

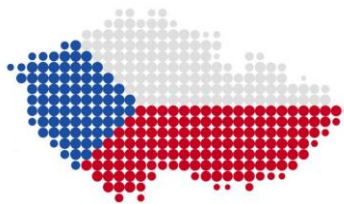


# **CARTOGRAPHIC SOCIETY of the Czech Republic**

*<http://www.czechmaps.cz>*

## **NATIONAL REPORT** on Activities of Cartographic Society of the Czech Republic

2011 - 2015



July 2015

compiled by

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### **Introduction**

The Cartographic Society of the Czech Republic was established in 1993 after splitting of Czechoslovakia and its Cartographic Society of the Czechoslovak Republic. The Cartographic Society of the Czech Republic has represented the Czech Republic in the International Cartographic Association (ICA) since 1995, when the

Czech Republic was readopted as a regular ICA member country by the ICA General Assembly in Barcelona (Spain).

The official names and contacts:

in the Czech language: Kartografická společnost České republiky

in English: Cartographic Society of the Czech Republic

Address: Pod sídlištěm 9/1800, 180 00 Prague 8 – Kobylisy, Czech Republic

Web site: <http://www.czechmaps.cz>

## **Home activities of the Society in the period 2011-2015**

### **Overview**

The 8<sup>th</sup> General Assembly of the Society, which was held in September 2009 in Olomouc, elected for the period 2009-2011 a new Executive Committee of the Society as follows:

President:	Miroslav MIKŠOVSKÝ
Vice-President:	Václav TALHOFER
Secretary General:	Milada SVOBODOVÁ
Treasurer:	Růžena ZIMOVÁ
Members:	Václav ČADA Milan KONEČNÝ Danuše SVOBODOVÁ Bohuslav VEVERKA Vít VOŽENÍLEK

The 9<sup>th</sup> General Assembly of the Society, which was held in September 2013 in Plzeň (Pilsen) elected for the period 2013-2017 a new Executive Committee of the Society as follows:

President:	Václav TALHOFER
Vice-President:	Vít VOŽENÍLEK
Secretary General:	Milada SVOBODOVÁ
Treasurer:	Růžena ZIMOVÁ
Members:	Václav ČADA Milan KONEČNÝ Miroslav MIKŠOVSKÝ Josef RANČÁK

The society has 106 individual and 6 collective members (in June 2015).

The main tasks of the Executive Committee of the Society were focused on preparation of

- ❖ the national competitions “Map of the Year“ (yearly in 2011-2015)
- ❖ the national competition „Children Cartographic Drawings“ (in 2013, 2015)
- ❖ the presentation of the Czech cartography on the ICA International Cartographic Conferences in Dresden (2013) and Rio de Janeiro (2015)

- ❖ the Bi-National Cartographic Conferences (in collaboration with the Cartographic Society of the Slovak Republic) in Plzeň (Czech Republic, September 2013) and Lednice (Czech Republic, September 2015)
- ❖ the national seminars and map exhibitions
- ❖ the issue of the newsletter „Zpravodaj KS CR“ (Review of the Cartographic Society of the Czech Republic) – in electronic form only
- ❖ continuous updating of the website of the Society (<http://www.czechmaps.cz>)

### **Map of the Year**

The national competition called „Map of the Year“ is the traditional competition in which cartographic products in paper and also in electronic (virtual) form are evaluated. The competition is announced in five categories (Atlases and map collections, Individual cartographic products, School cartographic products, Student works, Electronic cartographic products and web applications). The commission committee consists of respected cartographic experts from universities. The committee members evaluates all logged products according to given and published criteria and they set the order of products.

The results of the competition are yearly presented usually in May every years. In period 2011 – 2015 the results were announced in May 2012 and 2013 at the Prague Book Fair, in February 2014 in Olomouc, and in May 2015 again at the Prague Book Fair. Nominated maps and atlases were displayed at the ICA International Map Exhibition in Dresden 2013 and in Rio de Janeiro 2015. The thematic atlas „Atlas krajiny ČR“ (Landscape Atlas of the Czech Republic) won in the international competition in Paris 2011 the golden medal.



