State Emergency Service of Ukraine
National Academy of Sciences of Ukraine

UKRAINIAN HYDROMETEOROLOGICAL INSTITUTE (UHMI)

Prospekt Nauki, 37, 03028, Kyiv Ukraine

Tel.: +380 (44)525 12 50. Fax: +380 (44) 525 63 63.
E-mail: uhmi@uhmi.org.ua
www.uhmi.org.ua

AGROMETEOROLOGICAL RESEARCHES, MODELLING AND PROGNOSIS

JRC Information Day
September 14-15
National Academy of Sciences of Ukraine
Kyiv, Ukraine

HISTORY

- **15 May 1855 – official opening of Kiev Meteorological Observatory**
- **Since 1925 – Kiev Magnetic-meteorological Observatory**
- **Since 1944 – Kiev Research Geophysical Observatory**
- **Since 1953 – Ukrainian Research Hydrometeorological Institute**

SCIENTIFIC ACTIVITIES

- investigation of regularities of atmosphere physical processes;

- study of mechanisms of regional climate formation, trends of climate fluctuations, numerical modeling of regional climate, relation with global climate change, Environmental and socio-economic impact of regional climate change;

- development of numerical and physical-statistical methods for weather forecast;

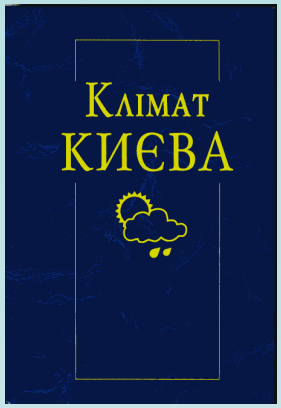
- development of agrometeorological forecasts, study on physical mechanisms and regularities of influence of the atmosphere and underlying surface on vegetation growth;

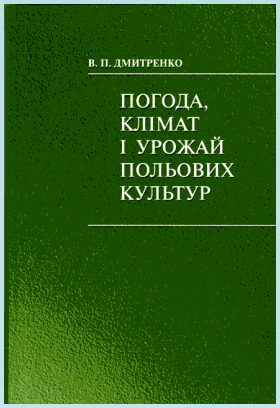
- investigation of mechanisms of severe hydrometeorological events formation and peculiarities of their time and spatial distribution, development of automated systems of spring and rain flood forecasting, modeling and calculations of river runoff;

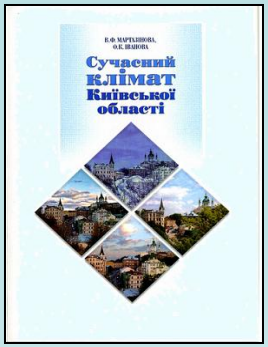
- study of natural and anthropogenic factors influence on formation of chemical composition and quality of surface water;

- development of systems, methods and technologies of hydrometeorological information receiving, processing and storage.

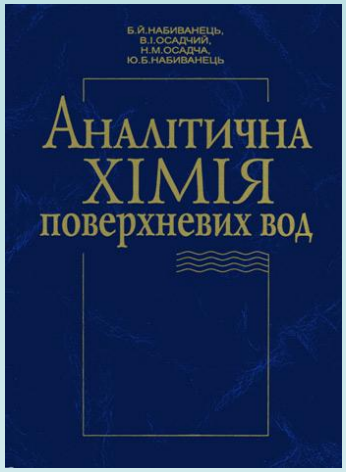
MONOGRAPHS

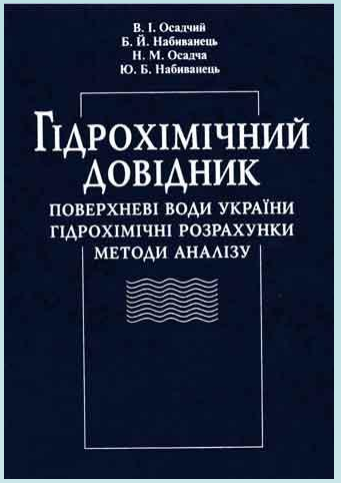

Клімат
Києва


В. П. ДМИТРЕНКО
ПОГОДА, КЛІМАТ І УРОЖАЙ ПОЛЬОВИХ КУЛЬТУР


Сучасний клімат Київської області


ДАТИ ПЕРЕХОДУ ТЕМПЕРАТУРИ ПОВІТРЯ
В УКРАЇНІ ЗА СУЧАСНИХ УМОВ КЛІМАТУ

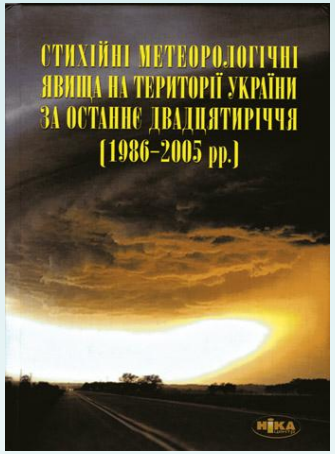

Б.Й.НАБИВАНЕЦЬ, В.І.ОСАДЧИЙ, Н.М.ОСАДЧА, Ю.Б.НАБИВАНЕЦЬ
Аналітична хімія поверхневих вод


В. І. Осадчий
Б. Й. Набиванець
Н. М. Осадча
Ю. Б. Набиванець
Гідрохімічний довідник
ПОВЕРХНЕВІ ВОДИ УКРАЇНИ
ГІДРОХІМІЧНІ РОЗРАХУНКИ
МЕТОДИ АНАЛІЗУ


В.Ф. МАРТАЗИНОВА
В.Е. ТИМОФЕЕВ
Е.К. ИВАНОВА
АТМОСФЕРНАЯ ЦИРКУЛЯЦИЯ ЮЖНОЙ ПОЛЯРНОЙ ОБЛАСТИ И КЛИМАТ АНТАРКТИЧЕСКОГО ПОЛУОСТРОВА


КЛІМАТ УКРАЇНИ

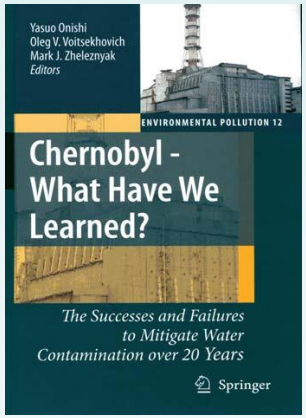

В.П. ДМИТРЕНКО, Л.В. ЩЕРБАК, В.В. БІБІК
Сільськогосподарська метеорологія
ТЕРМІНОЛОГІЧНИЙ ДОВІДНИК


Стихійні метеорологічні явища на території України за останнє двадцятиріччя (1986–2005 рр.)


