



European Meteorological Society

Distribution of heavy precipitation events in Romania between 1980 and 2009

Victor Emanuel Stefanescu^{1,2}, Sabina Stefan², Florinela Georgescu¹

1 – National Meteorological Administration of Romania

2 – University of Bucharest, Faculty of Physics



UNIVERSITATEA
DIN BUCUREȘTI
VIRTUTE ET SAPIENTIA



Object of the study

Various analyses on the series of heavy precipitation events in Romania - precipitation amounts larger than, or equal to 50 mm in 24 hours.

We have been able to look into the spatial and temporal (highlighted here) distribution of these events.

This study is the first of its kind that is carried out for Romania over the interval 1980-2009, starting on January 1st, 1980 and ending on December 31st, 2009.

The dataset

The dataset consists of observations at 163 meteorological surface stations and 68 pluviometrical surface stations in Romania, that have been carrying out observations between 1980 and 2010.

The number of observation points is 231; amounts of precipitation larger than, or equal to 50 mm in 24 hours, were reported there at the end of a climatological observation interval that ends at 18 UTC, the day of the measurement was made.

There are 2545 observations on heavy precipitation events, spread over 874 days.

The source of all these data is the climatological observation database of the National Meteorological Administration of Romania.

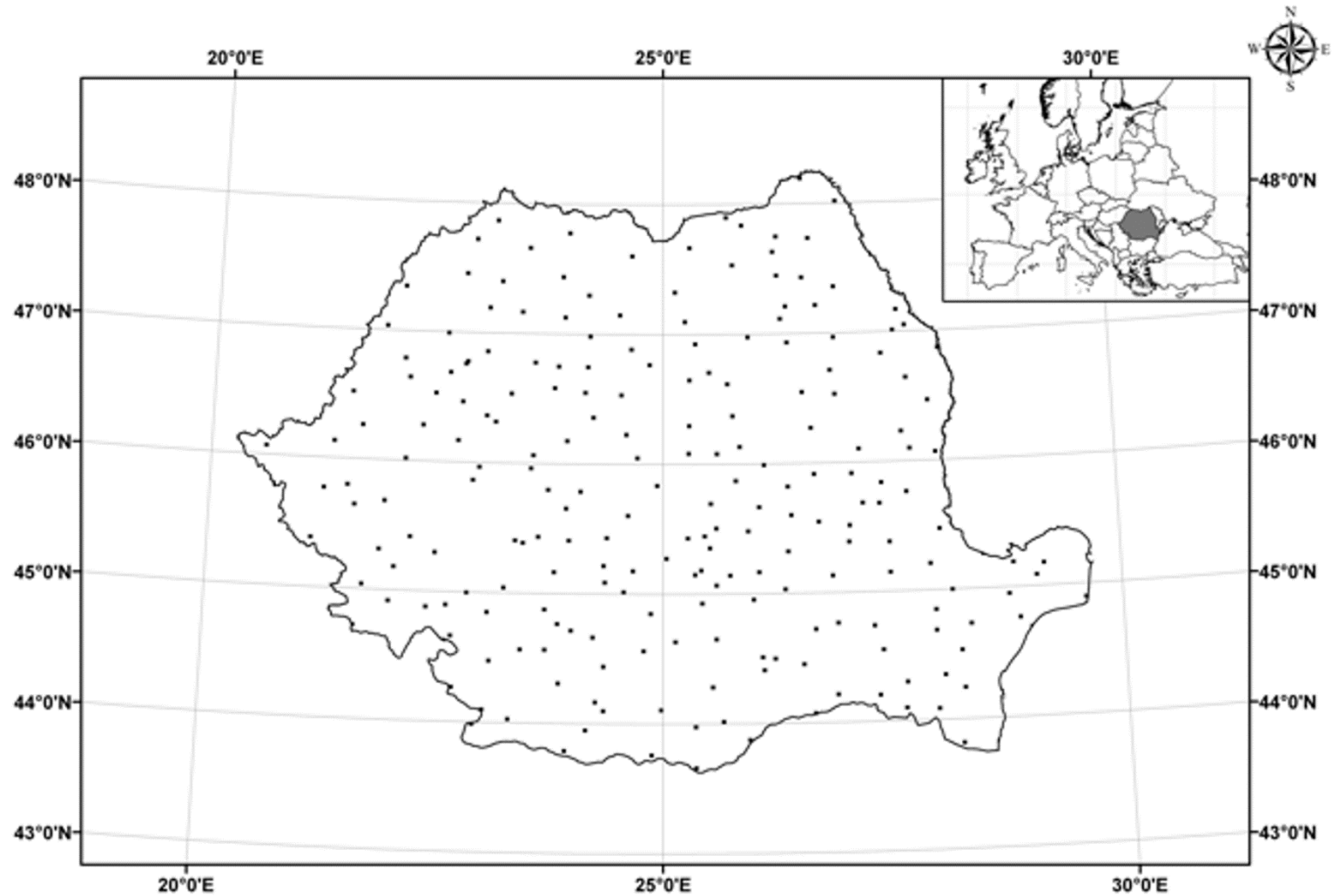
Data handling

The data that we have analysed have been stored into a database maintained by the Microsoft® SQL Server® 2008 Express Edition Relational Database Management System.

