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Natural Hazards and Earth System Sciences
Discussions
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Interactive comment on "Exceptional floods in the Prut basin, Romania, in the context of heavy rains in the summer of 2010" *by* Gheorghe Romanescu and Cristian Constantin Stoleriu

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Dear referee, thank you for your interests about our article,

Referee comment 1: Line 34 "Floods are one of the most important natural hazards on Earth" references are about Europe and not the earth

Authors' answer 1: Concerning line 34 we omitted to detail the phrase from "Floods are one of the most important natural hazards on Earth" to " Floods are one of the most important natural hazards in Europe (Thieken et al., 2016) and on earth as well (Merz et al., 2010; Riegger et al., 2009). They generate major human life losses and property damage (Wijkman and Timberlake, 1984).", and we modified in text's paper.

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Referee comment 2: Line 36. “Significant funds...”. You may cite the date provided in Merz et al. http://www.nat-hazards-earth-syst-sci.net/nhess- special_issue77-preface.pdf

Authors’ answer2 : We summarized the ideas specified by Merz et all. Into next paragraph: “According to Merz et al. (2010) “the European Flood Directive on the assessment and management of flood risks (European Commission, 2007) requires developing management plans for areas with significant flood risk (at a river basin scale), focusing on the reduction of the probability of flooding and of the potential consequences to human health, the environment and economic activity.” (p. 511).”

Referee comment 3: The reference in lines 37 to 44 should be documented and separated in different topics. Effectively the list is too long and is a mixing of several subjects. For example: -Ahilan et al. 2012 is about statistical distribution of maximum annual discharge using GEV and relationships with basin geology - Alfieri et al. 2015 is about climate change impacts on floods - Berariu et al. 2015 is about the effects of disasters on infrastructures such as transportation infrastructures and their interdependence, etc...

Authors’ answer3: We rephrase the paragraph about references between lines 37-44 Several studies investigated catastrophic floods or the floods that generated significant damage. They focused on: the statistical distribution of maximum annual discharge, using GEV and the links with the basin geology (Ahilan et al., 2012); climate change impacts on floods (Alfieri et al., 2015; Detrembleurs et al., 2015; Schneider et al., 2013; Whitfield, 2012); disasters effects on infrastructures such as transportation infrastructures, and their interdependence (Berariu et al., 2015); historical floods (Blöschl et al., 2013; Strupczewski et al., 2014; Vasileski and Radevski, 2014) and their links to heavy rain (Bostan et al., 2009; Diakakis, 2011; Prudhomme and Genevier, 2011; Retsö, 2015); public perceptions of flood risks (Brilly and Polic, 2005; Feldman et al., 2016; Rufat et al., 2015); land use changes and flooding (Cammerer et al., 2012); the evolution of natural risks (Hufschmidt et al., 2005); geomorphological effects of

floods in riverbeds (Lichter and Klein, 2011; Lóczy and Gyenizse, 2011; Lóczy et al., 2009, 2014; Reza Ghanbarpour et al., 2014); the spatial distribution of floods (Moel et al., 2009; Parker and Fordham, 1996); the interrelation between snow and flooding (Revuelto et al., 2013).

Referee comment 4: Line 61: are the Stanca-Costesti reservoir and the Prut reported in Fig. 1?

Authors' answer4: We modified the Figure 1, in order to appear River Prut, Danube and Stanca-Costesti reservoir.

Referee comment 5: Line 83 altitude in the catchment

Authors' answer5 : The situation observed at line 83 is an unfortunate manner of writing for describing the mean altitude within Prut catchment basin. The phrase was adjusted as follow: "The mean altitude of the midstream sector of catchment area is 130 m, and for the downstream sector is 2 m."

Referee comment 6: Line 90 Jijia basin area is not documented while this basin is important in the last part of the paper.

Authors' answer6 : We introduced some detailed information concerning Jijia River: "Jijia River has 275 km in length, a catchment area of 5757 km2 and an annual average flow of 14 m3/s. Its most important tributaries are Miletin, Sitna and Bahlui."

Referee comment 7: Line 94 what is the criteria to define a "large pond"?

Authors' answer7 : Small ponds are used as drinking water for livestock or to irrigate subsistence rural households. They usually belong to individual households. Large ponds on the other hand have multiple uses, such as: flooding mitigation, irrigation, fish farming etc. They resisted better in time because of their significant surfaces and depths. These large ponds belong to rural or urban communities.

