



BULGARIAN ACADEMY OF SCIENCES
SPACE RESEARCH AND TECHNOLOGY INSTITUTE

The activities of Space Research and Technology Institute

<http://www.space.bas.bg>
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Sofia, 2017

Space Research and Technology Institute-today

SRTI Mission

- **The SRTI-BAS carries out fundamental and applied research in the fields of space physic, remote sensing of the Earth and space technology.**
- **The Institute contributes to the development of hardware and software for scientific devices for satellites, planetary probes and manned space flights. The scientific teams participate in data and image processing.**

SHORT HISTORY

1979 - Bulgaria prepared its first cosmonaut **Georgi Ivanov**



- experiments for study of natural optical atmospheric emissions (**System DAGA**);
- multi-channel spectrometric remote sensing of the Earth (**spectrometer SPECTAR -15**);
- psycho-physiological monitoring of the cosmonauts (**Equipment SREDETS**);
- experiments for space material studies.

1988 - the second Bulgarian cosmonaut **Aleksandar Aleksandrov**. We prepared more than 42 experiments and 12 onboard systems.



SVET Space Greenhouse onboard the MIR Orbital Station



Russian cosmonaut Sergey Zalyotin from the last 28th MIR OS crew samples plants of *Brassica rapa* variety grown onboard and tastes its flavour quality for the first time

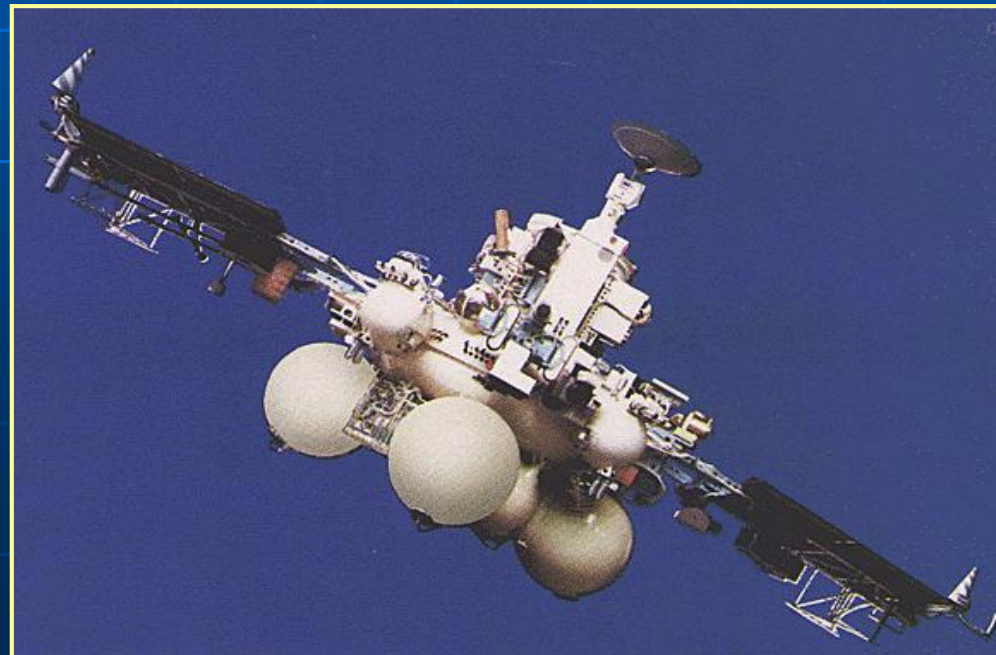
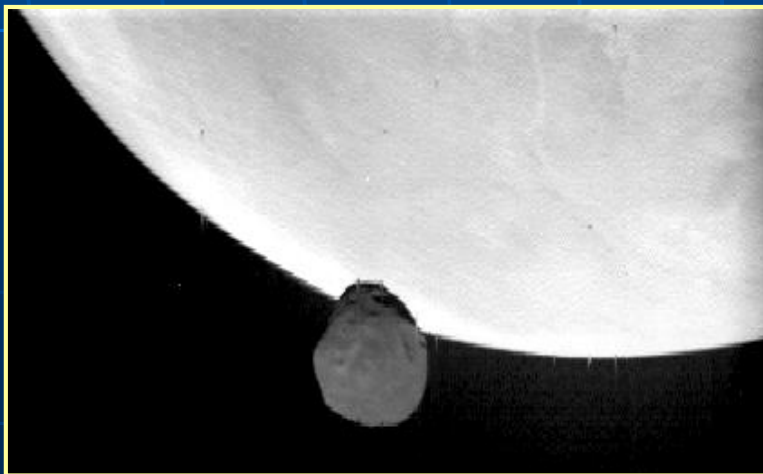
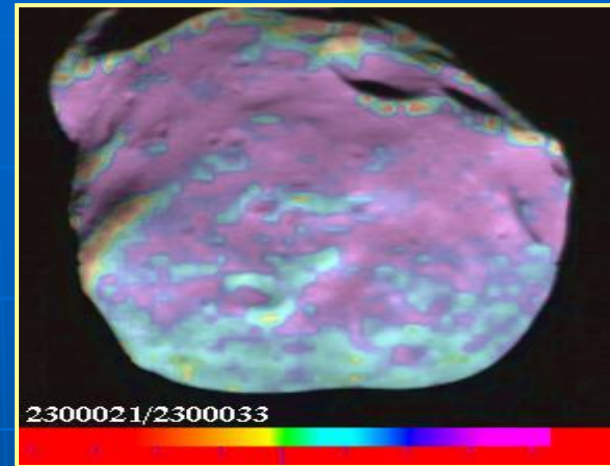


