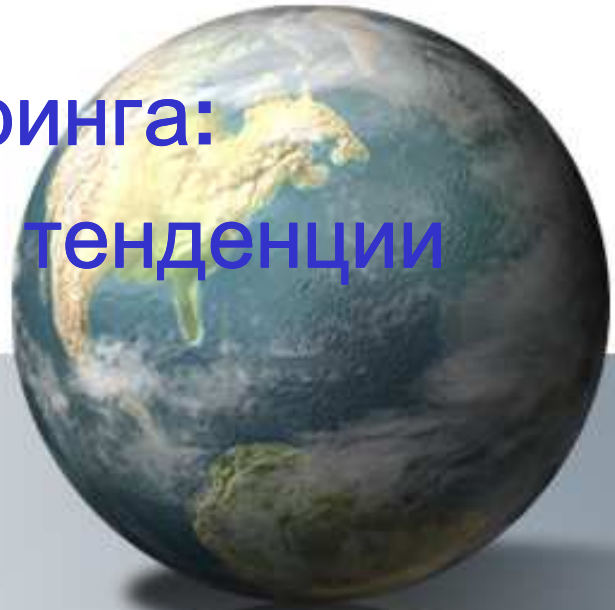
Дистанционные методы в решении задач агромониторинга: опыт Украины и современные тенденции

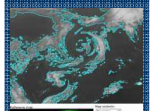
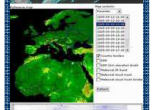
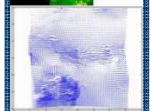
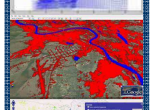


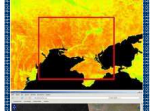
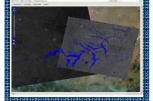
Н. Куссуль, А. Шелестов, С. Скакун,
А. Кравченко

Институт космических исследований
НАНу-НКАУ

План

- Опыт Украины в решении задач агромониторинга с использованием спутниковых данных
  - Оценка площадей посевов
  - Оценка состояния посевов
  - Классификация озимых
  - Прогноз урожайности
- Информационная инфраструктура
  - Спутник Сич-2
  - Grid- инфраструктура
  - Участике в World Data System
  - UN-SPIDER Regional support Office
  - Полигоны JECAM
- Тенденции и перспективы

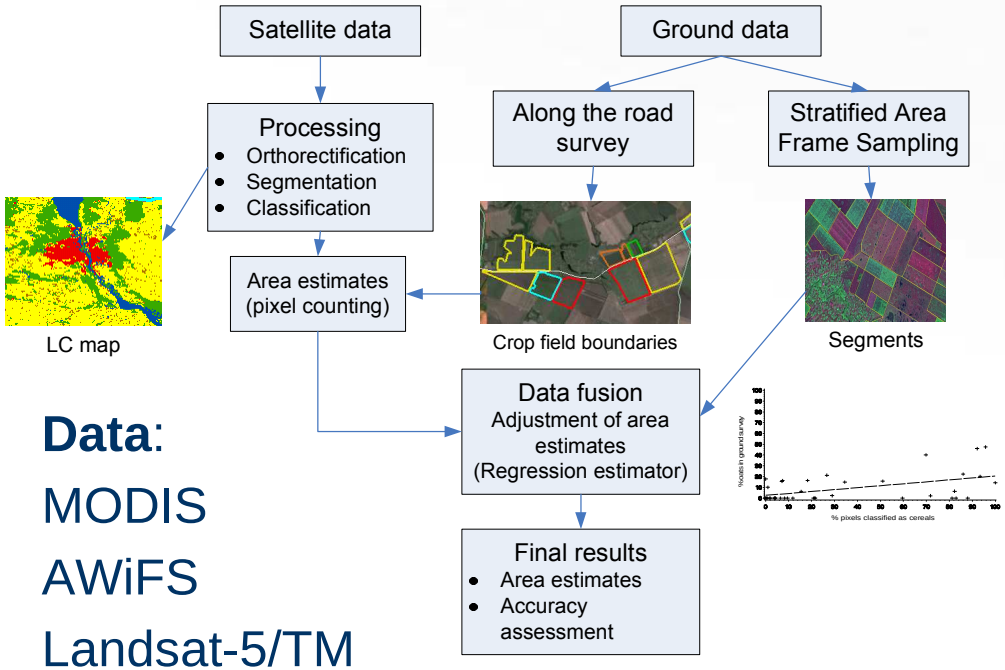






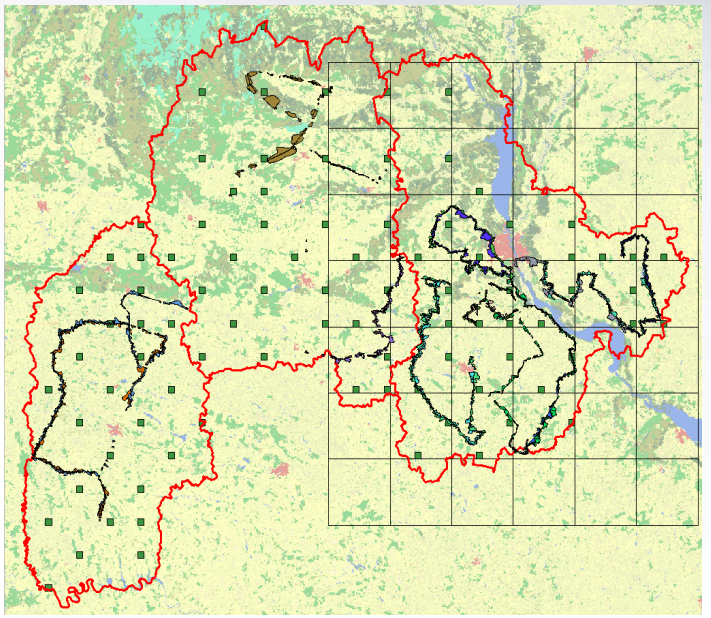



- Опыт Украины в решении задач агромониторинга с использованием спутниковых данных (международные проекты)

Анализ площадей посевов (MARS)

- Project EC JRC “Crop area estimation with satellite images in Ukraine”, 2009-2011





Data:

MODIS

AWiFS

Landsat-5/TM

LISS-III

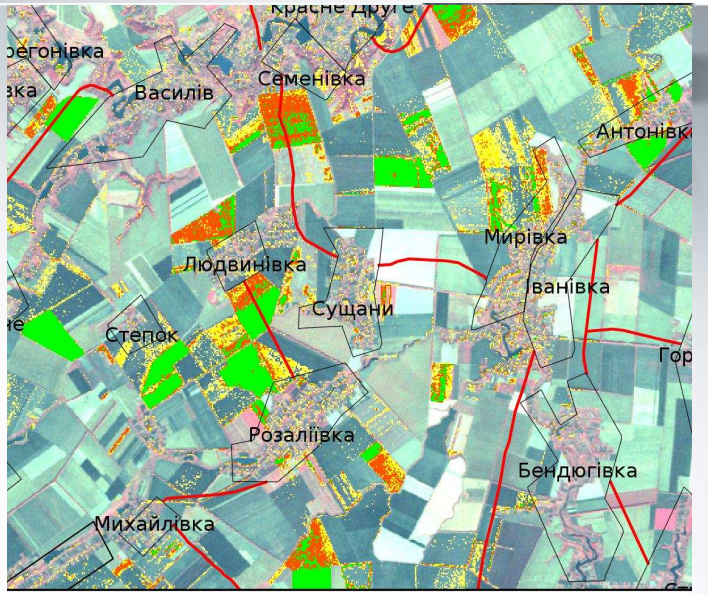
RapidEye

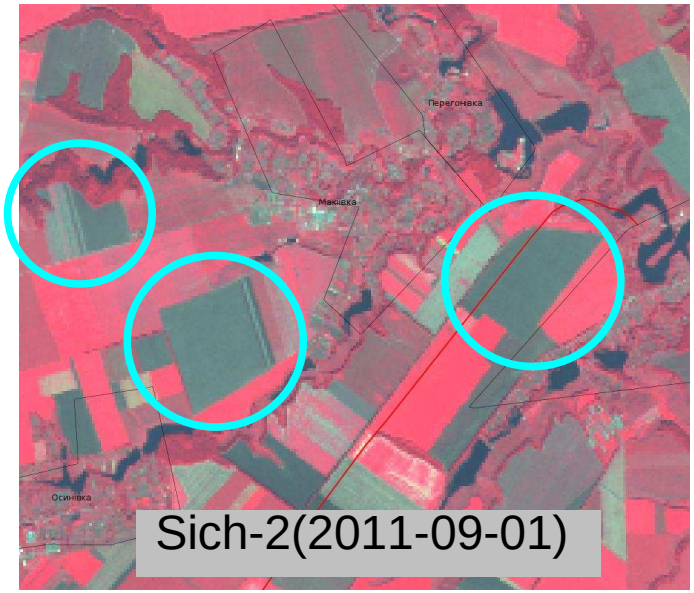
The benefit from satellite data usage:

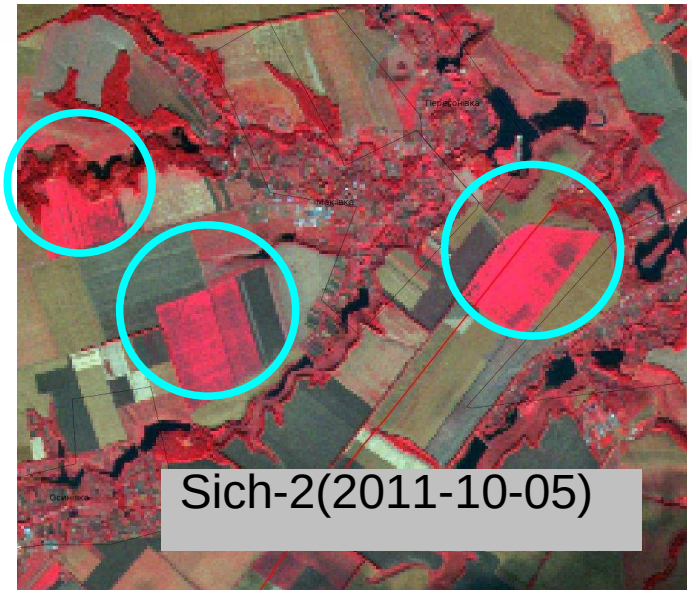
Decrease of work cost in **1.5 times**

Классификация озимых по данным Сич-2

- Task:
  - Winter rape area Estimation in 2011
- Data
  - Sich-2 (2011-09-01)
  - Sich-2 (2011-10-05)



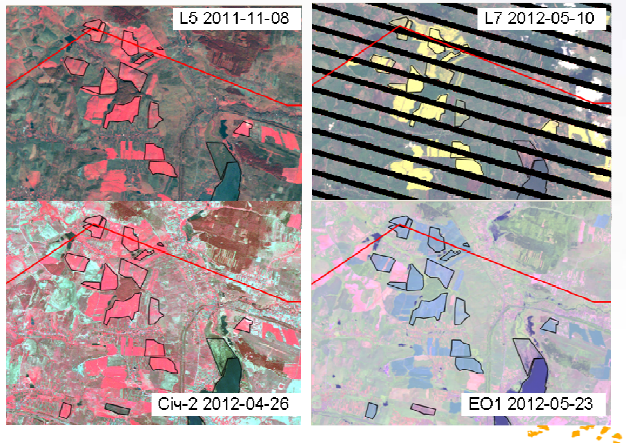




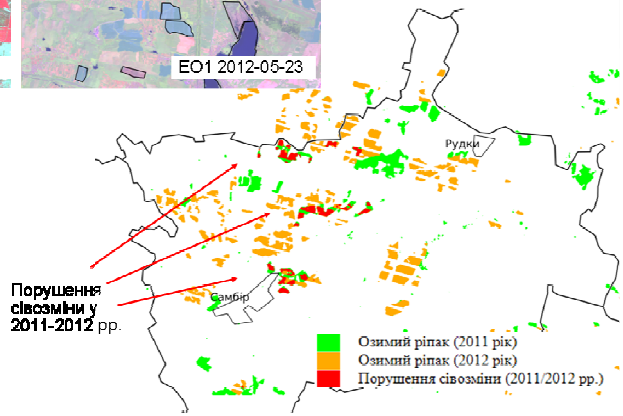
Анализ состояния посевов и контроль севооборота (GEO JECAM)

- Цель JECAM
  - Создание глобальной сети сельскохозяйственных полигонов
- В Украине два полигона JECAM
  - Киевская обл.
  - Львовская обл.
- Проект агромониторинга по данным Radarsat-2 (Канадское космическое агентство, MDA)
- Карты состояния посевов (2012 р.) и мониторинг нарушений севооборота (озимый рапс, 2011-2012 рр.) по спутниковым данным
  - Сич-2
  - Landsat-5/7
  - EO-1