Referee comment 8: Line 111 "measurements were taken to estimate the discharge."

It is important to say which kind of measurements.

Authors' answer8: Mathematical methods were used to reconstitute discharges and terrain measurements using land surveying equipment (Leica Total Station) were used to calculate the surface of the stream cross-section.

Referee comment 9: Lines 113 to 118 Same remark as in lines 37 to 44. It should be clear what type of method is behind a given reference. For example Ali et al. (2012) used tracers while Delli-Priscoli and Stakhiv examined "the performance of existing flood protection systems". Line 132 did CA, CI, CP have been defined before?

Authors' answer9 : We restructured the paragraph such as: "The recording and analysing methodology used is standard or slightly adapted to local conditions: e.g. the influence of physical-geographical parameters on runoff (Ali et al., 2012; Kappes et al., 2012; Kourgialas et al., 2012; Waylen and Laporte, 1999); the management of risk situations (Delli-Priscoli and Stakhiv, 2015; Demeritt et al., 2013; Grobicki et al, 2015 Grobicki et al, 2015); the role of reservoirs in flood mitigating (Fu et al., 2014; Serban et al., 2004; Sorocovschi, 2011); the probability of flooding and the changes in the runoff regime (Hall et al., 2004, 2014; Jones, 2011; Seidu et al., 2012a,b; Wu et al., 2011); flood prevention (Hapuarachchi et al., 2011); runoff and streamflow indices (Nguimalet and Ndjendole, 2008); morphologic changes of riverbeds or lake basins (Rusnák and Lehotsky, 2014; Touchart et al., 2012; Verdu et al., 2014) etc."

Referee comment 10: Line 148, 149 the methodology should be more detailed.

Authors' answer10 : The cartographic basis used to map altitudes and slopes is Shuttle Radar Topography Mission (Global Land Cover Facility, 2016), at a 1:50000 scale. The vector layers were projected within a geodatabase, using ArcGis 10.1. They include stream lines, sub-catchment basins, and reservoirs and ponds polygons, as well as gauging station points. In order to generate the GIS layers, we applied the following methods: digitisation, queries, conversion, geometries calculation (length, surface) and spatial modelling. Water levels and discharges data were processed and plotted on

charts using the Open Office software. We also used the Inkscape software to design the final maps and images.

Referee comment 11: Line 154 and 164 are not compatible (1 July, 9 July).

Authors' answer11 : In the first case it's about rainfalls registered in Romania (on July 1st) and in the second case it's about those registered in Ukraine (on July 9th).

Referee comment 12: Line 168 You need to specify what is registered in each station. What do you mean by "only water levels"? the stations reported in Table 1 should be easily identified in Fig. 3 (by using a different marker) and what is observed (level or discharge should be mentioned. Fig. 5 is not easy to read Line 199 and line 203. What is meant by "floods were recorded"? Do you mean that a flood gauging was operated instead of using the rating curve?

Authors' answer12 : Figure 3 was modified by using different marker. For line 168 "At Oroftiana gauging station, only the water levels data were registered. And for all other gauging stations are registering, in addition to water level, the discharges data." For line 199 and line 203 Floods were registered at the gauging station.

Referee comment 13: Line 211 the peculiarity of Oancea gauging station and Sivita station distinguishing tidal effects should be documented.

Authors' answer13: At line 211 there is an unfortunate translation for the term "backwaters". "Backwaters" is the correct term instead of "tidal bore". Backwaters were caused by increasing water level of Danube River, which influences the measurements results at the gauging stations situated on the downstream sector of Prut River.

Referee comment 14: Line 243 and elsewhere "Fig. 3 and 6" is not clear. Fig 6 is not easy to read. The peculiarity of Stefanesti(?) station should be mentioned and analyzed in the text. (lines 218 to 221) In all figures, with levels and discherges plts the basin area should be mentioned as well as in lines 310-315.

Authors' answer14 : The figures were modified for a better readability. Stefanesti gaug-

ing station is located in the downstream sector of the dam and itis directly influenced by the discharge water from the Stanca-Costesti Lake (since 1978).

Referee comment 15: Line 316. In is not clear why this mention here “The Oroftiana gauging station only records water level measurements.” Idem until line 321. What is the consequence on data accuracy? Line 317. Why this influence?

