The Academic Atlas of Czech History

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Abstract Processing historical maps for historical atlas work involves a series of time consuming and technically demanding activities. The creation of such maps is quite specific. Thematic atlases include mainly cartographic presentations of statistical (or other) data from a particular field. In historical maps not only the physical-geographical or general topographic content relative to the specific historical period must be shown, but also a historical event or situation in many cases linked to the present state. Thematic elements have multiple attributes and may reflect the quality, quantity and time of the displayed phenomenon, which must be suitably visualised. Combining cartography and geoinformatics supports the use of GIS products in the GIS implementation of a comprehensive project of a thematic cartographic atlas. This chapter summarises the basic information about the upcoming Academic Atlas of Czech History and the experience of the team of cartographers in making historic maps for the atlas – from the preparation of the atlas concept through materials used, creation of a data model, map key and particular data sets to issues related to technical aspects of the work or to balancing needs of historians and the map space delimited.

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1 Cartographic Production on the Theme of Czech or Czechoslovak History

Among the first thematic maps focusing on the history of the Czech lands are the maps of teacher and spiritual leader Aleš Pařízek from 1781 (Semotanová 2003). The first historiographical atlas, titled "The Old World Atlas" was prepared by Václav Merklas in 1850. A historical map of Czechia by František Palacký and Josef Kalousek, first issued in 1876, has become a well-known cartographic work. In the first half of the 20th century Antonín Balcar, Jaroslav Vlach, František Kameníček, Jan Macháček, Josef Brunclík, Otakar Dorazil and Jaroslav Lameš excelled among authors of historical atlases. In the period after World War Two, mainly historical school atlases were published; the "Pocket Atlas of World History" appeared in several editions in the 1970s and the 1980s.

To the 1960s in the 20th century fell the edition of the biggest thematic atlas focused on history – the Atlas of the Czechoslovak history (Purš et al. 1965). The atlas consisted of 45 sheets (approximately 86 by 50 cm) with more than 400 maps and graphs, created by the team of the Institute of Czechoslovak and World History of the Czechoslovak Academy of Sciences. Maps showing the history of national territory were also included in large (national) atlases issued in the 20th century (Atlas of the Czechoslovak Republic in 1935, Atlas of Czechoslovakia in 1966, Atlas of Slovak Republic in 1982).

At the end of the 20th century, new historical school atlases were released due to the changes in the interpretation of historical development in Czechoslovakia. In 2007 came the Otto's historical atlas by Eva Semotanová. Historical development of the area was also partly presented in the Landscape Atlas of the Slovak Republic (2002) (maps are also available in the internet application) and the Landscape Atlas of the Czech Republic (2010). Among the specialised historical atlases of recent years is the work dedicated to the development of the Slovak Evangelical Church (Kusendová 2010). After many years, the upcoming Academic Atlas of Czech History (AACH) is a comprehensive academic publication focused on Czech history from ancient times to the present.

2 Timeline of the work

The work of historians in the preparation of the content of the Academic Atlas of the Czech History begun in 2005. It was a part of the research project solved in the period 2005–2011 by the Institute of History, Academy of Sciences of the Czech Republic with topic on diversity of Czech historical space within a European context.

The conceptual work, and refinement of the structure and content of the atlas took place between 2005 and 2006, the team of authors was formed and the first maps with texts were drafted. In the following two years a manuscript of the atlas

including maps and reconstruction drawings was prepared; in 2010 and 2011, the manuscript was reviewed by external critics and negotiations for financial support of the work started. The result of the work of professional historians consists of text, graphs, tables, and material collected for map preparation, usually in analogue form, or in simple graphic programmes.

A team of cartographers from the Department of Geomatics, Faculty of Civil Engineering was then gathered for digital cartographic processing of the maps before professional printing in the next phase of the project. The cartography for AACH began in 2012. As of June 2013, proof readings of all parts of this work are taking place and the atlas will be released in 2014.