М.М. СУСІДКО, О.І. ЛУК'ЯНЕЦЬ
КАРПАТИ – ПАВОДКОНЕБЕЗПЕЧНИЙ РЕГІОН УКРАЇНИ
КОМПЛЕКСНА БАСЕЙНОВА СИСТЕМА ПРОГНОЗУВАННЯ ПАВОДКІВ У ЗАКАРПАТТІ: МЕТОДИЧНА ТА ТЕХНОЛОГІЧНА БАЗА ЇЇ СКЛАДОВИХ


В.А.Прусов, А.Ю.Дорошенко
МОДЕЛЮВАННЯ ПРИРОДНИХ І ТЕХНОГЕННИХ ПРОЦЕСІВ В АТМОСФЕРІ

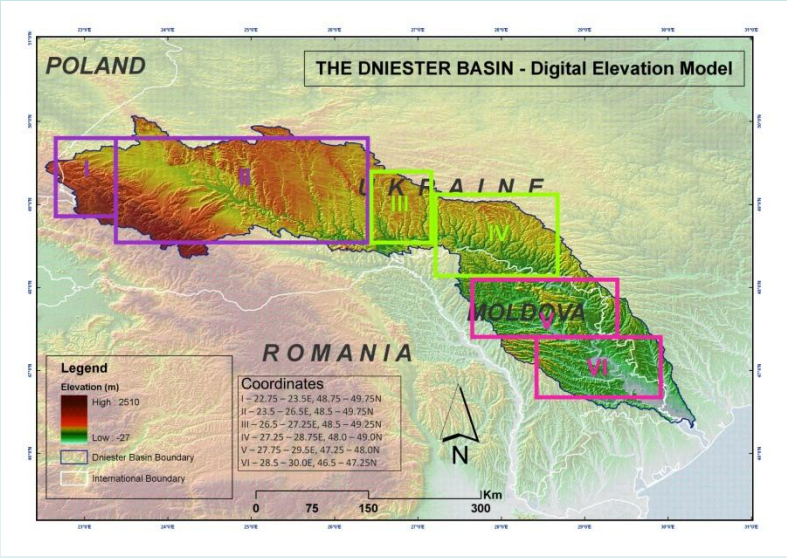

Г.М.Пірнач
ЧИСЕЛЬНЕ МОДЕЛЮВАННЯ ХМАР ТА ОПАДІВ У СИСТЕМАХ АТМОСФЕРНИХ ФРОНТІВ


Yasuo Onishi
Oleg V. Voitsekhovich
Mark J. Zheleznyak
Editors
ENVIRONMENTAL POLLUTION 12
Chernobyl - What Have We Learned?
The Successes and Failures to Mitigate Water Contamination over 20 Years
Springer

SELECTED RESULTS, INTERNATIONAL ACTIVITIES

1. CLIMATE STUDIES

International project
Reducing vulnerability to extreme floods and climate change in the transboundary Dniester basin
OSCE, UNECE, UNEP
2010-2012



Dniester Basin and regions selected for Regional Climatic Models verification and climate change assessment

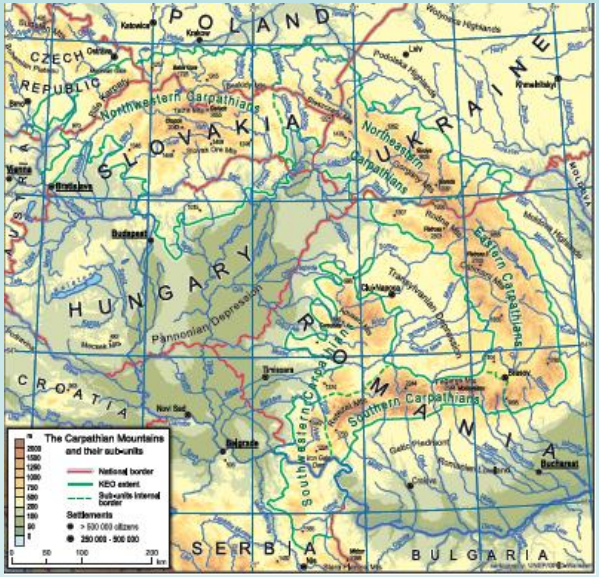
Region		Regional Climatic Model, Global Model							
		MPI-M REMO, ECHAM5	ICTP RegCM3, ECHAM5	DMIHIR-HAM5, ECHAM5	CNRM-RM5.1, ARPEGE	SMHI-RCA, ECHAM5	SMHI-RCA, HadCM3	SMHI-RCA, BCM	Ensemble
I	Temperature	0,9979	0,9955	*0,9970*	0,9885	0,9972	0,9981	0,9981	0,9988
	Precipitation	0,8990	0,8458	*-0,4408*	0,5734	0,8322	0,8730	0,6609	0,8784
II	Temperature	0,9982	0,9949	*0,9970*	0,9886	0,9973	0,9982	*0,9982*	0,9990
	Precipitation	0,9213	0,8376	*-0,1906*	0,6567	0,9321	0,9002	0,9222	0,9468
III	Temperature	0,9981	0,9956	*0,9959*	0,9883	0,9965	0,9976	*0,9970*	0,9989
	Precipitation	0,8825	*0,2630*	*-0,3249*	0,5721	0,9281	0,8107	0,7934	0,9101
IV	Temperature	0,9978	0,9955	*0,9945*	0,9876	0,9968	0,9975	*0,9961*	0,9985
	Precipitation	0,8469	*0,0314*	*-0,5397*	0,4901	0,9334	0,6094	0,7515	0,8838
V	Temperature	0,9972	0,9955	*0,9930*	0,9882	0,9969	0,9969	*0,9959*	0,9980
	Precipitation	0,7261	*-0,2840*	*-0,7778*	0,3089	0,8337	0,1764	0,8233	0,8871
VI	Temperature	0,9975	0,9960	*0,9935*	0,9902	0,9964	0,9957	*0,9961*	0,9977
	Precipitation	0,6472	*-0,5189*	*-0,8288*	0,1707	0,6223	0,1927	0,8446	0,9097

Correlation coefficients of regional models data (A1B scenario) with observed data for 1971-2000 period

CARPATCLIM
Climate of the Carpathian Region

International project
The Climate of the Carpathian Region

EU, JRC
2010-2012



Objectives

The main aim of the service is to improve the basis of climate data in the Carpathian Region for applied regional climatological studies such as a Climate Atlas and/or drought monitoring. The service will investigate the fine temporal and spatial structure of the climate in the Carpathian Mountains and the Carpathian basin with unified or at least directly comparable methods.