Fig. 1 The Landscape Atlas of the Czech Republic



Fig. 2 Authors of awarded maps in 2014 with organizers and EC ICA

### Children Cartographic Drawings BARBARA PETCHENIK competition

The national competition „Children Cartographic Drawings“ is the part of the wide-world competition named after Barbara Petchenik. During the period 2011-2013 the competition was conducted in April 2013; in the competition more than 200 children works took part. Winning drawings were sent the organizers of the ICA International Children Cartographic Drawings Exhibition“ on the price of Barbara Petchenik, which took place in Dresden, Germany, during the ICA International Cartographic Conference in September 2013.



Fig. 3 National competition „Children Cartographic Drawing“ 2013 - author: Viktorie Karla Wojnářová (10 years)

The next national competition „Children Cartographic Drawings“ was organized within „International Map Year“ and evaluated in April 2015. The awarded children’s drawings were sent the organizers of the ICA International Children Cartographic Drawings Exhibition“ in Rio de Janeiro.



Fig. 4 Winner of to 6 years category 2015 year - - author: Eliška Ambrožová -The way of fish

### **International and national cartographic conferences, meetings**

For the **24<sup>th</sup> ICA International Cartographic Conference** being organized in Dresden in September 2013 the Czech delegates presented 30 invited papers and 6 posters.

For the **25<sup>th</sup> ICA International Cartographic Conference** in Rio de Janeiro the Czech delegates prepared several invited papers and posters. The selected Czech cartographic products from the national competitions „Map of the Year“ in the period 2013-2014 were sent the Conference Exhibition Committee. The Vice-President of the Cartographic Society of the Czech Republic (Vít Voženílek) will be nominated for the ICA General Assembly, which will be organized during the conference sessions, to the ICA Vice-Presidency.

The **19<sup>th</sup> National Cartographic Conference** was organised by Cartographic Societies of the Slovak and the Czech Republics and was held (immediately after the ICA Conference in Paris) in Bratislava in September 2011. The conference was visited by the new ICA President Prof. G. Gartner.



Fig. 4 Participants of the 19<sup>th</sup> National Cartographic Conference in Bratislava (from left: J. Feranec, M. Mikšovský, G. Gartner, R. Fencík, J. Čižmár)

The **20<sup>th</sup> National Cartographic Conference** was prepared by both mentioned societies in Plzeň in September 2013; the following 21<sup>st</sup> National Cartographic Conference will be held immediately after the ICA 26<sup>th</sup> Conference in Rio de Janeiro in Lednice in September 2015.



Fig. 5 Participants of the 20<sup>th</sup> National Cartographic Conference in Plzeň (2011)

In the last week of February 2014, the Olomouc was a place of the top international cartographic conference. Department of Geoinformatics at Palacky University Olomouc organized the **CARTOCON2014 conference**. The conference was a major cartographic event that ever took place in the Czech Republic by more than

four hundred registered (signed) participants and a large number of prominent foreign guests from a total of 29 countries. CARTOCON2014 was attended by the Executive Committee of the International Cartographic Association (ICA) (the president, secretary and seven vice-presidents). Four ICA committees and one working group met at the regular meetings. The conference was attended by some of the world's leading representatives of cartography and geoinformatics. Over fifty foreign guests from around the world and dozens of experts from the Czech Republic presented at the conference. The thematic focus of contributions was very variable and covered some disciplines that make use of cartography and geoinformatics. Besides academic institutions the public administration, emergency management units, commercial businesses and others presented their achievements at the conference. Additionally the map exhibition "THE CHARM OF EARLY MAPS", national Cartographic day (the 8th annual) and advanced 3D printing technology seminar accompanied the conference.



Fig. 6 Participant of the CARTOCON2014 conference

The regular seminars called „**The Cartographic Days**“ have been organised in cooperation with the Dept. of Geoinformatics at Palacký University in Olomouc since 2002 focused on actual problems of thematic cartography and geosciences. The Days have been designed for scientific cartographers and for students as well. The year 2012 was devoted to cartographic technologies, 2013 to thematic cartography in the health care, and 2015 to 3D printing in cartography. The year 2014 (cartography and statistics) was part of CARTOCON2014 conference.

The periodical scientific students conferences „**Digital Technologies in Geoinformatics, Cartography and Remote Sensing**“ is annually organised in cooperation with the Faculty of Civil Engineering of the Czech Technical University in Prague every year since 2011.

In 2008, the „**Moravian Cartographic Center**“ was opened in a part of the castle in Velké Opatovice. The permanent exhibition of early maps and historical geodetic, photogrammetric and cartographic instruments, aids and techniques is placed there. The main exhibit of the museum is a big relief map of Moravia at the scale of 1 : 25 000.