Мережа полігонів JECAM

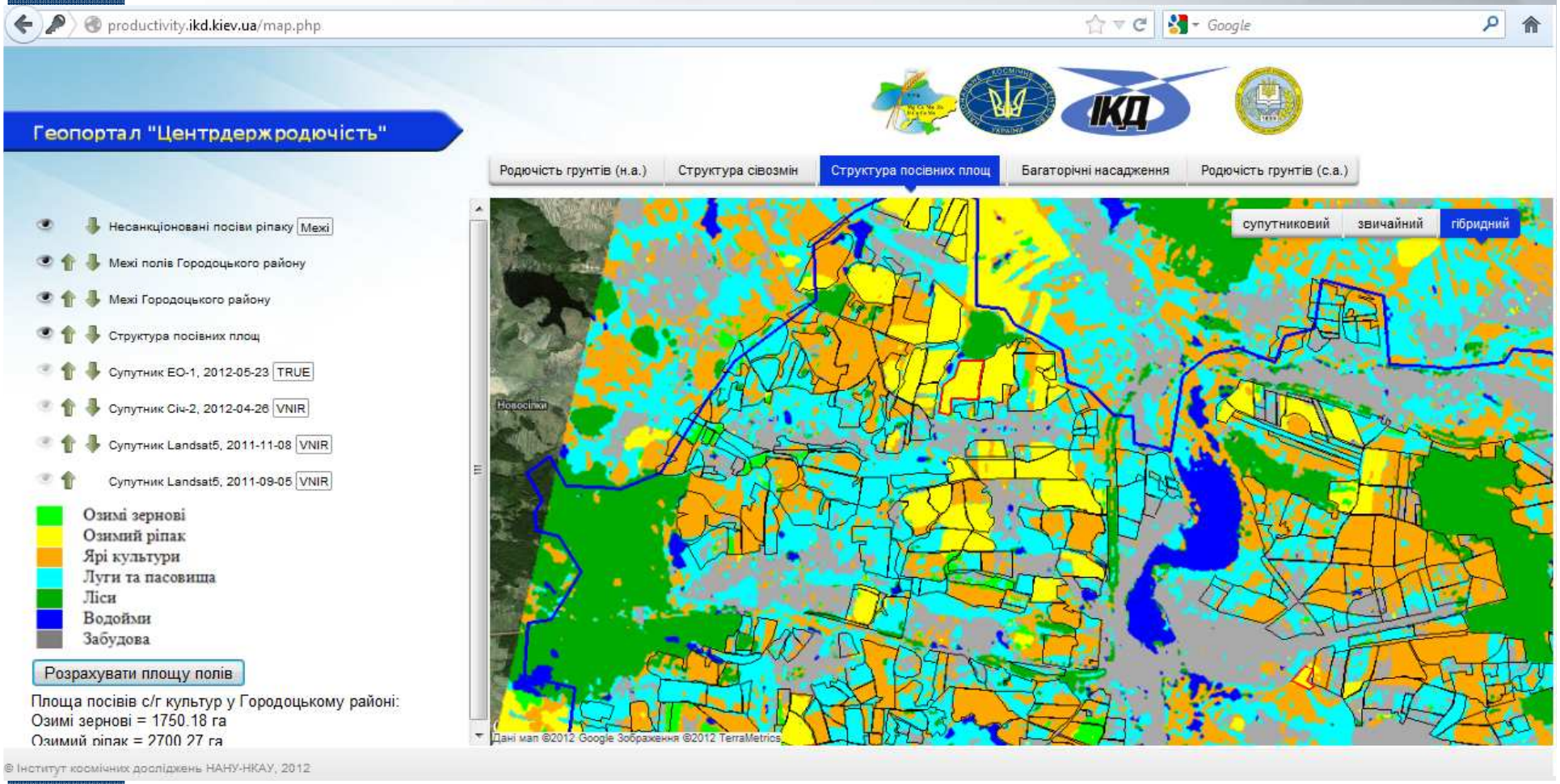


Озимий ріпак



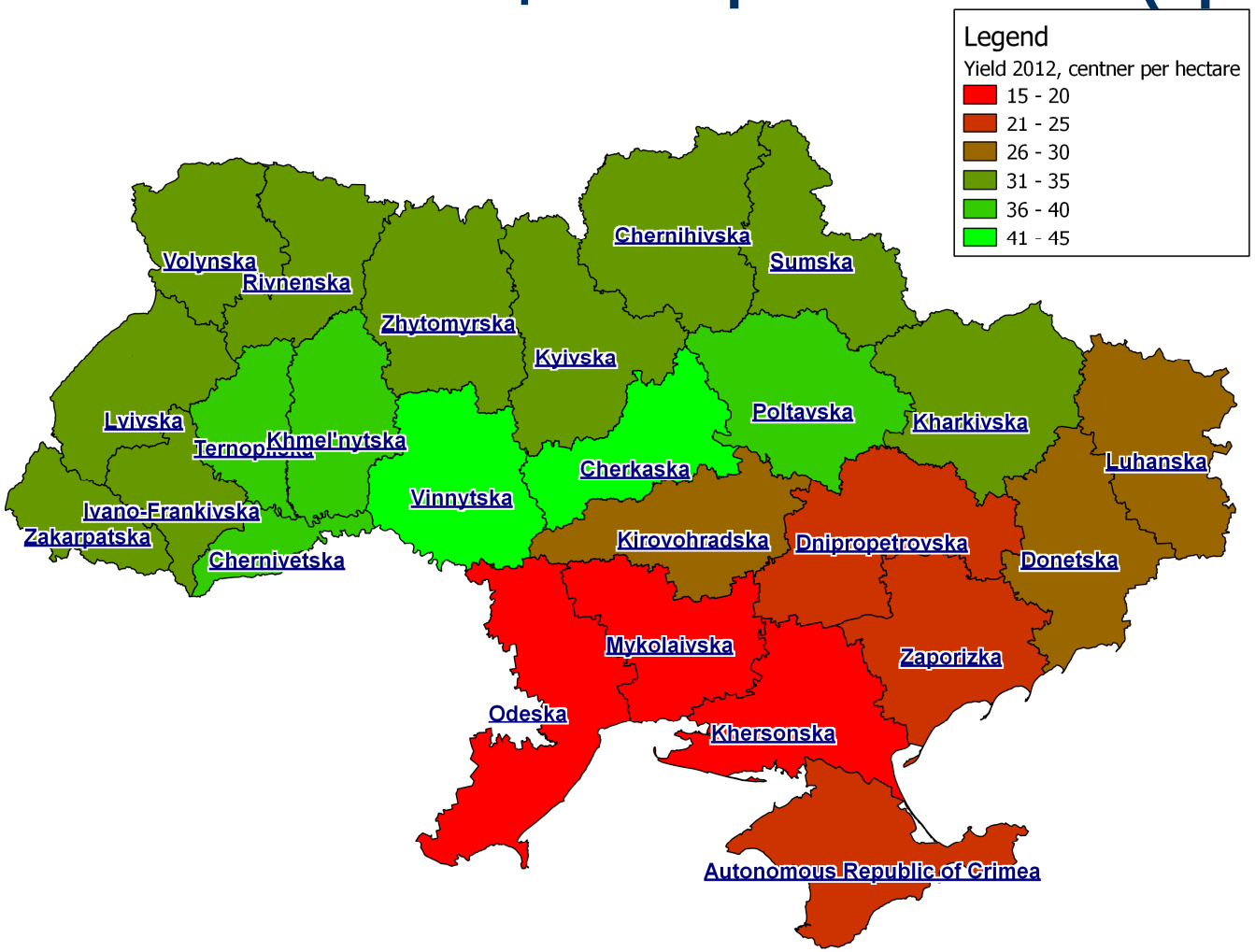
Примеры использования: геопортал ГЦ охраны плодородия почв