The Bulgarian SVET Space Greenhouse (SG) mounted in the Crystal module was the only automatic plant growth facility flown onboard the MIR OS in the period 1990-2001

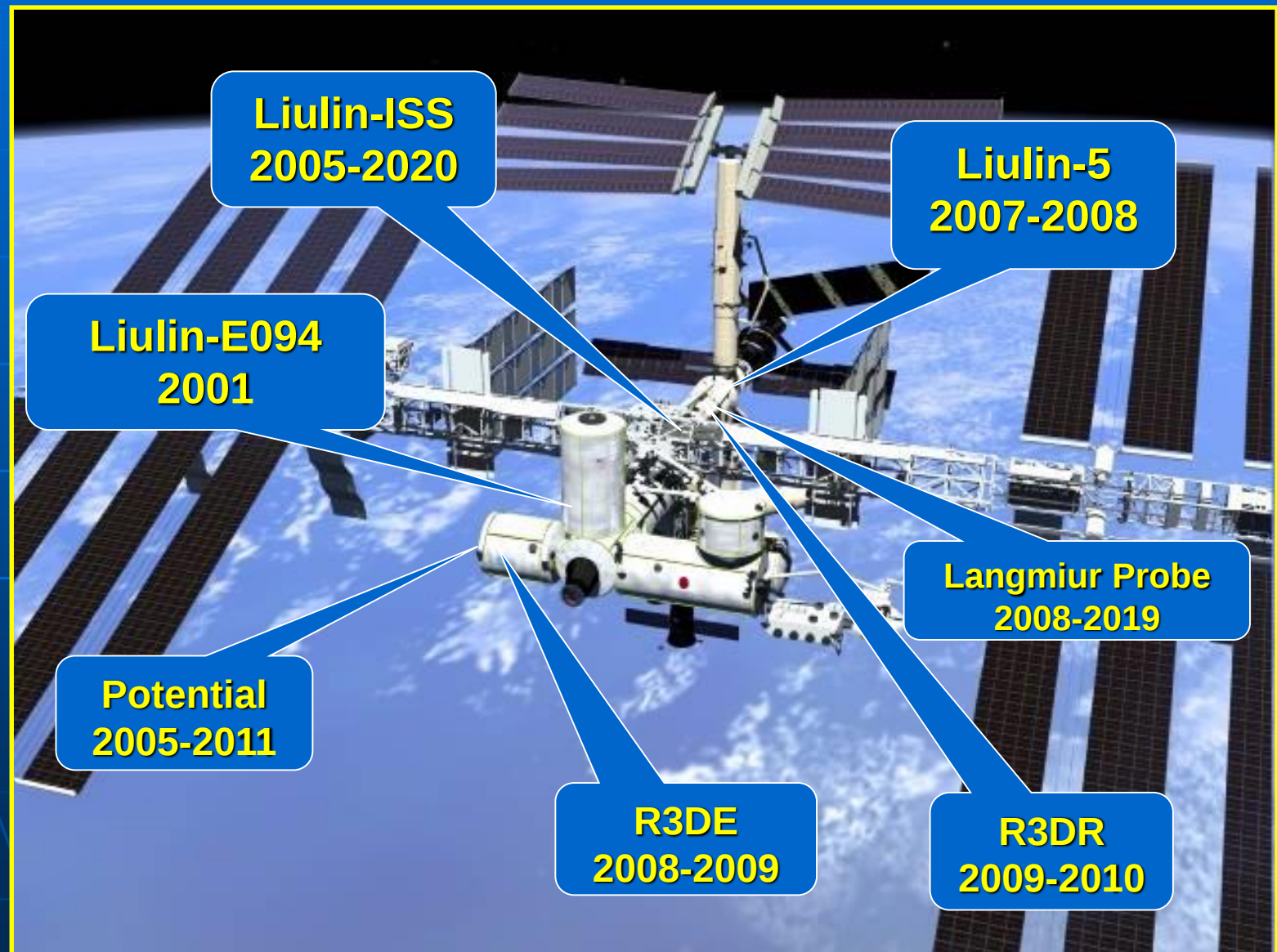


USA astronaut Shannon Lucid carried out wheat experiment (*Super Dwarf*) in 1996 – the heads were empty, without seeds, because of the gas ethylene in the atmosphere

In 1989 Bulgaria took part in the design of the **FREGAT** video spectrometric complex of the **PHOBOS** Programme



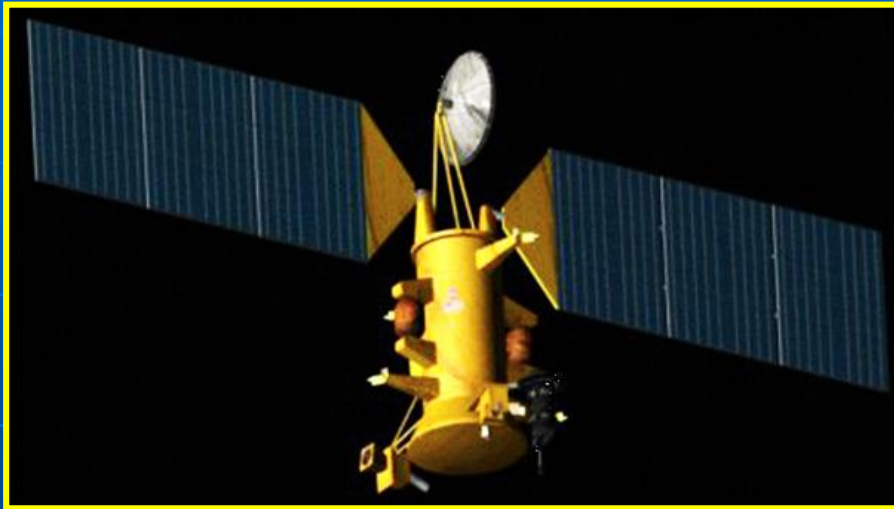
SRTI experiments on the International Space Station