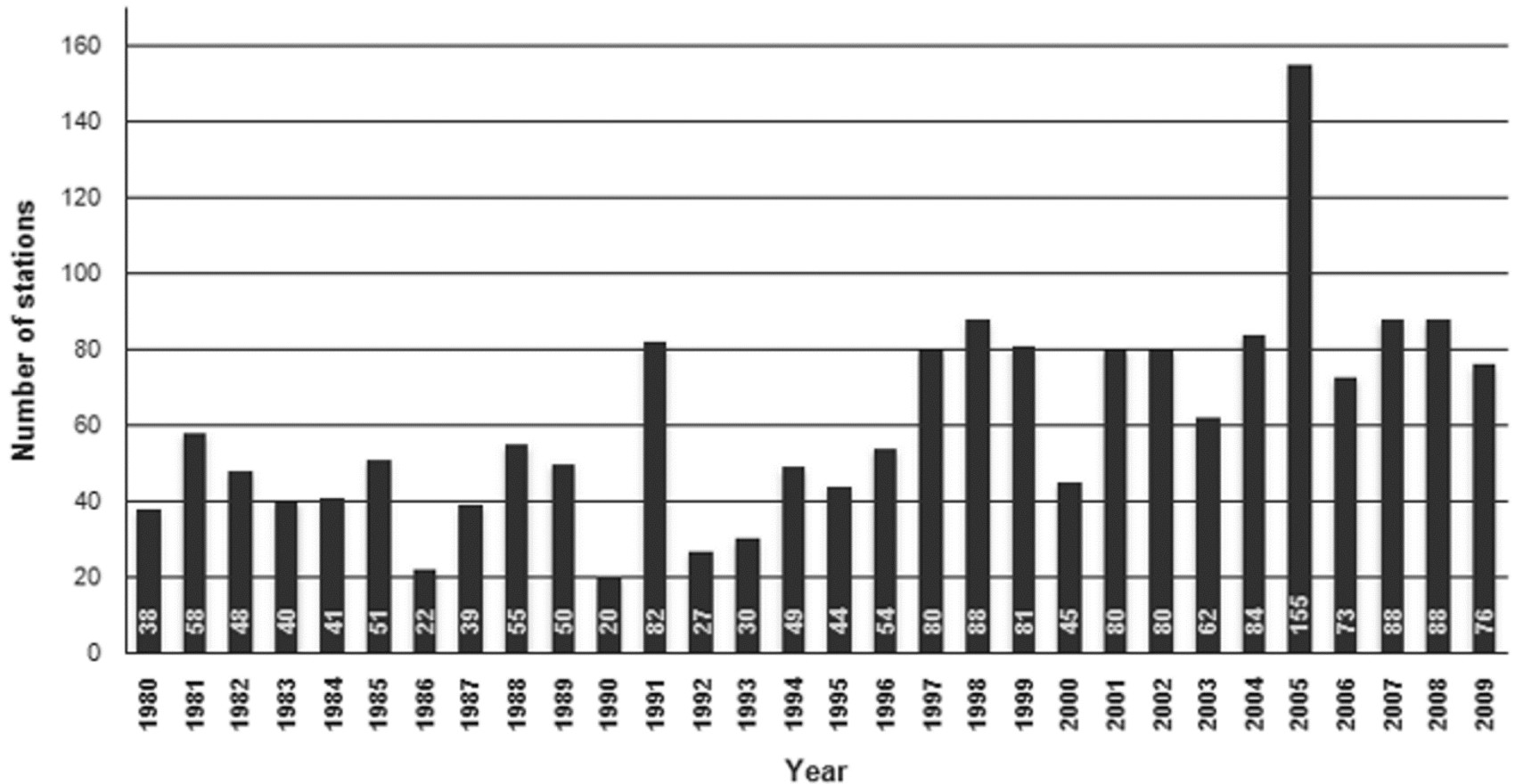
In order to analyze this information, we have used Structured Query Language (SQL) queries.

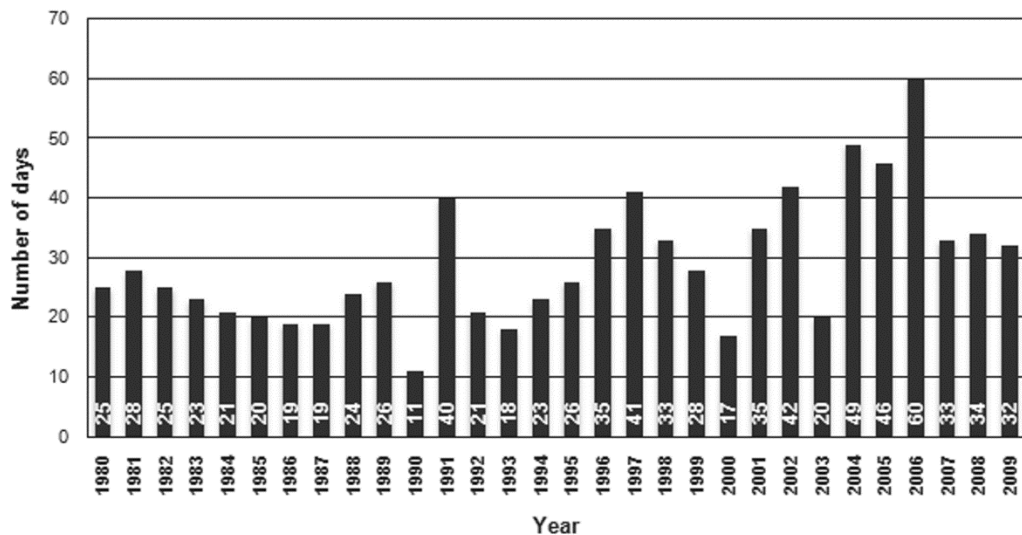
Various criteria for filtering out particular subsets have been subsequently applied.

The observation stations in Romania that have recorded heavy precipitation events between 1980 and 2009



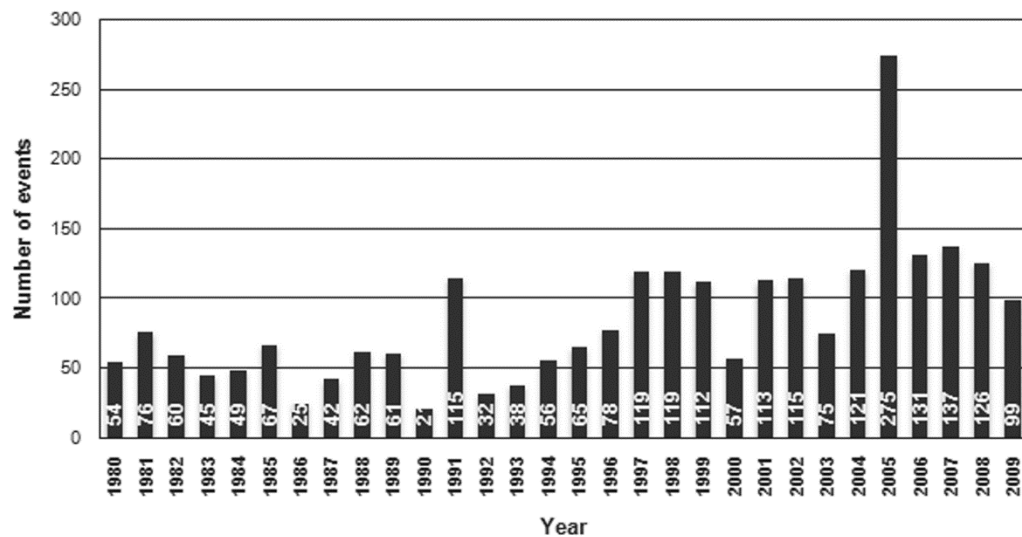
The annual number of stations (observation points) in Romania that have recorded heavy precipitation events between 1980 and 2009



