

Moscow State University of Geodesy and Cartography (MIIGAiK)

МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ  
ГЕОДЕЗИИ И КАРТОГРАФИИ  
(МИИГАиК)



“On development of open-source portal for use of the remotely sensed data in emergency situations response applications scenarios”

in Project 14.B37.21.1243

WGL-EGL Joint Tech Meeting  
September 19-21, 2013



Anton Bystrov, Alexander Grechishev,  
from Moscow

“Project 14.B37.21.1243”

“Research and development of the opened networked geospatial instrument and educational content based on deployment remote sensing technologies for decision support in emergency situations of natural and human-induced nature.”

## “Project 14.B37.21.1243”

- Funding: the study was supported by The Ministry of education and science of the Russian Federation.
- The project is implemented under the guidance of the invited foreign scientist
- The project involves three PhD, 6 PhD students and 6 students from MIIGAiK
- Using space and UAVs remote sensing data in emergency situations
- Using open source technologies for making Emergency web-portal
- Creating multimedia educational online content

“Project 14.B37.21.1243”

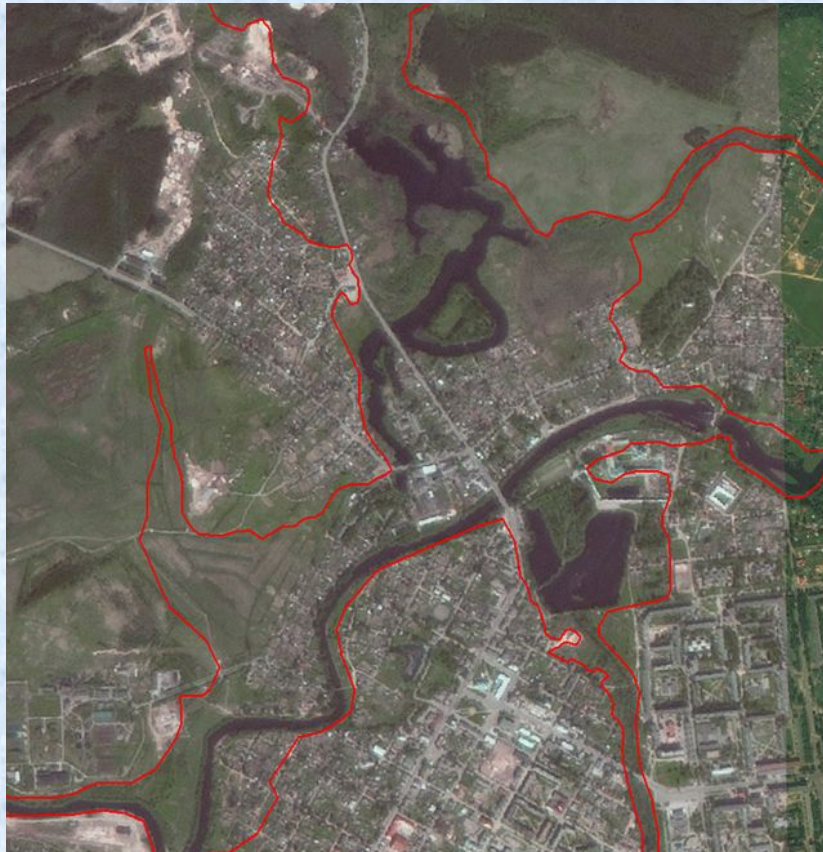
*Town Alatyr, Chuvashia region*



EROS-B (22 April 2012)