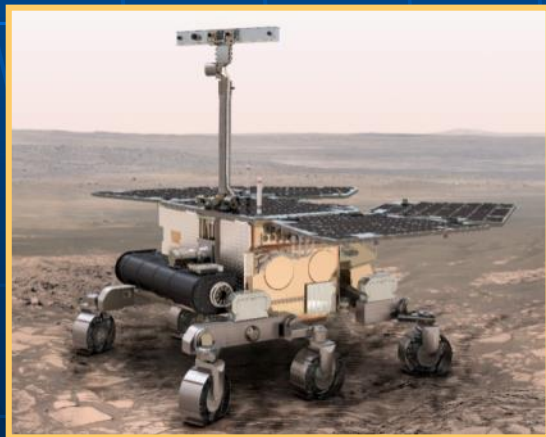
ExoMars Programme

SRTI has agreed with SRI-RAN and IMBP-RAS, Russia, our participation in the development of the FRENDS instrument. One new Liulin-F type equipment will be used at ESA ExoMars spacecraft (2016), two other on the landers in 2016 and 2018 and one on the rover in 2018.

MarsTraceGasMission-Orbiter



Liulin-ML



ESA's ExoMars Rover



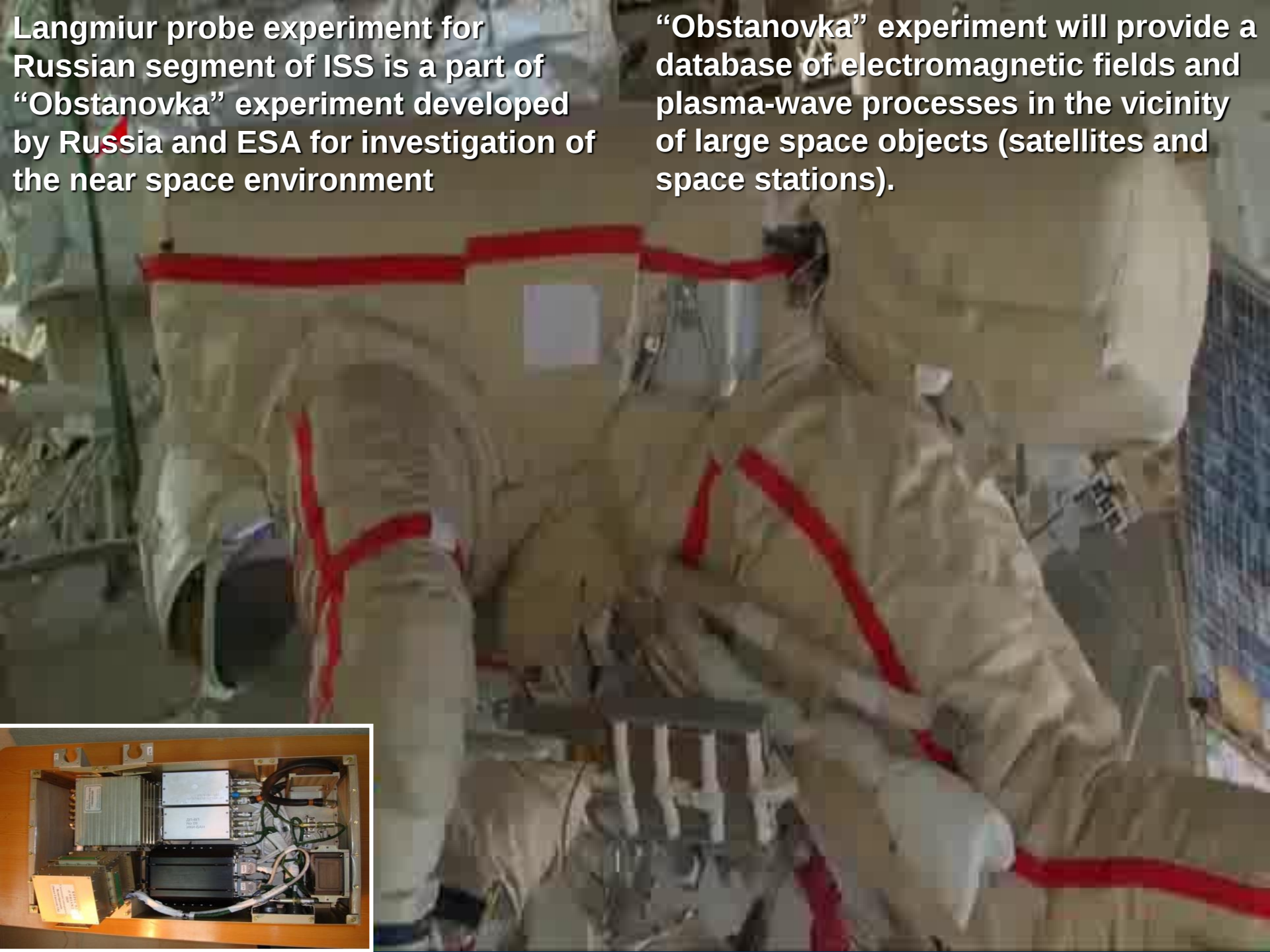
Mars Astrobiology
Explorer-Cacher (MAX-C) rover



Liulin-MO

Langmuir probe experiment for Russian segment of ISS is a part of “Obstanovka” experiment developed by Russia and ESA for investigation of the near space environment

“Obstanovka” experiment will provide a database of electromagnetic fields and plasma-wave processes in the vicinity of large space objects (satellites and space stations).