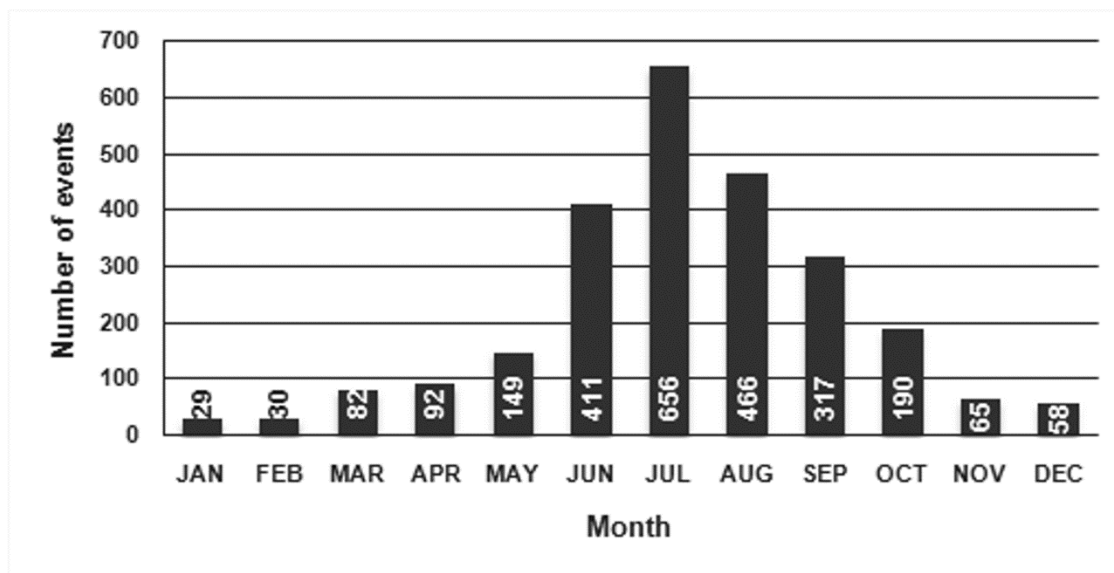
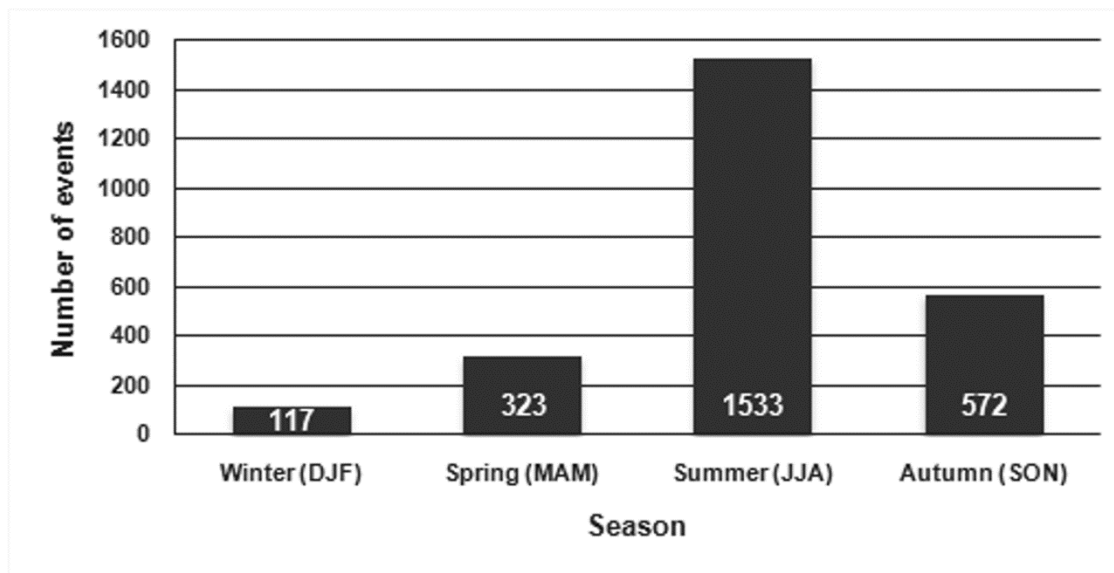


The annual number of days with at least one heavy precipitation event (observation) in Romania, between 1980 and 2009

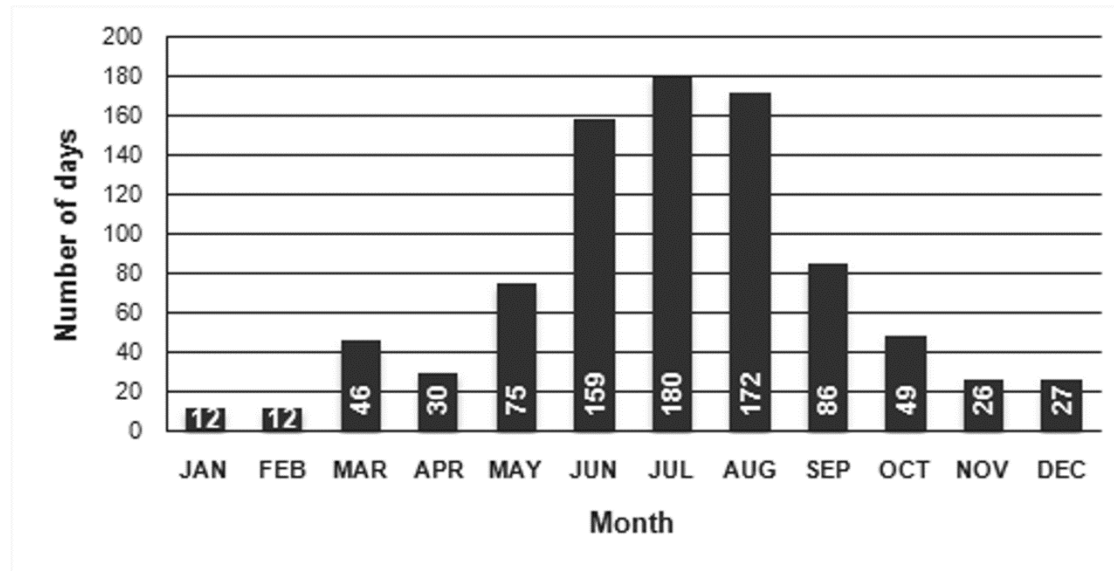
The annual number of heavy precipitation events (observations) in Romania, between 1980 and 2009



