Creation of a prototype system for forecasting dangerous wind speed events for the territory of Moscow State University
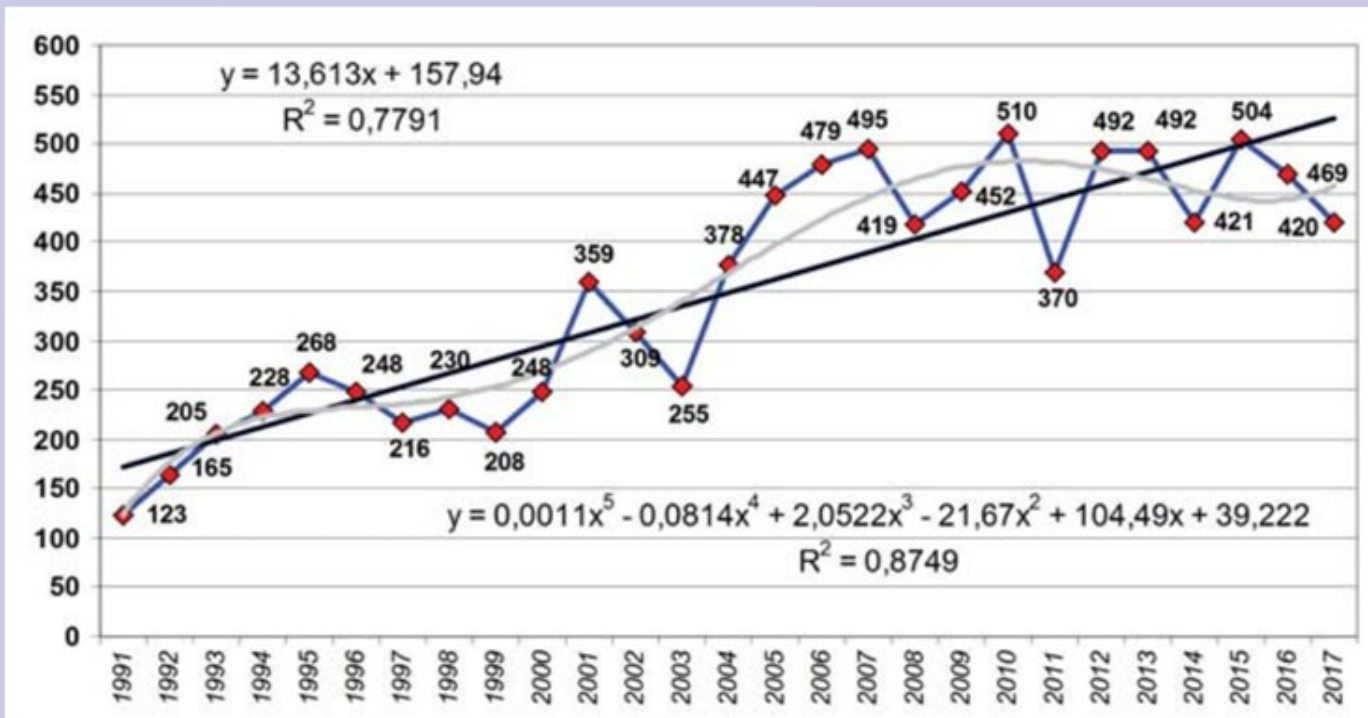
Создание прототипа системы прогноза опасных скоростей ветра для территории МГУ имени М.В.Ломоносова

Elizaveta Nikolaeva[1], Pavel Konstantinov[1,2]

[1]Lomonosov Moscow State University, Faculty of Geography ;
[2]RUDN University, Laboratory of smart technologies for sustainable development of urban environment under global changes
Corresponding author e-mail: nikolael99@mail.ru

$y = 13,613x + 157,94$
$R^2 = 0,7791$

$y = 0,0011x^5 - 0,0814x^4 + 2,0522x^3 - 21,67x^2 + 104,49x + 39,222$
$R^2 = 0,8749$