Fig. 7 Moravian Cartographic Museum in Velké Opatovice

## **Activities in ICA**

The Czech Republic has been an ICA regular member since 1995 and follows in the former membership of Czechoslovakia from 1968. The Czech Republic is in the ICA represented by its Cartographic Society.

Milan Konečný who hold position of president of ICA in the period 2003–2007 and past-president in the period 2007–2011 chaired the ICA Commission „Early Warning and Crisis Management“ in the period 2011–2015. In 2013. M. Konečný was honoured by the ICA Fellowship.

The Czech Cartographic Society was in the period 2011–2015 represented in the post of members or corresponding members in many other ICA Commissions and working groups.

## **International Map Year**

The Cartographic Society of the Czech Republic organized in the frame of International Map Year in cooperation with Dept. of Geoinformatics at Palacký University in Olomouc following events:

- the seminar „The Cartographic Day“ (Olomouc, February 2015),
- the National Competition „Map of the Year 2014“, designed for the Czech cartographic publishing houses, evaluation in May 2015 on International Prague Book Fair,



- the National Competition „Children Cartographic Drawings“,
- the 21<sup>st</sup> National Cartographic Conference in Lednice (in co-operation with the cartographic Society of the Slovak Republic),
- the exhibition of children cartographic drawings (September 2015),
- the 5th scientific students conference „Digital Technologies in Geoinformatics, Cartography and Remote Sensing“ in cooperation with the Faculty of Civil Engineering of the Czech Technical University in Prague (October 2015).



Fig. 8 The IMY roll-up and T-shirt

## Other activities

The Cartographic Society of the Czech Republic is a collective member of the Czech Association for Geoinformatics. The Society cooperates closely with the Cartographic Society of the Slovak Republic and organizes with it every two years common cartographic conferences. The Society cooperates closely with the Society for Photogrammetry and Remote Sensing of the Czech Republic, with the Czech Union of Surveyors and Cartographers and with the Czech Geographic Society as well.

The Society issues a newsletter „**Zpravodaj Kartografické společnosti ČR**“ (Newsletter of the Cartographic Society of the Czech Republic) with information of

activities of the Society and of the ICA. The actual reports are published on the web sites of the Society <http://www.czechmaps.cz>.

## **The state administration authorities in the Czech Republic**

The state authorities responsible for geoinformation and mapping support of the state administration are represented by civilian and military organisation as well.

### **Civilian organisations**

The civilian state administration authority is represented by the **Czech Office for Surveying, Mapping and Cadastre** (mail address: Pod sídlištěm 9/1800, CZ 182 11 Prague 8 – Kobylisy, Czech Republic, e-mail: [cuzk@cuzk.cz](mailto:cuzk@cuzk.cz), web site: <http://www.cuzk.cz>).

The subsidiary organizations of the Czech Office are the Land Survey Office in Prague, the Research Institute of Geodesy, Topography and Cartography in Zdíby, the Survey and Cadastre Inspectorates (7) and Cadastre Offices (77).

The state administrative bodies of the real estate cadastre managed by the Czech Office for Surveying, Mapping and Cadastre provide state administration of the real estate cadastre in the Czech Republic and ensure performance of surveying activities in the public interest given by the law.

The state administration of land surveying and the real estate cadastre is responsible beside the cadastre for important land surveying products and services which co-create the national geoinformation infrastructure necessary for task fulfilment of the state and local administration. In the year 2013 the operation and the modernization of the Czech network of GNSS permanent stations (CZEPOS) ensured providing services for fast and precise positioning at the whole territory of the state with cm accuracy thanks to permanent reception of signals from satellites of global navigation system. As well the care for classic ground and gravimetric control points was realized together with all planned land surveying works on the state borders. Both continuous and periodical updating of the Fundamental Base of Geographical Data (ZABAGED®), which has been provided for the public administration and as well commercial use, serving also as a data source for state map series, went on.

In cooperation with the Ministry of Agriculture and the Ministry of Defence the acquisition of new terrain model of the Czech Republic with help of airborne laser scanning was completed. It should serve not only for the state map series and geographical databases included the military ones but is fully usable for planning of anti-flood measures, for preparation of transport and other important constructions as well. Most products are provided via Geoportal ČÚZK remote access.