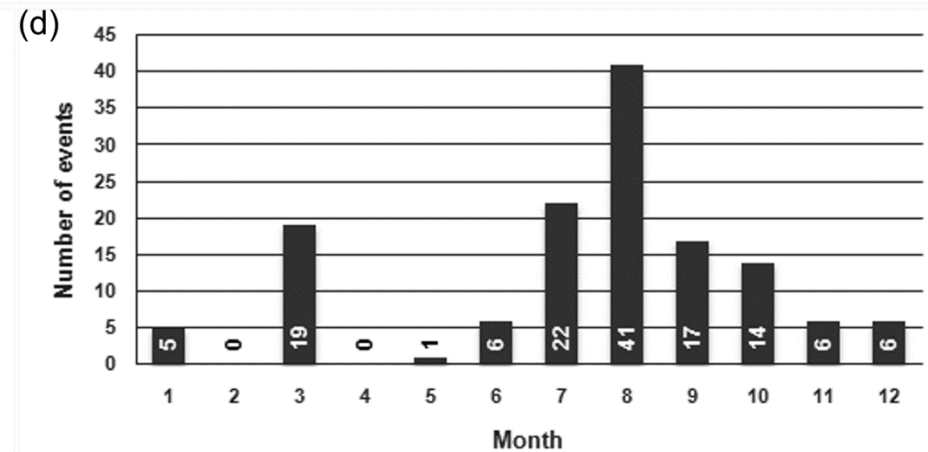
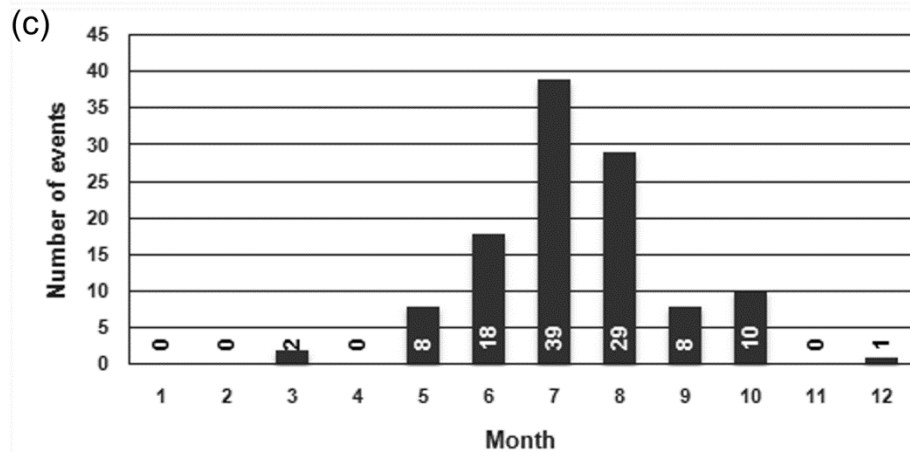
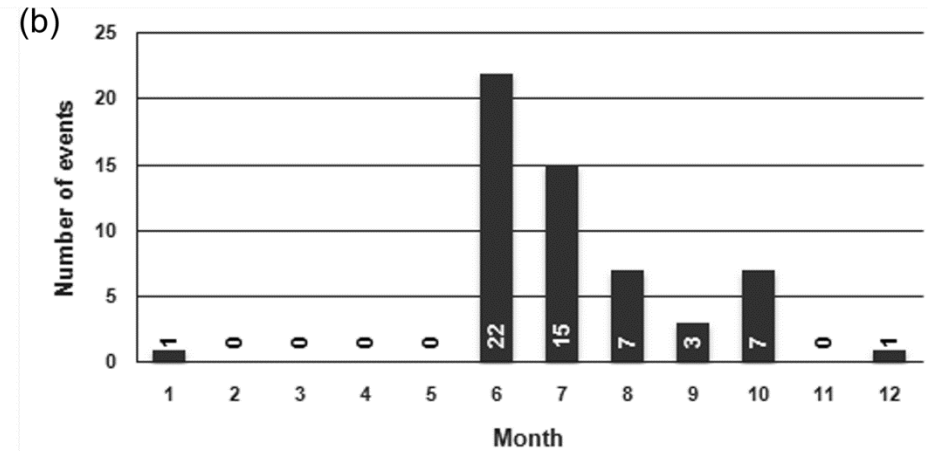
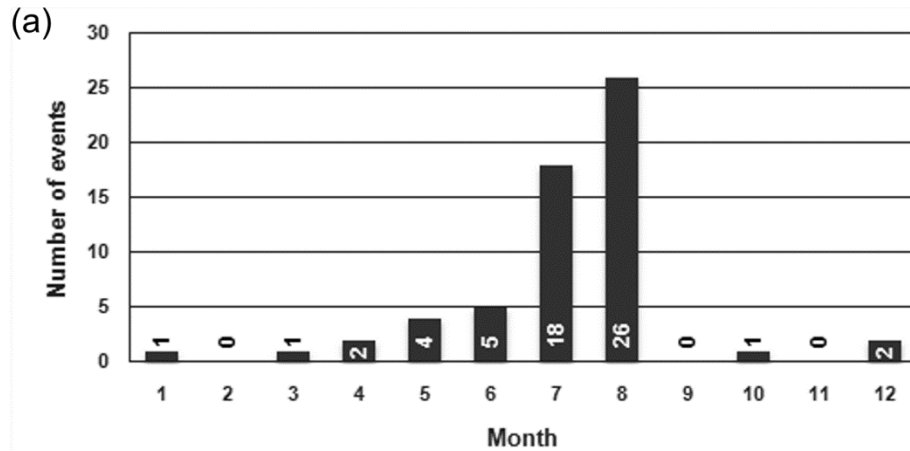
The total number of heavy precipitation events in Romania, corresponding to each season (top), and to each month (below) over the 1980 – 2009 interval



The total number of days when heavy precipitation events were recorded in Romania, corresponding to each month over the 1980 – 2009 interval

