

Documentary evidence of historical floods in lowland Romania during the last millenium



Gheorghe Bădăluță (1), Carmen - Andreea Bădăluță (1,2), Monica Ionita (3), Marcel Mindrescu (1)

(1) Department of Geography, Stefan cel Mare University of Suceava, Romania ,
 (2) Stable Isotope Laboratory, Stefan cel Mare University of Suceava, Suceava, Romania,
 (3) Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research, Bremerhaven, Germany,



Introduction

Floods are one of the most destructive natural hazards, which affect the socio-economical systems. The occurrence of floods is considered to be a sensitive indicator of the climate variability, in special linked with changes in atmospheric circulation modes. One of the best archive of the floods evidence are historical documents. In this study we present a 1000 years floods reconstruction – one of the most well documented hazard in the lowland of Romania.

Data and Methods

Data on the flood events over the last millennium were drawn from literary and narratives sources (Fig.2). To identify the physical mechanism responsible for the connection between the occurrence of flood events and the large scale atmospheric circulation we use the 500mb Geopotential hight (left panel) and direction of vertically integrated water vapour transport (Figure. 6)



Figure 2. Sources of historical documents

Present day

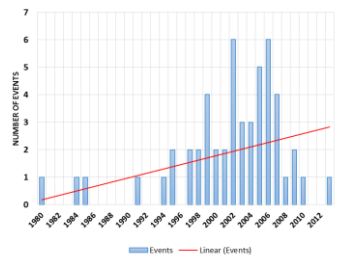


Figure 3. Long-term trend of the number of flood events over Romania (data source: EEA)

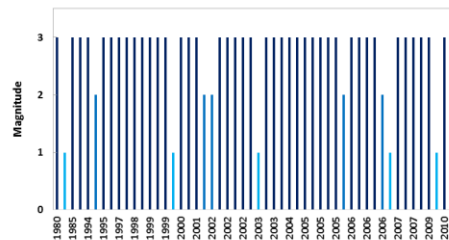


Figure 4. Magnitude of flood events (3-very high, 2- high, 1-moderate) in Romania (data source: EEA)

Study area

The most rivers of Romania flow down from Carpathian Mts. to Danube River. Thus, most of the floods occur in the lowland of Romania, a higher frequency having those on the Siret, Prut, Somes, Mures, Suceava, Bega, Olt, Ialomita and Danube rivers (Fig.1).

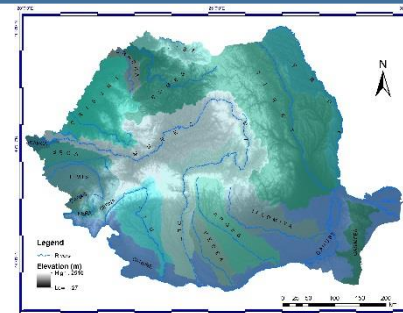


Figure 1. The main rivers from Romania where frequent floods occur

Preliminary long - term floods reconstruction

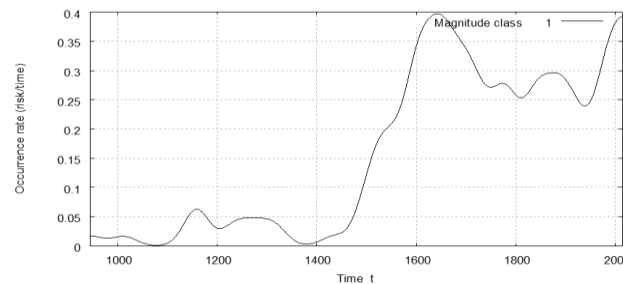


Figure 5. The long –term occurrence rate of the flood events in Romania

Key points/messages

Q: Can historical documents reconstruct the flood events?
 ♦ A: Absolutely!
 ♦ The flood events reconstruction have a major contribution to hydrometeorological events and can be used as an indicator in the context of ongoing climatic changes.

Synoptic situation of two flood events from Romania

The two analyzed flood events in Romania were triggered by the prevailing large-scale atmospheric circulation, characterized by a deep cyclone centered over the Scandinavian Peninsula and an anticyclonic circulation over the southern part Europe. This type of circulation mode allowed the intrusion of moist air from the North Atlantic basin, leading to heavy precipitation events over the analyzed region (Fig. 6).

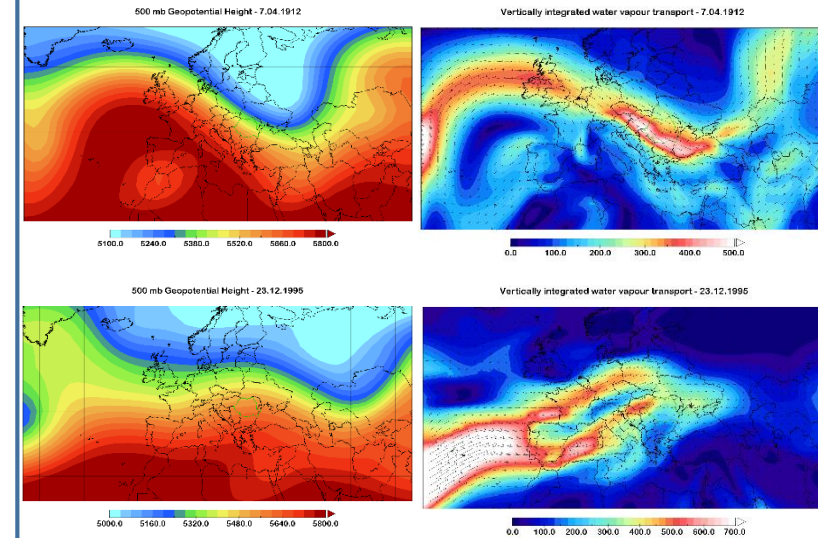


Figure 6. 500mb Geopotential hight (left panel) and direction of vertically integrated water vapour transport (right panels) for two extreme flood events: (a) and (b) flood of April, 1912 (c) and (d) flood of December,1995.