ABOUT THE POSSIBILITY OF AUTOMATED MONITORING OF ENVIRONMENTAL-CHEMICAL INDICES OF ATMOSPHERE PRECIPITATION

Fedoniuk V.V.[1], PhD (Geography), Assistant Professor,
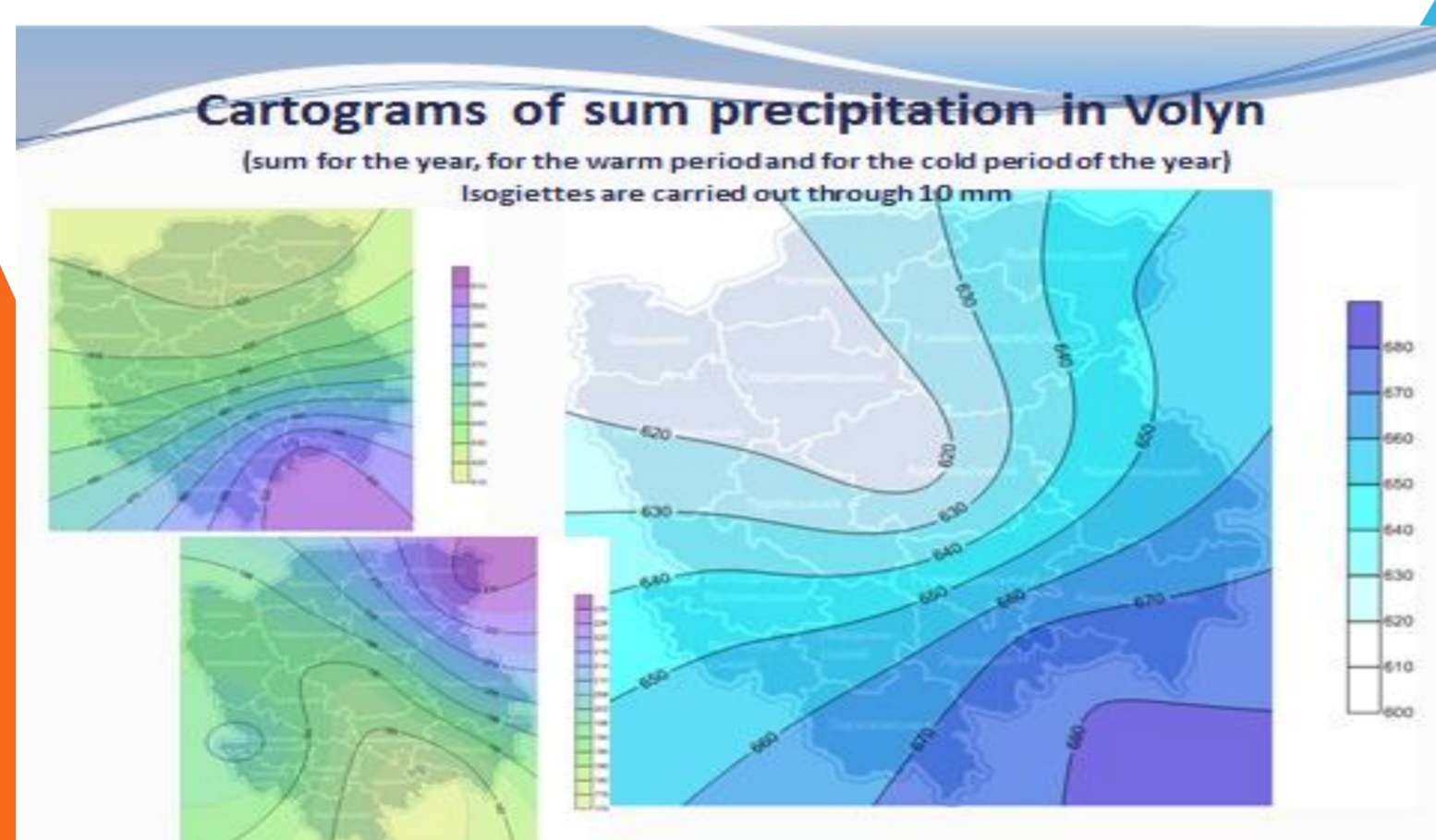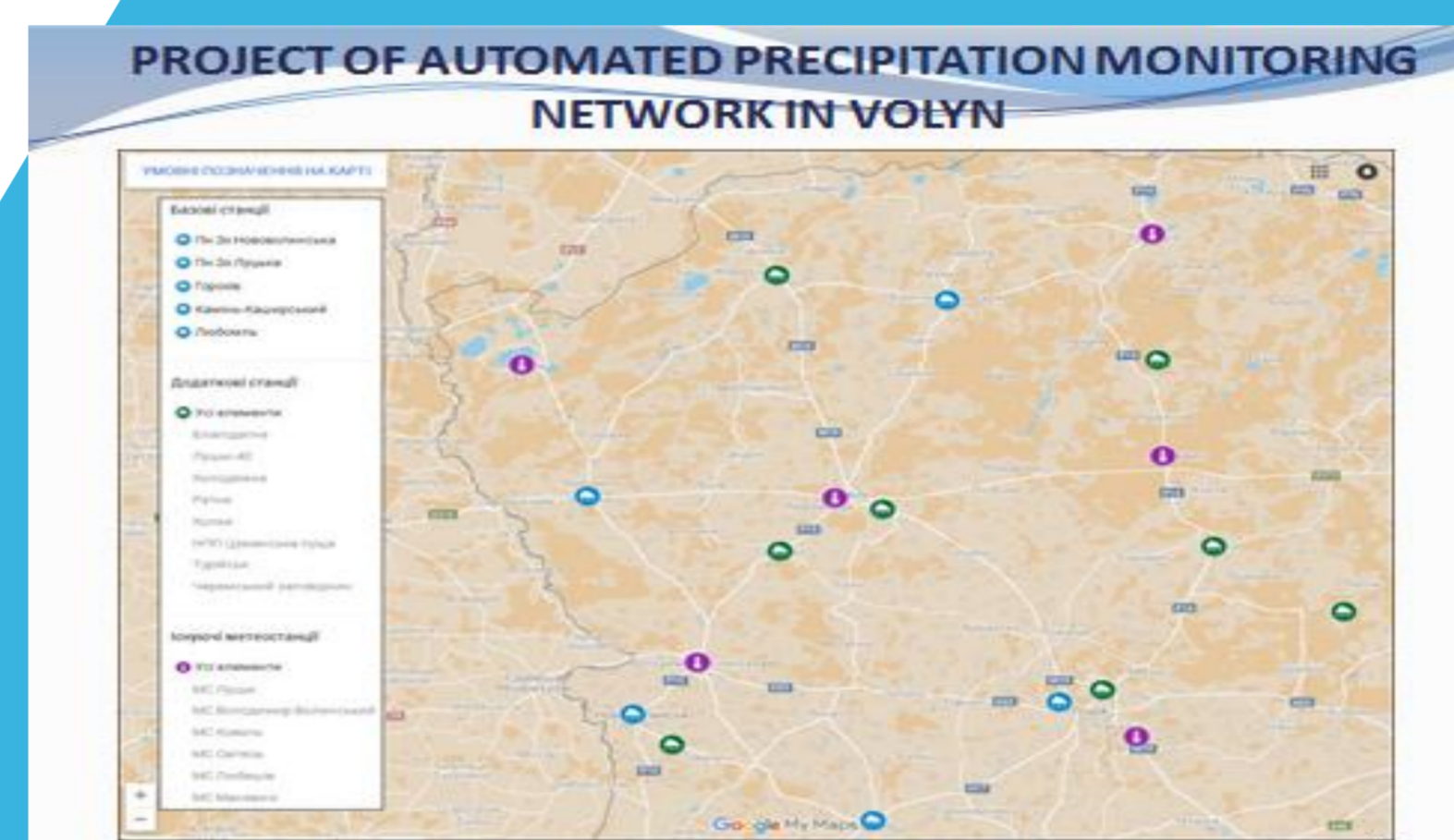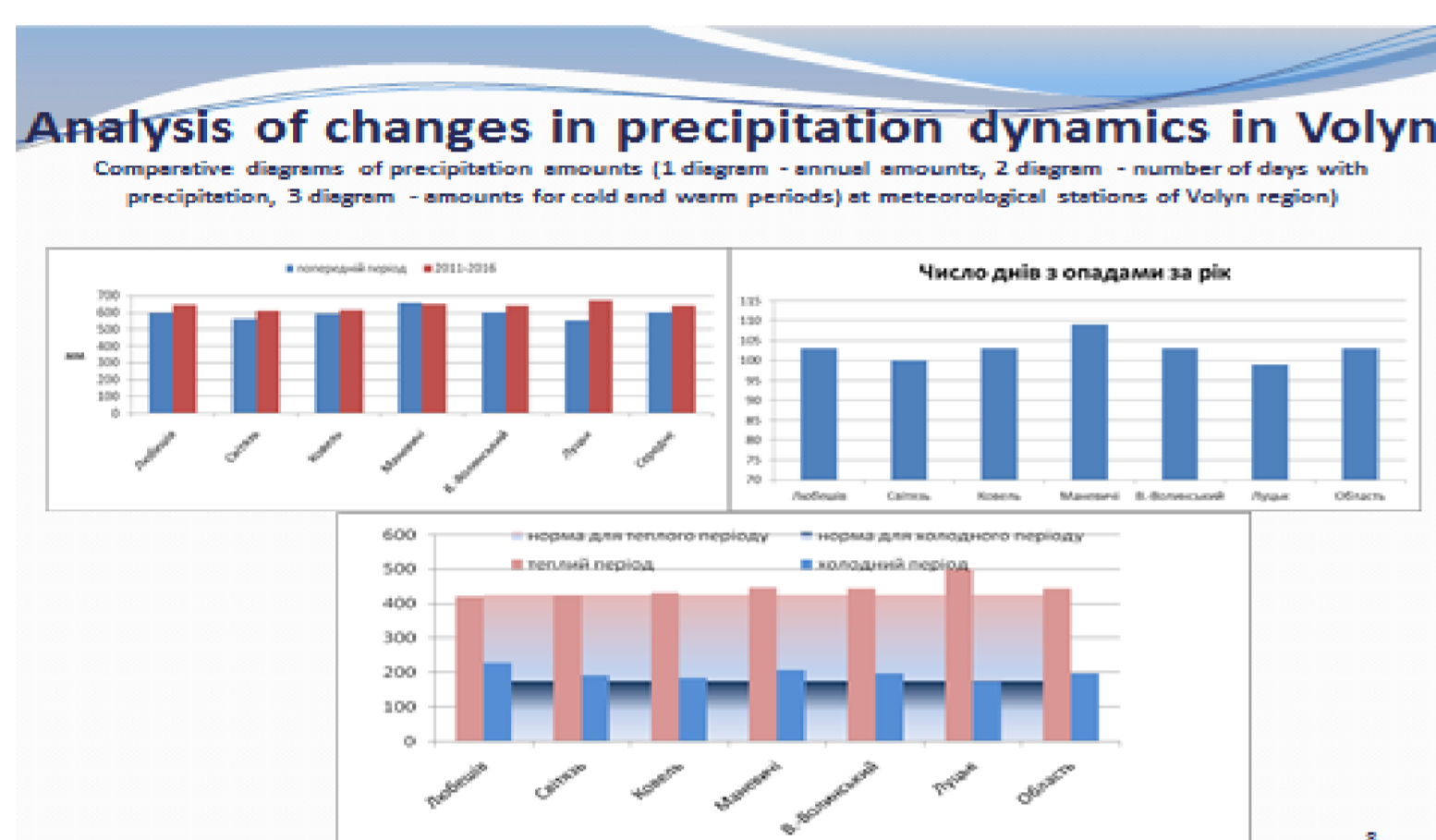**Kosthiv O.T.[2],**
Fedoniuk M.A.[1], PhD (Geography), Assistant Professor
[1]Lutsk national technical university, Ukraine
[2]Taras Shevchenko National University of Kyiv,
Institute of High Technologies, Ukraine

The purpose of the work is to analyze the changes in the rainfall dynamics in Volyn due to the global warming and the development of a device for the automated control of precipitation and their ecological and chemical indicators. The tasks of this research and research work are: 1) studies of changes in the dynamics of precipitation (their repetition and number) that have fallen in Volyn in the last decade; 2) analysis of the chemical composition and precipitation acidity during 2015-2018; 3) development of a module for automated monitoring of ecological and chemical parameters of atmospheric precipitation "RAIN-CONTROL".