“AEROcepture for Future spAce tranSporTation” FP7 project

AEROFAST GA No 218797

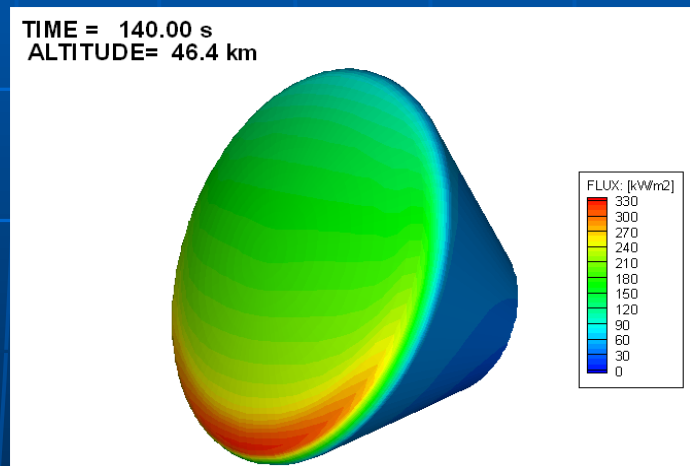
3D ablation and charring tool validation
Application to the Biconic shape

Dimensioning trajectory and
heat loads

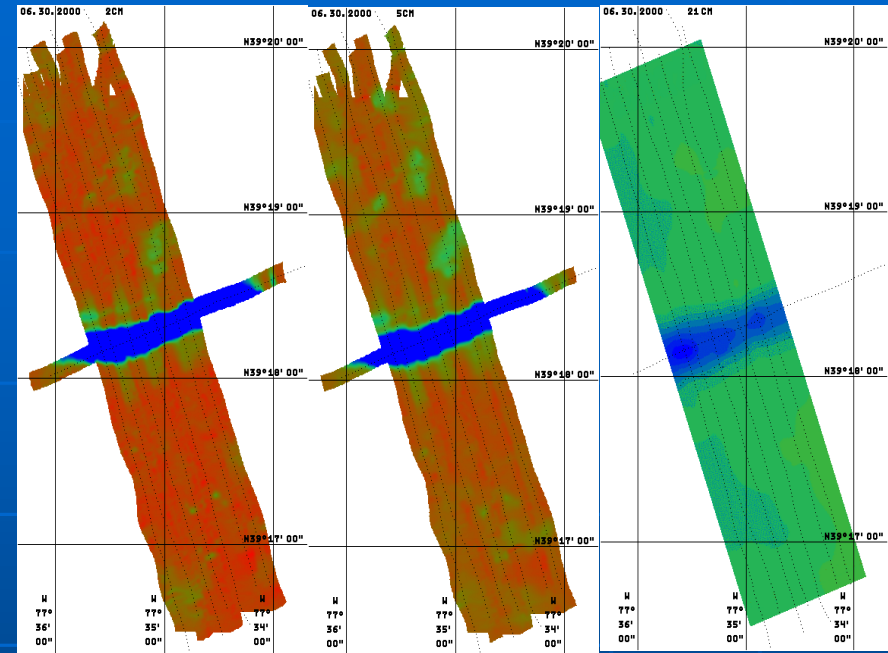
Summary of work

Dimensioning trajectory and heat loads
1D results for Norcoat-Liege model
Pollution assessment for in-board instrumentation
Bi-conic sled flying a maximum energy trajectory
Constant thickness Thermal Protection System
Variable thickness Thermal Protection System
Acceptability of the Thermal Protection System