At present, ZABAGED® consists of 123 types of geographic objects classified in planimetric or elevation section of ZABAGED®. Planimetric section of ZABAGED® contains two dimensional (2D) spatial information and descriptive information on settlements, communications, utility networks and pipelines, hydrology, administrative units and protected areas, vegetation and surface, terrain relief. It includes selected data on geodetic reference points within the territory of CR. Elevation section of ZABAGED® contains three dimensional (3D) elements of terrain relief and is represented as 3D contour files. ZABAGED® is continually expanded on the basis of user needs.

ZABAGED® is used as a base layer in geographic information systems (GIS), primarily in information systems of the public service. It is also the main data source for the creation of base maps of the CR at scales of 1:10,000 to 1:100,000.

In the year 2012 went on the regular updating of ZABAGED® at the whole territory of the state with use of orthophotos, aerial photos and field investigation on 809 map sheets of the Base map CR in the scale of 1:10,000 (ZM 10) but in smaller range than in previous years. Prolongation of the updating cycle of ZABAGED® to six years is compensated by more often updating of the 27 significant types of features (roads, administration boundaries, buildings etc.) based on the changes gained from their administrators. Big effort was given to systematic accuracy improvement of the position of roads, highways, railroads, watercourses and further ZABAGED® elements based on the data of a new altimetry model of the Czech Republic. Roads were improved on 968 map sheets of ZM 10 and watercourses and chosen points and lines of the terrain on 472 map sheets of ZM 10. In cooperation with partner office in the Free State Bavaria the ZABAGED® data were harmonized on the borderline with similar German database ATKIS, following similar already completed project with Saxon partners.

Based on the Agreement on cooperation on creation of CR altimetry digital databases between the Czech Office for Surveying, Mapping and Cadastre, the Ministry of Agriculture and the Ministry of Defence the airborne laser scanning for the new altimetry of the territory of the Czech Republic went on from 2008. The laser scanning of the territory of the Czech Republic was successfully completed in November 2013. Afterwards the digital terrain model in the form of point grid sized 5 x 5 m (DMR 4G) has been completed as well. The manual inspection as well as data classification necessary for creation of the digital terrain model in the triangular irregular network (DMR 5G) and digital surface model (DMP 1G) went on. Nearly from the whole completed zones (West and Central) the digital terrain model in the form of point grid sized 5 x 5 m (DMR 5G) is being provided to users as well as DMP 1G.

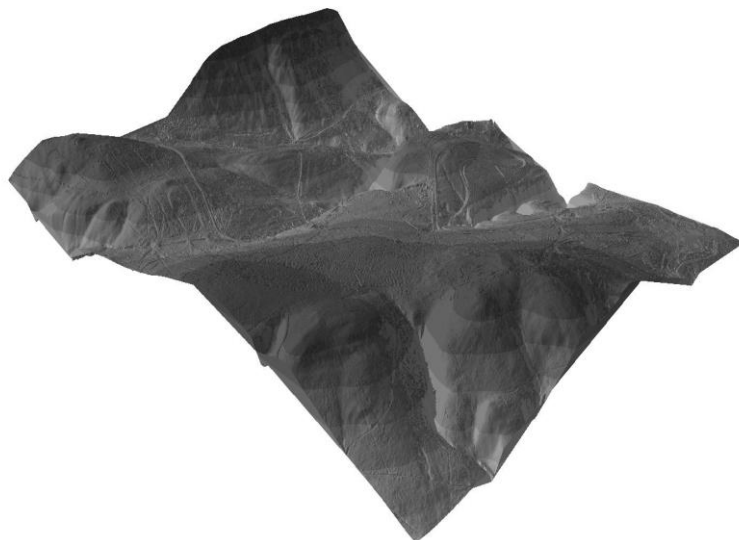


Fig. 9 The cut of DMR 5G in TIN format

Altimetry data of the Czech Republic territory administered and provided in the ZABAGED® frame in the form of altimetry contour line model and from it delivered

regular point net (10 x 10 m), has been updated in the areas where the area-wide ZABAGED® updating has been realized.

Apart from cadastral maps state map series represent sets of basic and thematic map series. The base state map series is a cartographic work with a widely usable content, coherently showing the territory according to unified principles, created and issued by the state administration body in the public interest. The sources of topographic content of the base state map series are ZABAGED® and Geonames, in particular. Modern technology of database cartography and digital print ensures the quality of map outputs processing and gradual reduction of their updating cycle.