Structure

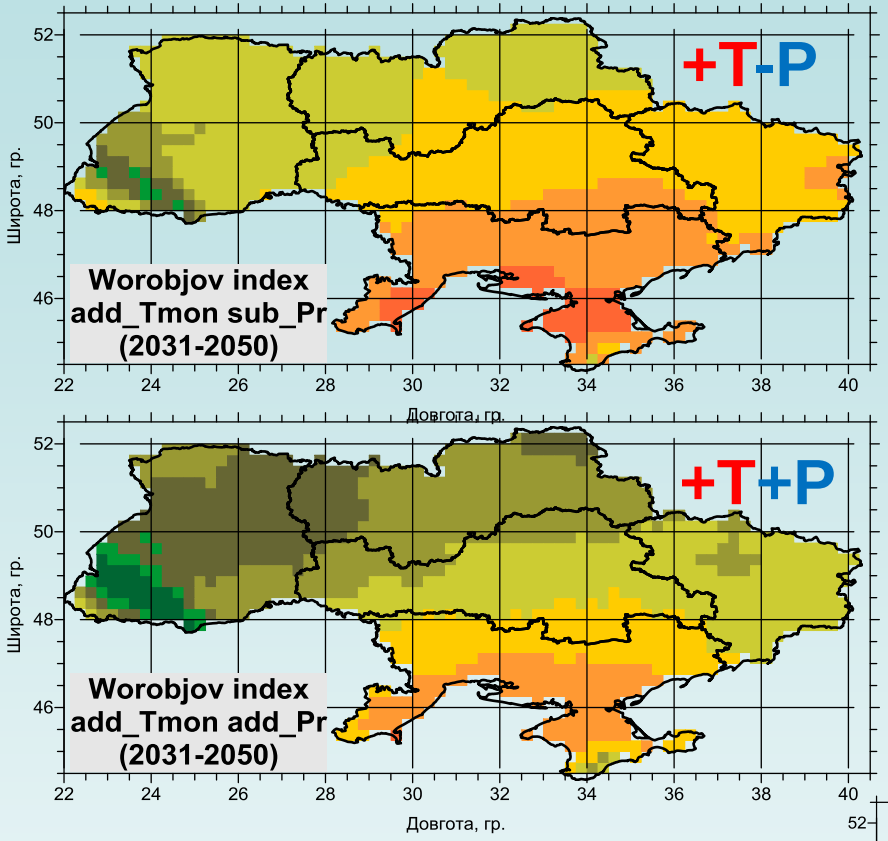
Module 1: Improve the availability and accessibility of a homogeneous and spatially representative time series of climatological data for the Carpathian Region through data rescue, quality control, and data homogenization (lead by the Slovak Hydrometeorological Service).

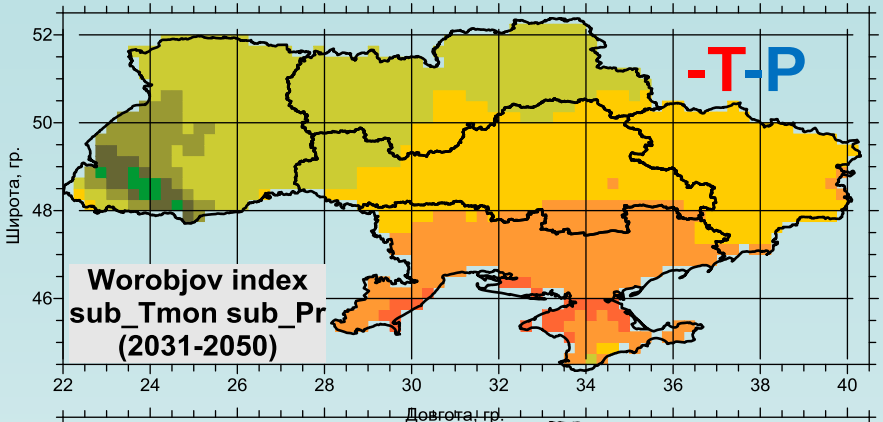
Module 2: Ensure Carpathian countries data harmonization with special emphasis on across-country harmonization and production of gridded climatologies per country (lead by the Hungarian Meteorological Service).

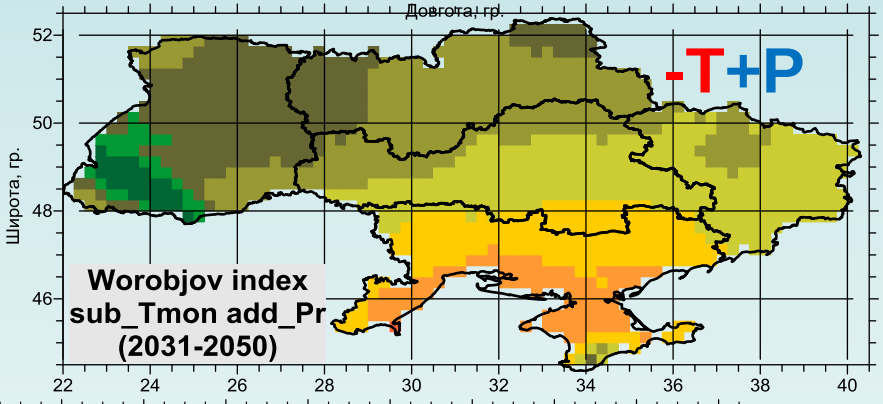
Module 3: Develop a Climate Atlas as a basis for climate assessment and further applied climatological studies as well as for drought monitoring in the Carpathian Region (lead by The Republic Hydrometeorological Service of Serbia).

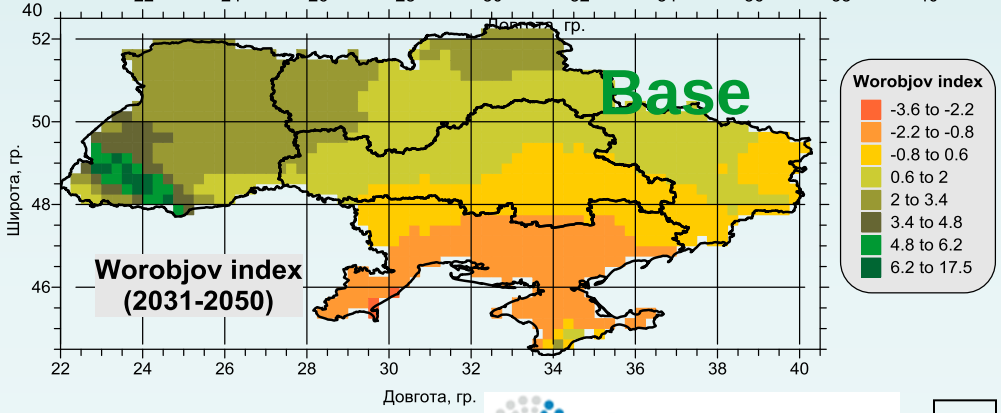
- **Hungarian Meteorological Service,**
- **Slovak Hydrometeorological Institute,**
- **Republic Hydrometeorological Service of Serbia,**
- **Czech Hydrometeorological Institute,**
- **Institute of Meteorology and Water Management (Poland),**
- **Ukrainian Hydrometeorological Institute,**
- **Ministry for Environment, National Research and Development Institute for Environmental Protection (Romania),**
- **Central Institute for Meteorology and Geodynamics (Austria),**
- **Meteorological and Hydrological Service of Croatia**
- **Szent Istvan University (Hungary)**

