CONSIDERATIONS CONSERNING THE SPATIAL DISTRIBUTION OF ANNUAL PRECIPITATION QUANTITIES IN THE HYDROLOGICAL BASIN OF JIJIA

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ABSTRACT. Considerations conserning the spatial distribution of annual precipitation quantities in the hydrological basin of Jijia. Precipitations are, besides other climate elements, a defining parameter for individualization of the climate in certain regions and a crucial influence in the climatic features and geographical landscape in its ensemble. Also, with a great temporal and spatial variability, precipitations induce some significant changes in human social activities. The hydrographical basin of Jijia is situated in Moldavian Plateau the subunit of the Moldavian Plain. Because it is lowered by 200 - 300m from adjacent subunits, it appears to be like a depression (valley) with altitudes between 270-300 m. Under the conditions of relatively uniform lithologie with little possibility of underground water storage or supply from river flow, precipitations are the main power supply units and underground water in the Jijia basin. Spatial and temporal variability of this parameter involve extreme great heterogeneity and other components of the hydrological balance (evapo-transpiration, drainage, infiltration), which increases the difficulty in determinations of quantitative small spaces and short intervals. Spatial distribution of precipitation posts and weather stations, in their large number (37) has enabled us to make a regular grid of points (including stations in the surrounding area and the basin). All this combined with a long study period over 50 years (1960-2011), allowed us to make a map of spatial distribution and annual amounts of precipitation in Jijia basin.

Keywords: Jijia, the spatial distribution of rainfalls, seasonal quantities, monthly amounts

1. CHARACTERIZATION OF THE HYDROGRAPHICAL BASIN OF JIJIA

The source of Jijia river is in the west town cold Pomârla, on the eastern slope of Bour Massif and it is made up of two main streams of water, which are well individualized over 10 km. One of the arms springs from Ukraine, at an altitude of 410 m and after 4 km enters the Romanian borders. The second spring flows from Bour Massif starting at 340 m.

The hydrographical basin of Jijia is situated in Moldavian Plateau the subunit of the Moldavian Plain Because it is lowered by 200 - 300m from adjacent subunits, it appears to be like a depression (valley) with altitudes between 270-300 m. The surrounding heights and lower level of the Prut valley, increased the

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appearance of an network of rich valleys, the average density being 0.49 km/km2 (Buruiana, 2012).

The precipitations, with temperature, are a main factor in today`s economy that consists an important climatic factor, being an indentation on the entire geographical landscape.

The region beyond the Carpathian arch is characterized by a temperate transitional climate,(Apostol, 2004). Mainly do to the movement of Western influence (across the Carpathians, and the surrounding areas and disappearing in the north), and secondly to the dominance of maritime polar parched (old) air and moderate annual quantity of precipitation.

In Jijia Basin, which crosses the hillside of Moldavian Plain, directly exposed to the circulation of continental air masses, south or west air frequently suffered the Föhn effect processes and the quantities of precipitation are reduced, ranging generally around 500 mm (Băcăuanu, 1992).

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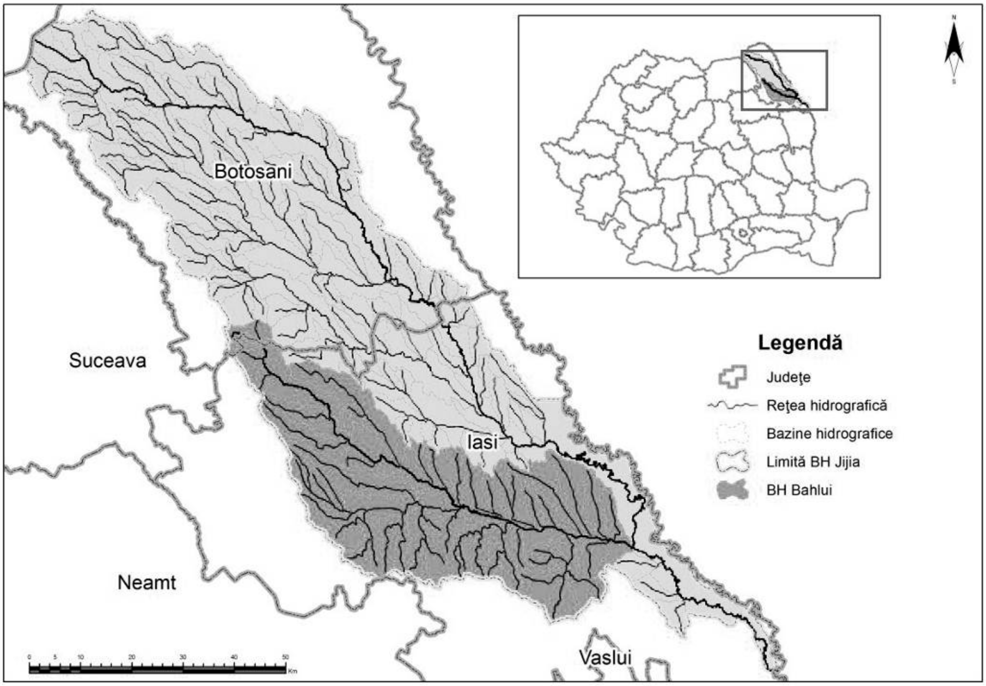