# “Project 14.B37.21.1243”

## *Town Tikhvin (near Saint-Petersburg)*



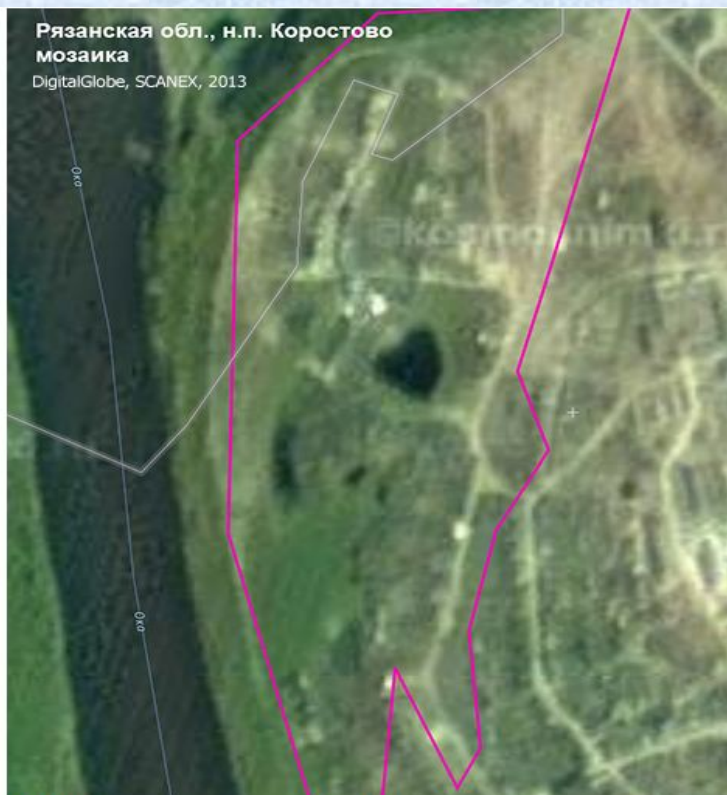
Yandex maps (geoportal)



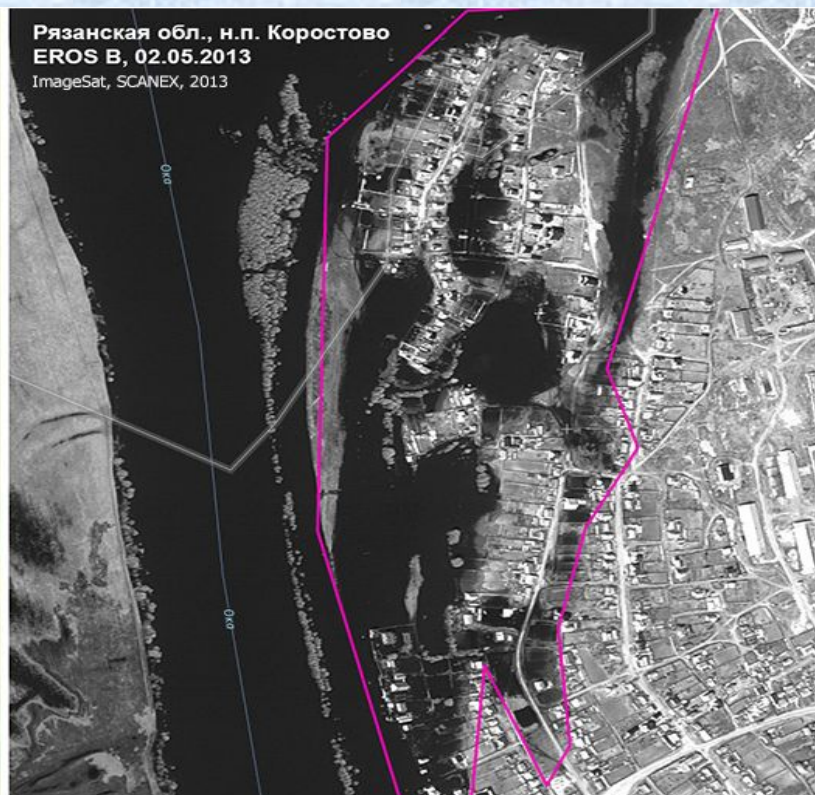
EROS-B (21 April 2013)

# “Project 14.B37.21.1243”

## Settlement Korostovo



Kosmosnimki.ru (geoportal)



EROS B (2 May 2013)



”Vyacheslav Barbasov, Pavel Orlov,  
from Moscow

“Multi rotary UAV  
in Project 14.B37.21.1243”

# UAV developed in MIIGAiK: SCB “Impulse”



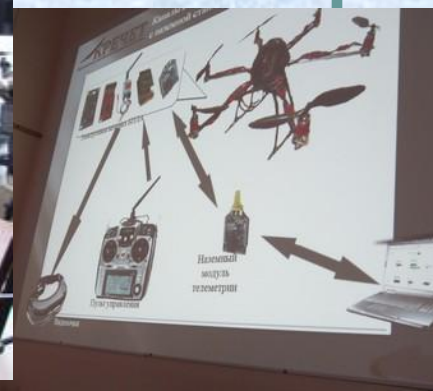
unmanned aircraft  
«PTERRO» with camera  
CANON




