ANNUAL CYCLE OF RIVER DISCHARGE ALONG THE ADRIATIC COAST OF CROATIA

Mira Pasaric

Andrija Mohorovicic Geophysical Institute, Faculty of Science,University of Zagreb, Horvatovac bb, 10000 Zagreb, Croatia - mpasaric@rudjer.irb.hr

Abstract

Time series of monthly mean river discharge along the Croatian coast of Adriatic are analysed. The pronounced interannual variability is related to (*i*) direct antropogenic impact and (*ii*) to natural climatic fluctuations. The mean annual cycle of river discharge shows significant changes over the last decades.

Keywords: river discharge, annual cycle, interannual variability, Adriatic Sea

Introduction

Freshwater discharge by rivers and land runoff is the mayor mechanism controlling density field of the Adriatic coastal waters. It has a strong impact on the boyancy driven general circulation in the basin, its spatial patterns and seasonal variability. Freshwater inflow into the Adriatic has been analysed by Sekulic and Vertacnik [1], but with no reference to seasonal variability. Raicich [2] examined annual cycle of river discharge around the basin. However, results for the greater part of east Adriatic were based on indirect estimates, with evenly distributed inflow along the coast. The aim of this study is to evaluate mean annual course of freshwater discharge by mayor rivers along the Croatian coast, with special reference to its temporal variability.

Data

Records of mean monthly discharge were analysed at all Croatian rivers where measurements are made regularly. At the Neretva River, due to strong tidal influence, the discharge is measured far from the river mouth in Bosnia and Hercegovina. Most of the time series span over 40 years or so. Several have long gaps in the last decade, due to war actions in the area.

Results and Discussion

Mean annual cycle is usually determined as long-term average of mean monthly values. However, over the period of measurement, all the time series of river discharge exhibit a more or less pronounced interannual variability. Here results for two rivers are presented – the Cetina River which is under strong antropogenic influence [3] and Mirna River where the variability is related to natural climatic fluctuations. Construction of numerous hydraulic structures for power plants on the Cetina River has largely changed its natural regime (Fig. 1). The mean annual discharge has diminished, while the redistribution of flow throughout the year has significantly flattened its annual course. The flow of Mirna River is closer to its natural regime. However, here too significant interannual variations are present (Fig. 2). They result in a changed shape of the mean annual cycle when calculated over the last decade. The change is consistently seen at all the studied rivers, including the ones that are strongly controlled by human activities. The interannual variability of discharge is closely related to precipitation anomalies. The wet and dry anomalies are likely a part of large-scale precipitation patterns associated with the Mediterranean Oscillation [4].

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References

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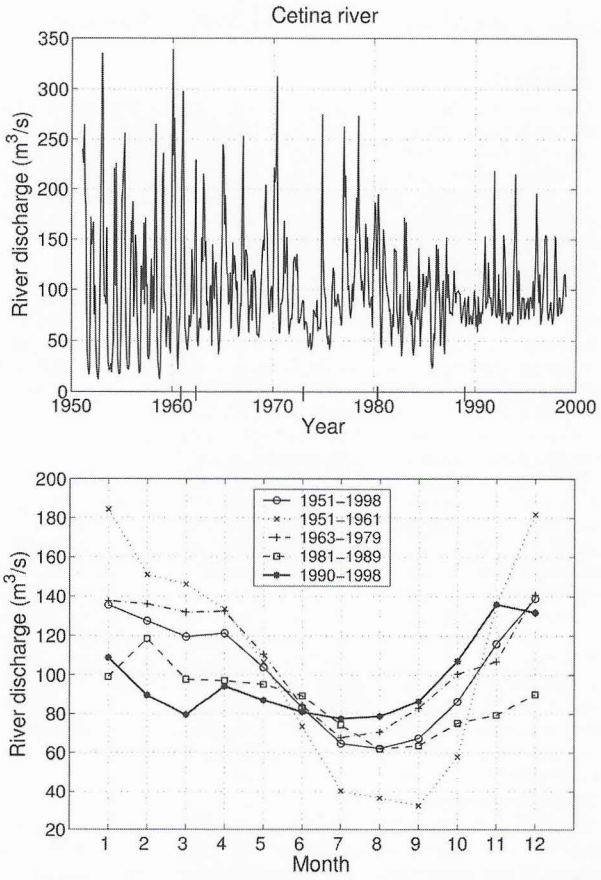

Fig. 1. Monthly mean discharge of the Cetina River; dashes on the horizontal axis show times when mayor hydrological constructions were put in operation (*upper panel*). Mean annual cycle of river discharge, determined over different intervals of the measurement period (*lower panel*).

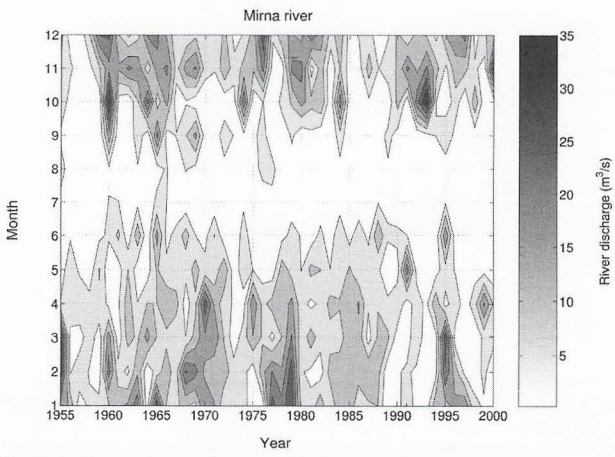

Fig. 2. Isolines of monthly mean discharge of the Mirna River.