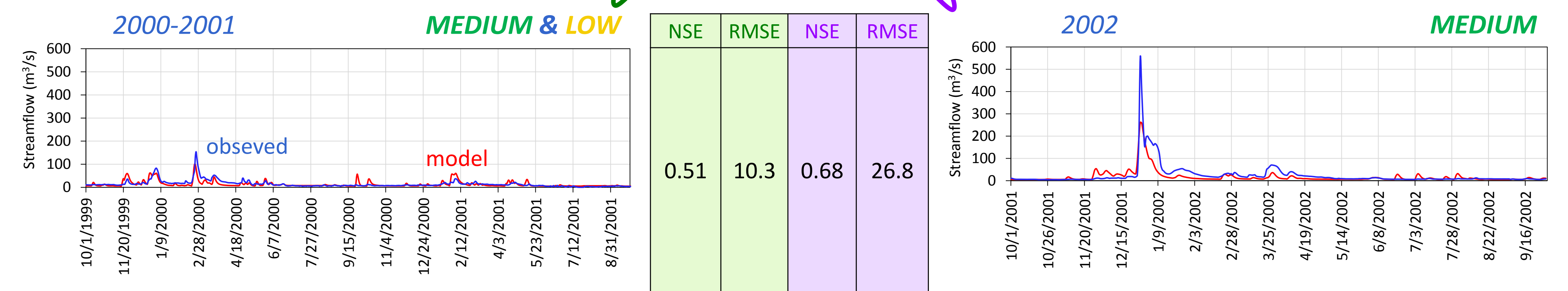


## ACKNOWLEDGEMENT

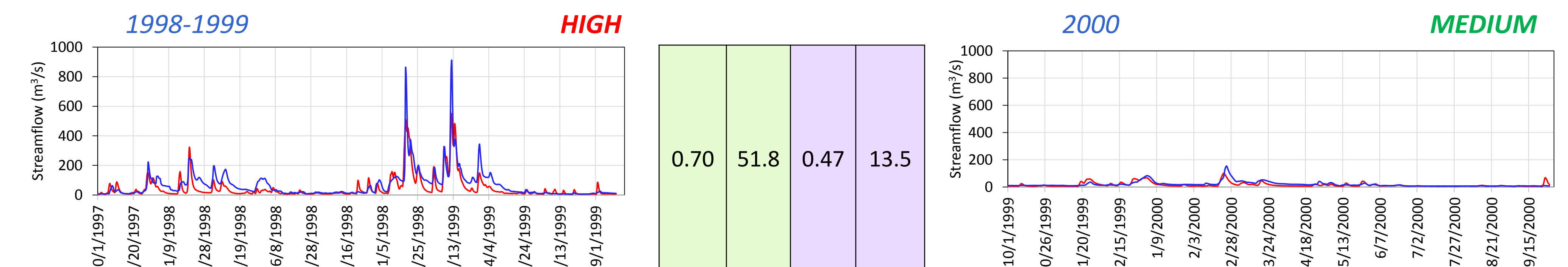
This study is funded by The Scientific and Technological Research Council of Turkey (TUBITAK) under Project Number 115Y064.

## RESULTS

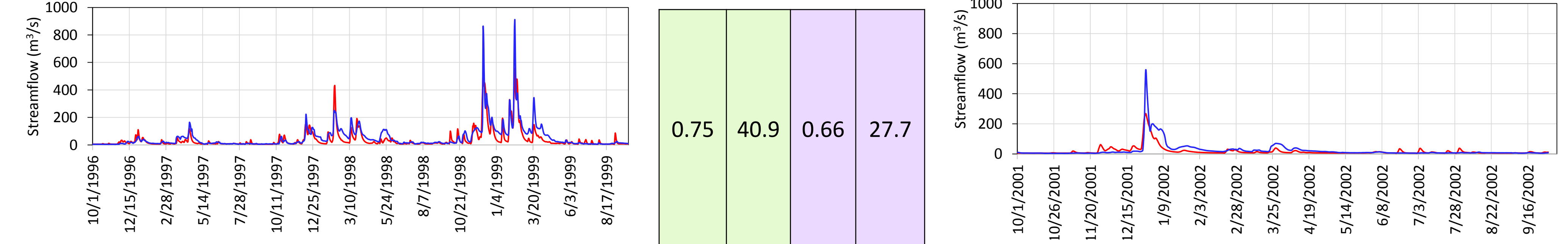
LOW & MEDIUM FLOW period is used for calibration & for validation MEDIUM FLOW period is used



MEDIUM & HIGH FLOW period is used for calibration & for validation MEDIUM FLOW period is used



1997-1999 (MEDIUM & HIGH)



## 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.