Tests on the MIIGAiKs  
geodesic test area





# UAV developed in MIIGAiK: SCB "Krechet"



Feature	Quadcopter "Schmidt"	Hexacopter "Juggernaut"	Octocopter Topocopter "Dreadnought"	
Deployed size, length×width×height, mm	350x350x270	825x825x325	1100×1100×450	  
Transport size, length×width×height, mm	350x350x150	825x300x325	1100×1100×250	
Speed of level flight, km/h	0÷55	0÷45	0÷50	
Operating altitude, m	5÷250	10÷350	10÷450	
Maximum altitude, km	2	2	2	
Flight duration, min	Up to 25	Up to 20	Up to 20	
Maximum take-off weight, kg	2,5	6	10	
Maximum payload, kg	0,8	2,5	4	
Take-off weight, kg	1,4	3	5	
Working temperature, °C	-25 ÷ +50	-20 ÷ +40	-25 ÷ +50	
Wind speed at launch, not more than, m/sec	6	8	10	
Wind speed at an altitude, not more than, m/sec	8	10	12	
Size of landing area, not less than, m*m	1×1	2×2	3×3	
Servicemen	1-2	1-2	2	
Engine (electric power), item	4	6	8	
Additional route camera (resolution) (Control of the axes)	No	No	Yes, (752x582), (2 axes)	
Portable	No	Yes	No	
Application	Monitoring, security forces	Monitoring	Cartography, Monitoring	

## “Multi rotary UAV in Project Project 14.B37.21.1243”

Multicopter UAV, which is developed in SCB MIIGAiK «Krechet», – octocopter «Dreadnought».

This drone can be used to receive snapshots, applicable in map (or site plan) creating/updating, forming of digital terrain model, making 3D-models of buildings and objects, thermographic maps, panoramic surveying and also monitoring of natural and manmade emergencies development.



## “Multi rotary UAV in Project Project 14.B37.21.1243”

### Functions & elements of ground control

When we use multirotor UAV in cartographic monitoring, it must be considered as a complex with its equipment (instrumentation) and payload. Its called UAS – Unmanned Aircraft System. UAS consist of payload and ground control.

What is it for?

- Automatic flight control;
- Flight navigation;
- Flight task input and processing;
- Setting up a wireless link with an operator;
- Data receiving, processing and storage (Video and Telemetry);
- Input of UAV control signals.