Base A1B and extreme (+/- CI for T and P) scenarios for hydro-thermal index by Worobjov (W)









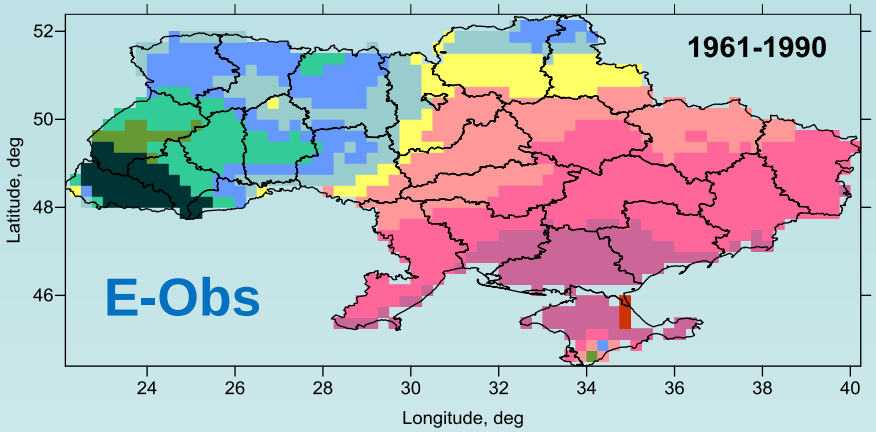
$$W = \frac{\sum R_{T>0}}{\sum T_{mon} > 0} - 0.0286 \sum T_{mon} > 0$$

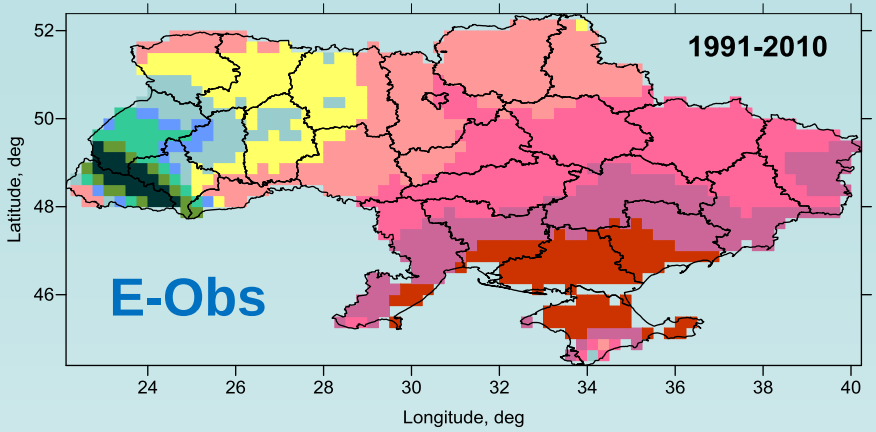
From experts of UHMI to the project "Building capacity for the assessment of vulnerability of Ukraine's flatland forests to climate change"

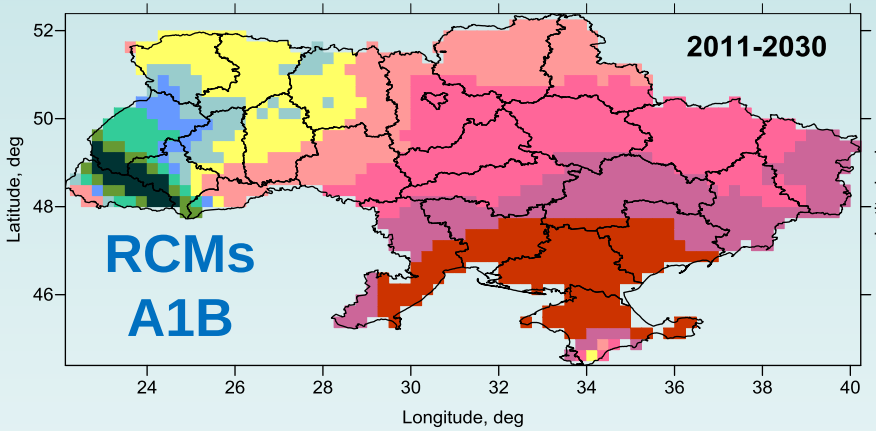
http://www.climaeast.eu/news/workshop-vulnerability-kiev-2016

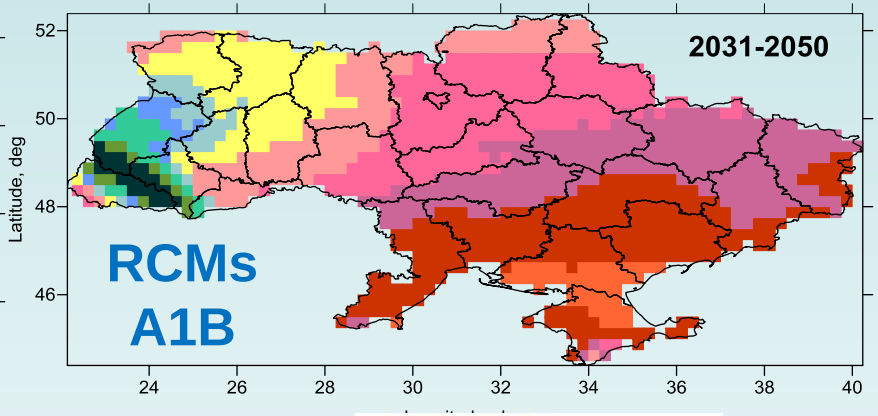
ClimaEast

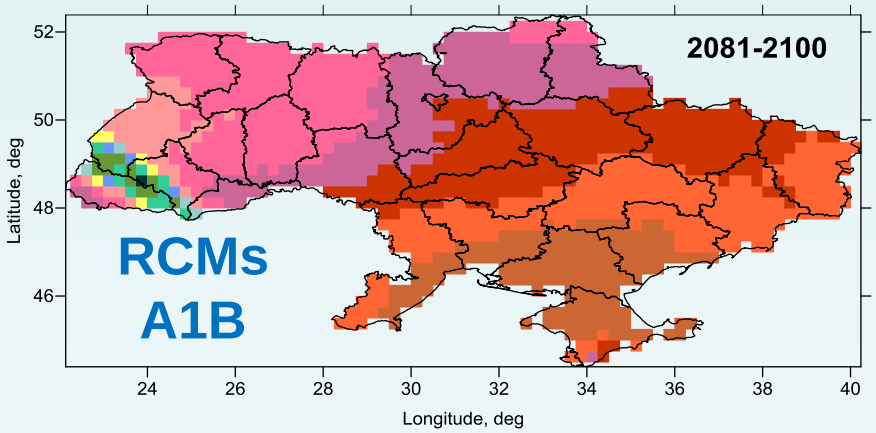
Potential deficit in moisture (P-PET, mm)