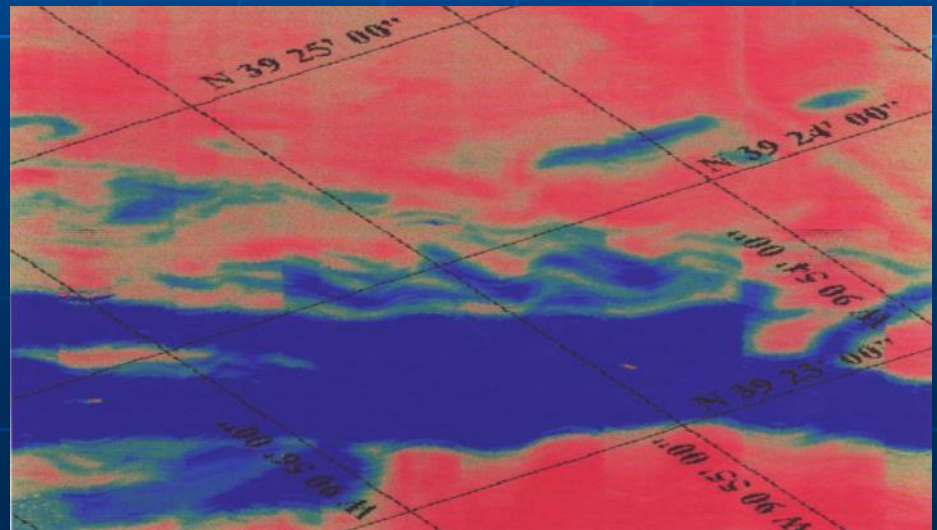
Heat flux



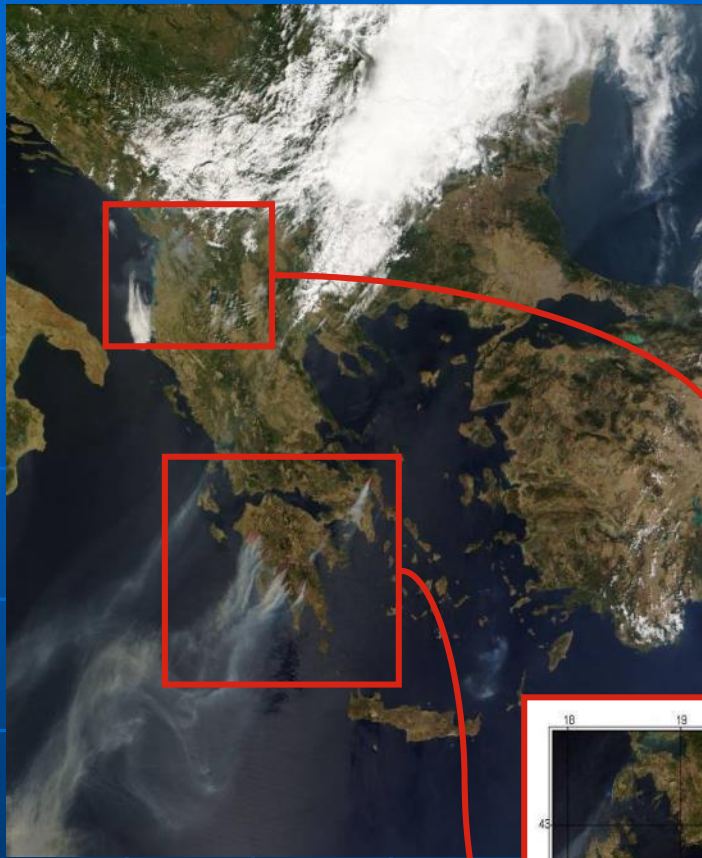
Soil moisture retrieval by passive radiometry



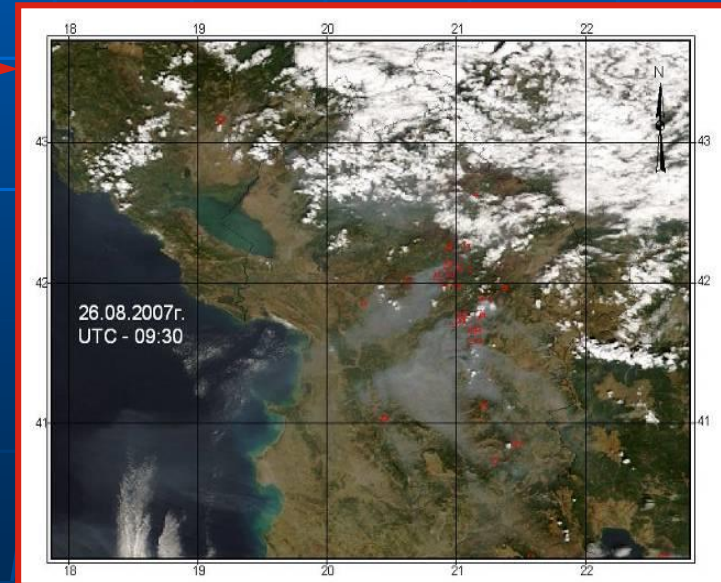
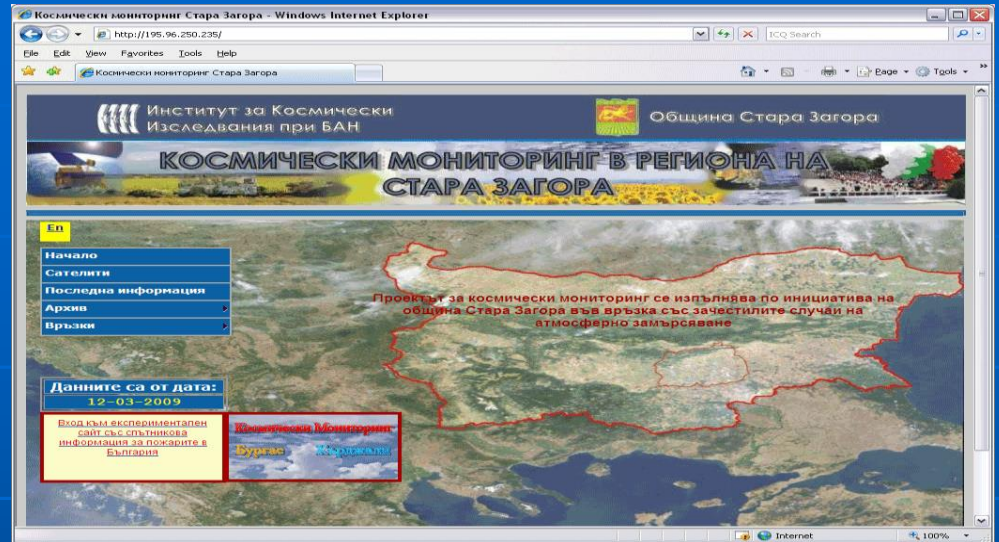
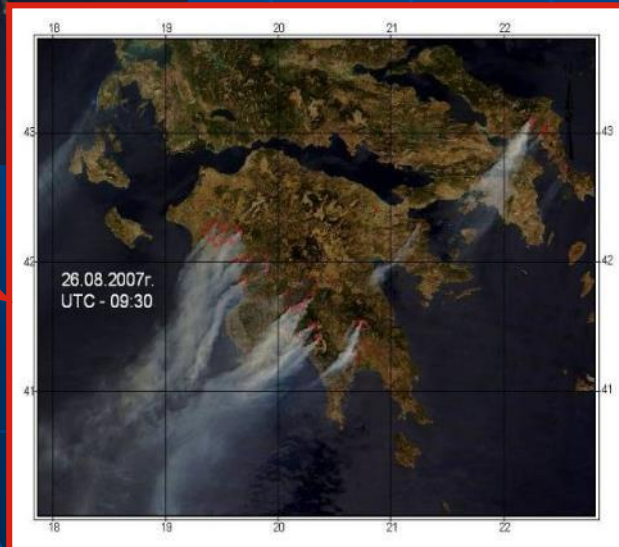
Maps of 2 cm, 5.5 cm, and 21 cm