Fig. 1. ***The geographical position of the Jijia catchment.***

Spatial and temporal variability of this parameter involve extreme great heterogeneity and other components of the hydrological balance (evapo-transpiration, drainage, infiltration), which increases the difficulty in determinations of quantitative small spaces and short intervals. On the relatively small area of the river basin Jijia is recorded however, significant territorial variations in annual precipitation amounts.

Solar radiation, general circulation of the atmosphere, dominant in western sector particularly in the first half of the warm season, and the Eastern sector in the cold half median, in correlation with local geographical factors, the relief with its characteristics, this tree vegetation, water basins, areas with excess moisture along the corridors of valleys or low areas depression, this large human settlements, especially of Iasi, above which thermal convection is more active and leads to large amounts of pollution urban atmospheric condensation nuclei) caused the precipitation differentiation exhibited together all over the basin (Iaţu, 1990).

2. THE SPATIAL DISTRIBUTION OF PRECIPITATIONS IN THE JIJIA CATCHMENT

For the more real and accurate analysis of the spatial distribution of the precipitation quantities were used data from the rainfalls observations during 1960 to 2011 from the meteorological and rainfalls stations (37 in total), located inside the catchment but also close to it.

The analyzed data from all stations not being homogeneous, for the period mentioned above, some data extensions were necessary. Spatial distribution of our pluviometrical and meteorological stations, allowed us to achieve a regular network of points (including stations in the surrounding area and of the ones on the basin), which has helped us to made a map of spatial distribution of the annual average precipitation quantities in Jijia hydrographical basin.

Spatial annual average amount precipitation in the catchment can be achieved by several methods. Overall, it calculated the arithmetic averages of the quantities recorded from the pluviometrical and meteorological stations in the entire basin, or just from one point. We have chosen, for spatial average precipitations, in Jijia basin, the IDW method (Inverse Distance Weighted),(Feng-Wen Chen, 2012).

The precipitations map of spatial distribution was generated by combining a set of data (statistical), the tendency, and the regression line with a numerical model of land. The first step was the placement Z's pluviometrical stations and then the extraction of DEM (Digital Elevation Model) (Figure 2. - A)),(Fries, 2010). After determining the dataset and obtaining horizontal gradients, maps will be made separately, for each land cover unit, by the method IDW (Inverse Distance Weighted) (Figure 2. - B).

The method is based on the assumption that the influence of a point compared to another decreases with distance. It is an exactly or approximately medium interpolator depending on the parameters established by the user. Generate so-called "bull's eye" effect can be reduced by applying a smoothing filter.

Post pluviometric	X	Y	Elevation	Media Multianuala
ac.Cal Alb	616825.00	736194.00	143	455.90
Albesti	653453.00	692990.00	70	499.10
Avrameni	645364.00	726077.00	229	561.66
Botosani	623624.00	694248.00	155	570.71
Chiperesti	709932.45	628235.07	33	536.60
Ciurbesti	693953.93	623863.98	69	503.20
Cotnari - Statia Meteo	646089.71	652085.12	229	536.22
Cristesti	629307.00	684683.00	156	585.30
Dângeni	647436.00	705380.00	81	514.30
Darabani	617008.00	745219.00	240	575.37
Ezareni	694242.64	626865.02	61	538.40
Halceni ac	673011.76	659994.81	48	522.10
Hârlau	643681.51	660145.83	134	529.60
Havârna	622338.00	732781.00	131	554.40
Iasi - Statia Meteo	699363.50	633566.35	100	572.69
Bârnova	697326.81	631557.34	354	774.50
Manoleasa	653695.00	723379.00	103	495.50
N.Balcescu	644257.00	676809.00	114	564.80
Oroftiana	599569.00	743131.00	168	556.50
Padureni	597827.00	720545.00	183	530.60
Pârcovaci ac.	637436.79	662945.61	167	543.50
Plugari	659779.04	667819.39	65	553.72
Podu-Iloaiei ac.	670758.80	636408.90	58	534.23
Pomârla	598708.00	729014.00	192	623.90
Prisacani	718732.02	625267.98	32	485.00
Radauti Prut	635058.00	750660.00	113	538.00
Stânca	666339.00	705968.00	88	459.22
Tansa ac.	658302.05	646224.40	84	404.10
Tg.Frumos	652612.57	635940.70	89	494.90
Todireni	658694.00	680917.00	57	513.10
Ungheni	711215.55	637179.15	38	518.10
Victoria	696727.50	648666.61	38	467.20
Dorohoi	604679.29	718019.91	154	548.01
Ciurea	695333.97	621042.45	136	645.60
Coarnele Caprei	659139.67	656787.24	139	472.50
Tudora	623126.94	668838.21	250	636.60