Potencial deficit of humidification, mm

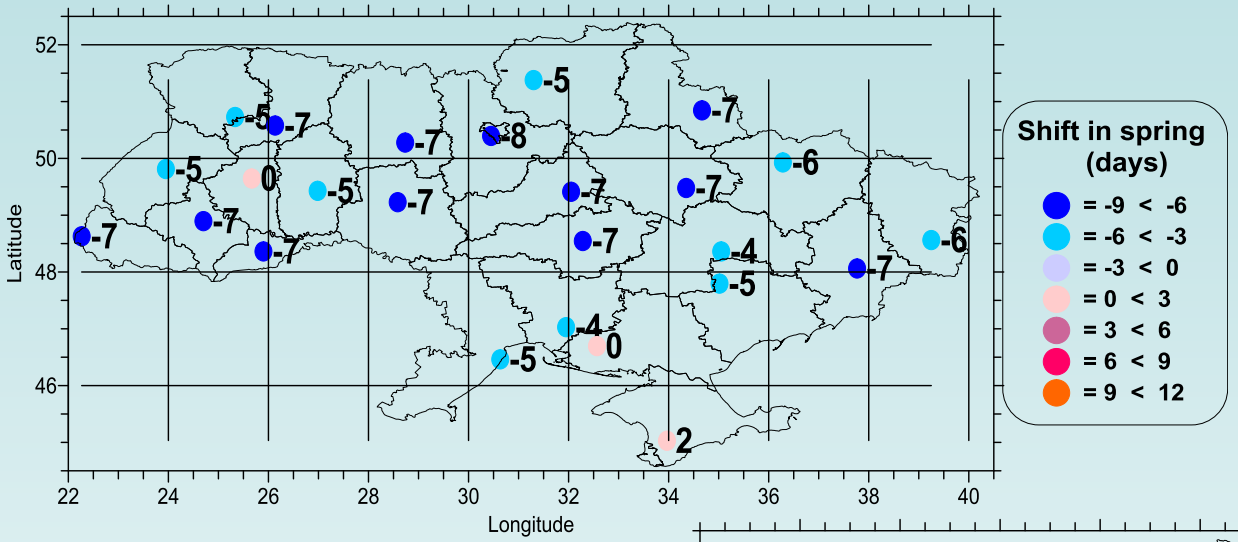
- -1500 to -1200
- -1200 to -900
- -900 to -600
- -600 to -400
- -400 to -200
- -200 to -50
- -50 to 0
- 0 to 50
- 50 to 100
- 100 to 200
- 200 to 300
- 300 to 950

This project is funded by the European Union

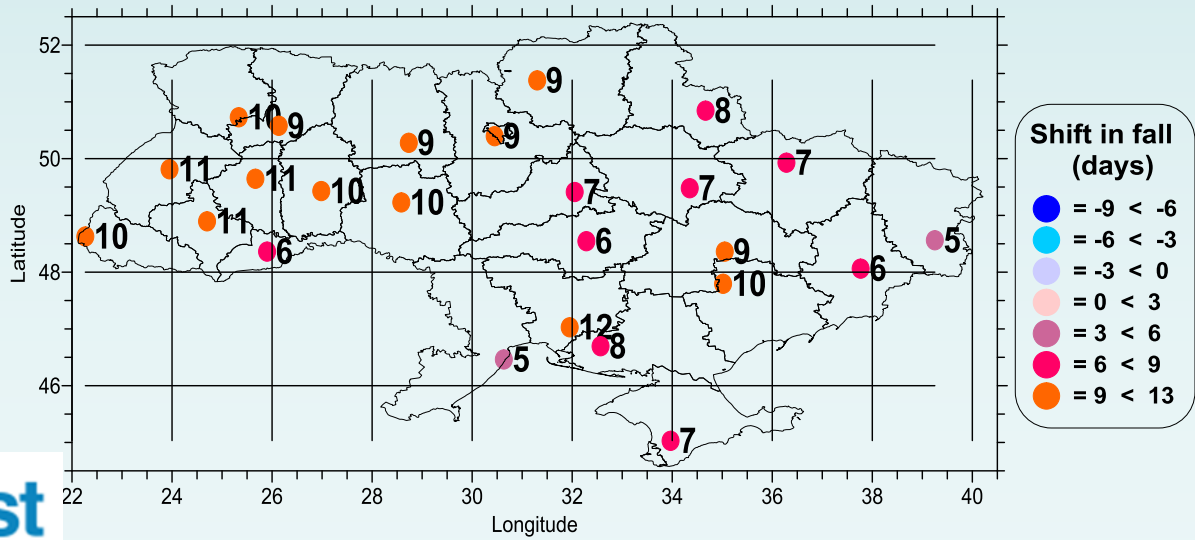
A project implemented by the HTSPE Ltd consortium *(Policy Project)* and UNDP *(Pilots Project)*

ClimaEast

Shift of dates for the start and the end of the active vegetation season (T>10 C)



Projection of 10RCMs for A1B SRES in 2021-2050 vs 1981-2010



This project is funded by the European Union

HTSPE

A project implemented by the HTSPE Ltd consortium *(Policy Project)* and UNDP *(Pilots Project)*