Air pollution monitoring in the cities Stara Zagora, Bourgas, Kardzhali



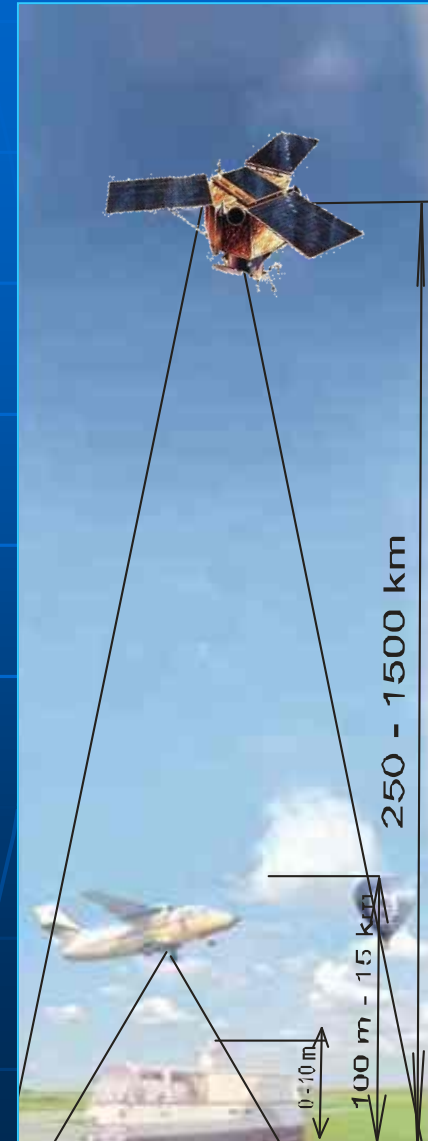
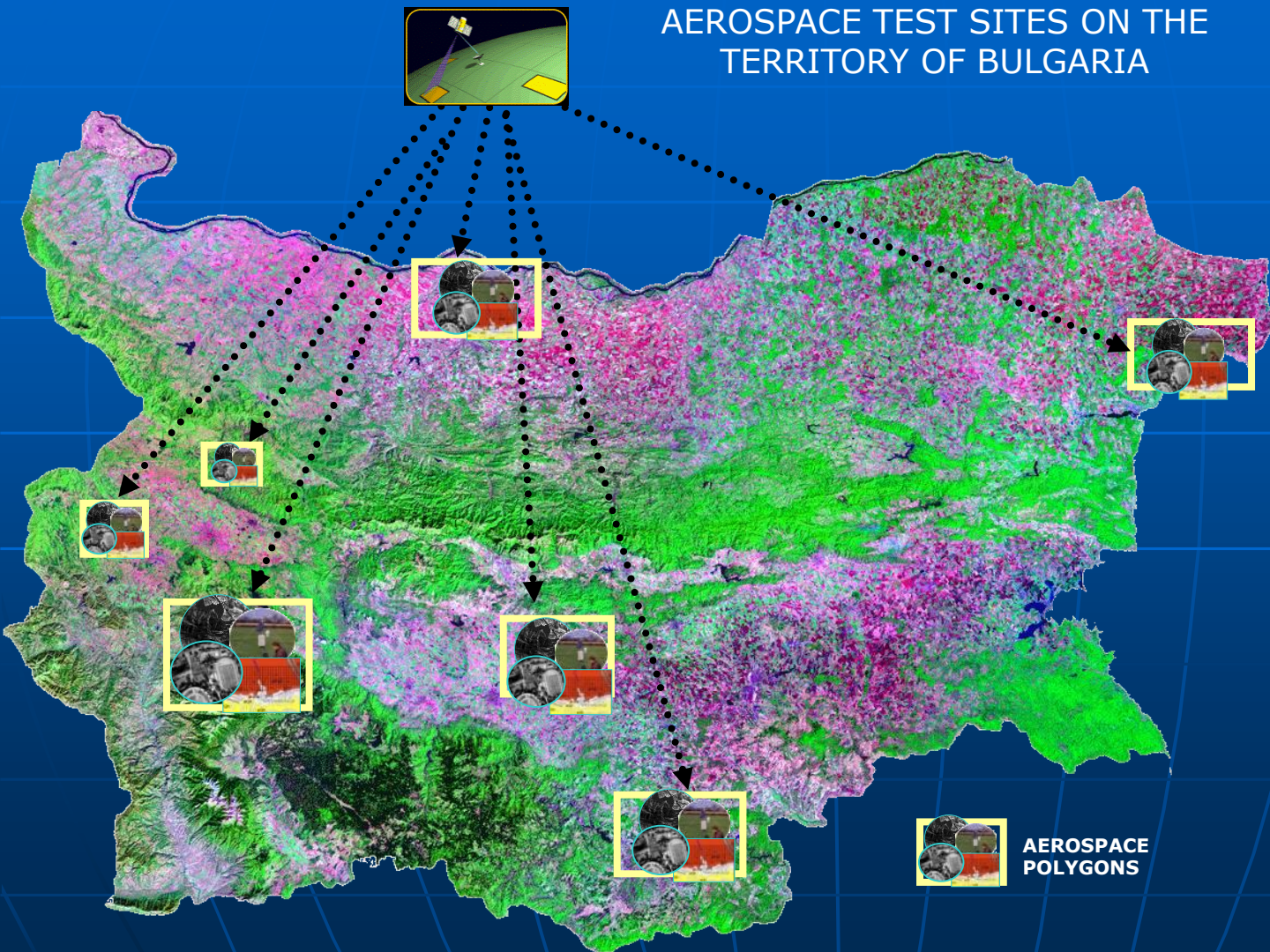
Fire in Greece