Authors’ answer15 : The water level registered at Radauti Prut gauging station could be influenced by the backwaters caused by Stanca-Costesti Lake. The most obvious case of backwaters was registered during the 2008 historic flood.

Referee comment 16: Lines 329 – 330. Was rainfall observed?

Authors’ answer16 : 200-400 mm of rainfall (ie 50-80% of the annual amount) was recorded between 1 May and 15 July 2010. During the flood manifested in 2008, a historic discharge value was registered for Prut river, but the by-passed water volume was low (in upstream of Stanca-Costesti dam) because the flood duration was short. The 2010 flood registered lower maximum discharges compare to 2008, but it by-passed a larger water volume, as flood lasted longer.

Referee comment 17: Line 331-341 should in the study area section

Authors’ answer17 : the lines 331-341 were moved in Study area.

Referee comment 18: Line 371; When did this record happened?

Authors’ answer18 : (July 5th, 2010)

Referee comment 19: Line 380. Is this increase a result from what was said before?

Authors’ answer19 : The discharge increase and the historic values registered were caused by several factors, such as: the water input from the upstream sector of Prut River and the water input added by the Danube backwaters.

Referee comment 20: Line 386 Table 2 should be in the study area section.

Authors' answer20 : This table is better in this paragraph location because the text referee to it.

Referee comment 21: Line 412 the backwater phenomena are effectively very difficult to assess and to predict.

Authors' answer21 : We mentioned this phenomenon because it is unique and had a major local impact for Dorohoi city.

Referee comment 22: Lines 427 to 432. The role of the reservoir and its location in comparison to the river stations is not well described in the text.

Authors' answer22 : The provision of an attenuation water volume (550 million m3) within the lake basin is efficient in retaining a 1% probability flood (reducing it from 2940 m3/s to 700 m3/s). Together with the embankments located on the dam downstream sector, it helps preventing the flooding of 100,000 hectares of meadow. At a normal retention level, Stanca-Costesti lake has a total area of 5900 ha and a water volume of 1.4 billion m3.

Referee comment 23: Line 449 Fig.12 presents challenging issues for water management.

Authors' answer23 : In order to avoid such phenomena it is necessary to increase the height of the overflow structure.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-289/nhess-2016-289-AC1-supplement.pdf

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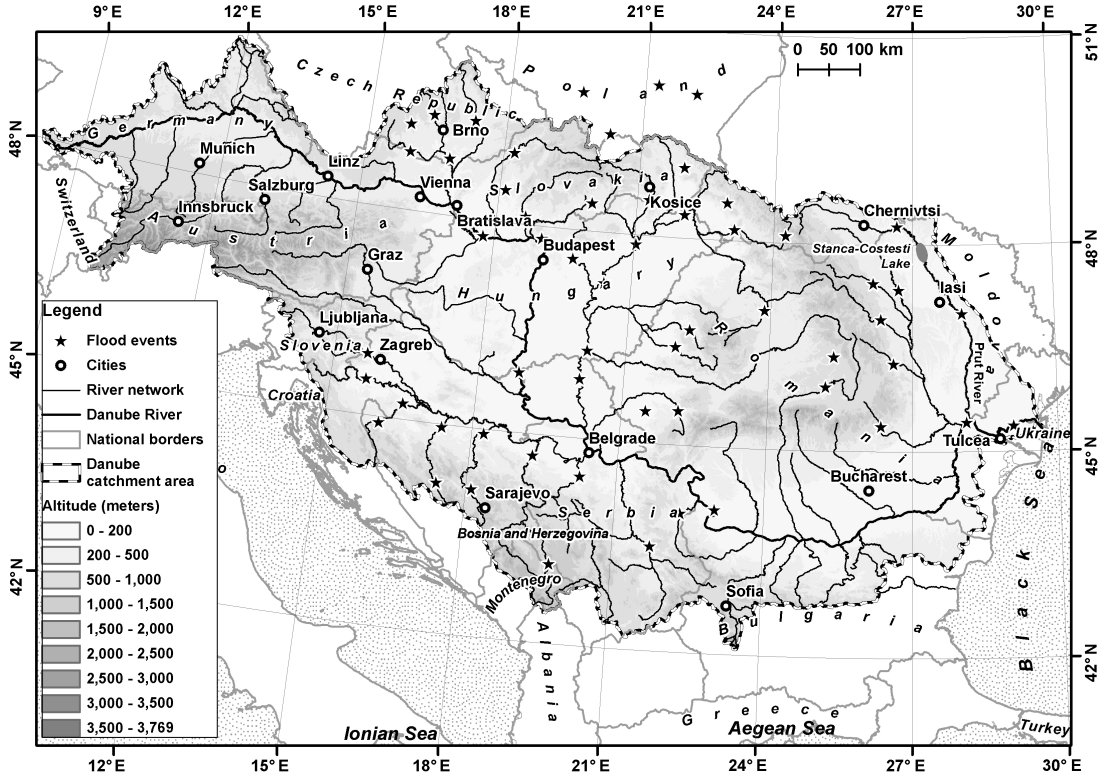
9° E
12° E
15° E
18° E
21° E
24° E
27° E
30° E
51° N
48° N
45° N
42° N
0 50 100 km
Czech Republic
Poland
Germany
Switzerland
Austria
Slovakia
Hungary
Slovenia
Croatia
Romania
Moldova
Ukraine
Serbia
Bosnia and Herzegovina
Montenegro
Albania
Bulgaria
Greece
Turkey
Munich
Linz
Salzburg
Innsbruck
Brno
Vienna
Bratislava
Kosice
Budapest
Graz
Ljubljana
Zagreb
Belgrade
Sarajevo
Sofia
Chernivtsi
Stanca-Costesti Lake
Iasi
Prut River
Tulcea
Bucharest
Black Sea
Aegean Sea
Ionian Sea
Legend
Flood events
Cities
River network
Danube River
National borders
Danube catchment area
Altitude (meters)
0 - 200
200 - 500
500 - 1,000
1,000 - 1,500
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2,000 - 2,500
2,500 - 3,000
3,000 - 3,500
3,500 - 3,769