3 Basic information about AACH

The title of the publication – the Academic Atlas of Czech History – was chosen due to the thematic focus of the work (Czech history), as well as the environment in which the authorial team worked on the scientific research project of the Academy of Sciences.

The goal of the atlas project is to process the results of historical research into Czech history in an international context. The atlas belongs to the small group of relatively few published scientific historical atlases. It reveals selected topics in modern Czech historical science after 1989 with connection to Europe, but especially Central Europe. The target user groups of the atlas are professionals in history, and the general public with an interest in history, historical geography, and related topics. The atlas arises as an extensive historical and cartographic work and it can also serve as a gift publication.

AACH presents the scientific activities of the Institute of History at the Academy of Sciences of the Czech Republic, however, it connects the results of historians with the output processed through creative collaboration with experts from several other institutions in the area of historical and social geography, demography, archaeology and other humanities and natural sciences. The conceptual background of the publication means that it can't present all the latest knowledge of historical sciences, studied in other research teams, universities, and other professionals. To be able to compare research issues from historical maps prepared by historians in the 1960s and again in the early 21st century, the atlas also indicates a list of maps in the Atlas of Czechoslovak History (1965).

The atlas is designed as a thematic atlas in the form of printed publications in A3 format (297 by 420mm) and it is formatted as an atlas encyclopaedia, containing text in individual sections supplied by maps, charts, pictures, photographs and other elements. The publication is written in Czech and contains a summary in English. The encyclopaedic concept of the work conforms to current trends (Voženílek 2008) and the upcoming work is significantly different in form to that of the historical atlas of 1965, where maps were strictly separated from the accompanying text. Editorial and publishing works are provided by the Academia Pub-

lishing House cooperating with the graphic studio. The atlas will be released as a printed publication; other (digital) forms are not intended.

4 The content of the atlas

The concept of the atlas content was designed by a group of authors from the Institute of History and is based on a conception of Czech history in an international, but especially Central European context. In addition to general research issues, selected several analytical probes of interesting historical processes displayed by reconstruction maps were selected for each period. In many cases, particularly in periods of modern history, the publication includes topics that were previously neglected or have been newly interpreted. The scope of the atlas was designed to be as balanced as possible, particularly with regard to the results of research projects of the Institute of History. The thematic content of the atlas is divided into the following sections:

- I. Prehistory (Stone Age – arrival of Slavs to the Czech lands): 27 pages, 8 chapters, 9 maps
- II. The Medieval Age (Samo Empire – reign of Jagiellons): 109 pages, 74 chapters, 82 maps
- III. The Early Modern Period (Habsburg dynasty – the end of the 18th century): 103 pages, 50 chapters, 86 maps
- IV. Top Modern Age (Napoleonic War – the disintegration of Austria-Hungary): 168 pages, 90 chapters, 111 maps
- V. Modern History (establishment of Czechoslovakia — the present): 88 pages, 40 chapters, 77 maps

The numbers above represent the maps created for the atlas using modern methods of digital cartography. The atlas also contains a number of thumbnails or reproductions (images) of previously issued maps relating to the topics of chapters. In addition to the thematic sections that present the main content area of the atlas, the publication includes an introductory section, geographical gazetteers and name indices at the end as well (see Fig. 11.1). Related references are included in each of the subchapters.

5 Cartographic process of making AACH

5.1 Organisational issues

For each of main thematic sections of the atlas a scientific editor–historian was appointed; the number of authors (of both text and graphics) for each chapter is considerable (experts from the Institute of History and from other institutions). The management team of historians was formed under the leadership of the Director of the Institute, Eva Semotanová. The editors of the sections were appointed: Martin Gojda (Prehistory), Robert Šimůnek and Josef Žemlička (The Medieval Age), Eva Chodějovská and Jiří Mikulec (The Early Modern Period), Aleš Vyskočil and Jan Hájek (Top Modern Age), Petr Prokš (Modern History).