The base maps of the Czech Republic (ZM) at scales of 1:10,000 to 1:100,000 have been created since 2010 from two digital databases as cartographic models, Data10 and Data50, which are part of the modern information system of state map series. Implementation of the new production system has enabled increasing of the number of ZM cartographic works. In 2013 following map sheets were created:

- 1 132 map sheets of ZM 10,
- 273 map sheets of ZM 25,
- 69 map sheets of ZM 50, and
- 22 map sheets of ZM 100.

In accordance with the publishing plan following map sheets were updated 20 map sheets. Overview of trigonometric and densification points, 20 map sheets. Overview of the levelling points and 10 map sheets of the Road map of the CR all in the scale of 1:50,000. Further 39 map sheets of the Map of municipalities with enlarged administrative competencies in scale of 1:50,000 have been covering after six years the whole territory of the CR. Finally 10 map sheets of the Map of Regions of the CR in the scale of 1:200,000 and the Map of the Czech Republic 1:500,000 were updated particularly for needs of local administration bodies.

In the year 2013 production of the new edition of the State map 1:5,000 (SM 5) was going on with the intention of serving especially for the purposes of urban planning. The conception of the new SM 5 is an automate visualisation of chosen object types based on the data from the cadastre of real estate, ZABAGED® and Geonames thus enabling its edition basically upon request. In 2013 was published in the state of update by 1/2013 and 7/2013 at 61.5 % of the territory of the Czech Republic.

Orthophotos created by the orthogonalization of aerial photographs find more and more use in various fields of activities. Colour aerial photography is being taken on the whole territory of the Czech Republic in cooperation with the Ministry of Agriculture and Ministry of Defence of the Czech Republic. Between 2003 and 2011 one third of the territory of the Czech Republic has been scanned, which means one of three zones (“West”, “Central”, and “East”). The aerial photographs have been taken by means of digital scanning, which enables simplification of data processing and improvement of their photo interpreting quality since 2010. In 2012 the whole east half of the Czech Republic was scanned and in 2013 the first two-year cycle of aerial photographing of the CR territory was completed.

Orthophotos are provided in datasets on map sheets of the State map 1:5,000 (5 sq. km) via viewing services and in print form. Data are in raster format JPEG or TIFF with the resolution of 0.25 m on the ground (from the period 2003–2008 only in the resolution of 0.5 m) and are georeferenced in the coordinate system S-JTSK with help of the text set JGWTFW. The data sets for coordinate system WGS 84 are also provided. In 2013 started the provision of file data of the archival black-and-white

orthophotos from years 1998–2001 and archival colour orthophotos from years 2003–2009.

The Geonames database provides a complete set of information of standardized geographical names (in total 165 types of designated objects) and names of settlement units. The Geonames database facilitates the access to terminological data, allows their analysis for the needs of onomastic and historical research. It is increasingly used in map portals, web applications and search services. Alongside with the ZABAGED® data it provides users with an integrated view of the territory of the Czech Republic. It is a source for publishing state map series of different scales.

In the year 2013 updating of the Geonames database was going on in cooperation with municipalities harmonized with updating of ZABAGED® together with digitization of cadastral maps. In the process of Geonames database updating, which was based on changes discovered by the cadastral offices during renewal of cadastral documentation, the local names in together 1 190 cadastral districts have been approved in 2013. After completing of the data integration in both mentioned applications geographical names have been connected direct to the objects and set into the database only once and not in the number of their occurrence in the map.

Most of mentioned products are accessible on the GEOPORTAL CUZK (<http://geoportal.cuzk.cz>). The geoviewer (<http://geoportal.cuzk.cz/geoprohlizec/>) is possible to use for data browsing. Most of products are accessible via open web services as well.

### **The Geographic Service of the Czech Armed Forces**

The **Geographic Service of the Czech Armed Forces** (GS) is the part of Ministry of Defence responsible for the Geographic Support of the Czech Armed Forces and Ministry of Defence (MoD) as well. The most of its task are fulfilled by own forces and resources. Two main missions has GS:

- performance of the state administration in the surveying in the area of national defense,
- geographic support of MoD and the coalition forces on the Czech Republic territory.

GS is closely connected with the Hydro-Meteorological Service. Both services have a join command and some common units.

The main part of GS (and also the Hydro-Meteorological Service) is the Military Geographic and Hydro-Meteorologic Institute (MGHMI).

