



Variability of Characteristics of Rains and their Erosive Potential

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Abstract

In work the questions connected with variability in time and space of characteristics of atmospheric precipitation are considered. It is established, that as a whole characteristics of rains under influence of variability of a climate are displaced aside potentially greater erosive danger. Carried out researches show presence of cyclic fluctuations of characteristics of rains in time. The Erosion-dangerous potential of precipitations defined by average for 30 mines by intensity of precipitations and position during a rain by a maximum of intensity of precipitations, also has cyclic fluctuations in time. Position of a maximum of intensity of precipitations is observed mainly in first half of rain.

Keywords: A Course of a Rain; Intensity of Precipitation; Position of a Maximum of Intensity; Erosive Danger

Introduction

Variability of characteristics of rains mentions many branches of a national economy. It and an agriculture (flooding, silting up or loss of crops and soils [11]), a municipal services (tap of waters from the urbanized territories [9,10]), transport construction (designing of a drainage system from road coverings, bridge transitions [8]), against freshet protection of territories.

Their variability in time can define the sizes of the possible damages, the first sequence of actions under the prevention of consequences, solidity of projected constructions, etc. Therefore to these questions it was given [3-11] and the significant attention is given [1,2,4].

Pregoiing researches have shown, that characteristics of atmospheric precipitation during the warm period of year in many respects are defined by a direction of moving air weights [6]. Spatial variability of precipitation is in inverse relationship from their duration [6]. On [5] with increase in a layer of precipitations the share of the area borrowed by them, decreases. The basic contribution to a total sum of years precipitation is brought with precipitations intensity up to 2 mm/mines, and the greatest size of the contribution, as well as for all rains, irrespective of their quantity it is necessary on gradation of intensity of 0.0-0.3 mm/mines.

Accepts [3,9] presence of close communication between duration of downpours and their average intensity. The greatest averages of intensity take place at short-term downpours. The more duration of a downpour, the less its average intensity, etc.

Variability of characteristics of rains within the limits of one natural zone on close located meteorological stations has appeared insignificant [1,2].

Materials of researches

It is carried out research of variability of characteristics of rains time in view of last materials of supervision hydrometeorological service behind their course in time by means of pluviograph on a meteorological station Kiev. Characteristics of rains with quantity of precipitations more and equal 10 mm were analyzed. The period of supervision 1950-2016 years. The general number of the investigated rains 280. In table 1 ranges of change of characteristics of precipitations on a meteorological station Kiev are presented.

Results of researches

In territory of Ukraine the general tendency of increase in time of quantity of deposits, including on a meteorological station Kiev (Figure 1) is observed. Besides the number of rains with quantity of precipitation more than 10 mm (Figure 2) has increased. During

with 1981 on 1992 years data about loss of rains on a meteorological station Kiev with quantity of precipitation more than 10 mm are not revealed.

The characteristic	The minimal value	The maximal value	Average value
Quantity of precipitation for a rain, mm	10	82.4	19.9
Average intensity of precipitation for a rain, mm/min	0.01	0.6	0.092
The maximal intensity of precipitation for a rain, mm/min	0.013	7.1	0.45
Duration of a rain, min	26	1610	426
Average intensity of a rain for erosion-dangerous interval, mm/min	0.012	2.21	0.20
Position of a maximum of intensity of precipitation, relative units	0.003	0.998	0.39
Number of peaks of maxima of precipitation for a rain	1	5	1-2

Table 1: Characteristic of rains, measured on a meteorological station Kiev.

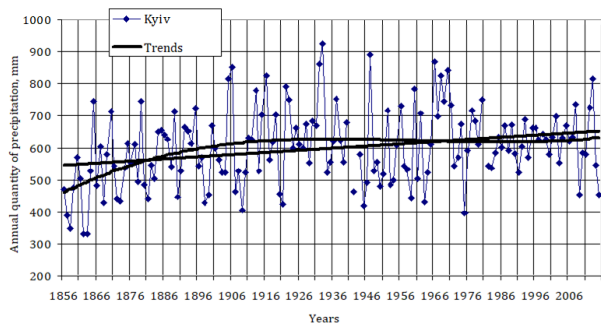


Figure 1: Change in time atmospheric precipitation for a year on a meteorological station Kyiv.