Fig. 1.

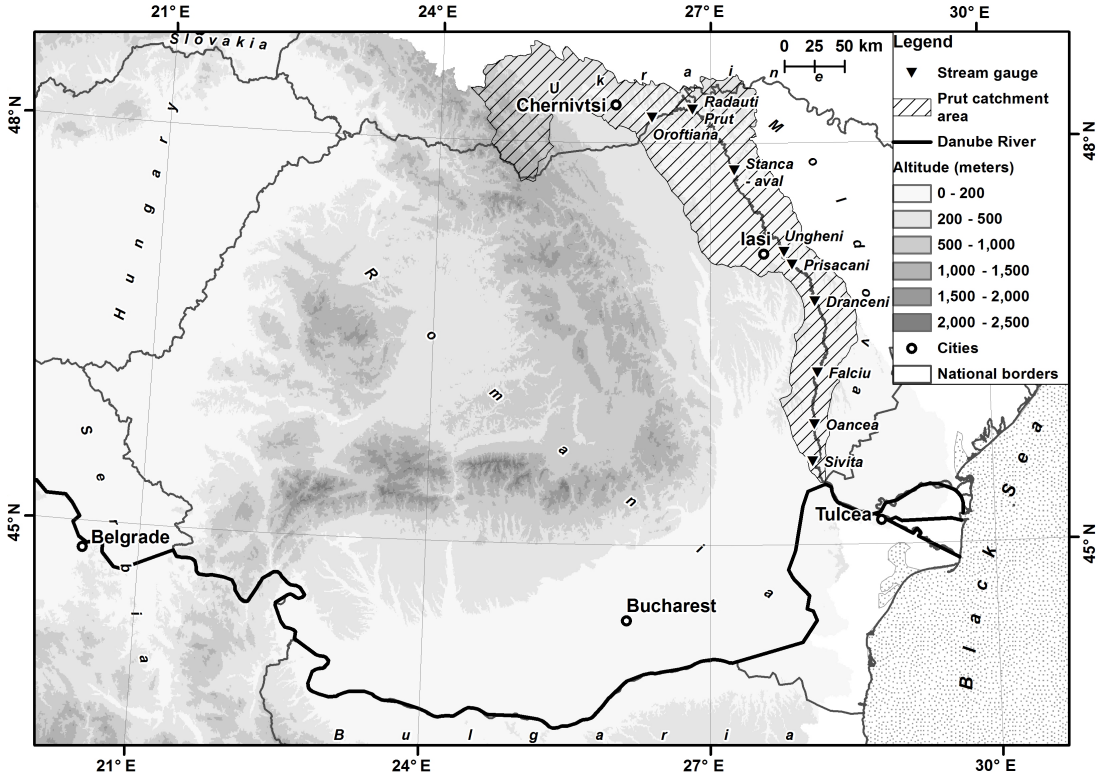

Fig. 2.