- http://productivity.ikd.kiev.ua

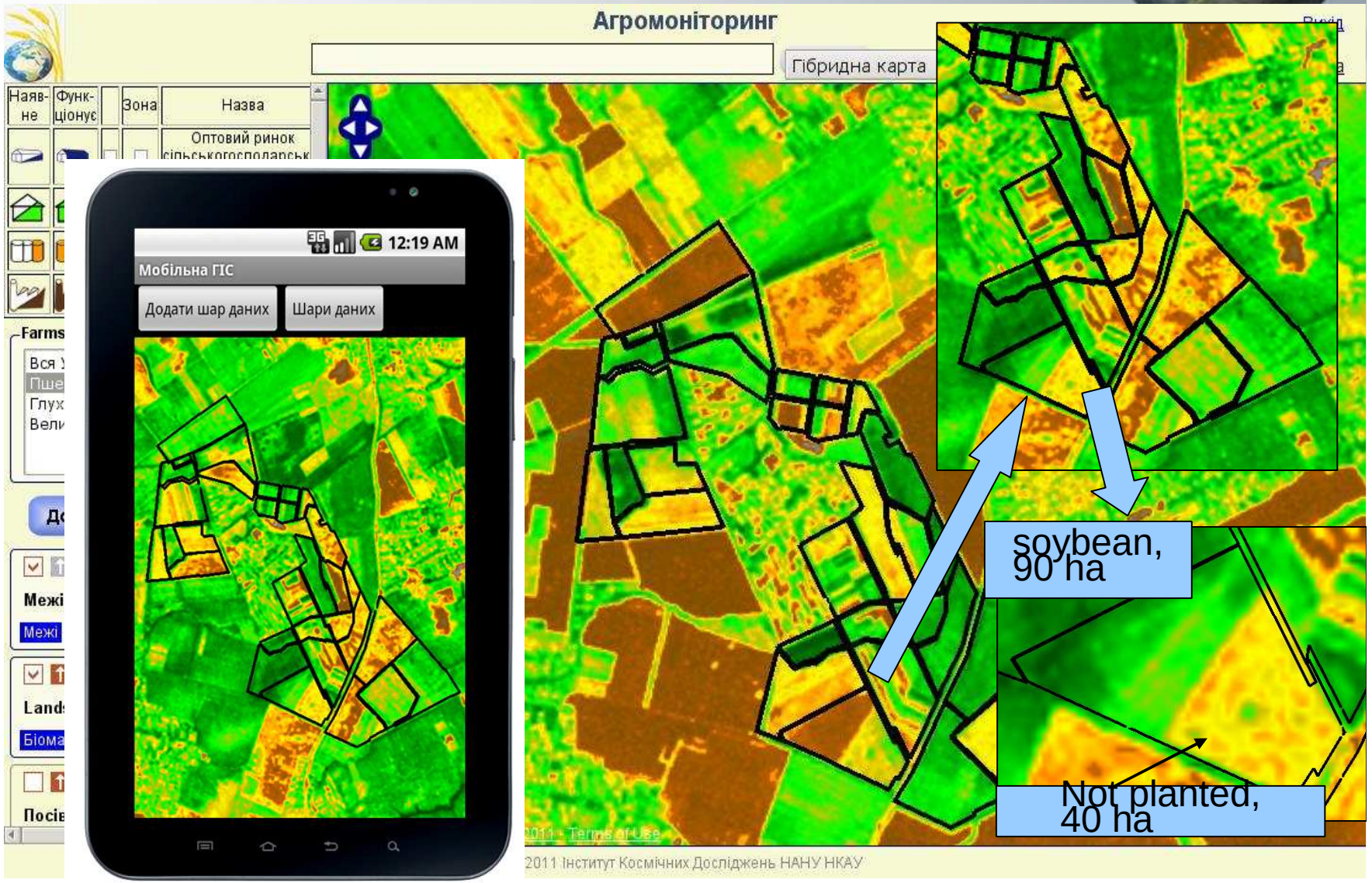


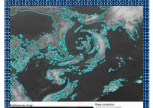
Прогнозирование урожайности

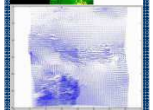
- **Оперативное прогнозирование урожайности озимой пшеницы в Украине в 2012 (проект CRDF)**

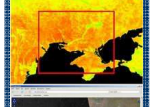
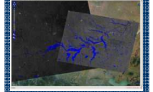