Distribution of the total number of dangerous phenomena by years for 1991 - 2017, causing material damage
(Alekseeva A.A. et al. Forecast of strong squalls in the European territory of Russia and their identification by Doppler radars.)
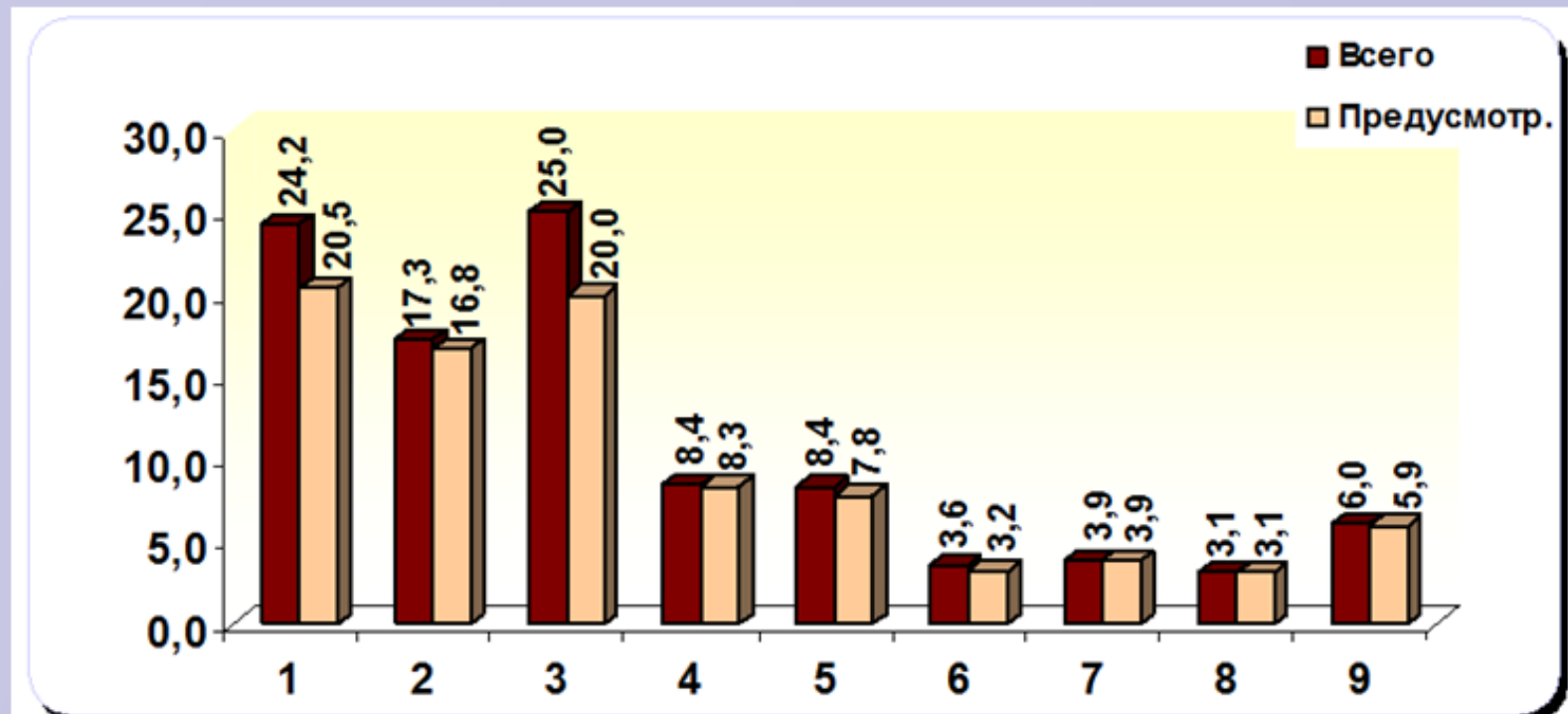
The proportion of the number of cases of hazardous events (by type) for 1991-2015
1 - Wind; 2 - Snow;
3 - Rain; 4 - Heat and frost;
5 - Floods; 6 - 9 - Other hazards
(Natural hydrometeorological phenomena on the territory of Russia in 2015.)

Main issue and methods:

Rapid forecasting of hazardous weather phenomena in cities is an important task in meteorology. Failure to provide timely warning of a hazardous weather event can cause colossal damage. Therefore, it is necessary to develop more accurate and advanced forecasting of adverse weather events.