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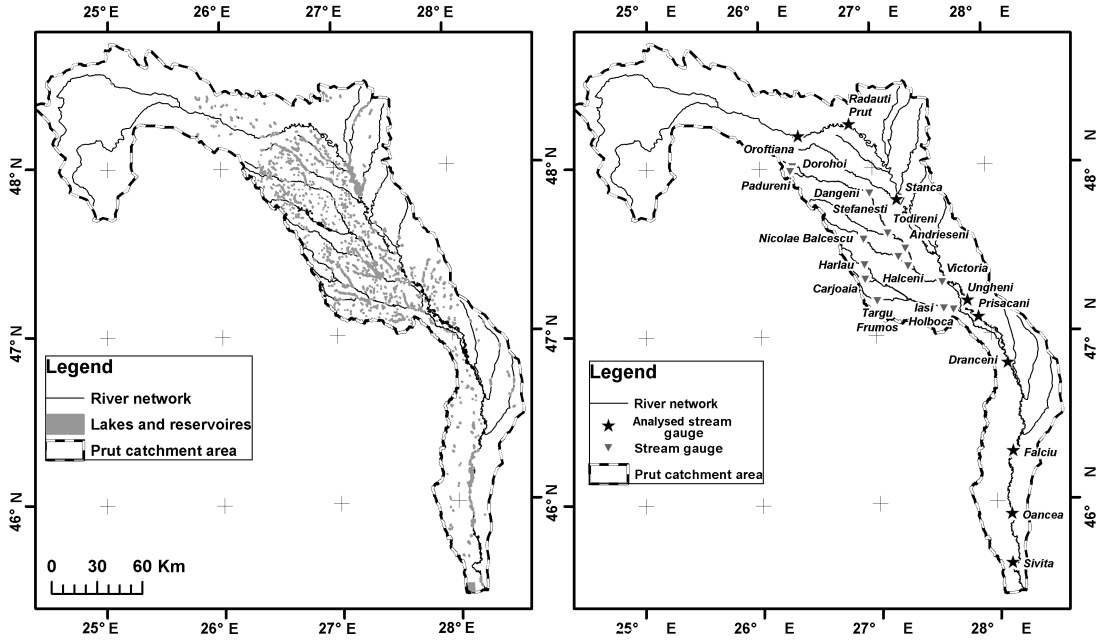

Fig. 3.

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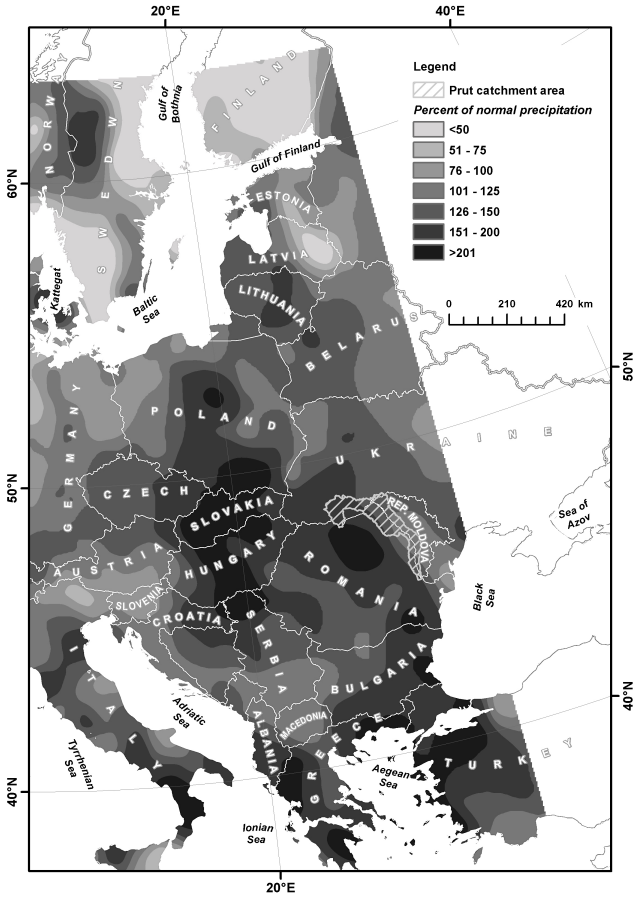
20°E
40°E
60°N
50°N
40°N
Legend
Prut catchment area
Percent of normal precipitation
<50
51 - 75
76 - 100
101 - 125
126 - 150
151 - 200
>201
0 210 420 km
NORWAY
SWEDEN
FINLAND
Gulf of Bothnia
Gulf of Finland
ESTONIA
LATVIA
LITHUANIA
Kattegat
Baltic Sea
BELARUS
POLAND
GERMANY
UKRAINE
CZECH
SLOVAKIA
AUSTRIA
HUNGARY
REP. MOLDOVA
Sea of Azov
ROMANIA
Black Sea
SLOVENIA
CROATIA
SERBIA
BULGARIA
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ALBANIA
MACEDONIA
GREECE
TURKEY
Tyrrhenian Sea
Aegean Sea
Ionian Sea