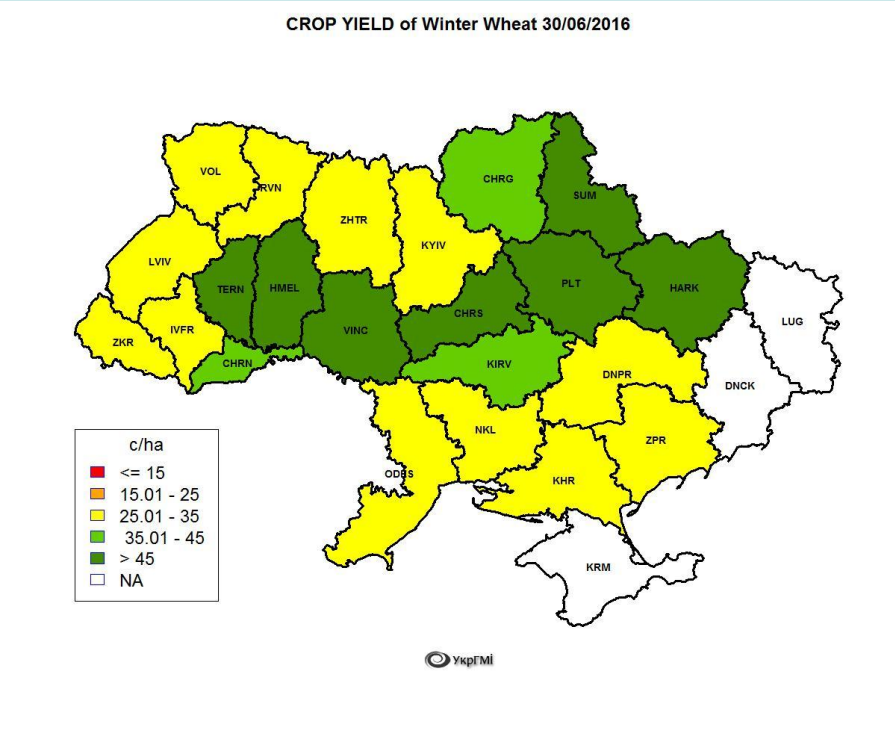
UNDP

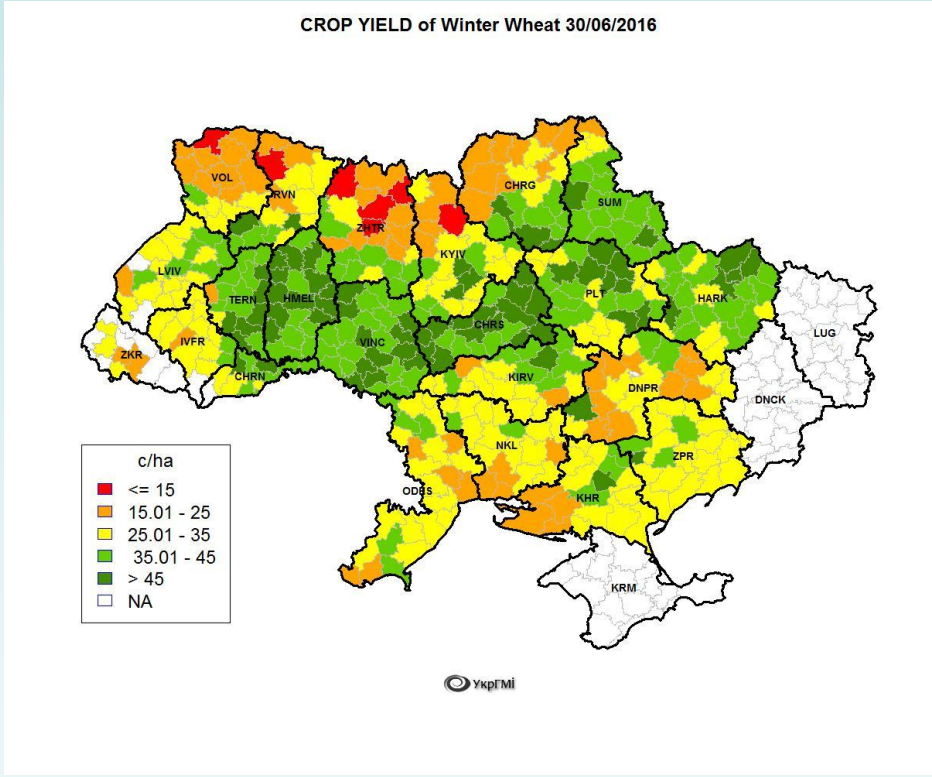
ClimaEast

AGRICULTURAL AND FOOD SECURITY

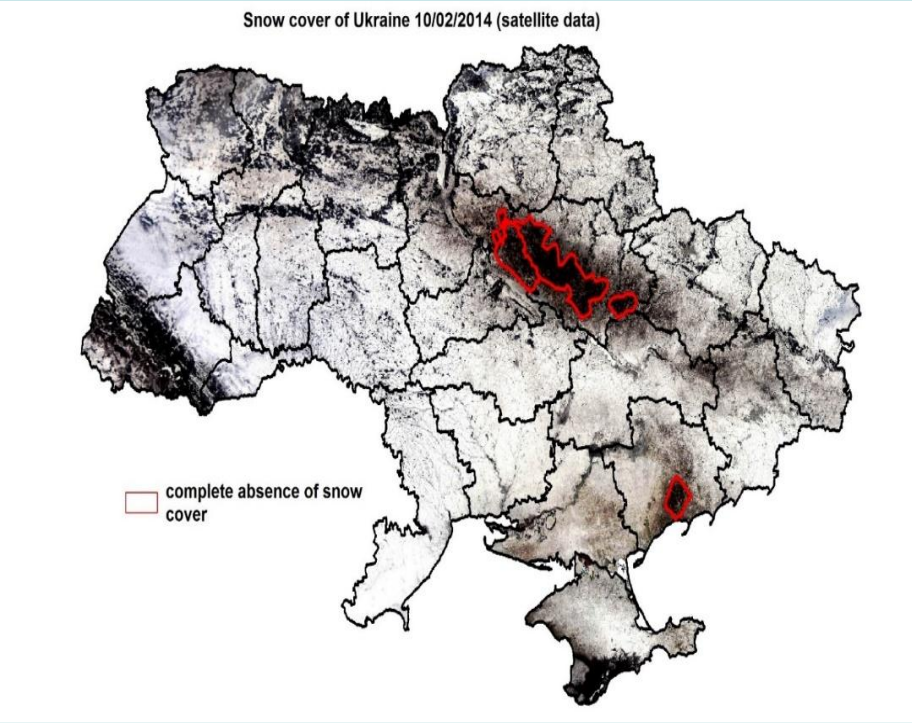
Agrometeorological research in UHMI

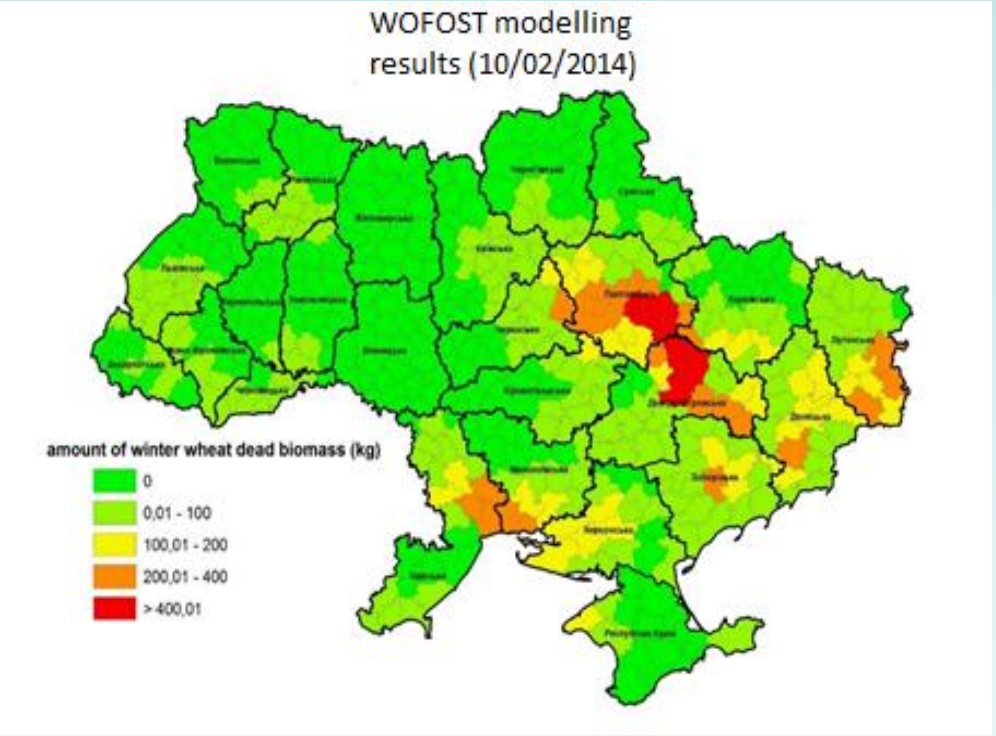
For the last 10 years UHMI has developed and adapted for operational activity the system of agricultural monitoring and yield forecasting of main crops in Ukraine. It consists of several independent modules which are integrated to monitor crop behaviour and produce crop yield forecasts. From a technical point of view the system includes the maintenance of a meteorological database, the application of an agro-meteorological model (**WOFOST, CropSyst, CERES**) the processing of low resolution satellite data, statistical analyses and yield forecasts of the main crops at national level.