The main goal of this work is to create a prototype system for forecasting dangerous wind speeds for the MSU campus based on real forecast data.

This work is carried out using data from the Canadian GEMglobal model. The modeling of the initial wind fields for the system is based on the ENVI-met 3D non-hydrostatic microclimate model.

Main goals:

⇒ Deployment of the ENVI-met model for the MSU campus.

⇒ Investigation of the relationship between the initial conditions and the output field of wind speeds.

⇒ Using the Bash shell in Linux, the Fortran gfortran programming language compiler and online geographic information systems, based on the predictive data of the Canadian GEMglobal model, develop a script method for online calculation of the wind field distribution on the MSU campus.
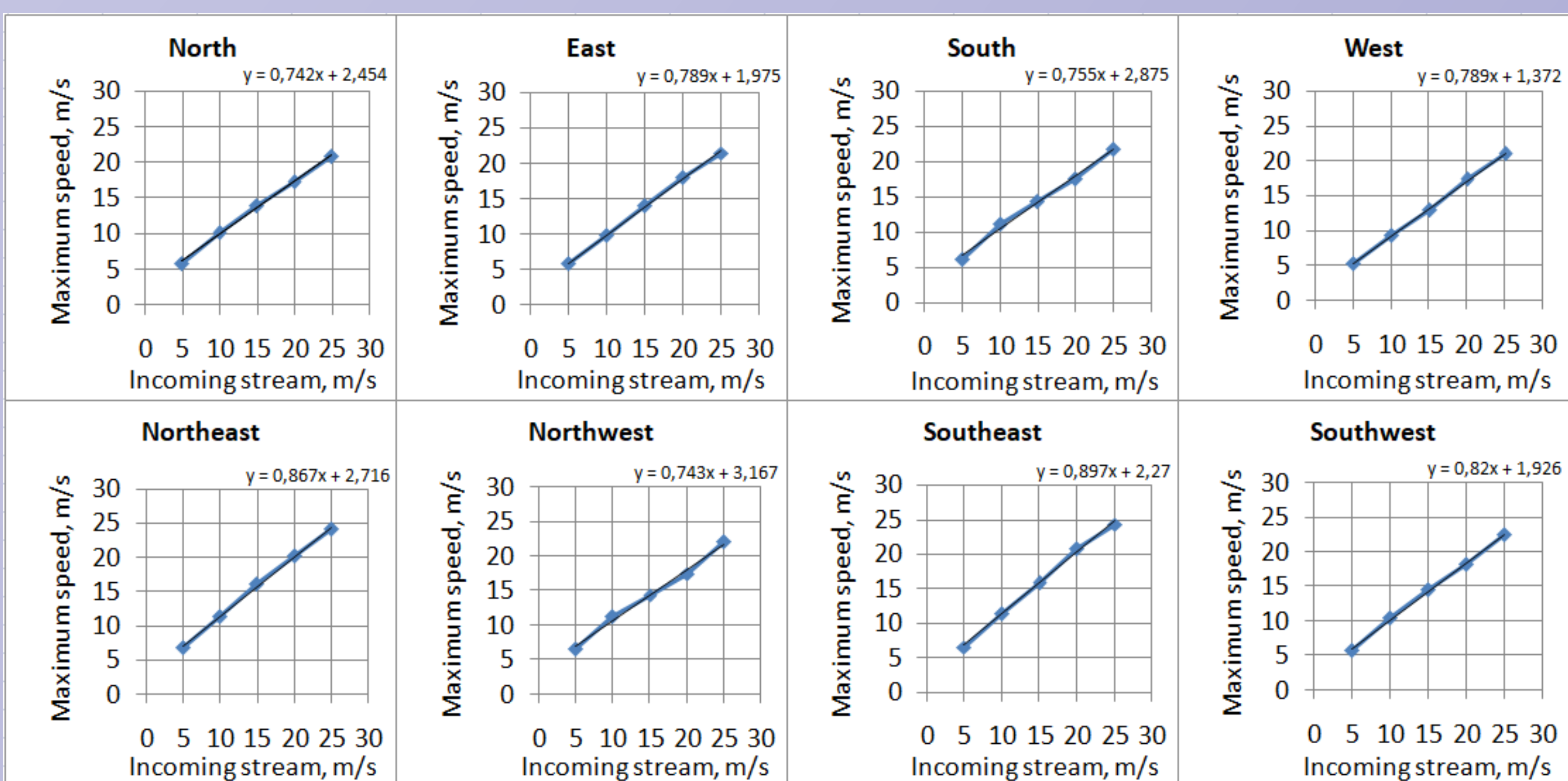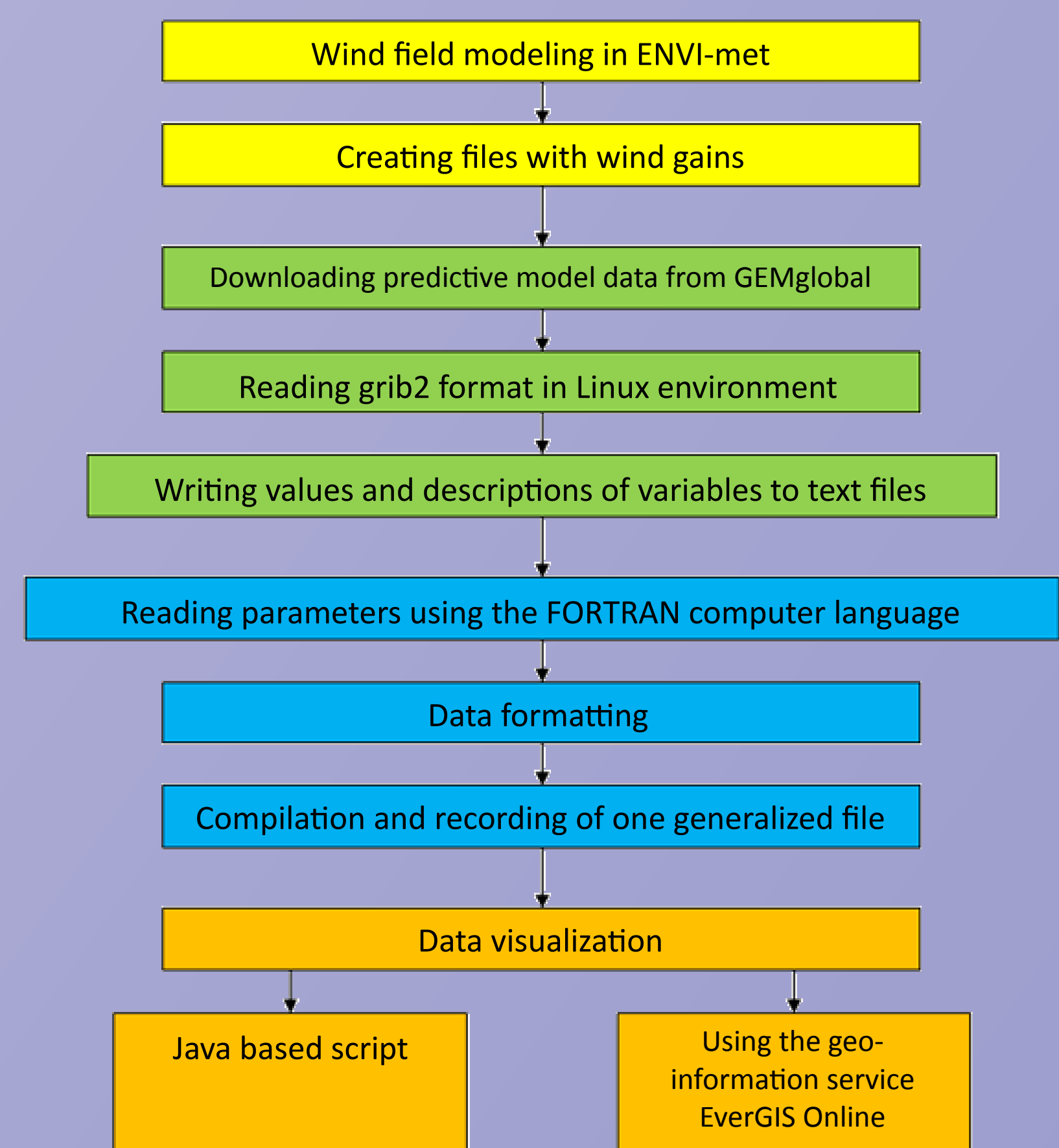
Architecture of the ENVI-met model complex
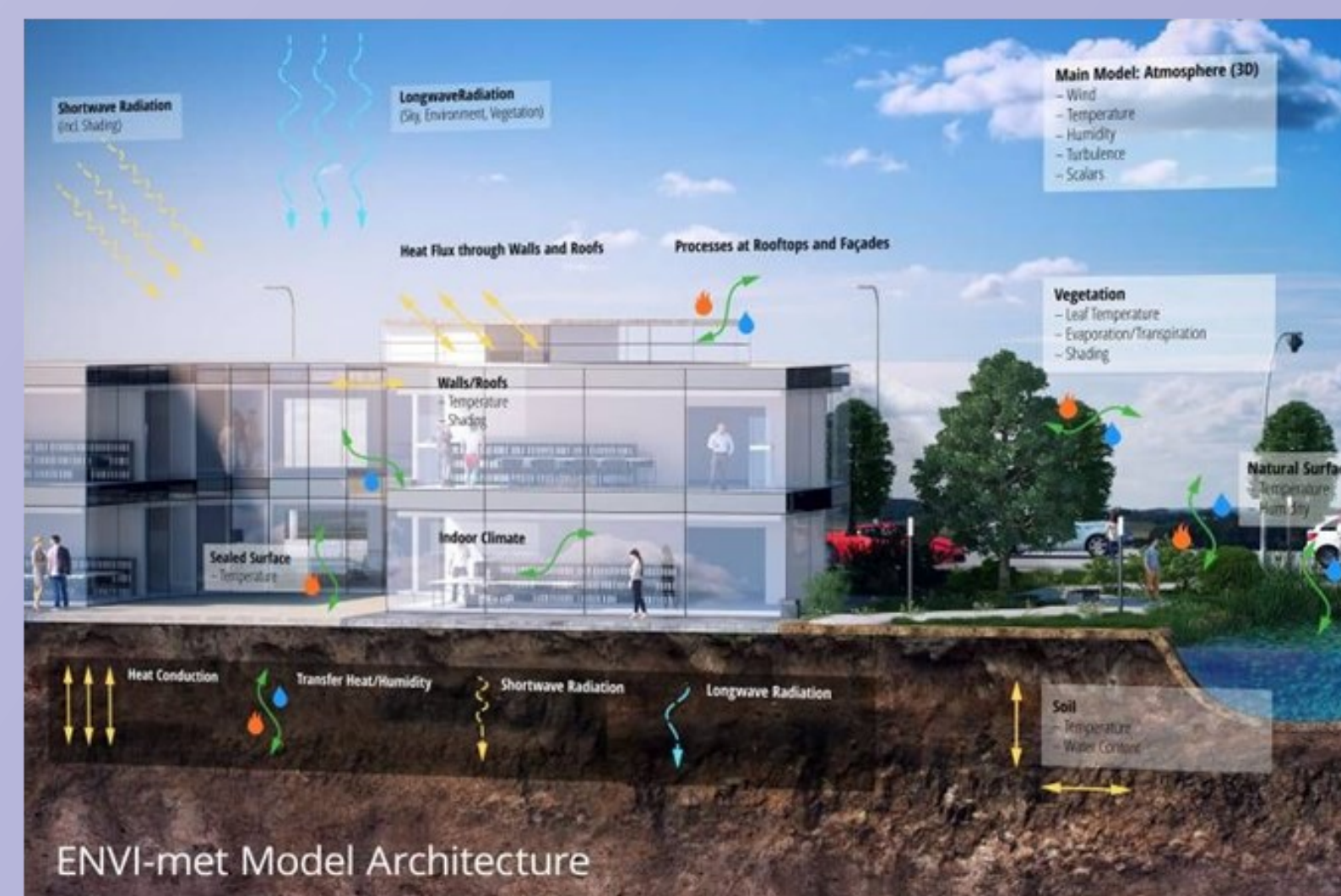
Digitized study site