Fig. 4.

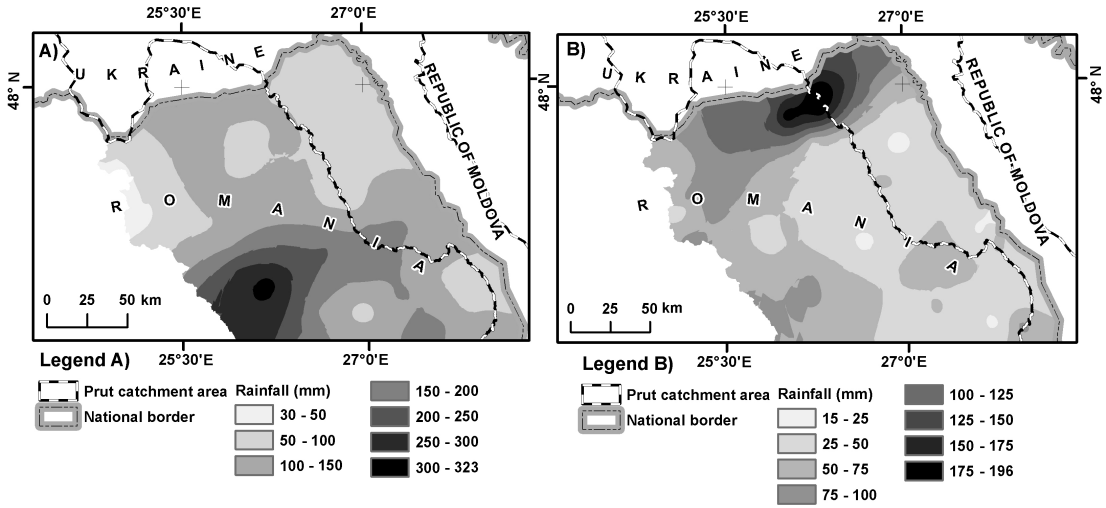

Fig. 5.