Maps were prepared at the Department of Geomatics, Faculty of Civil Engineering by a team including Jiří Cajthaml (Prehistory and the Medieval Age; leading cartographer), Pavel Seemann (the Early Modern Period; design and preparation of the map key, cartographic revision of all maps), Tomáš Janata (Top Modern Age; design and preparation of specialised point symbols) and Růžena Zimová (Modern History). During the mapmaking, particularly vectorisation of the manuscript's background materials, other members of the department and several students made contributions.

Cooperation between cartographers and authors–historians during atlas creation is essential. In the case of AACH this cooperation was launched at an advanced stage of the project, when the manuscript of the atlas and most of manuscript maps and cartographic data had been prepared. Best practice in the creation of cartographic projects say that cartographers should work on formulating the concept of cartographic works and on the principles of map making (Pravda 2001, Slocum 2005, Voženílek 2011). This was not possible for this publication.

Due to relatively long intervals between manuscript creation and cartographic works the authors of sketch maps often had to modify or supplement the current state of knowledge in the field, or add or change maps. Due to the large number of authors maps were consulted mostly by editors of the individual sections from the Institute of History.

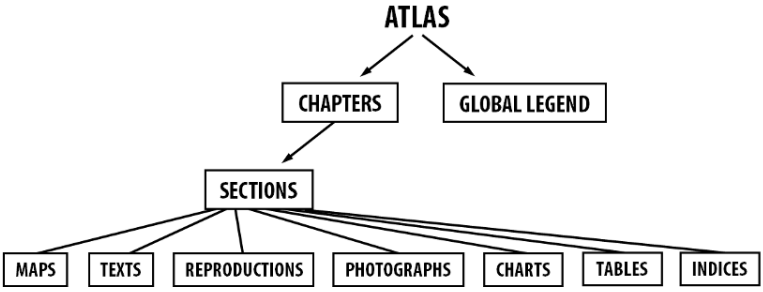

Fig. 11.1 Structure of the atlas

5.2 Materials for map creation

The data used in the processing of maps was diverse. In the authors elaborate concept maps the thematic content was often schematically hand-drawn onto a copy of a formerly published topographic or thematic map. In addition copies of previously published thematic maps were used; sometimes there was only a verbal description of the content of map elements (the list of thematic settlements or localities, line routes description of phenomena, etc.) or simply a reference to some existing map. Sometimes, digital thematic data (e.g. statistical data) was available. If the data was in digital form, it was usually in raster format; graphical data in vector form was available only in a few cases. A large portion of documents were delivered in analogue form and then scanned in a standard density (300 dpi).

5.3 Scale of maps

Atlas maps show the territory of the Czech Republic in different historical periods, or present thematic phenomena related to a larger, smaller or completely different area. In many cases it was therefore not possible to set a single series of scales due to the spatial and content diversity of the maps. The scale often had to be selected individually. Most often, maps at a scale of 1 : 2 million or similar were created; this corresponds approximately to a display of the Czech Republic in a map frame of width 265 mm. The structure of map scales is approximately as follows (using the scale number M, as a percentage of the total number of about 370 maps):

- M up to 200,000 … 14%
- M ranging 200,000 – 1 million … 6%
- M ranging from 1 to 2 million … 51%
- M ranging from 2 to 4 million … 16%

- M greater than 4 million … 13%

5.4 Size of maps

Due to differences in the range of the displayed areas (Europe, Central Europe, the former Czechoslovakia, the Czech Republic or smaller historical sites) and various requirements of the authors for detail in the subject represented, in many cases it was not possible to determine the dimensions of the map in advance, nor to introduce a simple variety of map frame sizes. The scope of the work process and the diverse character and quality of materials supplied did not allow the creation of a template for the final layout of atlas pages as recommended by the principles of atlas cartography (Voženílek 2011).