MGHMI is responsible for permanent data collection from various sources. The effective co-operation with civilian organisation, mainly with the Czech Office for Surveying, Mapping and Cadastre, enables to manage the data acquisition from the Czech Republic territory. The base data sources is the Digital Model of Territory (DMÚ25), vector database in resolution of 1 to 4 meters according to feature classes. This model covers the whole CR territory including of small overlap over CR border. The topographic maps in the scales of 1:25,000, 1:50,000, and 1:100,000 are generated from DMÚ25.

GS is also responsible for military thematic maps production. The basic thematic maps are issued for Air Forces and for military training in Military Training Areas.

DMÚ25 and from its generated vector model DMÚ100 are used for these maps production.

Three digital elevation models use GS from the CR territory – DMR3 (raster model with resolution of 10 m), DMR4 (raster model with resolution of 5 m) and DMR5 (TIN model). DMR3 was created using photogrammetry, DMR4 and DMR5 are the newest created in co-operation with with the Czech Office for Surveying, Mapping and Cadastre.

All databases are implemented in military command and control systems and enables to provide the basic and also advanced terrain analyzes.

The web portal for geographic data and raster maps was created in MGHMI accessible for all Czech Armed Forces staff, but only on internal network – military intranet. The portal is called MapyAČR (“CAF Maps” in English). The portal is not only for data presentation, but offers some user function for solution of chosen military tasks.