Fire in FYR Macedonia

Scientific-Information Complex for Aerospace Polygons

Under a contract NSF-B a project Establishment of a Scientific-Information Complex for Aerospace Polygons on the Territory of Republic of Bulgaria. Contract between the SRTI-BAS and the Scientific Research Fund.



Testing PROBA-V and VEGETATION data for agricultural applications in Bulgaria and Romania (PROAGROBURO) - Under a contract between the SRTI-BAS and the Belgian Federal Science Policy Office (BELSPO), PROBA-V Preparatory Program

Partners on the Project are:

- The Space Research and Technology Institute – Bulgarian Academy of Sciences (SRTI–BAS),
- The Romanian National Meteorological Administration (RNMA)
- The National Institute of Meteorology and Hydrology – Bulgarian Academy of Sciences (NIMH–BAS)



The main objective of the PROAGROBURO Project is to assess the quality of the PROBA-V mission as a continuity mission to VEGETATION 1 & 2 by comparison and validation of SPOT-Vegetation and PROBA-V simulated data for assessing crop condition on chosen test sites for the territory of Bulgaria and Romania.

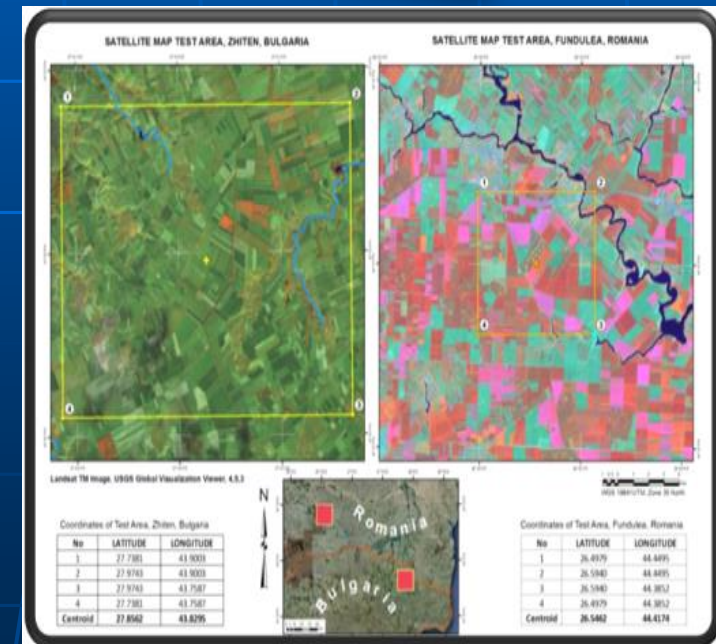
PROAGROBURO web site

<http://proagroburo.meteoromania.ro>

Study area

**Zhiten,
Bulgaria**

**Fundulea,
Romania**



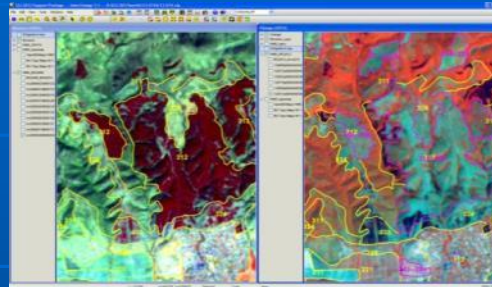
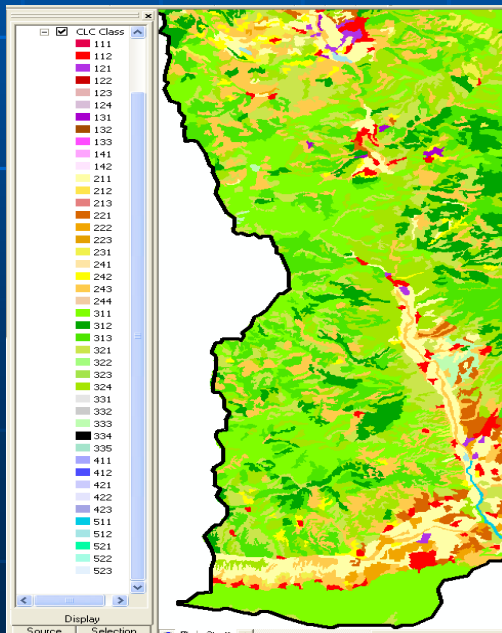
GIO Land 2012 project of the European Environment Agency (39 countries)