The maximum width of the map frame (265 mm) was determined according to the publication format (A3) and the design of the graphic concept of the atlas prepared by a professional graphic studio and recommendations to use one of several proposed sizes of map field were formulated as far as possible. Approximately half the total map frames have a dimension of 265 by 177mm, roughly a fifth of maps have a square frame, 177 by 177mm, and there are other larger or smaller sizes of map frame. The dimensions of the maps were chosen according to their spatial extent, appropriate scale for the plot and authors' themes as required, taking into account the general composition of the atlas pages.

5.5 Cartographic projection

As default, the Albers conic equivalent projection was chosen. The choice of the base meridian and undistorted parallels took place separately for each map and depended on the extent of the displayed area. For the frequently occurring extent of the Czech Republic at a scale of 1 : 2 million the parallels 45° and 55° N along the central meridian 16° E were chosen. Several maps (especially larger scales were made in other cartographic projections, mainly in view of the original data. The creators anticipated any implementation of cartometric or other geometric analysis of the content of the atlas maps, therefore it did not seem crucial to minimise the distortion of the maps caused by cartographic projection.

5.6 Map key

Creating a map key for such a large and diverse set of thematic maps presented a special issue. A map should fulfill its cognitive function (Pravda 1997). Various aspects of geovisualisation and map design are discussed regularly at scientific

events and/or in publications (e.g. Dykes et al. 2005, Kraak and Ormeling 2010). Nevertheless, the heterogeneity of historical topics involved in this historical atlas, the complexity and details of authors map concepts (and a demanding time schedule) made the process of map element symbolisation relatively difficult.
At the beginning of the cartographic work, a set of symbols for elements found in most maps was designed by the team of cartographers. These were particularly elements of topographical background, but also of common thematic features: areal (a scale for colour hypsometry, water bodies, colours for thematic areal elements such as areas of states, the colour scale for cartograms or diagram maps), line (various types of borders (Seemann 2012), hydrography, geographical grid, communications, thematic line elements such as those for military campaigns, front lines, etc.) or figural (settlements, castles, churches, monasteries etc.). Other symbols were gradually complemented by processing the respective map, the content of which was sometimes very specialised. The choice of colours was based on general cartographic rules (Brewer 2005, Voženílek 2011); the colours and parameters of figural signs were discussed and agreed with the graphic studio that designed and also provided fonts for map labels and all the text in the publication.

5.7 The composition and preparation for printing

The graphic and typographic solution, including the composition of the atlas pages, was designed and compiled by the graphic studio. Each map is surrounded by a thin map frame (line width 0.75 pt); thematic map legend and a simple graphic scale bar was placed the layout by the graphic designers within, usually out of the map frame (it was not always possible to put the legend on the same page of the atlas). A general list of symbols, containing characters mainly used to render the topographic base of the maps, is found in the opening section of the atlas. The name of each map was set by the authors–historians; sometimes it was necessary to refine or modify it. Numerical labelling of the maps corresponds to their inclusion in thematic sections. Author names (for text chapters and maps) are shown at the beginning of each thematic subchapter or through a refinement with the respective map. Supplementary compositional elements contain the north arrow used in large-scale maps without a geographical grid. Print layers of maps were exported as PDF (1200 dpi), or alternatively EPS (300 dpi) files for maps with colour hypsometry and hill shading, in the CMYK colour space. During the whole process, special attention was paid to structured, systematic and regular backup of all data. Some examples of maps in the atlas colours are available in the publications by Cajthaml (2013), Seemann (2013) or Seemann et al. (2013).