Geoportal: area estimation, crop rotation



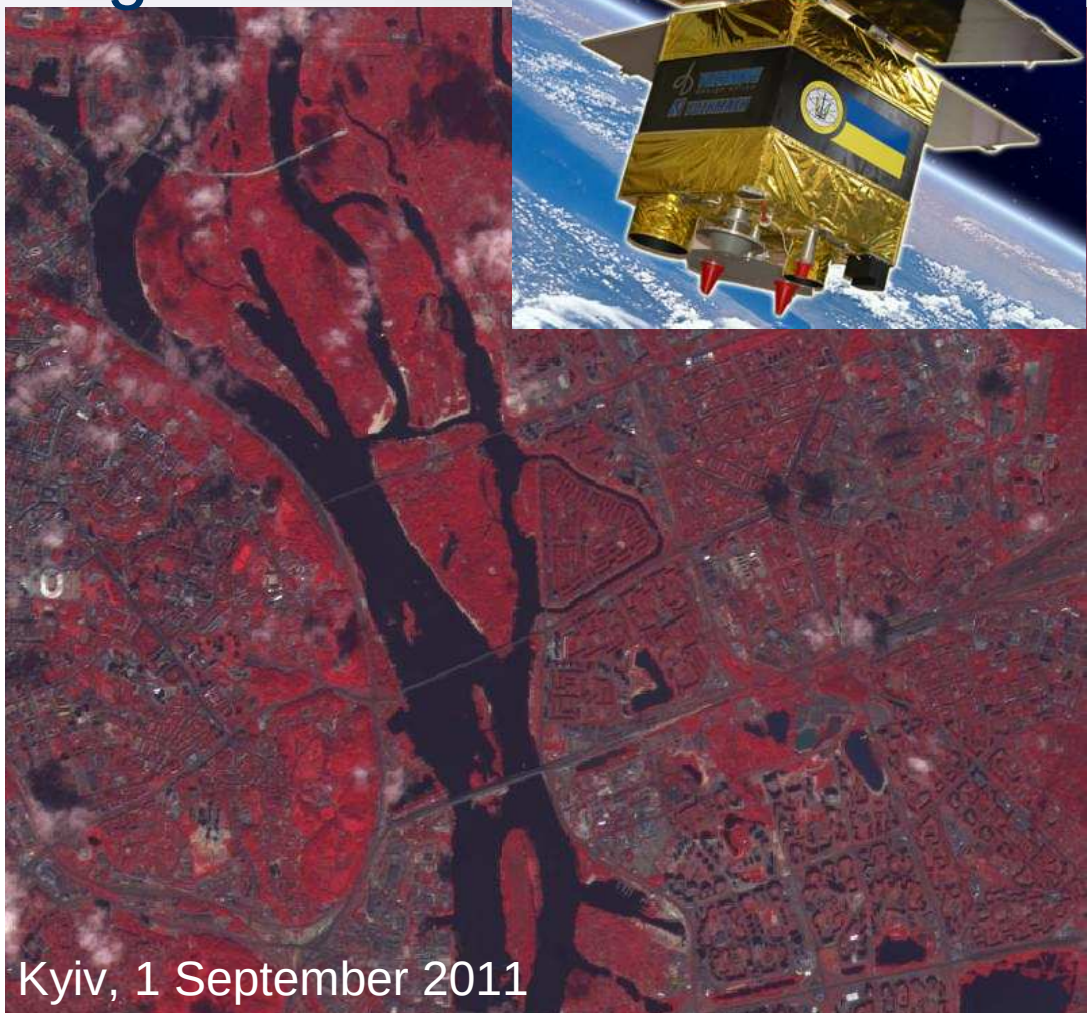



- Информационная инфраструктура: космический и наземный сегмент

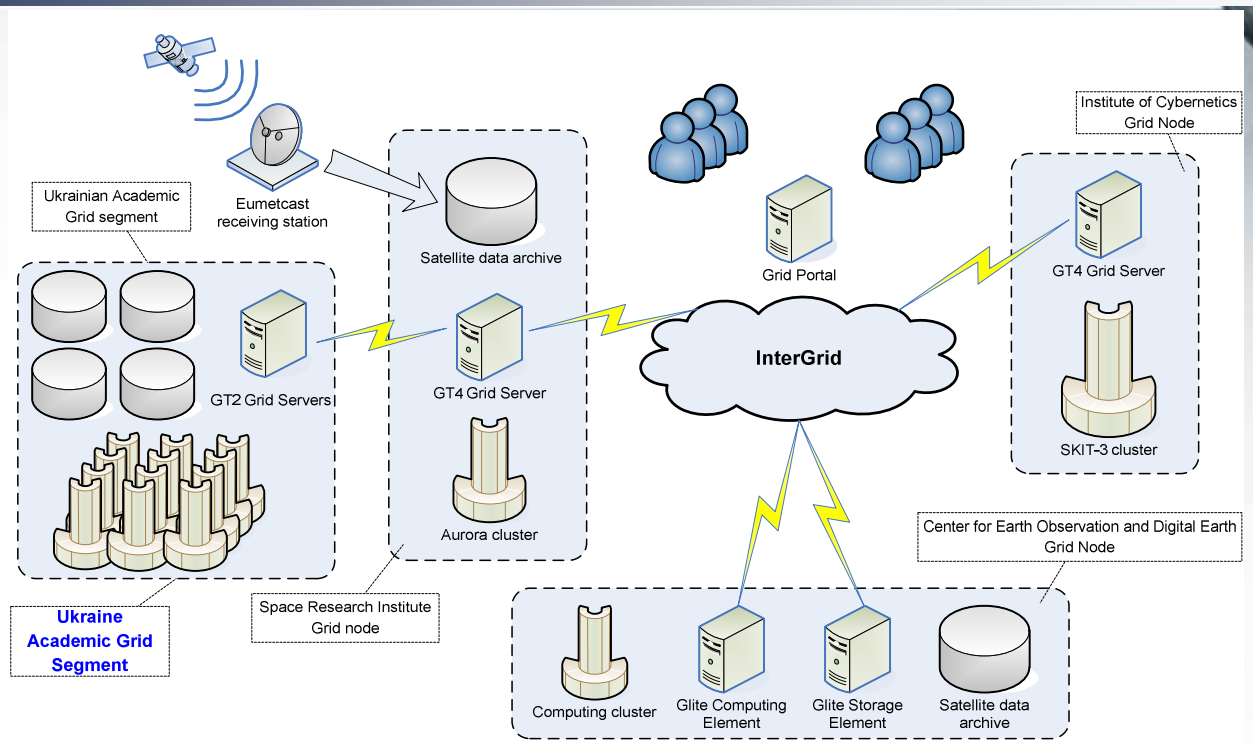
Sich-2 Earth Remote Sensing Satellite

- First Ukrainian ERS within new National Space Program
- Optical
  - VNIR (8 m), SWIR (40 m)
  - 48.8 km swath
  - Inclination angle: ± 30°
- Launched 17 August 2011
  - Ukrainian Dnipro launcher