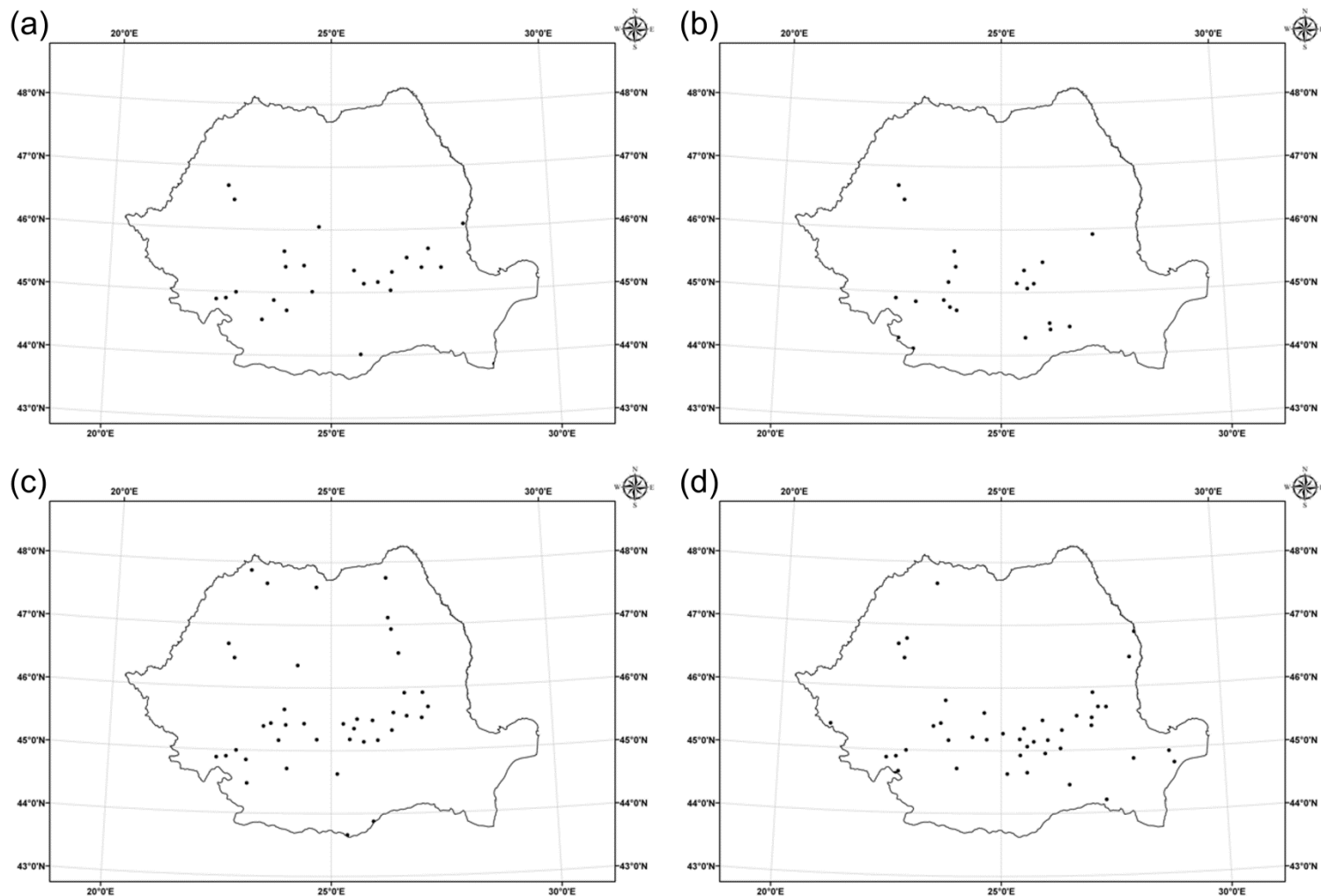


*The number of heavy precipitation events in Romania
in each month of 1982 (a), 1994 (b), 2002 (c) and 2007 (d)*



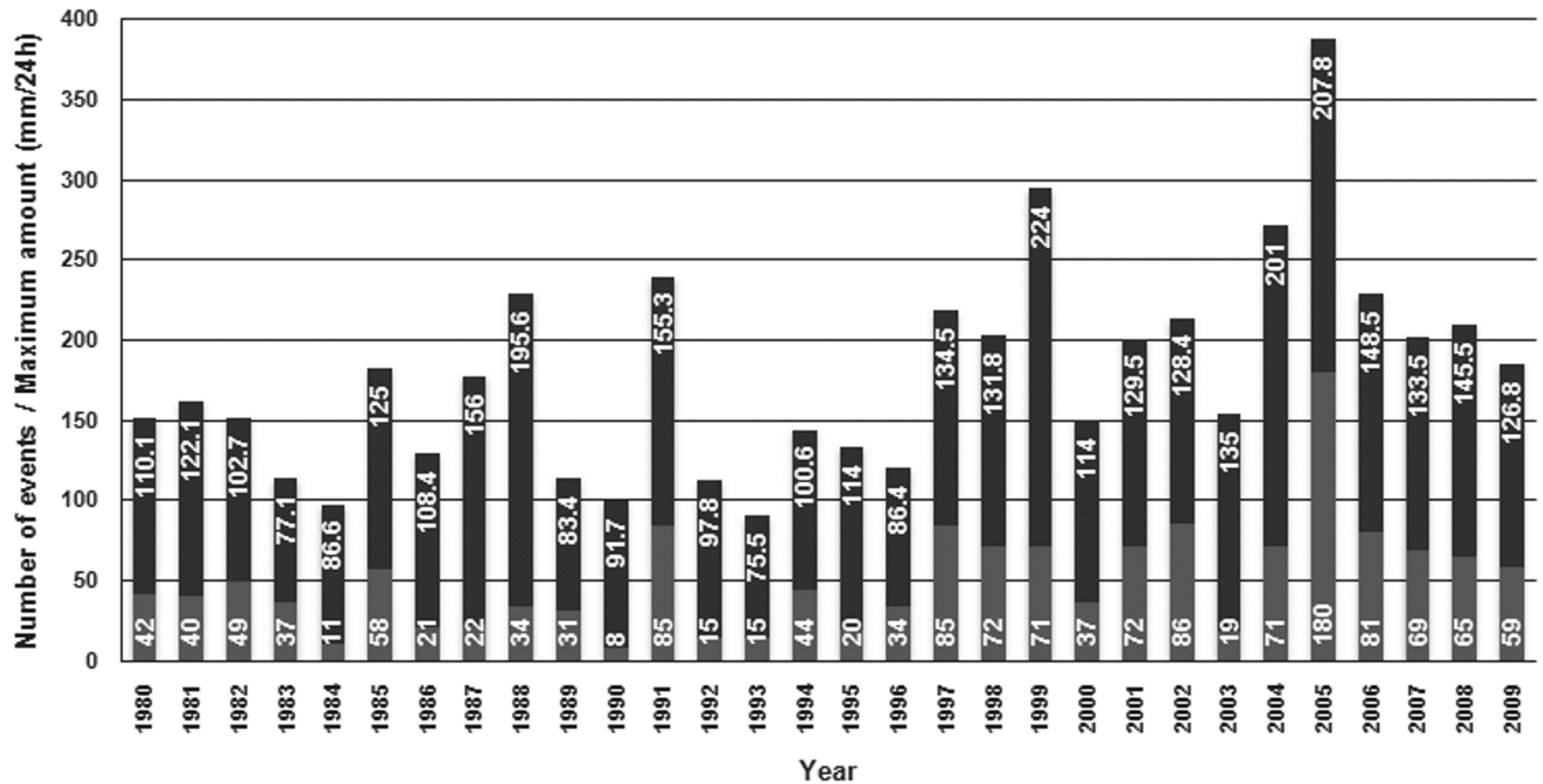
Peculiar (Gaussian-like regularity) distributions in 4 of the 30 years