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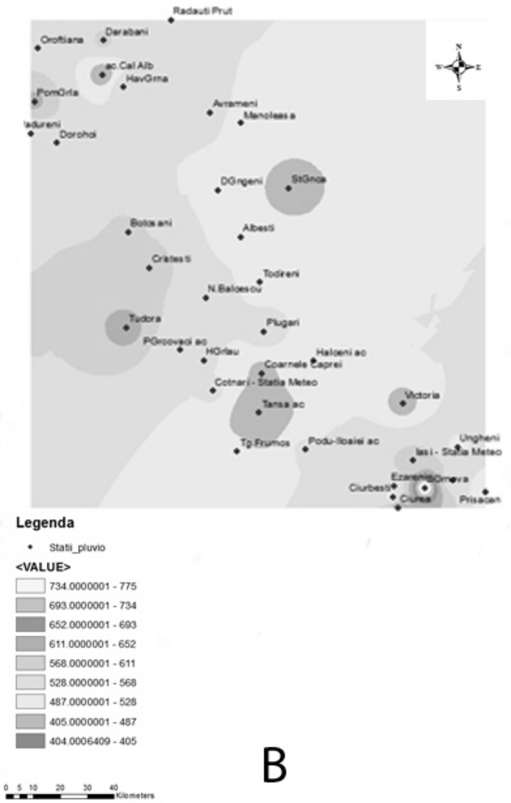

Fig. 2. ***A- pluviometric stations with z according the Digital Elevation Model; B - Map for each unit of land cover by IDW method (Inverse Distance Weighted).***

Vertical distribution of precipitation was done using the formula:

Pp (x, y) = PpDet + Y gradient altitude [ZDem (x, y) - Zdet] where Pp (x, y) is the final result of the multiannual average at a position Z (x, y) numerical model of land point position.

By analyzing the annual map of precipitation and quantity distribution in Jijia Basin (Figure 3), we can easily say that precipitations decreases from west to east due to the decreasing of altitude in this direction and greater frequency air masses, more humid in the west (air masses often Atlantic origin), which in east is barren requiring by the slightly less pluviometrical east-west difference. However the next map we can deduce that:

The higher altitude areas of the landscape, have a greater precipitation contribution [Ibănesti or Darabanilor Hills in the north: Pomârla - 623.90 mm Hills Copal - Cozancea - Guranda from the center: Cristeşti - 585.30 mm, Balcescu - 564.80 mm). Lower Basin Bahlui deserve special mention. Iasi coast, 350 m hurdle in front of prevailing north-west movement, generates it and in the lower to Bahlui (where start ascent the air masses), greater amounts of precipitation (see comparative Jijia