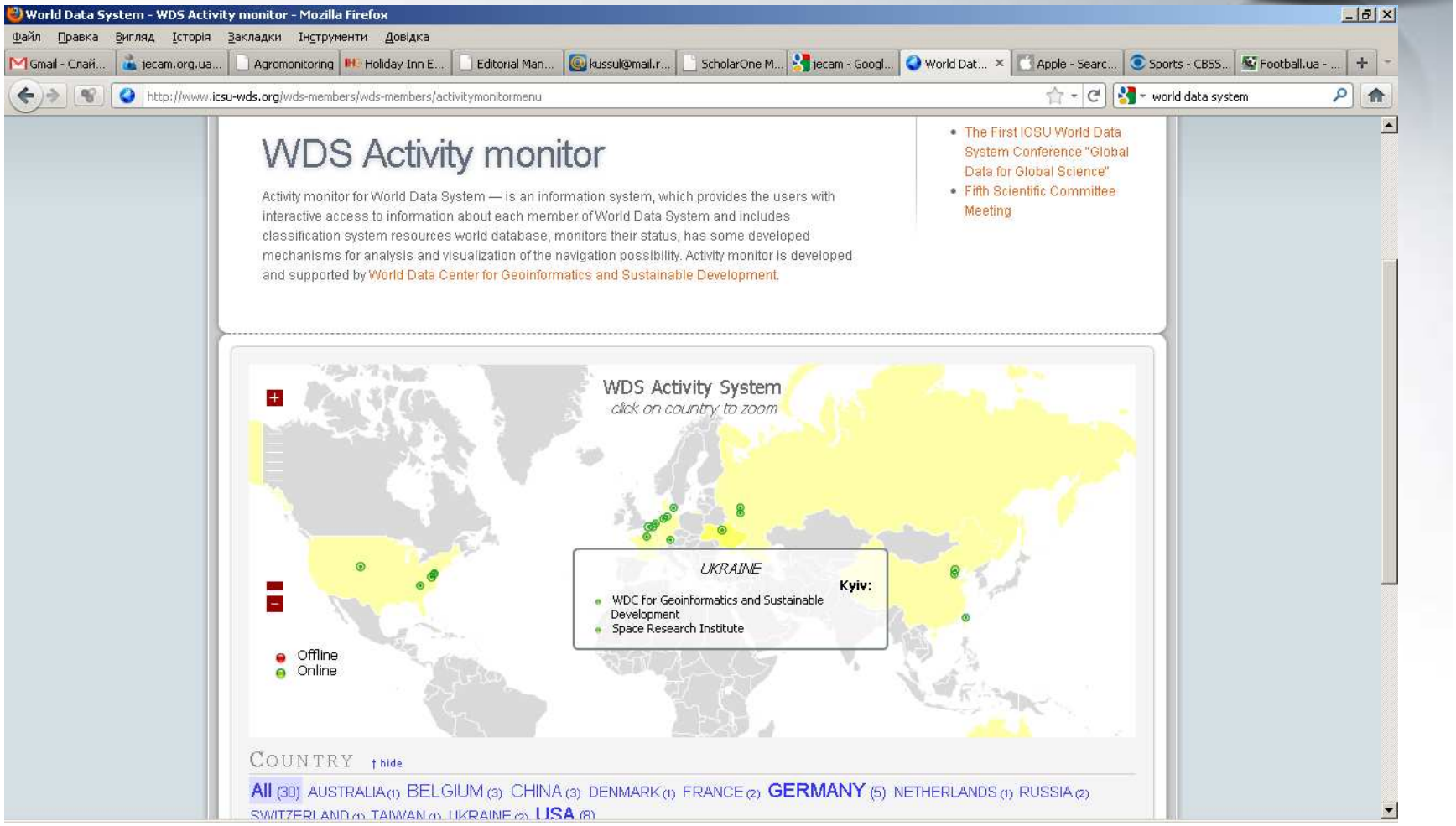
Kyiv, 1 September 2011

Information infrastructure: GRID



- *Integrates computational and informational resources*
  - *Space Research Institute NASU-NSAU*
  - *Institute of Cybernetics NASU*
  - *European Space Agency*
  - *Chinese Academy of Sciences*
- *Included to Earth Science Research VO of EGEE*
- *Integrated to Academic Grid Infrastructure of Ukraine*
- *Computational resources – 756 cores*
- *Storage capacity – 22Tb*

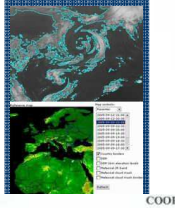
Information infrastructure – Member of World Data System



UN-SPIDER RSO in Ukraine

UNITED NATIONS
Office for Outer Space Affairs

- Signing of the Agreement during UN Committee on the Peaceful Uses of Outer Space (COPUOS) Session in Vienna



COOPERATION AGREEMENT

between the

UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIR

and the

SPACE RESEARCH INSTITUTE OF
THE NATIONAL ACADEMY OF SCIENCES OF UKRAINE /
THE NATIONAL SPACE AGENCY OF UKRAINE

on the establishment of the

UN-SPIDER REGIONAL SUPPORT OFFICE IN UKRAIN

NOTING the generous offer made by the Government of Ukraine to host a UN-SPIDER Regional Support Office,

RECALLING that the General Assembly Resolution 61/110, paragr that the United Nations Platform for Space-based Information for Disaster and Emergency Response (UN-SPIDER) Programme, being implemented Nations Office for Outer Space Affairs, should "work closely with regiona centres of expertise in the use of space technology in disaster managem network of regional support offices for implementing the activities of the their respective regions in a coordinated manner and to take advantage of experience and capabilities being offered, and to be offered, by M particularly by developing countries",

FURTHER NOTING the guidelines for selecting and setting up the SPIDER Regional Support Offices as stated in A/63/20, paragraph 129, an Assembly's agreement with those guidelines, as expressed in A/RES/63/90,

DESIRING to establish a common ground for cooperation betwe Nations Office for Outer Space Affairs and the Space Research Institute o Academy of Sciences of Ukraine and the National Space Agency of Ukrain to the operation of the UN-SPIDER Regional Support Office in Ukrai referred to as "Regional Support Office"),

The **UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS** an **RESEARCH INSTITUTE OF THE NATIONAL ACADEMY OF SC UKRAINE AND THE NATIONAL SPACE AGENCY OF UKRAINE,**

HAVE AGREED as follows:

1. The Space Research Institute of the National Academy of Sciences the National Space Agency of Ukraine shall be responsible for providi infrastructure (computer equipment, office furniture, communication maintenance and operational support) and at least one expert, to be the the Regional Support Office, as well as additional funding as needed

participation of the Regional Support Office staff in UN-SPIDER and other relevant activities, as well as to support the agreed UN-SPIDER-related activities to be carried out by the Regional Support Office;

2. The UN-SPIDER Programme Coordinator and the Coordinator of the Regional Support Office shall define in the beginning of every year, through an exchange of letters, an agreed upon workplan, to be carried out by the Regional Support Office and which should contribute to the UN-SPIDER workplan;

3. The Coordinator of the Regional Support Office shall prepare and submit annually a report on the activities carried out by the Regional Support Office during the previous year and which shall be incorporated into the report that the UN-SPIDER Programme Coordinator will prepare and submit annually to the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space;

4. The Regional Support Office may not use the name or logo of the United Nations, the United Nations Office for Outer Space Affairs, or the United Nations Platform for Space-based Information for Disaster Management and Emergency Response, without prior written consent from the United Nations.

5. The present Agreement shall be without prejudice to the privileges and immunities of the United Nations as set forth in the Convention on the Privileges and Immunities of the United Nations (1946).

6. The staff of the Regional Support Office shall not be considered in any respect as officials or staff of the United Nations. The United Nations does not accept any liability for claims arising out of the activities performed under the present Agreement, or any claims for death, bodily injury, disability, damage to property or other hazards that may be suffered by the personnel of the Regional Support Office as a result of their work pertaining to the UN-SPIDER-related activities. However, when the Regional Support Office expert is specifically invited by the UN-SPIDER Programme Coordinator to join a technical advisory mission to a Member State that requests such advisory support he/she will be considered an "expert on mission" within the meaning of article VI of the Convention on the Privileges and Immunities of the United Nations (1946).

7. This Agreement shall enter into force upon signature by the Parties. It may be terminated by either Party by giving six months prior notice in writing.

Signed on this ___th day of _____ 2010.