Cold season - spatial distribution of heavy precipitation events recorded in Romania, between 1980 and 2009 in January (a), February (b), March (c) and November (d); overall distribution over the entire interval

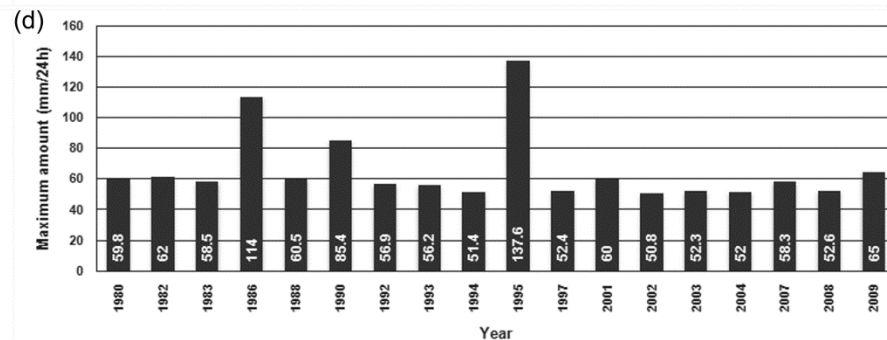
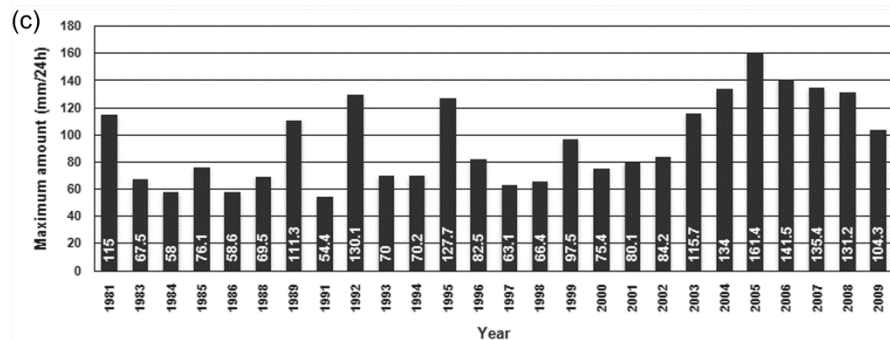
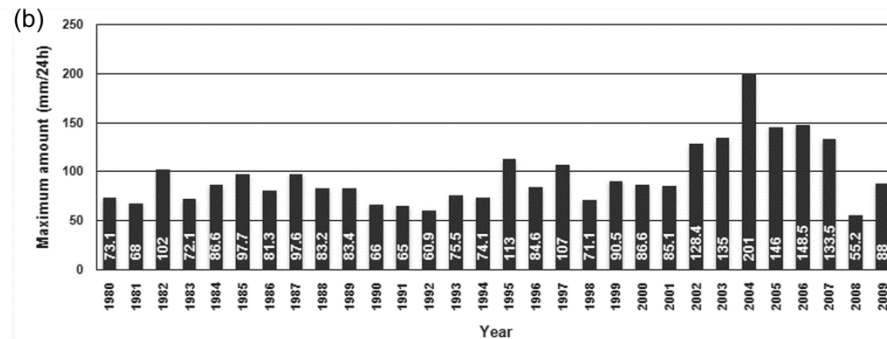
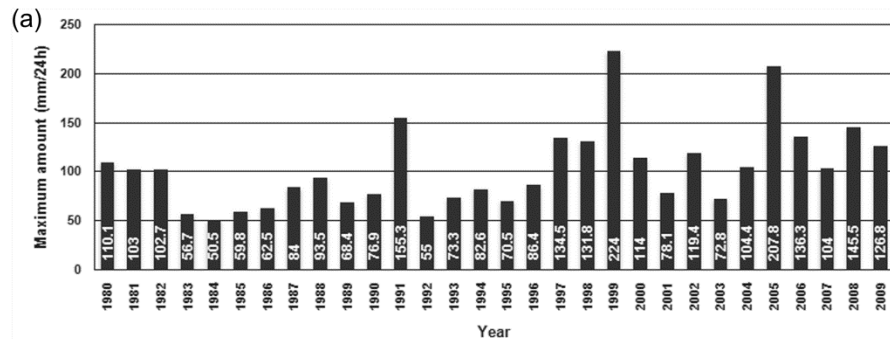


***Mediterranean cyclones are most relevant
in determining the cause of this distribution in the Southern half of the country***