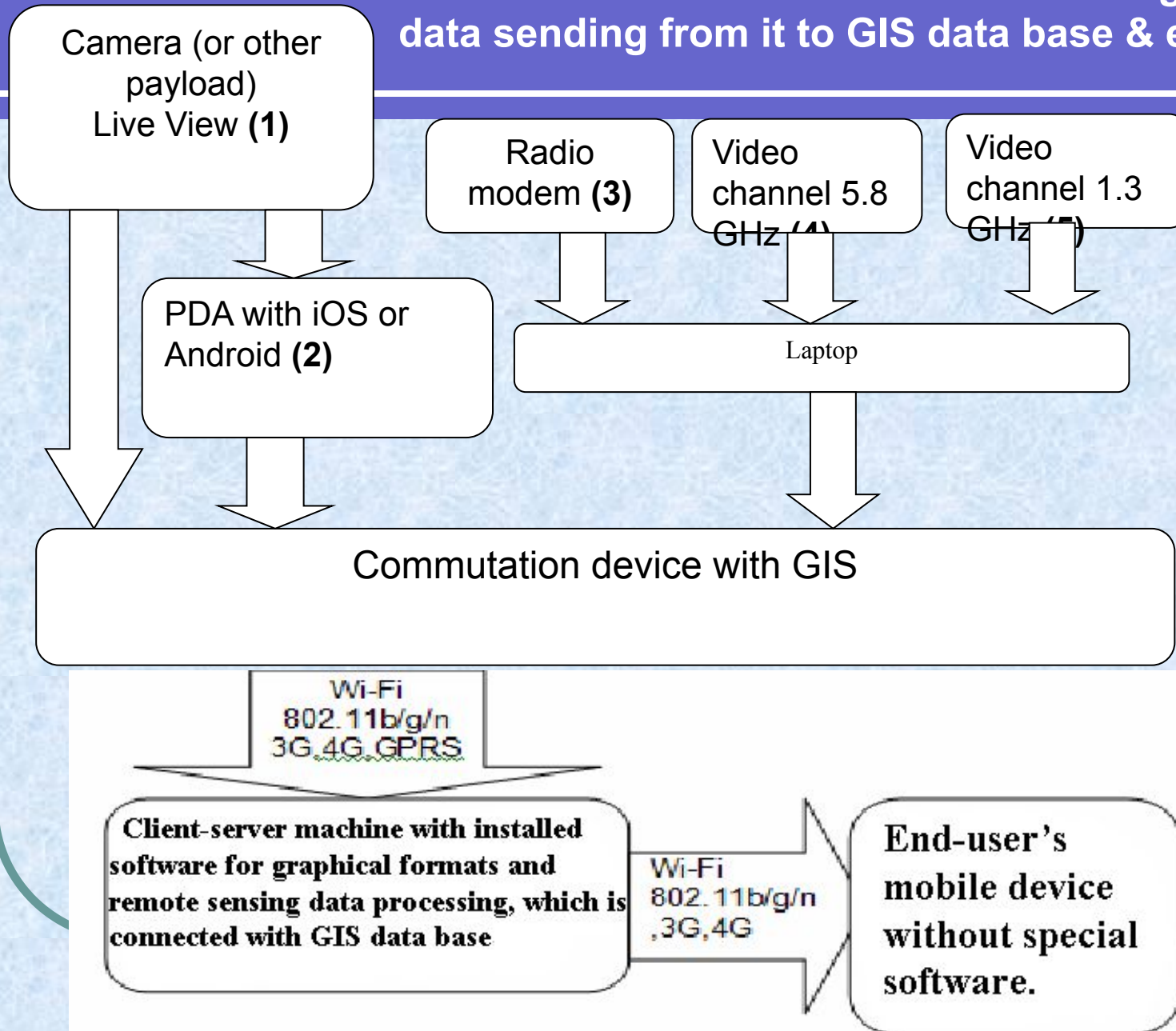


# “Multi rotary UAV in Project Project 14.B37.21.1243”

## Data, which is receiving by operators



# Flowchart of multirotor UAV «Dreadnought» data sending from it to GIS data base & end-user



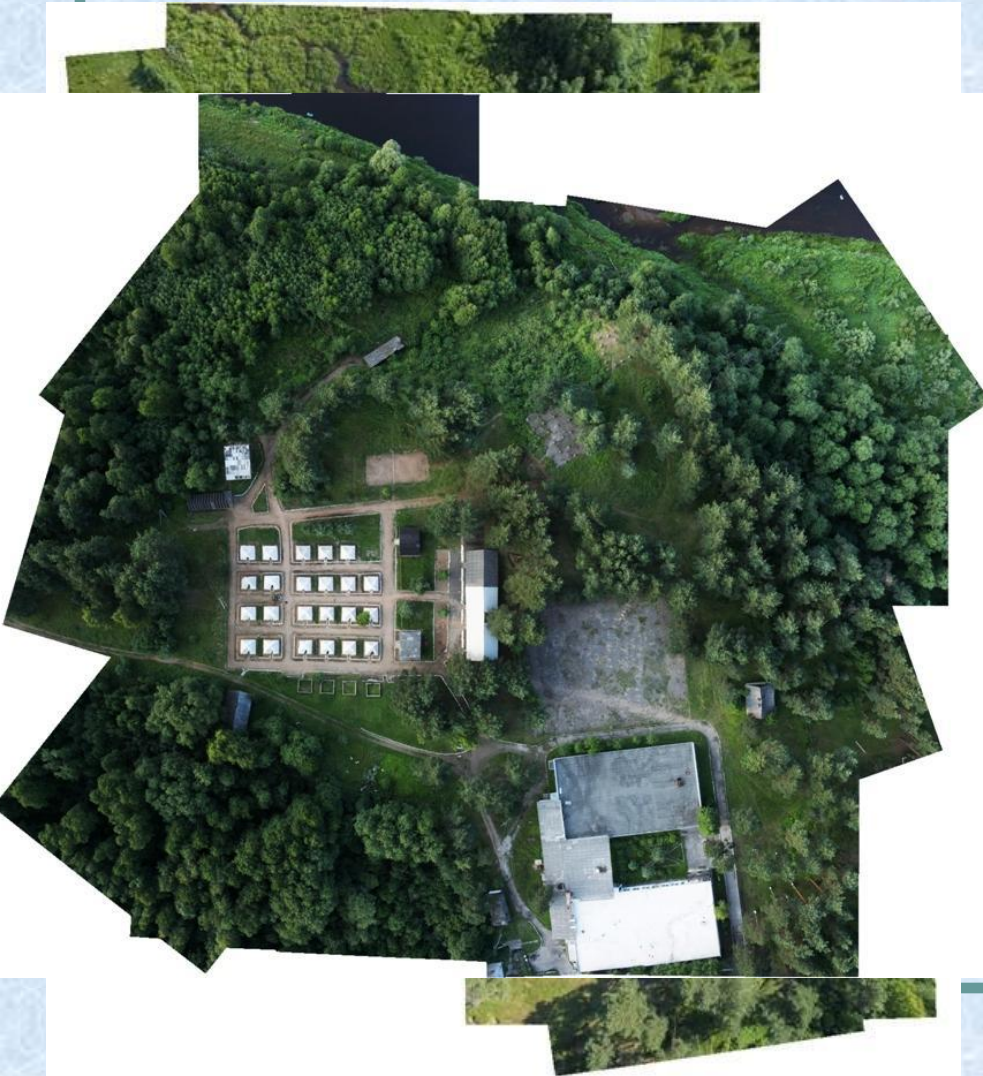
## “Multi rotary UAV in Project Project 14.B37.21.1243”