For the United Nations

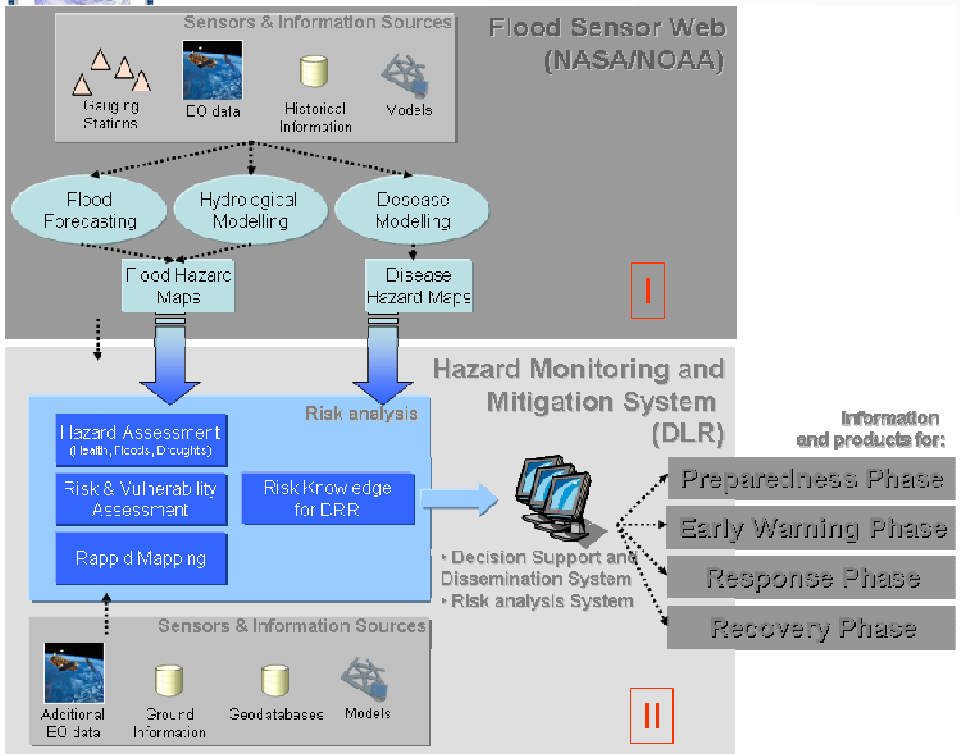
Mazlan Othman
Director
Office for Outer Space Affairs
United Nations Office at Vienna

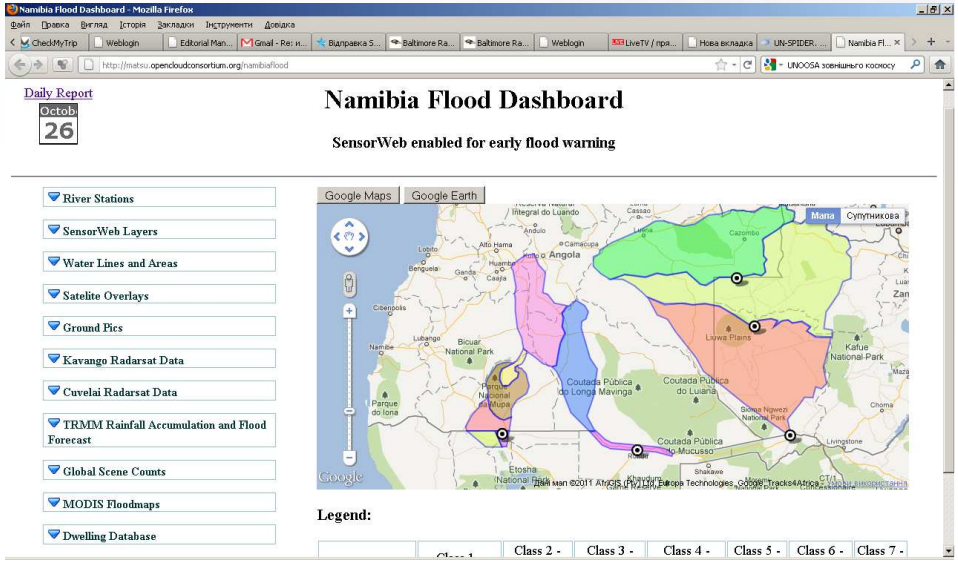
For the Space Research Institute of the National Academy of Sciences of Ukraine and the National Space Agency of Ukraine

Oleg Fedorov
Director
Space Research Institute of the National Academy of Sciences of Ukraine and the National Space Agency of Ukraine

GEO Sensor Web Pilot Project

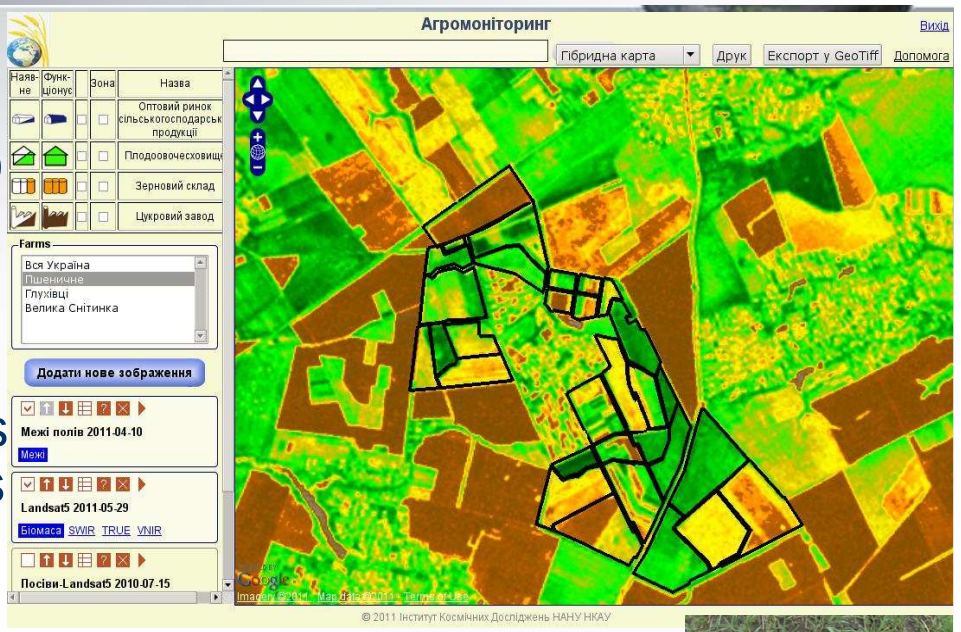
- **Paricipants**
  - UN-SPIDER, NASA, NOAA, DLR, SRI NASU-NSAU
- **Objective**
  - Sensor Web Flood Monitoring System for Namibia http://matsu.opencloudconsortium.org/namibiaflood