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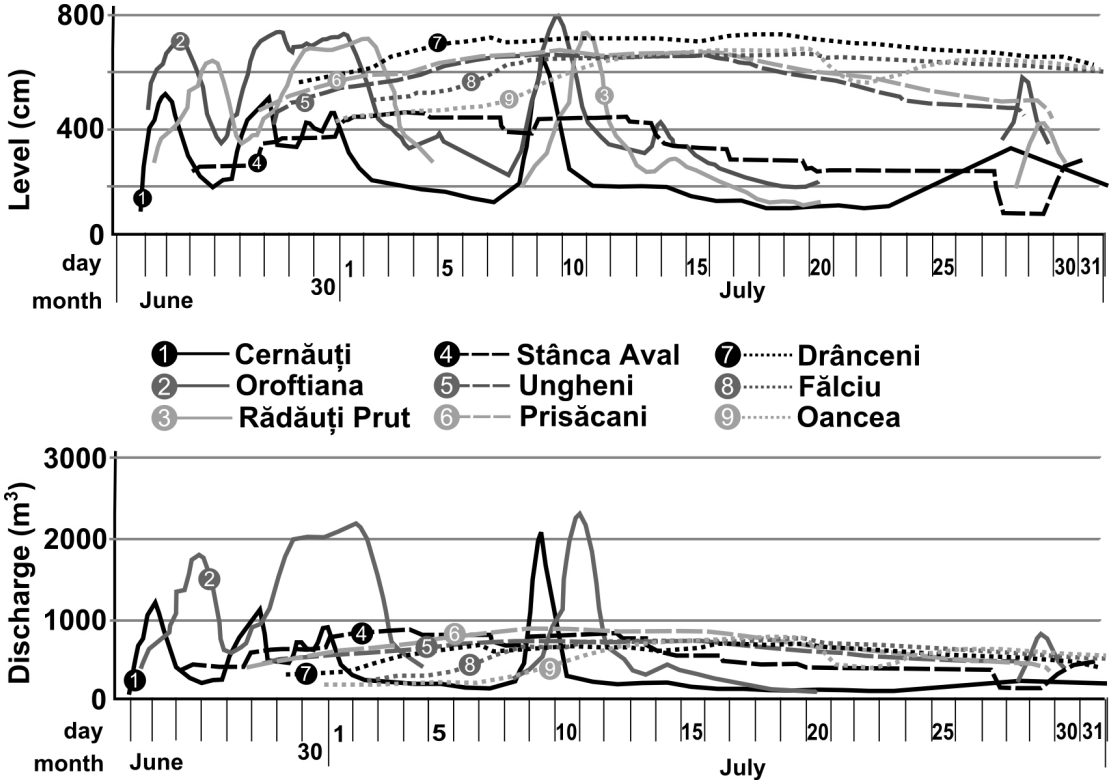

Fig. 6.

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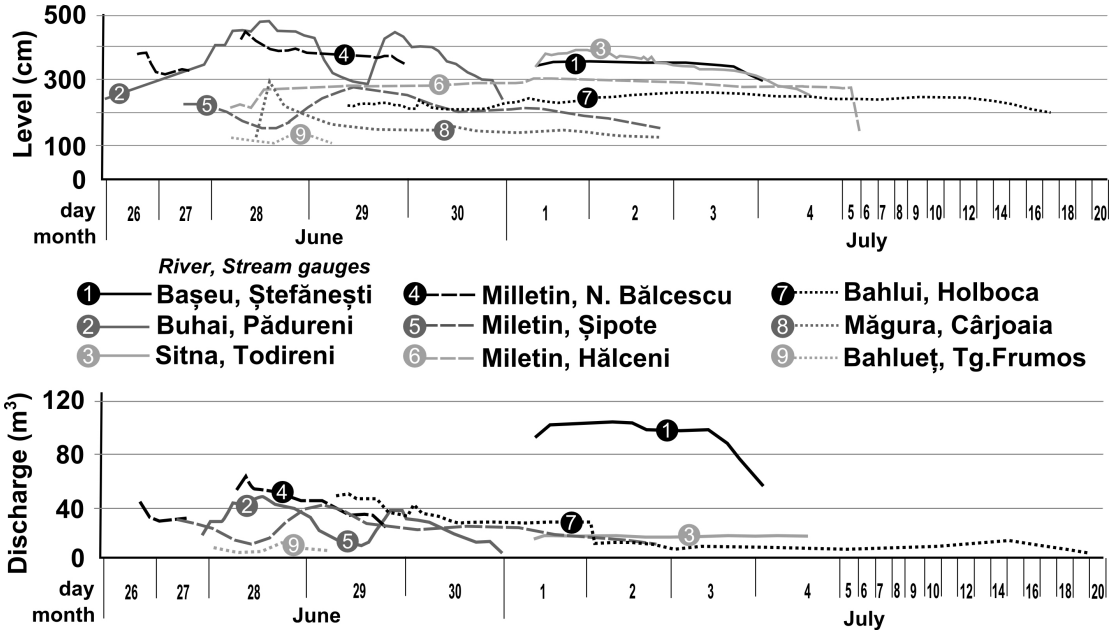

Fig. 7.