5.8 Some aspects of processing the maps

ArcGIS Desktop 10.0 software was chosen as the basic tool for digital map processing. It offers a number of cartographic tools for creating high-quality maps. Its advantage is the potential for a database-oriented store of map layers. An important issue was to use the appropriate attributes in order to facilitate correct map content depicting various time periods (e.g. the year of the water dam construction). Cartographic visualisation was performed with the standard methods of ArcGIS, without use of cartographic representations as that would have required more time which unfortunately was not available. In several cases, the cartographic program OCAD 10 was used, and final processing was performed using Adobe Illustrator.
The compilation of the topographic background of maps was mainly based on freely available reference data layers (SRTM30, CleanTOPO, ETOPO, Natural Earth, EUROSTAT), which were revised, supplemented and modified. For each specific map and its topographic component, the layers of thematic content were created, mainly by vectorisation of raster background. The creation of a data model in ArcGIS consisted of the design of feature classes within the dataset of each map, while generally usable reference data (e.g. altimetry, geographical grid, hydrography, administrative boundaries) was stored in a separate reference dataset (see Fig. 11.2) in two versions with different degrees of generalisation, usable in less detailed resolution for Europe or at larger scales for Central Europe or territory of the Czech Republic. The data model enables tracing of individual map data and sharing the layers between different maps. It represents a valuable database, usable both for supplementing further content of the maps and for creating any other similarly oriented cartographic work.

Cartographic visualisation of spatial phenomena was in some cases considerably complicated. It was often necessary to display various kinds of border lines, identification and movement lines, which were furthermore related to different time stages of the historical events presented. In this respect, the most complicated were the maps showing combat events in which it was necessary to distinguish the lines/arrows symbolising the movement of combat troops with regard to a variety of attributes, such as membership of the parties of the conflict, type of movement of combat troops (attack, advance, transfer, retreat, leaving), its intensity (major, minor, unresolved attack), military hierarchy (army, brigade, division, group, etc.), type of weapons (aircraft, tanks, etc.), time period of the war. Quantitative and qualitative attributes of these phenomena have been expressed by diversely selected parameters of linear features (structure, thickness, colour, orientation) in combination with the location of various end-line symbols (arrowhead single or double), adding another point symbol within line element or additional text or abbreviation (see Fig. 11.3).

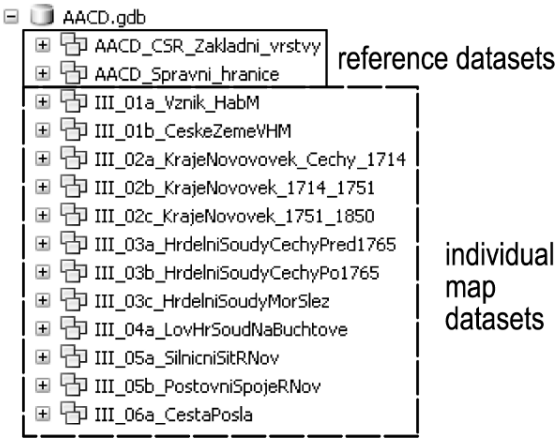

Fig. 11.2 Structure of the geodatabase

Delimitation of areal features in the map was depicted by coloured areas corresponding to the map key; for overlapping areas hatching was used. For the areas of countries, colour hypsometry in combination with hill shading (for maps containing figural and linear thematic elements) or solid colour fill with hill shading (for maps containing areal thematic elements) was applied. In maps of larger scales (approximately 1 : 500,000 and more detail), the relief is not included at all, or only in the form of more significant spot heights.

Czech geographic names were used for labelling geographic features; the official name in the language of the country was assigned to the settlements, if necessary supplemented with the name belonging to the period of historical event, such as Zlín (Gottwaldov), Chemnitz (Karl-Marx-Stadt). The use of exonyms represents a methodically serious issue that had to be solved at both a general level and when taking into account each specific map. With regard to the cultural–historical importance of exonyms, the names of settlements related to the topic of the map are accompanied by the Czech doublets in brackets, e.g. Dresden (Drážďany),Wrocław (Vratislav), Graz (Štýrský Hradec), and exceptionally also by doublets in a foreign language, such as Oświecim (Auschwitz, Osvětim) (see Fig. 11.4). The UN database of geographic names (UNGEGN 2013) and the List of Czech exonyms (Beránek et al. 2006) were used as sources of valid data. The cartographers, in collaboration with historians, tried to adapt the contents and labelling of maps in order to avoid overfilling the map image.