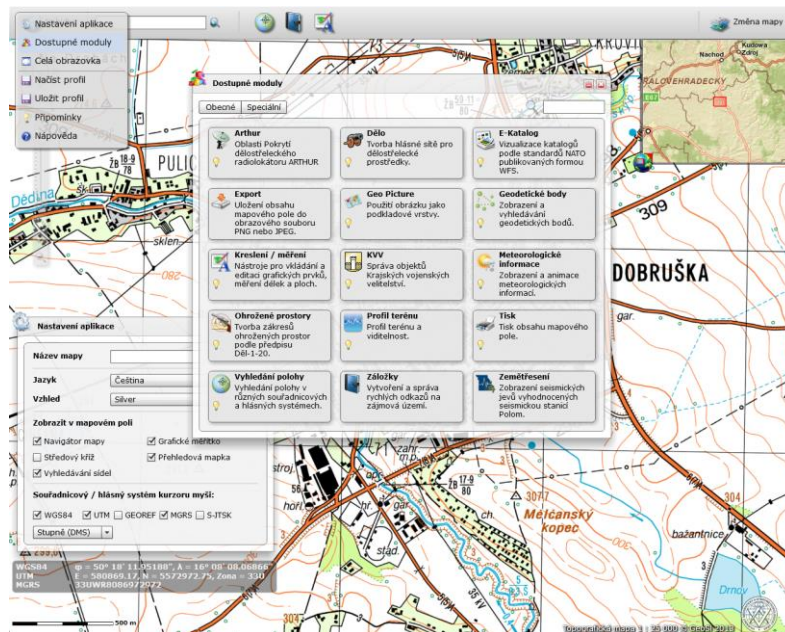


Fig. 10 „Mapy AČR“ portal - tasks selection

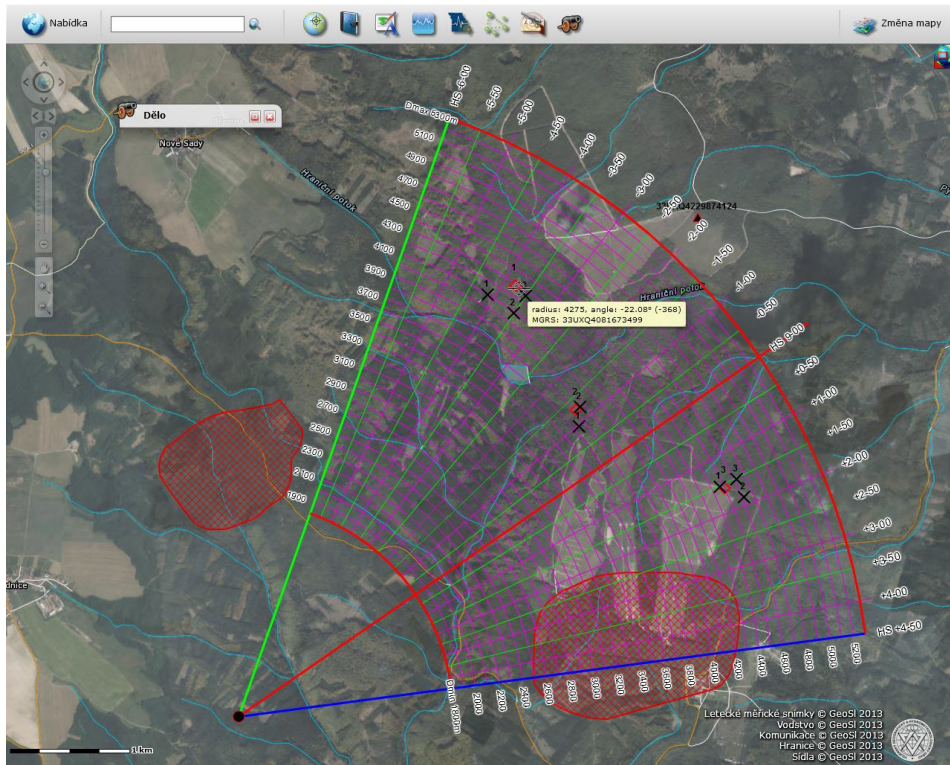


Fig. 11 „Mapy AČR“ portal and support of artillery (module „Gun“)

An important part of GS responsibility is the geographic support of field units in foreign missions. The NATO standardised data is necessary to supply and therefore one of the main tasks of GS is the contribution on NATO standardised products. The Multinational Geospatial Co-production Program (MGCP) can be mentioned as an example.

Geographic support is realised not only from the permanent locations, but also the mobile and deployable means are used in territory of the Czech Republic and during foreign mission as well. The deployable set called SOUMOP was used during geographic support of the Czech Province Reconstruction Team in Lógar (Afghanistan) in the period of 2008-2012. The technical and software equipment enabled to provide all tasks from data editing to map production and advanced terrain analysis. This system is replaced by mobile set SGEOB and deployable set GeMoZ-C.



Fig. 12 Geographic support set GeMoZ-C (camouflaged position in the field and workplace)

## Education in Cartography

The education of cartographers in the Czech Republic is provided on several **universities** and is included into geodetic, geographic or geoinformatic programs. These programs are provided at the Charles University in Prague (the Faculty of Natural Sciences), at the Masaryk University in Brno (the Faculty of Natural Sciences), at the Palacký University in Olomouc (the Faculty of Natural Sciences), at the University of Ostrava (the Faculty of Natural Sciences), at the Czech Technical University in Prague (the Faculty of Civil Engineering), at the Technical University in Brno (the Faculty of Civil Engineering), at the West-Bohemian University in Plzeň (the Faculty of Applied Sciences), Technical University in Ostrava (Faculty of



geology and Mining) and at the University of Defence in Brno (the Faculty of Military Technology).

All university courses are divided into Bachelor programs (6 terms), Master of Science programs (normally 4 terms after receiving of Bc. degree). After receiving of Ing. degree (Master of Science equivalent) the graduates can continue in the post-graduate study at some chosen universities (the Charles University in Prague, the Masaryk University in Brno, the Czech Technical University in Prague, the Technical University in Brno, and the University of Defence in Brno). For more information see the universities web sites.

The Bachelor studying program is closed by state exam and by viva voce of the Bachelor thesis. The Bc. graduates can continue in the Master of Science studying program, sometimes without any entrance examination.

The Master of Science studying program is closed by state exam and by viva voce of the Master of Science thesis as well. Some of the Ing. graduates can continue in the post-graduate studies; its duration is normally 3–5 years. This study is closed by doctoral state exam and a viva voce, the part of it is a presentation of a scientific work. After it presents the student his thesis; after their defence and their considering in the Scientific Council of the faculty receives the student the doctoral degree Ph.D.

All study programs are deeply checked by the Accreditation Commission which is part of the Ministry of Education, Youth and Sports. The commission gives a state permission to educate students usually for four or eight years.



Fig. 12 Eye-tracking laboratory for cognitive cartographic research at Palacky university Olomouc

## **Research activities in cartography**

Main research activities in cartography has been founded from several sources since 2012. The Grant Agency of the Czech Republic (GACR) and the Technological Agency of the Czech Republic (TACR) are the main providers for research financing. Only several states departments continue to support research, mainly the Ministry of Interior, Ministry of Defence and Ministry of Environment can be mentioned as examples. The applicants have to follow the rules of the providers and usually it is necessary to prepare the research intention for open competition. This process is general and valid also for research in cartography.