Block diagram of a prototype system for forecasting dangerous wind speeds

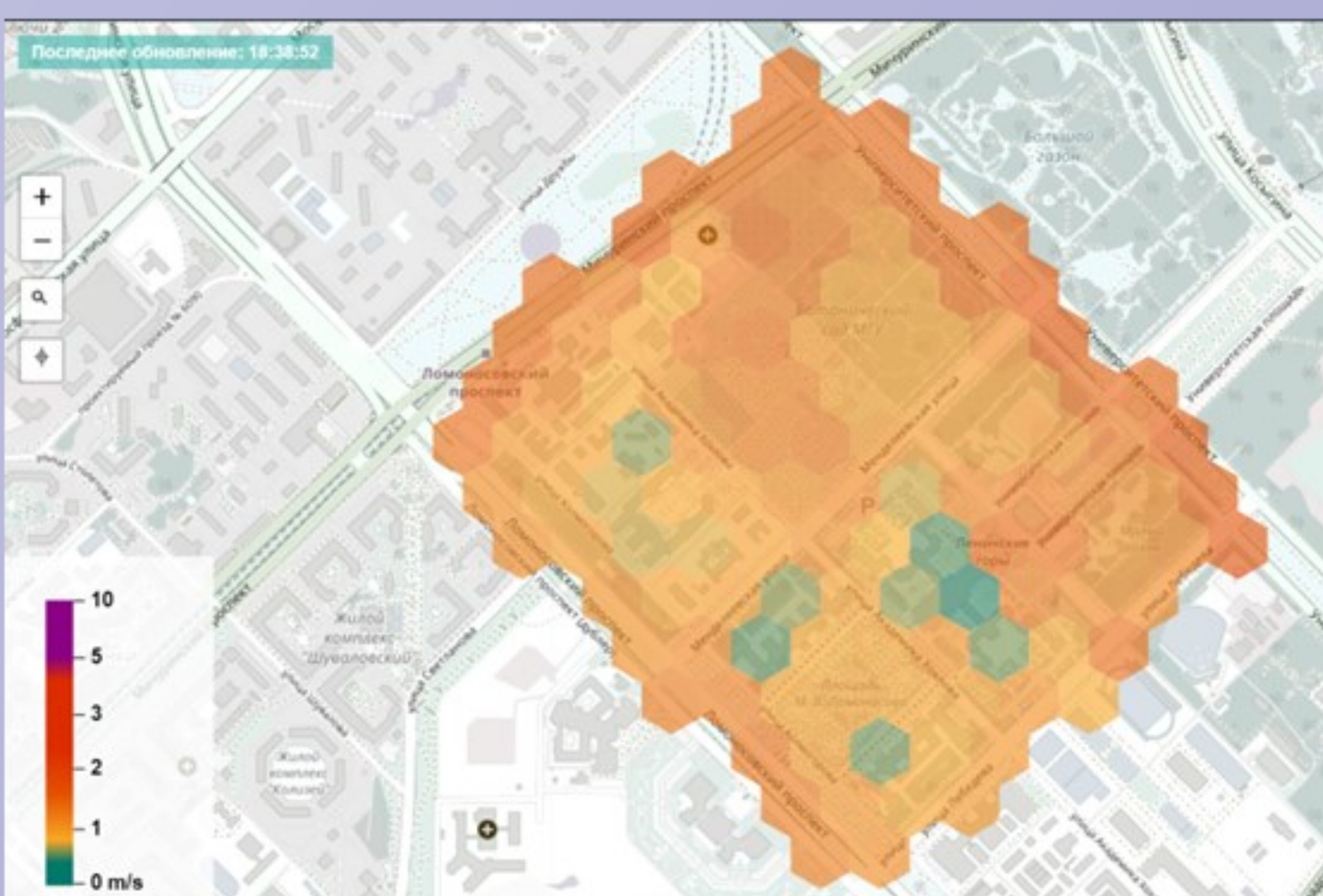## Analysis of the correspondence between the input wind speed and the maximum speed within the entire modeling area, for a level of 1.5 meters

Visualization of the forecast map using the computer language JavaScript or the geographic information service EverGIS Online

As a result of the work of the system, an interactive map of the wind field is obtained, in which you can customize various styles of presentation of layers for a more visual presentation of data.

In this work, original calculations were carried out to ensure the wind comfort of a person's stay in an urban environment. In the future, the forecasting technology is planned to be expanded outside the MSU campus.