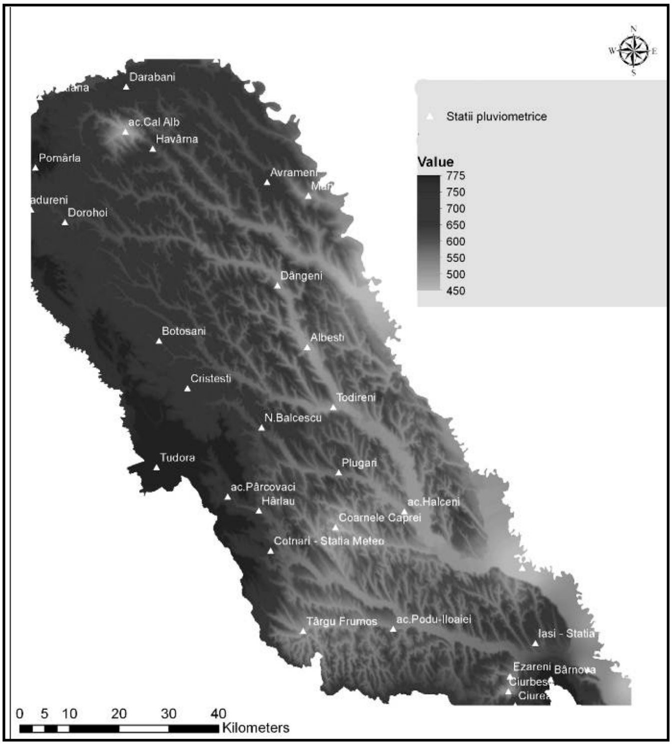

Fig. 3. ***Spatial distribution of rainfall in the catchment Jijia***

valley at north of Iaşi, Victoria, 467 mm). Iasi, through the emission of large amounts of condensation nuclei, and by,, thermal funnel "created, also produces a slightly plus (Iaşi, 573 mm). In the west coast of Iasi are two, orographic funnels "that capture, directs, chunky power lines and obliges the masses of air to ascent, open to the south, between Face Prut and Codri Hills (Moldova), where growth is discernable south of the area studied by us and Ciurea basin, where the funnel is blocked south of the hill of Bârnova where quantities of precipitations are surprisingly high compared to what is known in the literature in the country (646 Ciurea mm and 775 mm in Bârnova, at an altitude of only 354 m, comparable amounts of mountain areas to over 700 m altitude).

The lower areas are the areas with the lowest annual precipitation amounts. Among them, we can mention one north – east in the Campia Jijiei superioare (Plain Jijia Upper): Cal Alb ac. 455.90 mm; Stânca, 459 mm and one south - west, the,, shadow 'Big Hill - Hârlău (Tansa, 467.20 mm Coarnele Caprei, 473 mm). A third area of low precipitation accompanying river Prut.

Besides pluviometrical differences outlined above, we find an alternation of wet areas, overlapping with higher relief and drier areas, overlapped the lower one, succession well highlighted on the north-west - south-east.

Slopes exposed to the movement of horizontal air from an area to another, moist air masses from the north - west are wet, the south - east masses are drier, both suffered the Föhn effect, greater differences between the opposite slopes or exposed to the horizontal air masses be noticed especially in maritime air masses.

3. THE SPATIAL DISTRIBUTION OF SEASONAL PRECIPITATION QUANTITIES

Atmospheric dynamics, the relief, the presence or absence of evaporation sources, the forest areas, large urban agglomerations, are contributing to the spatial distribution of seasonal atmospheric precipitation (Apostol, 1987).

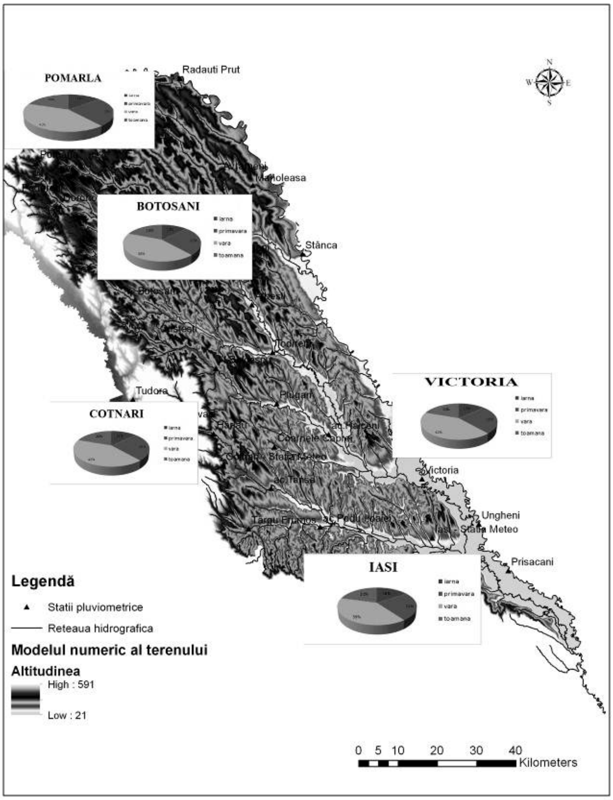

Fig. 4. ***Spatial distribution of seasonal amounts of rainfall in the catchment Jijia***

Changes in direction and intensity of atmospheric dynamics over one year have an approximate repeatability from year to year and introduced a relatively predictable monotony and gait characteristic of precipitations from one season to another, but many local geographical factors and spatial combinations and value of solar radiation, impose significant changes in how the amount, duration, frequency and intensity of precipitations on restricted time intervals and narrower areas, such as, rarely, precipitation same season were from one year to the same quantitative and qualitative characteristics (Mihăilă, 2006).