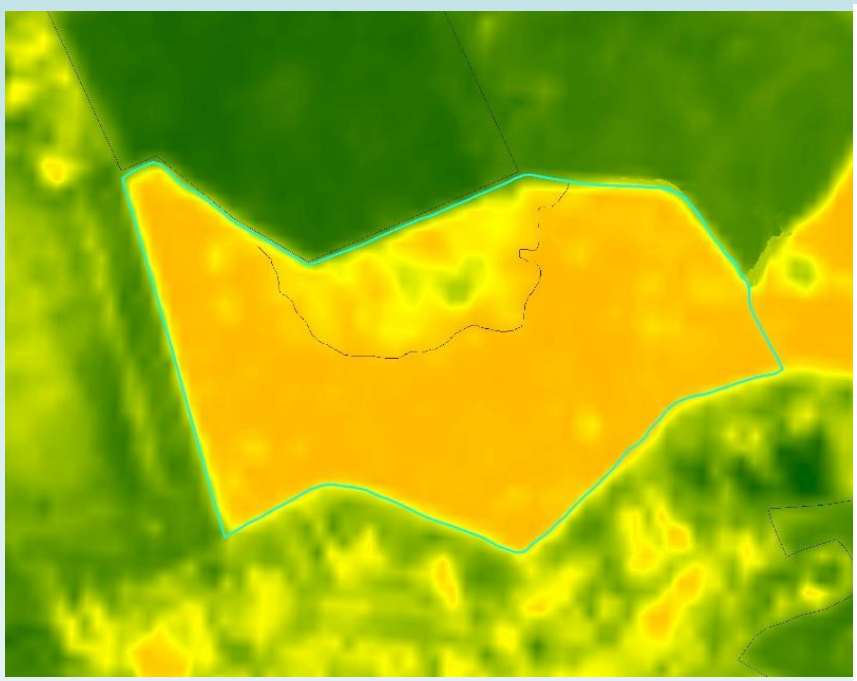


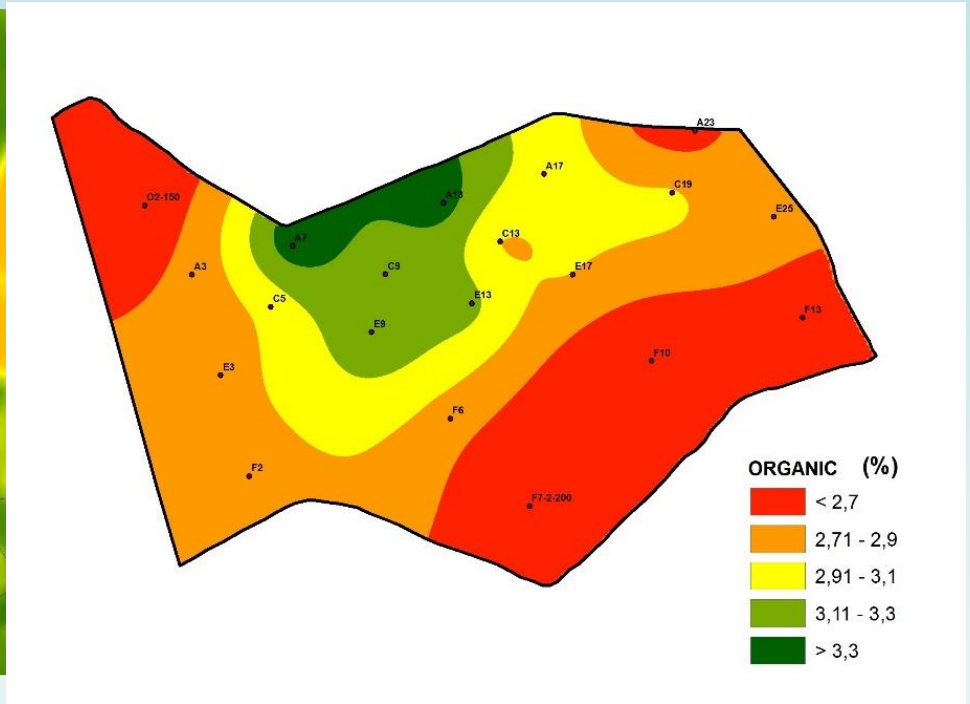
The system includes the module to simulate winter crops from autumn without stopping during the winter. This has been organized by inserting one extra parameter describing the fraction of the leaves that have died because of severe winter conditions. The module has been calibrated for Ukraine and improved based on the research that carried out in UHMI. Combination of agro-meteorological model and satellite data (**MODIS**) provides qualitative assessment of an yield loss because of severe winter conditions.





The other line of our agrometeorological research is a **precise agriculture**, based on a precise location in a field that allows to create maps of spatial variability of crop yield, terrain features/topography, organic matter content, moisture levels, nitrogen levels, pH, EC, Mg, K and others. The main goal is to monitor weather, soil and crop conditions in order to assess the effect of different components to make early yield and production estimates per individual field. This approach is based on a combination of modelling, observations and high resolution satellite data.