- Digital camera (including Video camera)
- Thermographic camera
- IR-camera
- Radiolocation equipment (Sonar)
- Geiger counter

**What can you find in UAV payload?**



## “Multi rotary UAV in Project Project 14.B37.21.1243”



Examples of UAV  
“Dreadnought” survey:  
Altitude: 100 meters  
Camera: Canon 550D  
Camera lens: 18 mm  
Overlap: 65%  
Flight duration: 8 minutes  
Flight speed on a route: 5  
meters/sec

*Data processing, orthoimages creation,  
3D terrain modeling etc are making on  
Russian software such as: Agisoft  
Photoscan&Stereoscan, Racurs  
Photomod, Scanex ImageProcessor,  
Panorama GIS-Karta.*

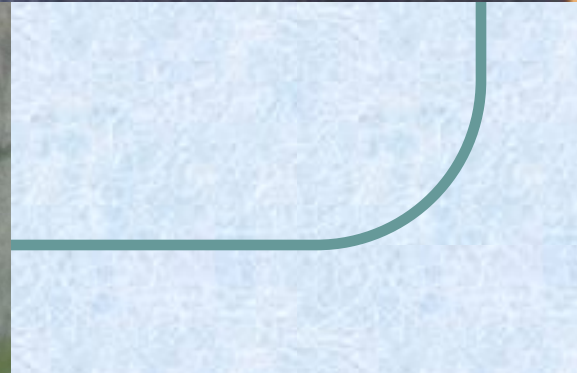


## MIIGAiKs geodesic test area



3D terrain model proceed on UAV images

Survey of fires in Smolensk region, near town Gagarin, with wide-angle camera lens



## “Multi rotary UAV in Project Project 14.B37.21.1243”

- Cartographic monitoring
- Topographic survey
- Multispectral survey
- Thermographic survey
- Geology
- Cadastre (stereo image)
- Emergency control
- Tasks of agro-industrial complex
- Snapshots for 3D modeling
- Agriculture: control of farms & fields condition
- Ecological monitoring:
  - radiation;
  - chemical pollution;
  - bacteriological pollution.

**The ways of  
multirotor UAV  
usage in  
environment  
monitoring:**

## Usage of results in studying & education

- Experience of UAV development, its usage and data processing embeds in educational program of MIIGAiK.
- One of the main tasks of our project is a development of special educational courses.