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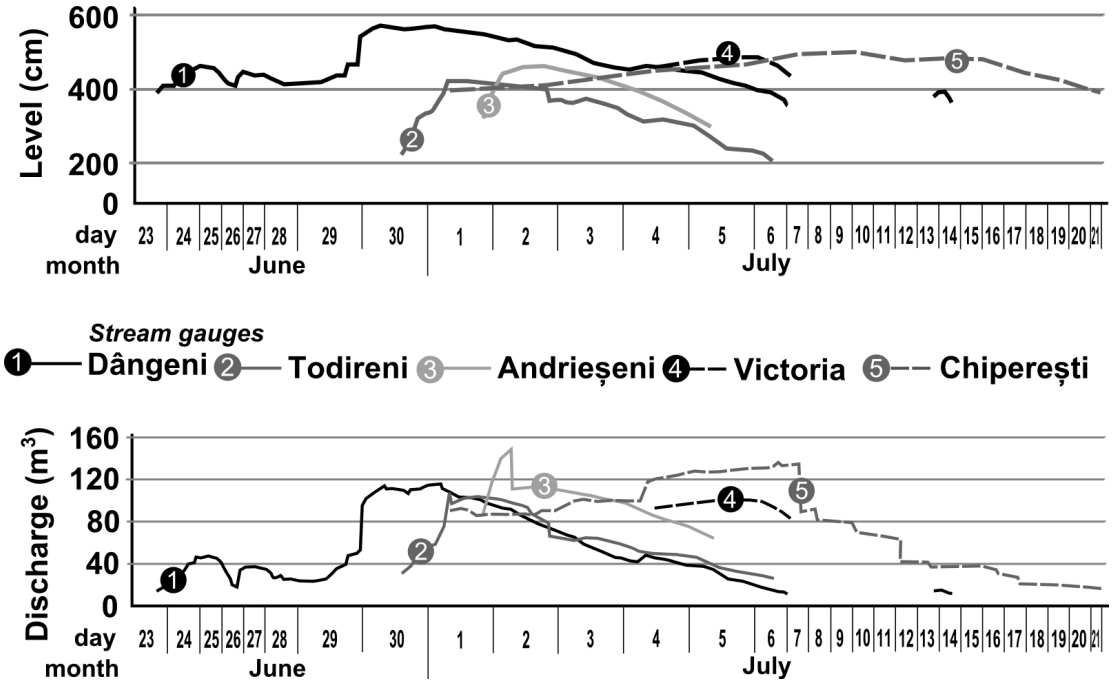

Fig. 8.

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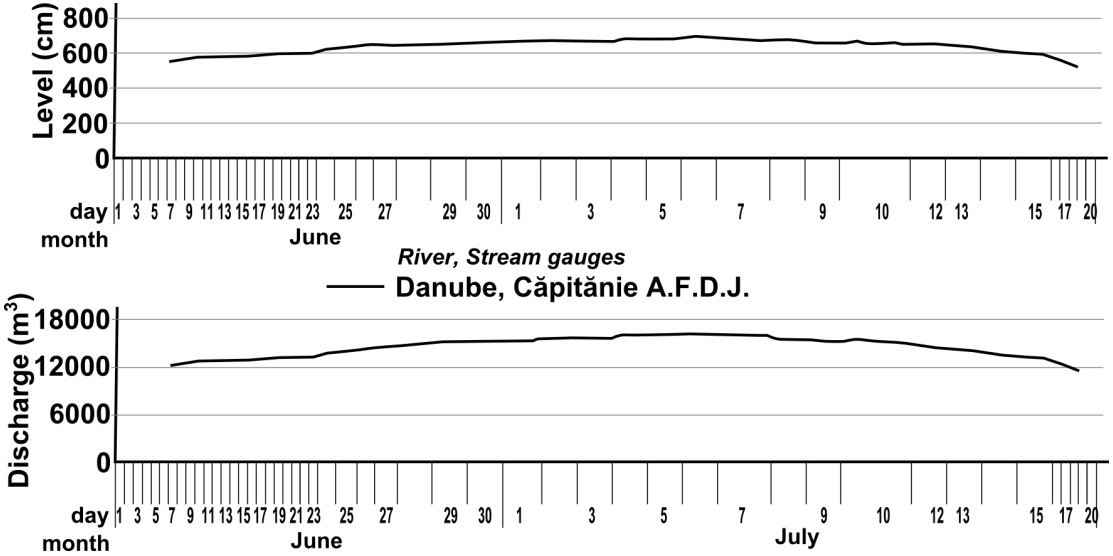

Fig. 9.

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