Methods of research: the method of field research (the collection of samples of rainwater in Lutsk during 2015-2018), the method of scientific experiment (study of the influence of precipitation of different acidity on building materials and vegetation cover in the city), the method the laboratory analysis (determination of acidity, mineralization, content of individual impurities in rainwater), the method of statistical-mathematical analysis (study of precipitation dynamics for the period of 2011-2018), graphic and cartographic methods (plotting, charts, distribution maps of sum precipitation); the experimental design method (the development of the basic scheme of the automated module of monitoring of precipitation "RAIN-CONTROL").

Analysis of changes in precipitation dynamics in Volyn

PROJECT OF AUTOMATED PRECIPITATION MONITORING NETWORK IN VOLYN

Cartograms of sum precipitation in Volyn
(sum for the year, for the warm period and for the cold period of the year)
Isogiettes are carried out through 10 mm

The main results of the study

- we calculated the average monthly rainfall amounts for every weather station of Volyn (Lutsk, Svityaz, Manevichi, Kovel, Lyubeshiv, Volodymyr-Volynsky), the average rainfall for the warm season of the year (IV - X months) and the cold season of the year (XI - III months), average rainfall for every year and for the entire surveyed period (2011-2018). It also determined the number of days with precipitation for each year, the warm and cold period of each year, the average values of this indicator. According to these data, graphs, diagrams and cartograms were constructed, which clearly represent the dynamics of atmospheric precipitation in our region during the studied period (2011-2018).
- on the basis of the calculated indicators with the GS Surfer program, we have constructed 3 maps of the geographical distribution of precipitation amounts in the territory of the Volyn region during the investigated period (annual amounts, amounts for the warm and cold period of the year). When comparing them with maps of the period of the twentieth century wegad estimated the current growth of rainfall in Volyn.
- We had developed the automated module "RAIN-CONTROL". It is a small specialized meteorological station, created on the basis of the microcontroller ArduinoMicro and the set of the sensors. This device will allow automatic measurement of the main parameters characterizing atmospheric precipitation.

