Chapter 11
Seasonal Statistical Variability of Precipitations in Dobrogea and Danube Delta

Gabriel Minea
National Institute of Hydrology and Water Management, Romania

Georgeta Bandoc
University of Bucharest, Romania

Gianina Neculau
National Institute of Hydrology and Water Management, Romania

ABSTRACT

The objective of this chapter is to highlight the seasonal statistical variability of rainfalls in Danube Delta and Dobrogea Tableland (Romania), considering the extreme and outliers values. The geomorphological and evaporimetric features of this region are also mentioned. Area of study is a complex geographical region, with two major units: the Dobrogea Tableland and the Danube Delta spread over 14,695 sq. km in the south-eastern part of Romania. The outcomes show that the minimum and maximum values of the lower quartile median and of the upper quartile median with the highest values occur in summer. The lowest values occur for all the indicators during winter and there are intermediate values for all indicators during autumn and spring. Regarding the seasonal variability of rainfalls, it has a mosaic distribution of the outliers and extreme values. The extreme values record a small number of values, both in autumn and summer. The maximum number of extreme values is during spring and winter. The drought is amplified by evaporation from water surface in summer.

INTRODUCTION

The aim of this paper is to highlight the seasonal statistical variability of rainfalls in Danube Delta and Dobrogea (is also known as Dobrudja - in English, Dobroudja in French), considering the extreme and outliers values. The geomorphologic and evaporimetric features are mentioned, too. Rainfalls are one of the main factors of the hydrological regime because they contribute to the emergence of water excess and hydrologi-

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cal drought (Haidu, Sorocovschi, & Imes, 2003; Sorocovschi, Tudose, Selagea, & Roman, 2010).

The importance of knowing the precipitations quantity comes from the utility of the resource, both as the main power source of the hydrographic arteries and as a necessary irrigation source. The hydrological effect of rainfalls on the water resources, especially on rivers, is strongly determined by the periodic variability of the rainfalls and evaporation. The hydrological elements of flow hydrograph (shape, timing and peak flow) are significantly influenced by spatial and temporal variability of rainfalls (Singh, 1997). Some studies investigated the effect of seasonal rainfalls variability on streamflow (Beven & Hornberger, 1982; Berndtsson & Niemcaynowicz, 1988; Krajewski, Lakshmi, Georgakakos, & Jain, 1991; Obled, Wendling, & Beven, 1994; Arnaud, Bouvier, Cisneros, & Dominguez, 2002; Arnaud, Lavabre, Fouchier, Diss, & Javelle, 2011).

Geographically, multiple and complex scientific studies, aimed at a deep knowledge, both monographic and applicable, were done on the region of Dobrogea. Among the relevant studies, we mention those of the following authors: Ionesi (1994); Zugrăvescu, Polonic, Horomnea, & Dragomir (1998) in geology; Conea (1970), Badea, Băcăuanu, & Posea, (1983), Posea & Badea (1984), Popescu & Ielenicz (2003), Ielenicz (1999), Panin (1989, 2003), Posea (2006), Vespremeanu-Stroe, Constantinescu, Tătui, & Giosan (2007) concerning the relief; Ciulache & Torică (2003); Păltineanu, Mihăilescu, Seceleanu, Dragotă, & Vasenciuc (2007), Tişcovschi, Manea, Cocoş, Vijulie, & Cuculici (2013), Şerban, Maftei, & Bărbulescu (2010) on climate; Ujvari (1972), Gâştescu (1971), Zaharia & Pişota (2003), Telteu, Stan, Brănescu, & Berghezan (2013) in the field of hydrology.

Data and Method of Analysis

The meteorological (precipitations and evaporation) and hydrological data (discharges), geospatial datasets (vectors) were provided by the National Institute of Hydrology and Water Management (NIHWM), Bucharest. The weather data (1960-2012) were provided by the National Administration Meteorological from 20 pluvial stations, and evaporation data from 3 evaporimetric stations by NIHWM (Figure 1).

The main methods of research were represented by bibliographic documentation, spatial analyses - using GIS techniques - and statistical analysis of hydrometeorological data. Specific computing and graphic software (e.g. Box-and-whisker plot - sometimes abbreviated as Boxplot), was used for the quantitative analyses of the data (e.g. precipitations, evaporation), because they offer an overview on the region and on the extent of the spatio-temporal variability. At the same time, using boxplots, the seasons and the stations having a limited number of emergences of outliers values (1,5…3)•IQR extreme values 3•IQR and the variability of data (Isac-Maniu, Pecican, & Ştefănescu, 2003) are identified.

BACKGROUND

The climate characteristic of this region is characterized by emphasized continentalism with shades of semi-aridity – brought out by dryness and hydrological drought phenomena. This is due to its orientation, which lacks orographic barriers and to its location between the Danube and the Black Sea.

Păltineanu et al. (2007) pointed out the strong spatio-temporal feature of the rainfalls, having significant differences, at a seasonal scale, in Romania.

Dobrogea Tableland has a high risk of drought (Vrînceanu, Ignat, Niţu, Lăcătuşu, Muşat, & Jinga, 2011) and it is the warmest, clearest, driest and windiest region. Rainfalls are the main climatic factor that best define this region (Ciulache & Torică, 2003; Păltineanu et al., 2007). Dobrogea's climatic individuality results from the complex