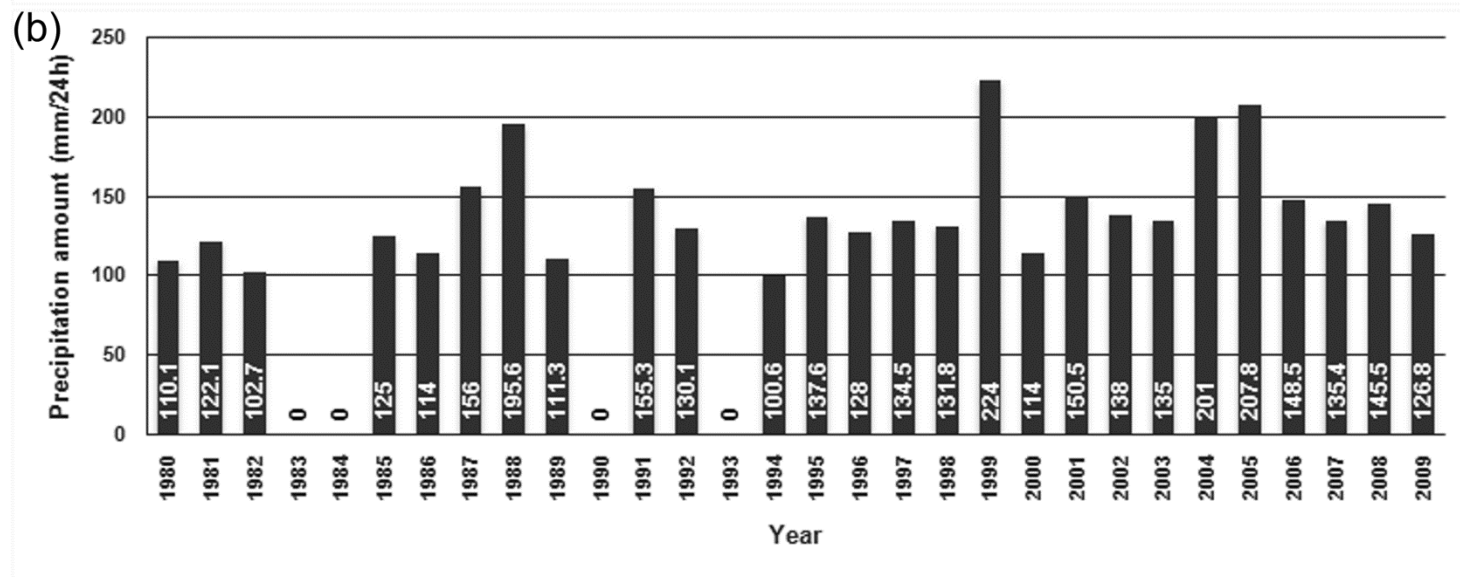
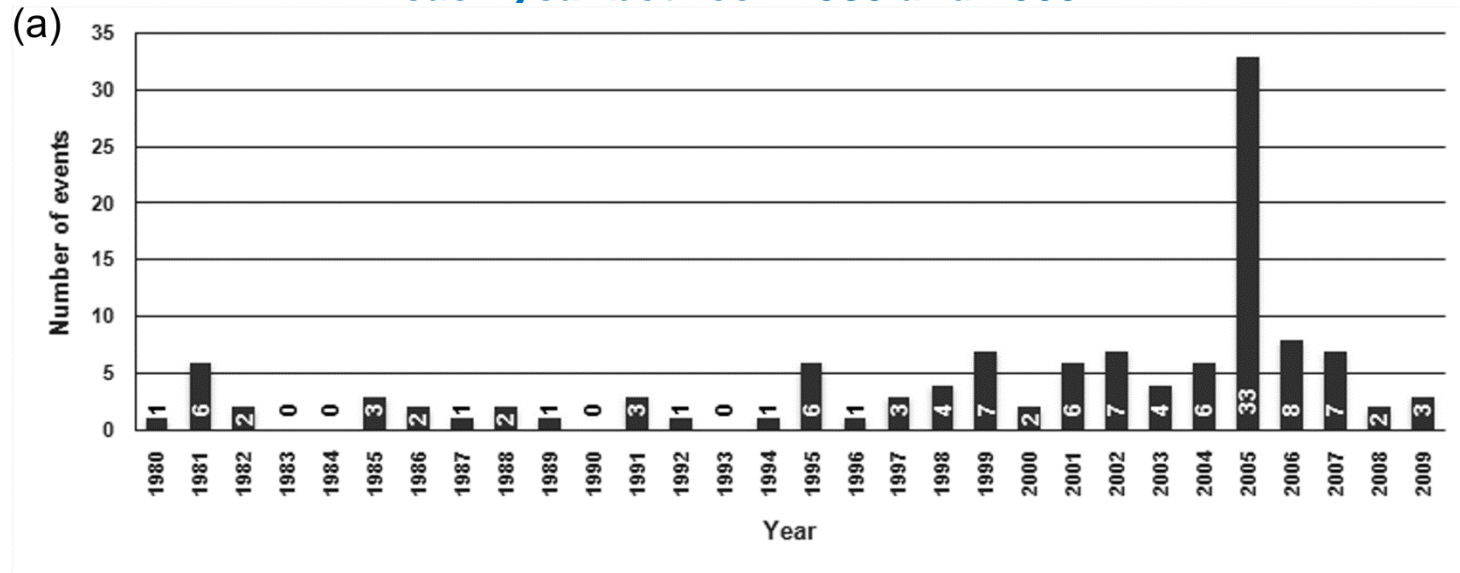
*Summer – the number of heavy precipitation events in Romania
between 1980 and 2009, and the maximum amount of precipitation each year*

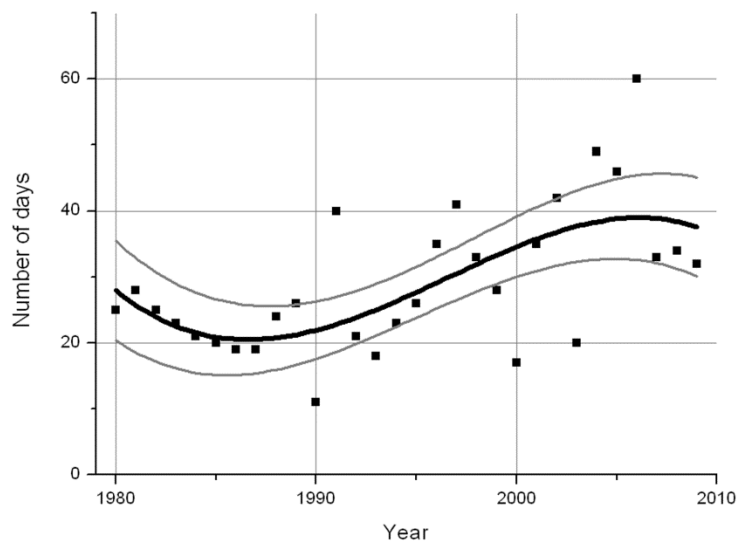


Maximum monthly precipitation amounts in Romania between 1980 and 2009, in July (a), August (b), September (c) and December (d)