Development of a module for automated monitoring of ecological and chemical parameters of atmospheric precipitation "RAIN-CONTROL"
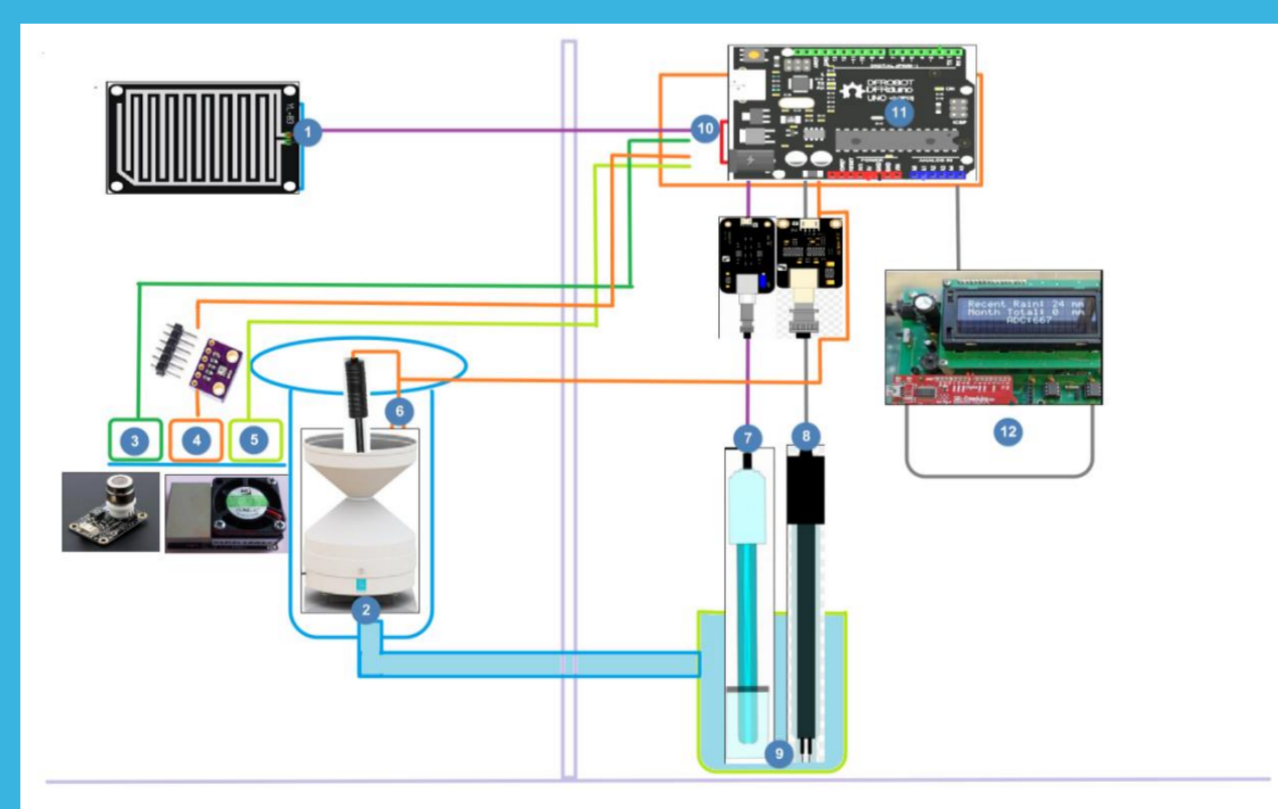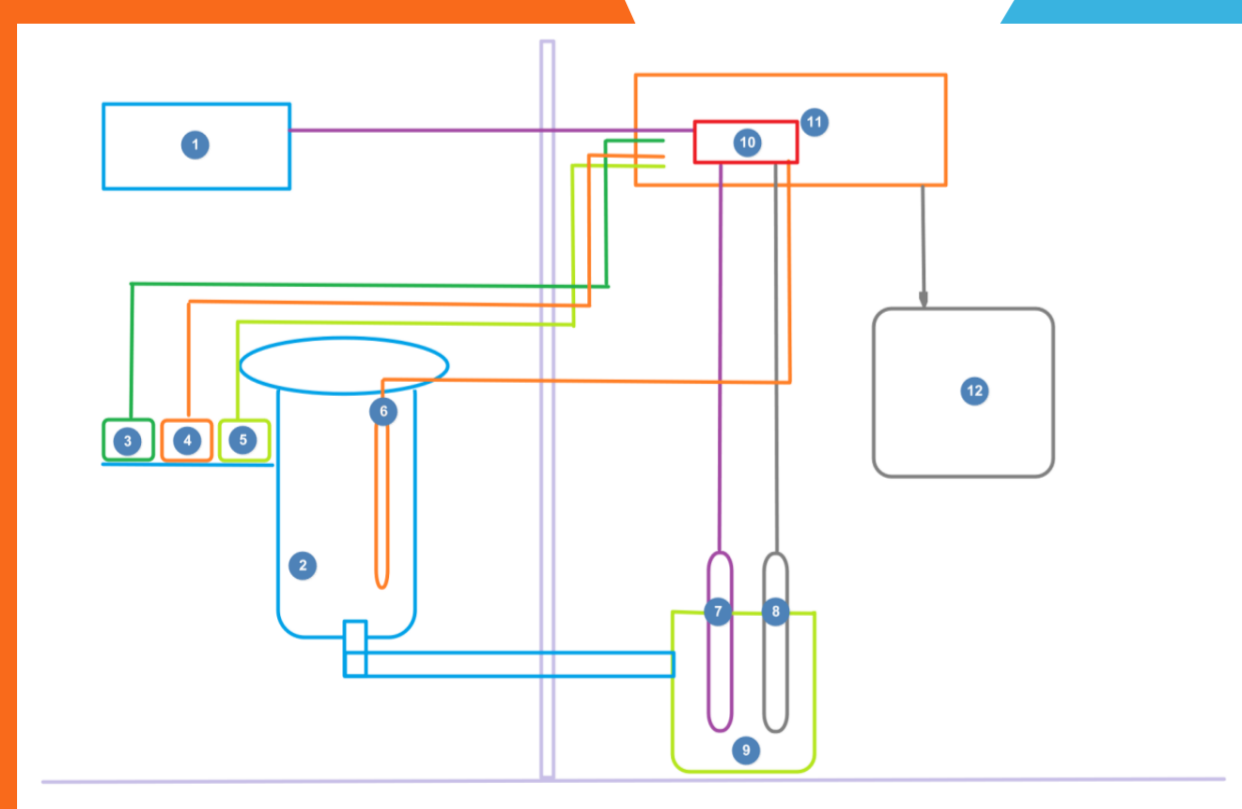
Automated module "RAIN-CONTROL". It is a small specialized meteorological station, created on the basis of the microcontroller ArduinoMicro and the set of the sensors.This device will allow automatic measurement of the main parameters characterizing atmospheric precipitation, namely:
- the duration of precipitation;
- the amount of fallen precipitation;
- the temperature of rain (mist snow) water;
- pH of the precipitation;
- the mineralization of precipitation;
- the CO_2 content in the air (to assess the dynamics of the formation of the pH indicator because carbon dioxide significantly influences on it).
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Conclusions

1. During the investigated period (2011-2018) on the territory of the Volyn region annual precipitation increased by 20-45 mm, but the annual number of days with precipitation decreased by almost 30%. The revealed patterns clearly demonstrate the graphs, charts and cartograms we had built.
At all six weather stations in Volhynia (Lutsk, Kovel, Manevichi, Lyubeshiv, Volodymyr-Volynsky and Svityaz) the average annual rainfall exceeded 600 mm. Reducing the number of days with precipitation during the year and a more even distribution of them during the warm and cold seasons causes the inhabitants of the region having a false sense that "the rains became less."