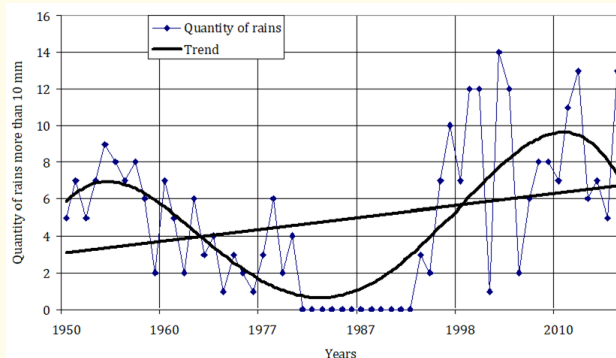


Figure 2: Change in time of number of rains more than 10 mm.

As a whole, the tendency of cyclicity of intensity of precipitation in time (Figure 3) is traced. And years 1981-1992 just fall to the period of the minimal intensity. Cyclicity is shown as well during position of a maximum of intensity (Figure 4).

The maximal intensity of precipitations for a rain is necessary more often on 0.1-0.4 half of rain and the most intensive precipitations concern to 1960-1970. With increase in duration a rains the maximal intensity decreases.

It is considered [11], that the erosive potential of rains is defined by average for 30 minutes intensity of rains with a maximum of rains on the middle and position of a maximum of intensity of rains.

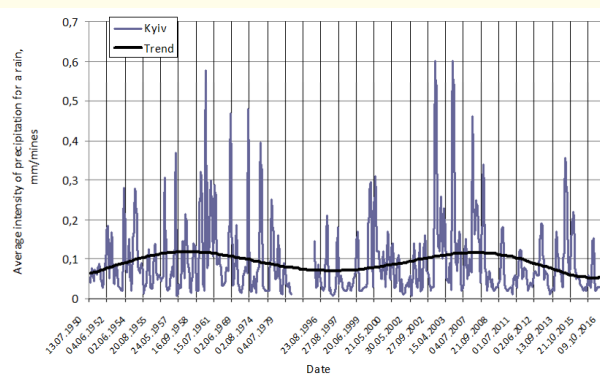


Figure 3: Change in time of average intensity of precipitations for a rain on a meteorological station Kyiv.

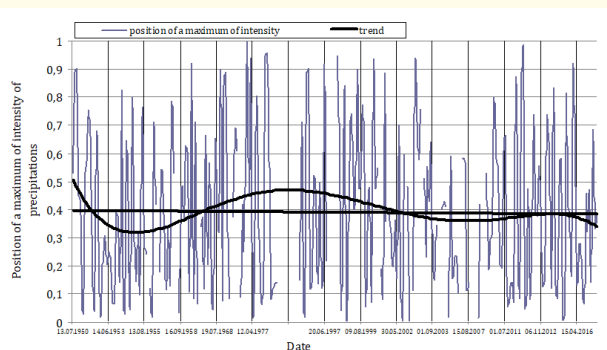


Figure 4: Change position of a maximum of intensity of precipitations in time on a meteorological station Kyiv.

The greatest erosion-dangerous intensity fall to the beginning of a rain, its first third. Displacement of a maximum of intensity of precipitations on the beginning of a rain that promotes more intensive loss of soils (Figure 4) is on the average observed.

Average for 30 minute interval intensity of precipitations (erosion-dangerous intensity $i_{30 \text{ min}}$) well correlates mm with average intensity of precipitations for a rain (i_{cp} , the mm) and at a unknown course of a rain in time can be defined it on dependence:

$$i_{30 \text{ min}} = 1.4324 i_{cp}^{0.8406}, r = 0.78,$$

where r – factor of correlation

Conclusions

Carried out researches show presence of cyclic fluctuations of characteristics of rains in time that speaks presence of the general cyclicity of all meteorological, hydrological, biological and other processes the Earth, defined by solar activity. The Erosion-dangerous potential of precipitations defined by average for 30 minutes by intensity of precipitations and position during a rain by a maximum of intensity of precipitations, also has cyclic fluctuations in time. Position of a maximum of intensity of precipitations is observed mainly in first half of rain.

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