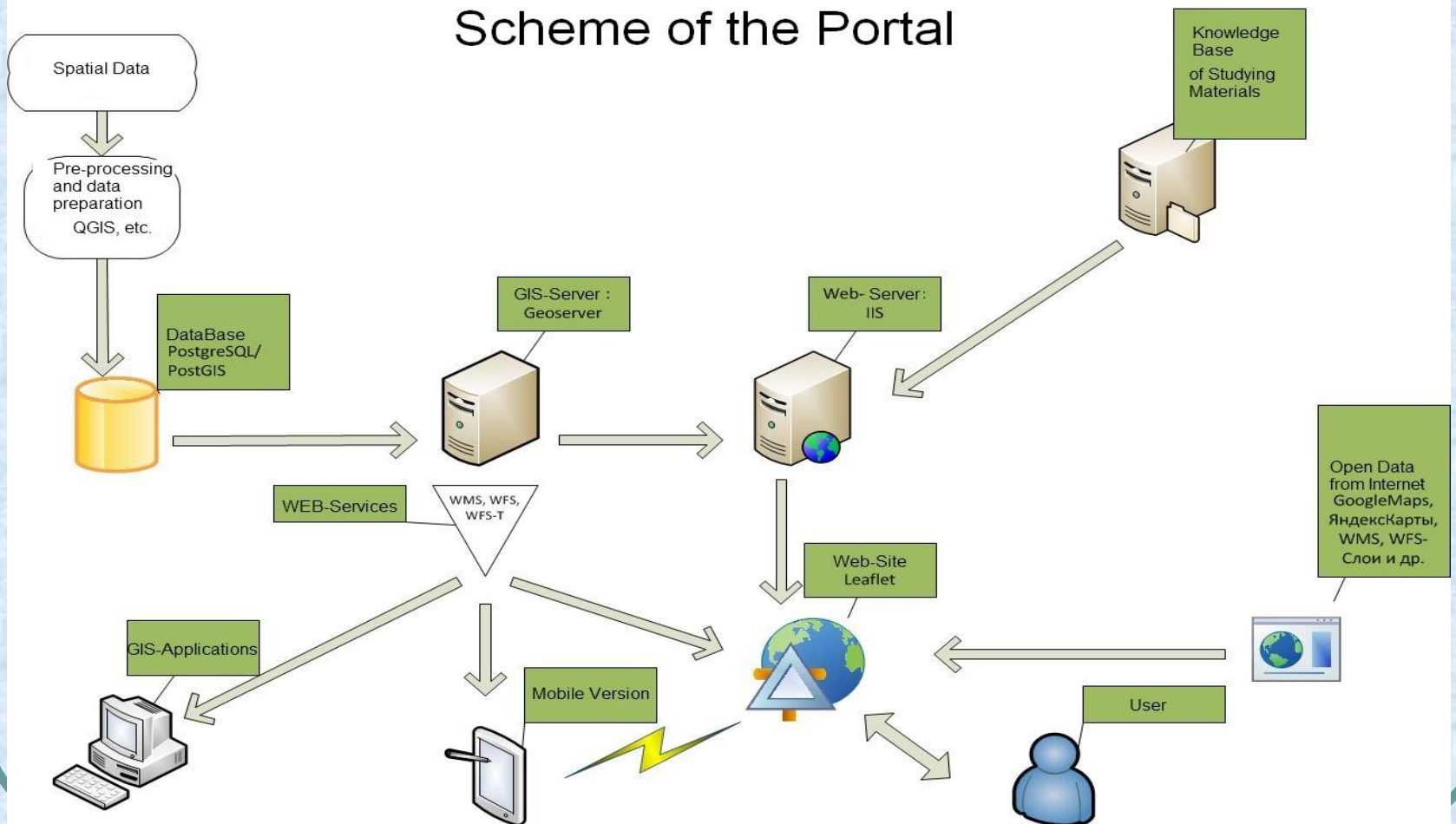


Igor Kostrukov, Eugene Stovolosov  
from Moscow

“On development of open-source portal for  
use of the remotely sensed data in  
emergency situations response  
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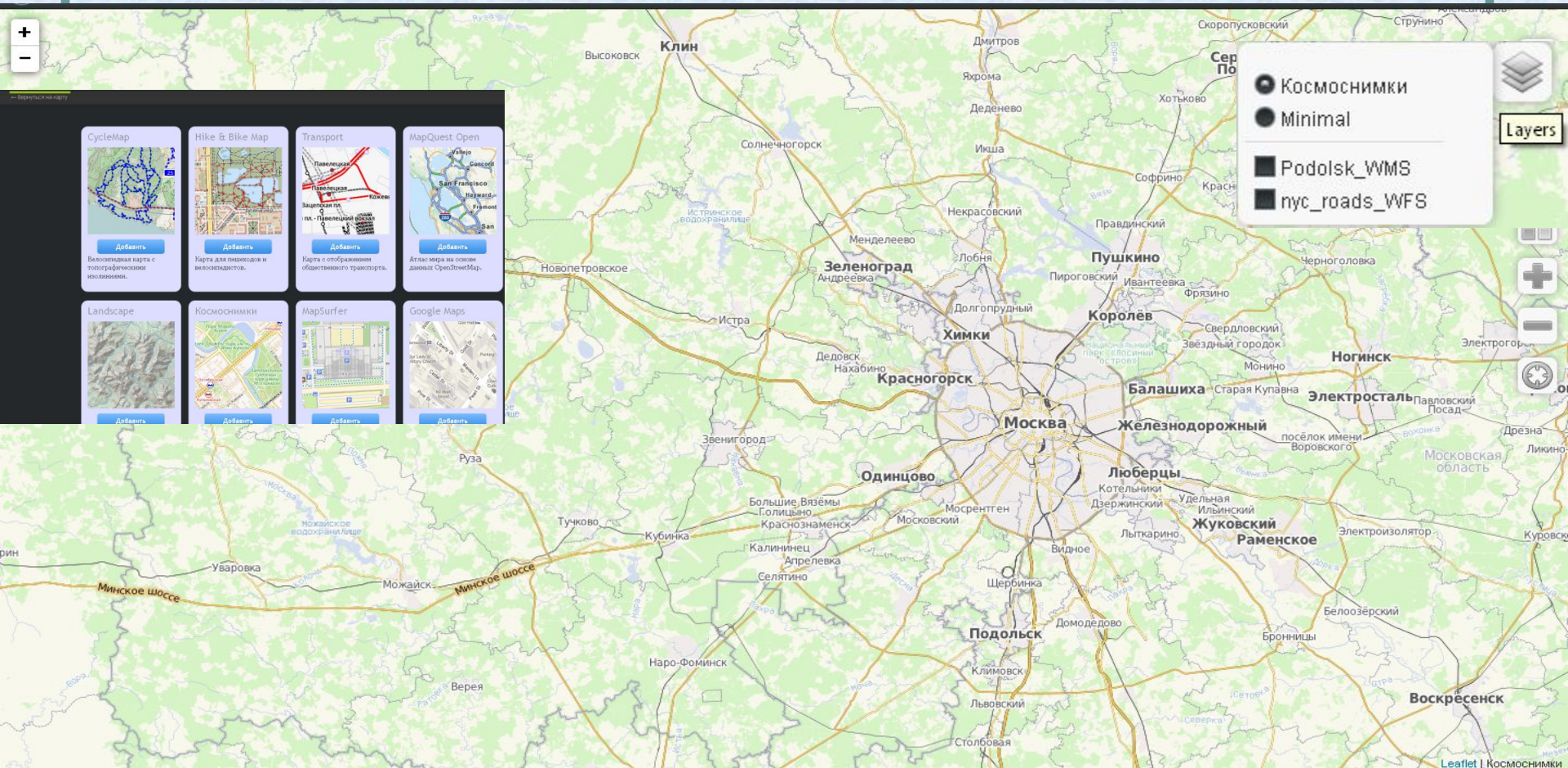
# “On development of open-source portal ...”

## Scheme of the Portal



“On development of open-source portal ...”

## Portal Interface



“On development of open-source portal ...”

## Layers

- Tile Layers
- WMS Layers
- WFS Layers

Добавление слоя

Тайловый слой (+Potlatch Link) WMS Half-Link (+JOSM Link)

Адрес URL: `http://mt1.google.com/vt?hl=ru&src=app&lyrs=m@17`

Значение символов: {s} - субдомен; {z} - зум; {x} - широта; {y} - долгота.

Максимальный зум: 18 Источник : ©  
User Map

Базовый (подложка)  Наложенный (оверлей)

Добавить Отмена



## “On development of open-source portal ...”

### Layers

- Tile Layers
- WMS Layers
- WFS Layers

Добавление слоя

Тайловый слой (+Potlatch Link) WMS Half-Link (+JOSM Link)