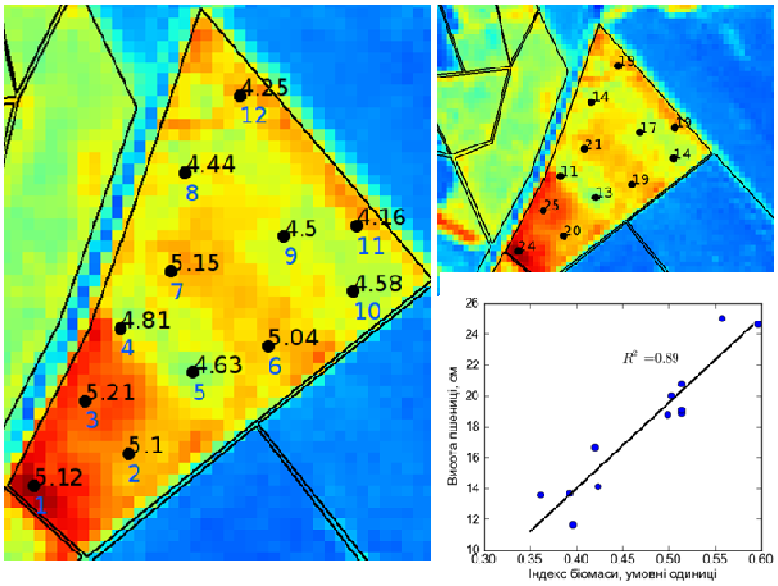


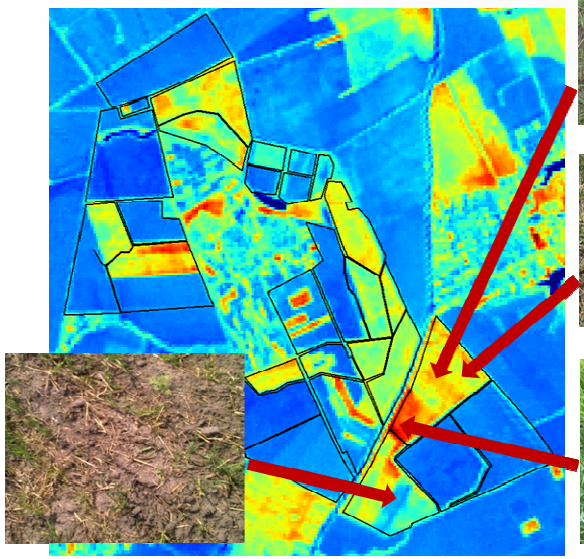


Участие в GEO: проект JECAM

- JECAM
  - Joint Experiment for Crop Assessment and Monitoring
  - Ukrainian test sites
    - Biophysical parameters and soil measurements
  - Geoportal

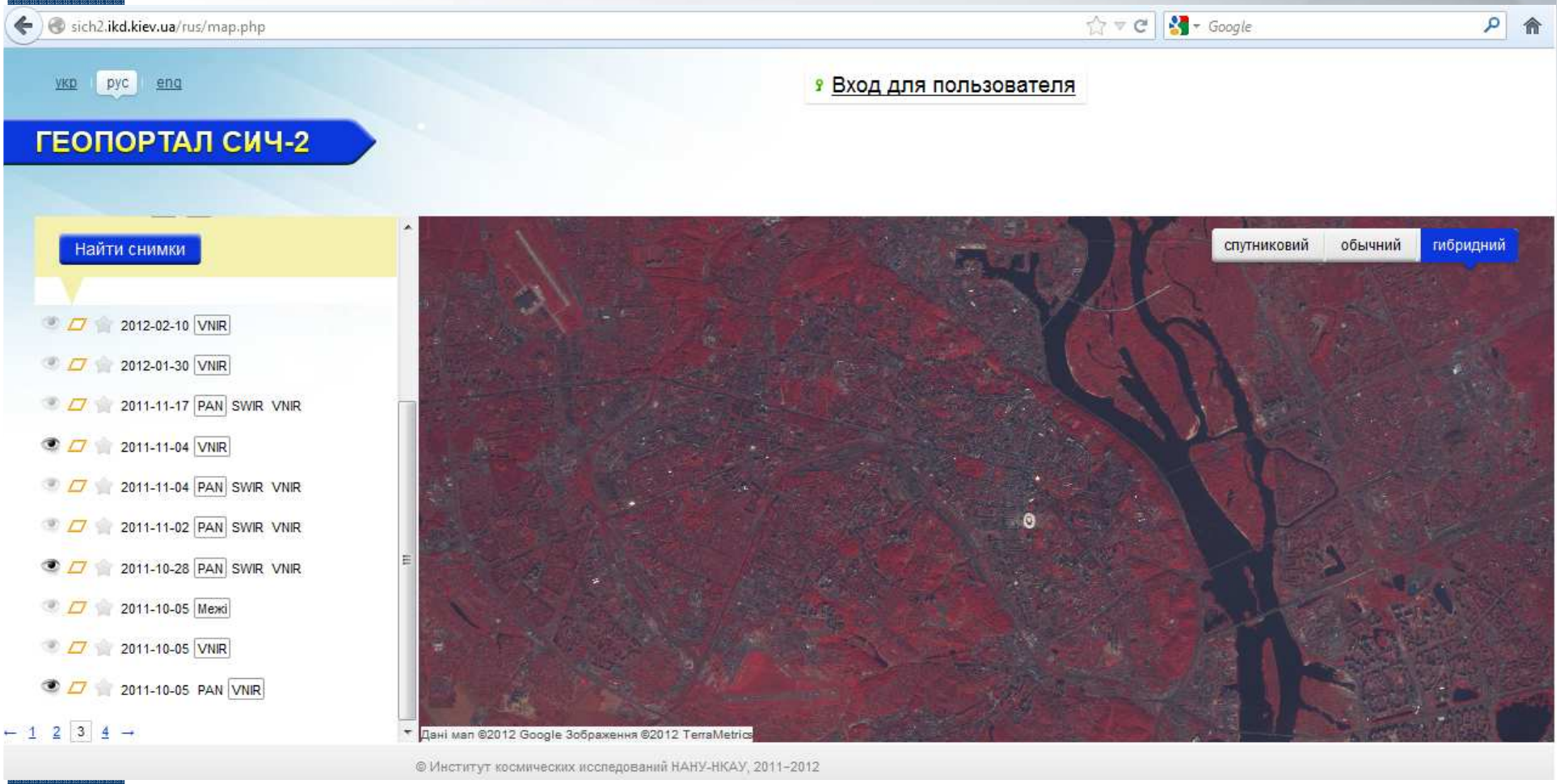




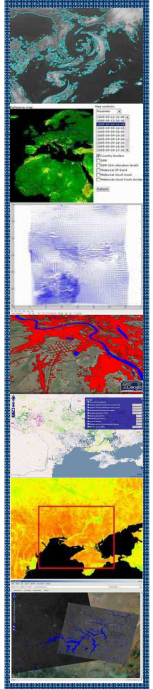


Примеры использования: геопортал «Сич-2»

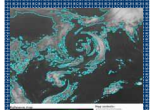
- http://sich2.ikd.kiev.ua

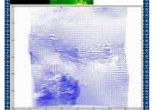
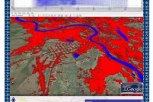
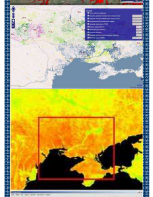


Перспективы



- Развитие информационных систем и сервисов для Минагрополитики, гидрометцентра
- Участие в Российско-Украинской программе космических исследований: мероприятие Регион/Полигон
- UN-SPIDER
- Участие в планах GEO – проекты GLAM и JECAM (анализ применимости радарных данных для задач агромониторинга)
- Планы участия в FP7


Thank you!