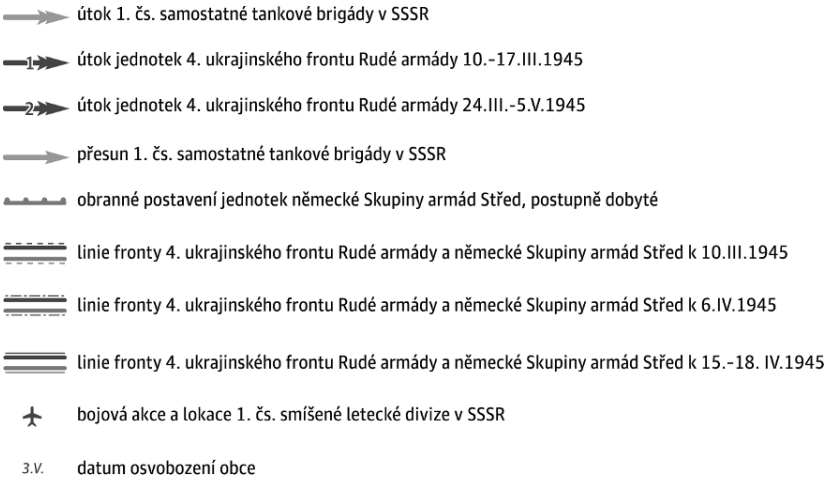

Fig. 11.3 Example of map symbols for combat events

6 Conclusion

The Academic Atlas of Czech History constitutes a unique multidisciplinary publication, which presents the results of the research of historians of the Academy of Sciences processed under cooperation with experts from several other departments in the areas of historical and social geography, demography, archaeology and other humanities and natural sciences.

In the process of the creation thematic historical maps, a close synergy of cartographers with the authors of professional thematic content is really essential. For quality processing of maps, it is important to understand the authors (historians) and to treat the historical phenomena correctly. Cartographers need not only the appropriate knowledge of and experience in map creation, but also some degree of knowledge about history, commonly used expressions and historical context. Experts in history (or other professional fields) are authors of the map content and therefore they are responsible for the factual accuracy of cartographic presentation of topics. Their effort to include correct, detailed and comprehensive historical content in the maps was sometimes found to be in conflict with what it was really possible to depict in a map of defined size and scale while respecting the principles of cartographic expression.

The processing of maps in ArcGIS software was carried out in the standard way but was not without several problems. It is worth remembering that the software does not always render graphical elements absolutely correctly (exported graphics are slightly different). It was also necessary to process the legends of size scales for diagram maps manually, as ArcGIS does not provide the tools to do so. The exported layers of maps also have unexpected outcomes in some settings and therefore everything should be carefully examined. In general, this software could

be certainly recommended for atlas creation. With compliance to the basic principles, the job is quick and efficient. It is very important to coordinate the appropriate procedures with a graphic studio providing professional printing of the publication.

Fig. 11.4 Example of map with exonyms

Based on the experience of the cartographic processing of maps for the AACH, it is necessary to draw attention to two important aspects: firstly, the need to involve cartographers in the preparation of the atlas at the very beginning of the project, and secondly, the emphasis on quality and unity of base sources for creation of maps. The concept of the atlas should be formed by authors-historians, always in cooperation with cartographers. In the initial phase, the rules used for the preparation of data for map creation should be mutually agreed. In the case of AACH, there was a friendly cooperation between authors and the team of cartographers at an excellent level. Nevertheless, the involvement of cartographers in the project of the atlas from the beginning could have solved many problems and positively influenced the time required for map processing. Uniform data processing for cartographic production would require considerable efforts before starting work on authorial originals. This practical problem particularly affected the duration of the preparation of the atlas and caused uncertainty in its processing, which is usually caused by the financial resources for its development. For the team of cartographers, the work of processing the Academic Atlas of the Czech History was a very valuable experience which it will be possible to further develop in the future.

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