One of the main research institutes in cartography is the Research Institute of Geodesy, Topography and Cartography (VÚGTK, in Czech). Its activity was focused

on applied and basic research in the land surveying and cadastre branch, partly also in cartography. Under the roof of the institute work the authorized meteorological centre, accredited calibration laboratory, land surveying library and the institute is also the accredited educational body. The research and development activity in the sphere of GIS and cadastre of real estate concentrated mainly on the maintenance and development of programme products for renewal of the cadastral documentation and for administration of digitized cadastral maps. Necessary software products were handed over from the area of GIS and cadastre of real estate during the latest period. The provided products were some versions of DIKAT ZPMZ which were step by step modified so as to be able to communicate with new VFK versions. The last version is DIKAT ZPMZ 2.4. Further the VÚGTK focused on creation of a new system MicroGEOS UKM for processing of thematic cadastral maps and on other MicroGEOS Nautil versions.

Multilingual terminological dictionary containing 4000 technical terms has been continuously updated with foreign-language expressions. The dictionary is available on the Internet. VÚGTK has been the active member of the Council of Public Research Institutions for Applied Research (RAV), the mission of which is to contribute to solution of existing legislation and operational problems of the public research institutions beyond the scope of the Academy of Sciences of the CR.

The universities provide the large part of research in cartography and GIS. Almost all doctoral thesis are dealing with present development. Most of universities are focused on different branches and therefore also doctoral thesis have various topics. For example dissertations from the Czech Technical University deals with problems of old maps publication on the Internet, dissertation from the Palacky University with problems of thematic mapping and color systems, dissertation coming from the Masaryk University with problem of cartography and Early Warning and dissertation from the University of Defence with problem of cartography and GIS application in command and control systems. Many university teachers co-operate on research projects with non-academic teams.

One of the biggest research project in the Czech Republic has been the project Geoinfostrategy solved since 2012. The vision of this project was to determine the adequate stage of the spatial data infrastructure with the relationships to social economical perspectives of the Czech Republic to 2020 and to find the compliance of users requirements on spatial data ensured by the state authorities. The solution of balance between of requirements and possibilities of the state budget was also one of the main goal of this project. The project was approved by the Czech government and the Ministry of Interior was charged with leading of this project. Several tens of workers coming from governmental and commercial organisation and from academic sphere contributed to this project an worked in 14 teams. The Czech government approved the final conception in October 2014 and the Action Plan waits for debate by the Government.

## **Cartographic publishing houses**

About 30 cartographic publishing houses exist in the Czech Republic at this time. The most important of them are (in alphabetical order) :

Alpro CZ, Ltd., Valašské Meziříčí, <http://alpro.cz.com>

maps, photomaps, map printing

Geodézie ČS – Kartografické nakladatelství, Inc., Prague, <http://www.geodezie.cz>

map production to order, databases, vector and raster data, licences

GeoGalileo – Kartografie Brno, Ltd., Brno, <http://www.geogalileo.cz>

map production, advertizing agency

Kartografie Praha, Inc., Prague, <http://www.kartografie.cz>

geographical and school maps and atlases, road maps and atlases, tourist maps, city plans and other cartographic products, e-shop

Kartografie HP, Ltd., Jičín, <http://www.kartografiehp.cz>

relief maps, lenticular maps, orientation charts, pictorial relief maps

P.F.art, Ltd., Brno, <http://www.pfart.cz>

maps, advertizing agency

PLANstudio, Ltd., Prague, <http://www.puamstudio.cz>

digital maps, interactive maps, Internet maps

Prokart, Ltd., Doksy, <http://www.repreob.hyperlink.cz/prokart>

city plans, orienteering maps, orientation charts

SHOCart, Ltd., Zádveřice, <http://www.shocart.cz/cs>

tourist maps, map guides, cyclotourist maps and guides, maps for water sports, road maps and atlases, on-line maps, city plans

Stiefel Eurocart, Ltd., Vyškov, <http://www.mapy-stiefel.cz>

wall maps, political maps, road maps, satellite images

Topograf, Ltd., Prague, <http://www.topograf.cz>

cartographic products, information technologies

ZES Brno, Inc., Brno, <http://www.zesbrno.cz>

wall maps, city atlases, map lamination, map distribution

Žaket, Ltd., Prague, <http://www.zaket.cz>

city plans, tourist maps, road maps and atlases, wall maps, DTP studio, map printing