CORINE Land Cover (CLC) Bulgaria 1990, 2000, 2006 and 2012 projects

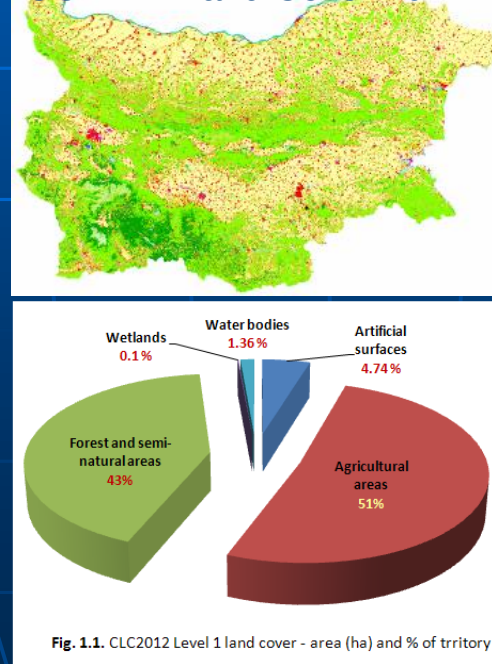
CLC Products:

- National CLC2012
- National CLC of Changes
- National revised CLC2006

CLC Map Legend: Example of South-West Bulgaria



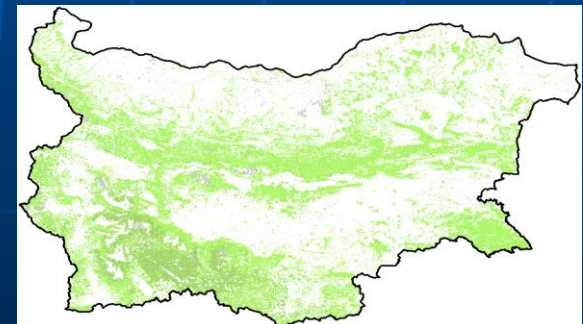
CORINE Land Cover 2012



High Resolution Layers 2012

Five pan-European high resolution layers (HRL) for the reference year 2012 with specific land cover characteristics: **imperviousness**, **forests** (tree cover density and forest type), **permanent grassland**, **wetlands**, **permanent water bodies**.

These intermediate products form the input for **verification** and **enhancement** tasks that are implemented by separate countries.



Forest HRL products

Hyperspectral laboratory and *in-situ* measurements

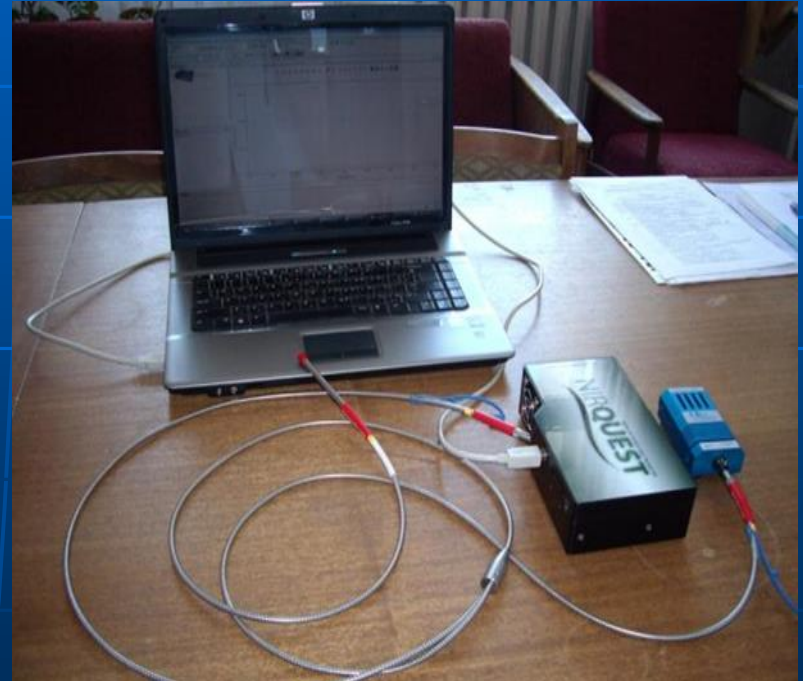
Multichannel Spectrometric System (TOMS 01)

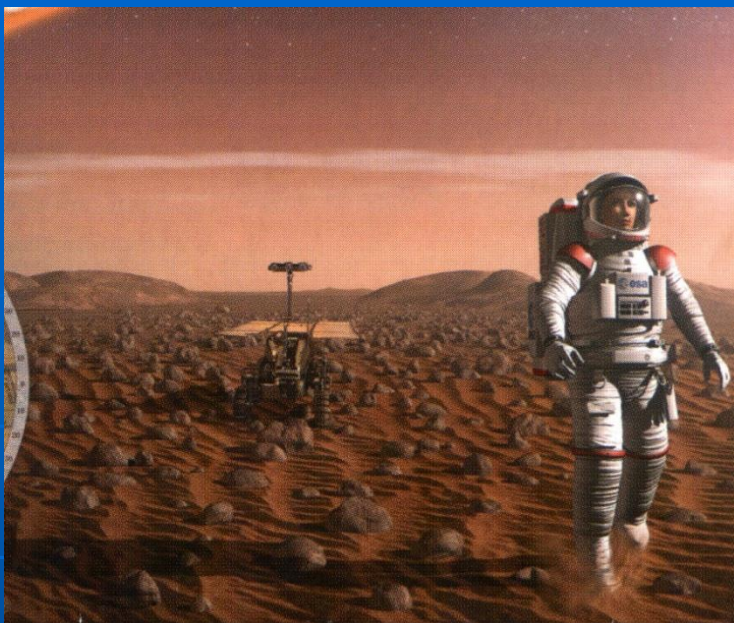
Designed for remote sensing observation, development and validation of spectral-biophysical models for land cover features estimation and state assessment.



NIR Spectrometric System

Spectrometer, covering the range from 900-2500 nm, and optical resolution of 6.3 nm.





Thank you!



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