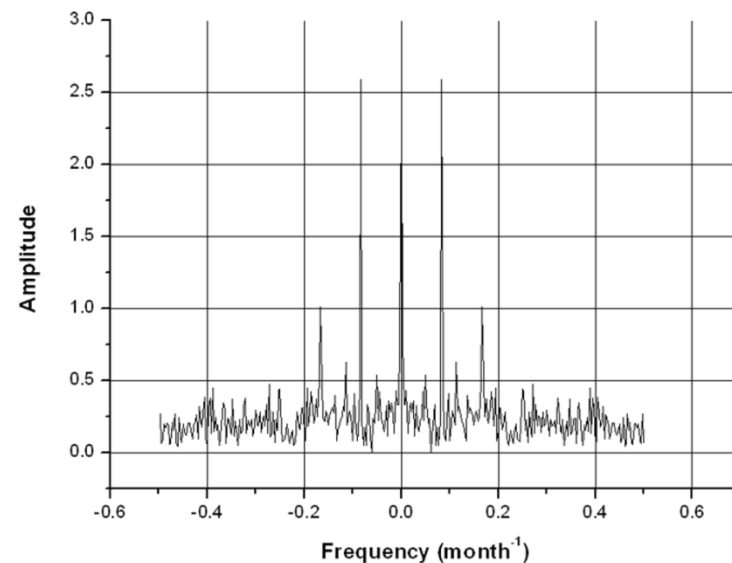


The annual number of precipitation events with amounts larger than, or equal to 100 mm/24h (a), and the precipitation amounts larger than, or equal to 100 mm/24h (b), each year between 1980 and 2009

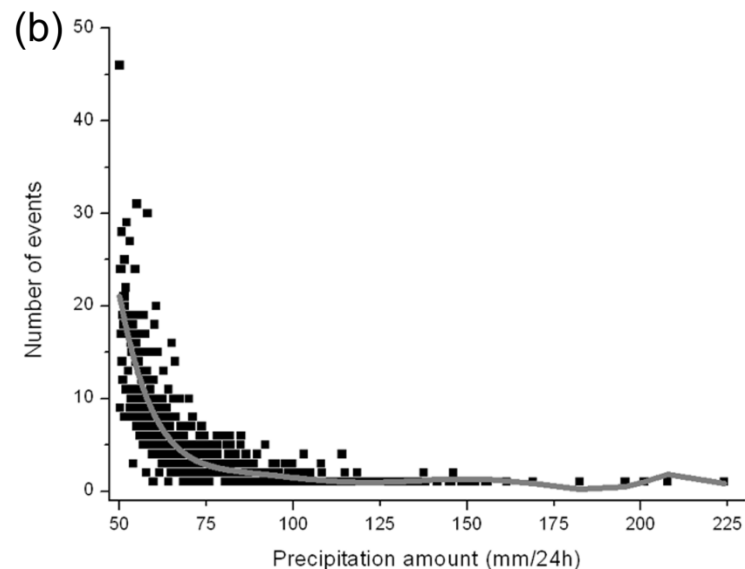
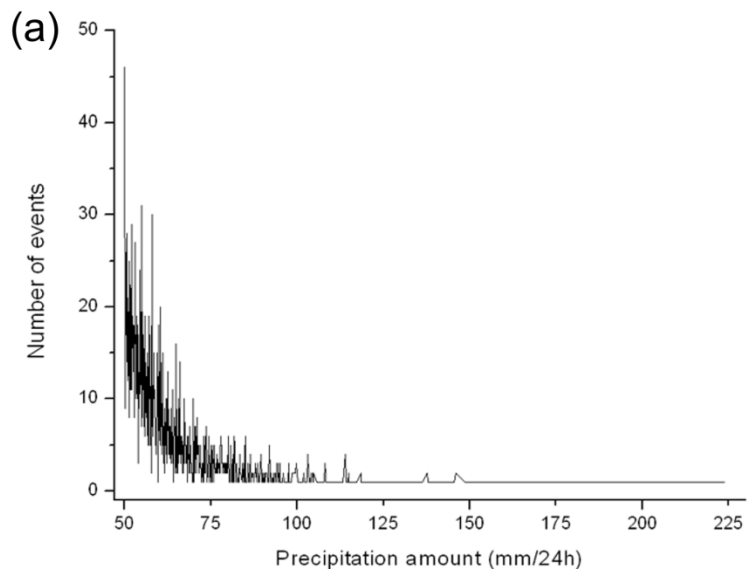




Polynomial fit for the annual number of days with at least one heavy precipitation event



FFT analysis on the number of days with heavy precipitation, in all months between 1980 and 2009



Distribution of the number of heavy precipitation events of distinct amounts (a), and a polynomial fit for this distribution (b)

Main results^(1 of 3)

1. The overall number of days with at least one heavy precipitation event in Romania was largest (511 days) during the summer months of June, July and August.

In contrast, only 10% of this number (51 days) corresponds to the winter months of December, January and February.

2. In the context of an insignificant variation of the number of stations, the average of the total number of stations that have recorded heavy precipitation events in each year was 22% larger in the 1995-2009 interval (78.5) than that of the number of similar stations in the 1980-2004 interval (43.3).

Main results^(2 of 3)

- 3. The steady decrease, until circa 1990, in the number of days each year when at least one heavy precipitation event has occurred is contrasting with the irregular increase of this number, afterwards. Since about 1995, the number of such days has generally been on the increase.**
- 4. March has been the month most lacking in days with at least one heavy precipitation event, and August is its opposite in this aspect.**
- 5. Most of the events (1533) have been recorded during summer (June, July, August), and the least number of events (117) during winter (December, January, February).**

Main results^(3 of 3)

6. An increase has been detected in the maximum amounts of heavy precipitation, their average after circa 1995 being with approximately 24% larger over the summer, than in previous years. Similarly, since 1995 there was also an increase in the number of these events.

7. Periodicities of 12 and 6 months were detected, of days with at least one heavy precipitation event.