



Morphometric analysis of the Marmara Sea river basins, Turkey

Emre Elbaşı and Hasan Ozdemir

Physical Geography Division, Geography Department, Istanbul University, 34459, Istanbul, Turkey.

The drainage basin, the fundamental unit of the fluvial landscape, has been focus of research aimed at understanding the geometric characteristics of the master channel and its tributary network. This geometry is referred to as the basin morphometry and is nicely reviewed by Abrahams (1984). A great amount of research has focused on geometric characteristic of drainage basins, including the topology of the stream networks, and quantitative description of drainage texture, pattern, shape, and relief characteristics. Evaluation of morphometric parameters necessitates the analysis of various drainage parameters such as ordering of the various streams, measurement of basin area and perimeter, length of drainage channels, drainage density (Dd), stream frequency (Fs), bifurcation ratio (Rb), texture ratio (T), basin relief (Bh), Ruggedness number (Rn), time of concentration (Tc), hypsometric curve and integral (Hc and Hi) (Horton, 1932, Schumm, 1956, Strahler, 1957; Verstappen 1983; Keller and Pinter, 2002; Ozdemir and Bird, 2009). These morphometric parameters have generally been used to predict flood peaks, to assess sediment yield, and to estimate erosion rates in the basins.

River basins of the Marmara Sea, has an area of approximately 40,000 sqkm, are the most important basins in Turkey based on their dense populations, industry and transportation systems. The primary aim of this study is to determine and analyse of morphometric characteristics of the Marmara Sea river basins using 10 m resolution Digital Elevation Model (DEM) and to evaluate of the results. For these purposes, digital 10 m contour maps scaled 1:25000 and geological maps scaled 1:100000 were used as the main data sources in the study. 10 m resolution DEM data were created using the contour maps and then drainage networks and their watersheds were extracted using D8 pour point model. Finally, linear, areal and relief morphometries were applied to the river basins using Geographic Information Systems (GIS).

This study shows that morphometric analysis of the basins in regional level are very important to understand general morphological characteristics of the basins. In this case, tectonic and lithological conditions of the basins have greatly affected the morphometric characteristics of the north and south basins of the Marmara Sea.

References

- Abrahams, AD. 1984. Channel Networks: A Geomorphological Perspective. *Water Resources Research*, Volume 20, Issue 2, pages 161–188.
- Horton, R.E. 1932. Drainage basin characteristics. *Trans Am Geophys Union* 13:350–361.
- Keller, E.A., Pinter, N. 2002. *Active Tectonics Earthquakes, Uplift, and Landscape*, Second Edition, Prentice Hall, New Jersey.
- Ozdemir H., Bird D. 2009. Evaluation of morphometric parameters of drainage networks derived from topographic maps and DEM in point of floods, *Environmental Geology*, vol.56, pp.1405-1415.
- Schumm, S.A. 1956. Evolution of drainage systems and slopes in badlands at Perth Amboy, New Jersey. *Geol Soc Am Bull* 67:597–646.
- Strahler, A.N. 1957. Quantitative geomorphology of drainage and channel networks. In: Chow YT (ed) *Handbook of applied hydrology*. Me Graw Hill Book Company, New York.
- Verstappen, H.Th. 1983. *Applied geomorphology*. ITC, Enschede.