Адрес URL: `http://80.250.164.70:8080/geoserver/wms`

Имя слоя: `SP5_105236_070528_NC`

Формат: Image/PNG  Оставить пустые области прозрачными

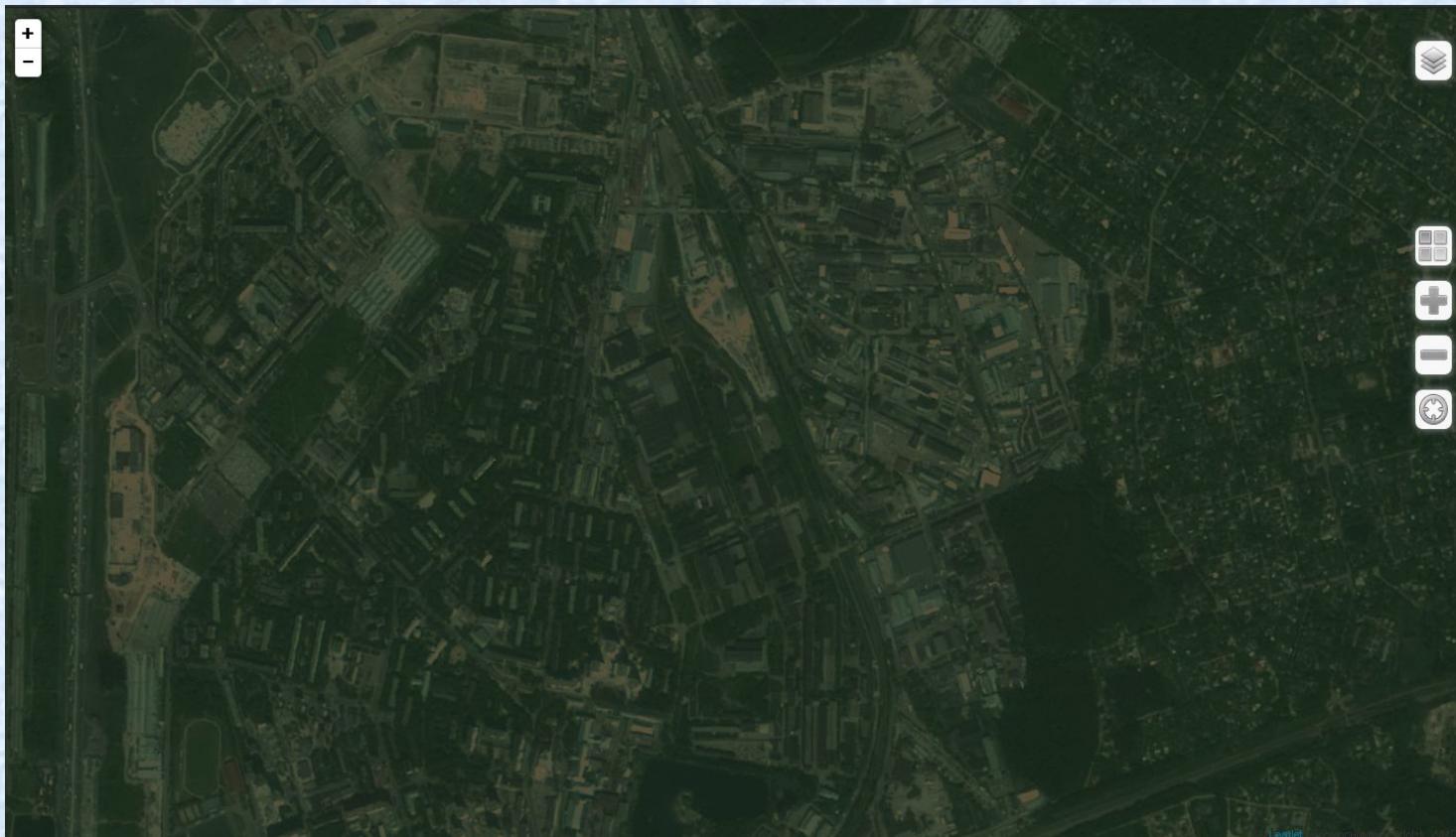
Источник : © Podolsk\_WMS

Базовый (подложка)  Наложенный (оверлей)

Добавить Отмена

“On development of open-source portal ...”

## Added WMS Layers



## Portal on Mobile Devices

- Based on “Phonegap” by Cordova
- Could save map layers and show it in off-line mode
- Better geolocation

“On development of open-source portal ...”

## 3D Data

- Based on Web-GL technology
- Spatial Data from UAV
- 3D models from Photoscan

Moscow State University of Geodesy and Cartography (MIIGAiK)

“On development of open-source portal ...”





# Thank You for Your Attention!