The relatively constant, summer is the season with the most significant amounts precipitation (42%), followed by spring (25%), autumn (20%) and in winter are falling the lowest seasonal quantities precipitation (13%), about the same temporal distribution situation being encountered in absolute values or percentage of seasonal amounts precipitation at each station or pluviometrical station in hand (Figure 4).

The spatial distribution of precipitation amounts the seasons, highlights outlining three areas with important quantities precipitation (in north and north - west, the central - western and central Europe, plus the south) and two geographical spaces with pluviometric deficient (one in the northern half, the other in the southern half).

4. THE SPATIAL DISTRIBUTION OF MONTHLY PRECIPITATION QUANTITIES

Months, in their sequence, show different values of precipitation amounts, as the season they belong but depending on the frequency and intensity of wet or dry air. Moreover, the analysis of precipitation distribution on the surface of the basin, every month, we see that the dispersion value is in close touch with local factors, especially with the relief, even if it is not extremely varied and spectacular morphology. This can be explained by the fact that, although they are separated by small distances, stations or meteorological stations register monthly the pluviometric precipitations amounts with different values.

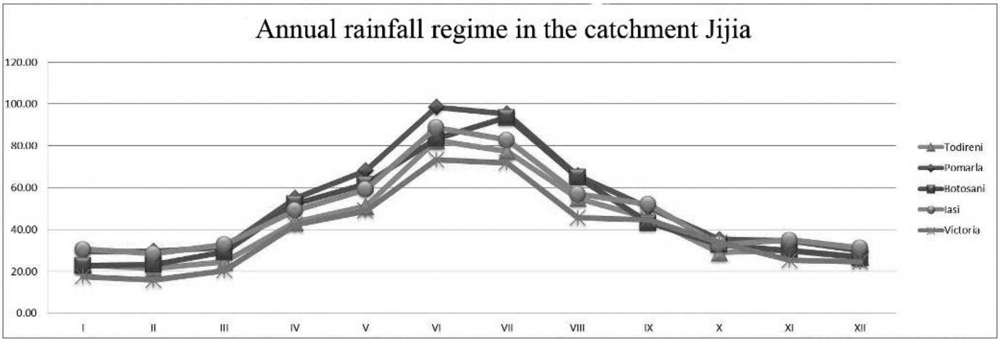

Fig. 5. ***Annual rainfall regime in the catchment Jijia***

Jijia Basin, in February (the month with the most minimal stations records) precipitation amounts increase gradually monthly until June when there is a maximum annual precipitation (Figure 5).

In February, the movement of the continental - Eastern is dominant and very active. Mediterranean depressions do not reach the north - eastern Romania only rarely, bypassing dams or mountain climbing Dinaric Alps, Balkans and Carpathians. Thermal convection not yet activated, but replaced by a thermal inversions accompanied with stratiform clouds, contribute to the registration of the smallest annual amount of precipitation in many stations (between 16.6 mm and 29.6 mm Pomârla Victoria).

Along with a strong warming in April, May and June, cyclone activity at the northern periphery of the Azores anticyclone Ridge, is intensified, bringing moist and unstable air mass meanwhile thermal convection act is additional moisture brought by the circulation of the western oceanic expanses of western Europe. Atlantic cyclone sweeps through northern periphery of the Azores High Ridge and reaching over Romania loaded with precipitation falling from cumuliforme and stratiform cloud systems (Erhan, 1988). Even if in April the average monthly amounts oscillate between 42.8 Victoria mm and 54.9 mm Pomârla, in May are more significant increases (48.9 mm Victoria at 68.1 mm

Pomârla) to reach the maximum rates in June (73.3 mm Victoria at 98.5 mm Pomârla).

The monthly average of precipitations amounts, resulting from the processing of a long data strings in instrumental observations, allows us to make nature appraisals global and synthetic, but hide extraordinary the item of climatic variability, which in terms of a temperate shades of excessively transition may reaches the maximum and minimum much different from average values.

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