2. The results of laboratory studies of collected samples of precipitation showed that the level of atmospheric precipitation in Lutsk during the year is normal and varies within 6-7. Sometimes there is a weakly alkaline reaction (8-8, 25), and only in individual cases the pH was less than 5.7. The mineralization of precipitation varies from 2 to 35 mg / dm3. A high correlation was found between the duration of the rainless period and the acidity of precipitation (the correlation coefficient -0.5925) and their mineralization (the correlation coefficient +0.7405).
3. The automatic module "RAIN-CONTROL", which we have developed, can be installed in schools, on school meteorological sites. Geography teachers together with students will monitor the uninterrupted work of the module, and through the Internet the received monitoring results will be transmitted online to the special site "Rain in Volhynia". These data will be publicly available. Every inhabitant of the region, a tourist or a person who watches with the professional interest of the weather (farmers, drivers, builders, scientists, etc.) will be able to visit the site and observe the dynamics of precipitation in the online mode. Eventually, an electronic archive of data will be accumulated, which will be of great interest to climatologists.
4. The control of the ecological parameters of water released in the form of atmospheric precipitation is very important for human, his health and quality of life. Therefore, in the future, after testing our module "RAIN-CONTROL", we plan to develop a methodology and justify the necessity of creating a network of automated monitoring of precipitation for Ukraine as a whole.