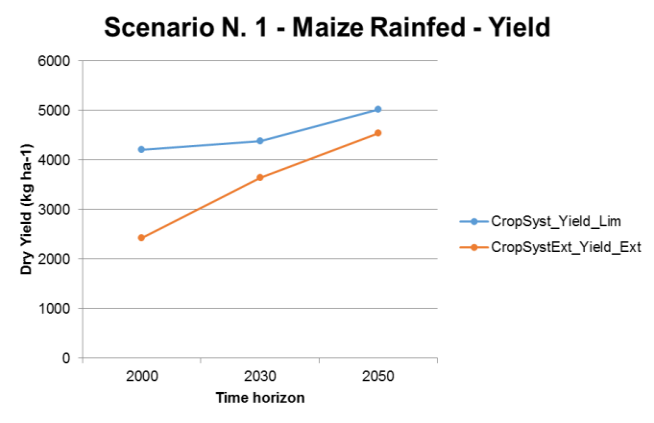


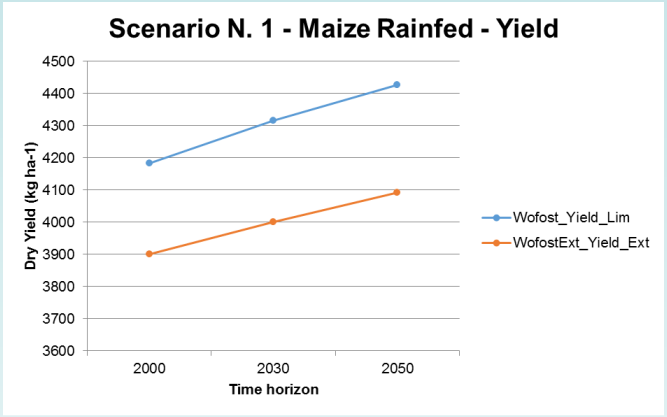


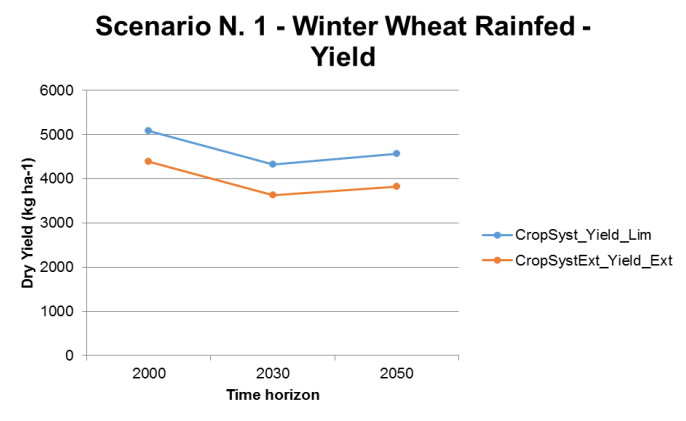
FIELDS

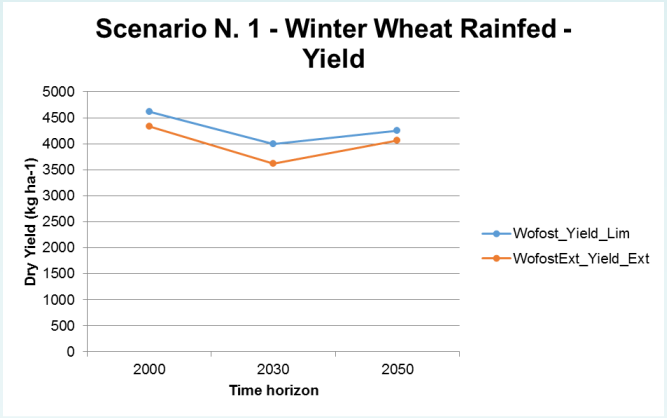
Estimation of extreme weather impact on crops productivity

The main objective of the study is to provide a series of process models and computer-mediated solutions for the modelling of the impact of extreme weather events on crop and grassland yields. This approach is realized based on modelling platform **BioMA** (which is basic to the **MARS** system). The feasibility of the BioMA platform for Ukraine was verified by the deployment of two crop models of a large use (**CropSyst, WOFOST**) and simulation of yield for winter wheat and maize crops for a specific area in Ukraine. Taking into account that we have expect the increased number of extreme weather events in Ukraine in the future, the simulations of crops yield for different climate scenarios with (MMS) and without (EMS) impact of extremes have been done.





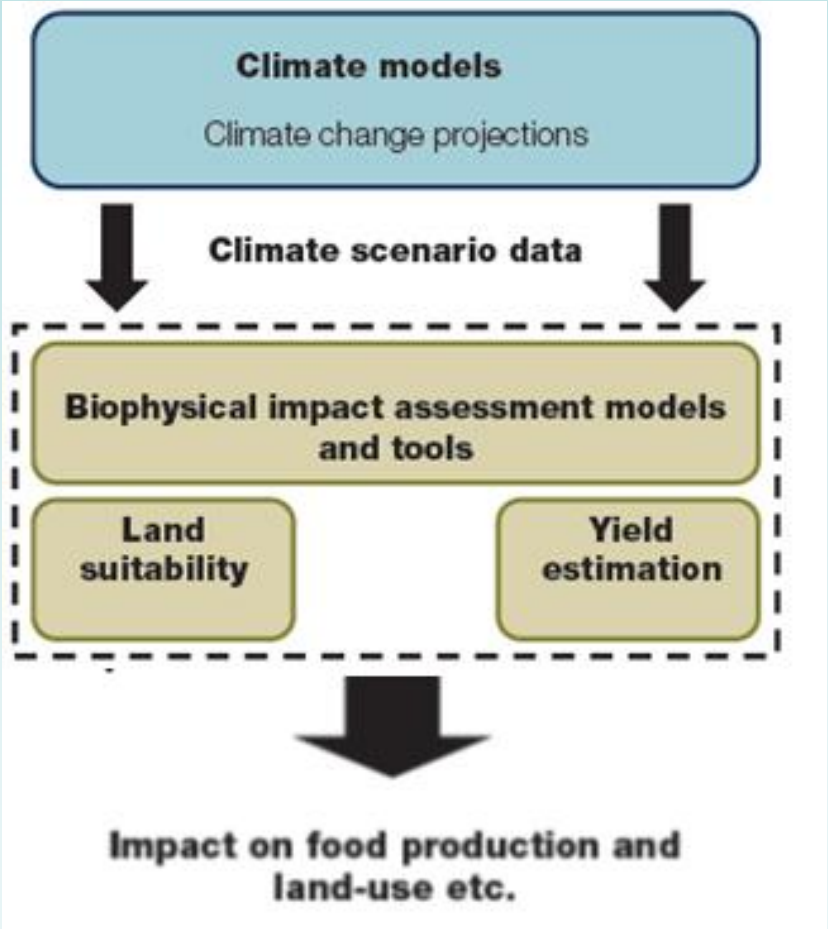




FURTHER…

Assessing Agricultural Vulnerabilities for the design of Effective Measures for Adaptation of Climate Change in Ukraine

The motivation of the study is the lack of information on vulnerabilities, risks and needs for the adaptation of Ukrainian agriculture under a changing climate in the next few decades. There is a wide range of process through which climate change could potentially impact agriculture in the 21 century. Due to complexity governing the interactions between these processes and the uncertainty associated with modeling them, it is not presently possible to reliably quantify the aggregate impact of climate change on agricultural productivity. The only suitable tools for quantitative assessment of future environmental conditions on biomass production are biophysical models, out of which crop growth models are those which can be used for estimation crop productivity and land suitability, land use as well.




THANK YOU FOR ATTENTION !