

## THE NEW WEB-BASED "SWISS WORLD ATLAS INTERACTIVE"

*HAEBERLING C., BAER H.R., HURNI L.*

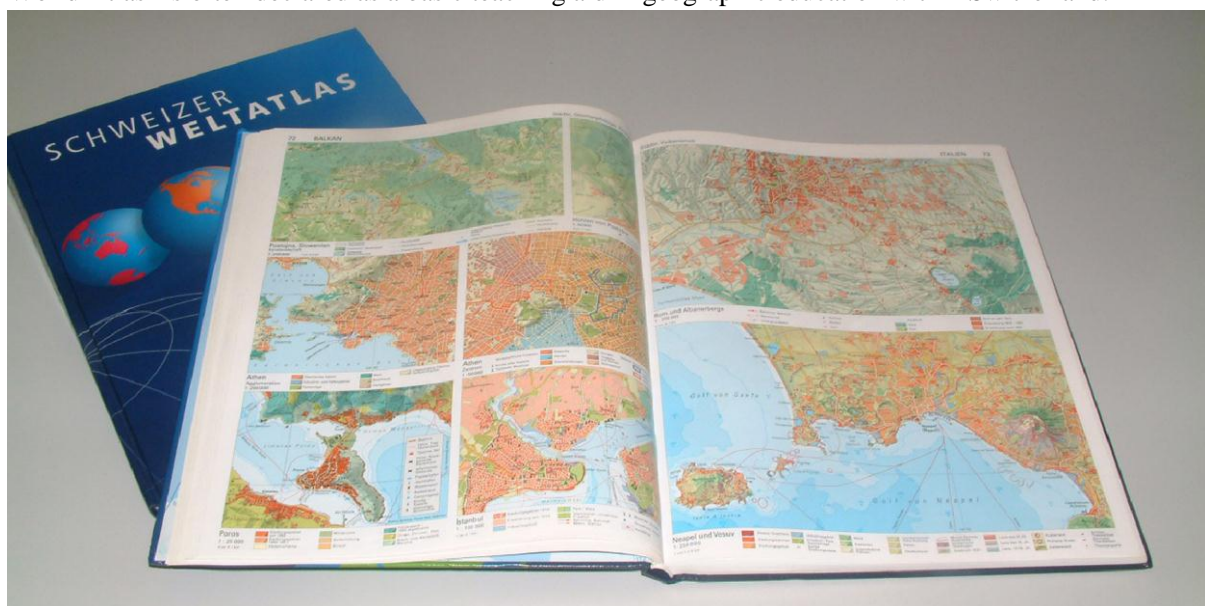
*ETH Zurich, ZURICH, SWITZERLAND*

The new online version of the well-established printed "Swiss World Atlas", the "Swiss World Atlas interactive", also includes different cartographic representations. Beside classic interactive maps, the atlas contains supplementary representation types such as the block diagram, a virtual globe, and illustrative models. Concerning the general didactic concept, the "Swiss World Atlas interactive" follows also an exemplary approach in respect of geographic regions and of physical-geographic situations, or social-economic aspects. Every representation is designed in a highly elaborated graphic style to differentiate each object class very clearly and to present the map content always in a readable and attractive way. A well-arranged graphical user interface offers tools for map selection as well as functions for map comparisons or map synchronisation. The atlas serves for a wide range of teaching aids, such as wall maps while teaching in class or as additional information source while individually learning at home. Teachers and students get an additional value by switching map layers on and off or by querying map objects so that complex geographic phenomena or processes can be explained more comprehensibly. First experiences have shown that the use of the "Swiss World Atlas interactive" is very welcomed by both explicit target groups, independently of the different educational needs on every level of education. In future, the "Swiss World Atlas interactive" will be enhanced in respect of content and functionality. Due to its flexible and client-server-based architecture it can be easily developed by publishing new or updated map representations as well as by implementing improved or additional tools without any editorial deadline.

Project of the "Swiss World Atlas interactive" (chapter title)

The traditional printed "Swiss World Atlas" (subtitle)

Most modern school atlases consist of numerous topographic or thematic maps at different scales. The well-established printed "Swiss World Atlas" provides also such a static map collection dealing with all kind of physical-geographic situations or social-economic phenomena on the level of Switzerland and Europe, other countries, continents, large regions, or world representations (Swiss World Atlas 2010). Based on an exemplary approach, over 400 maps of different geographic extent, scale, and thematic content are disposable (Fig. 1). Additionally, numerous illustrations about stellar objects and their constellation within the solar system, some sections about map reading, mapping and remote sensing as well as extensive registers complete the content of this classic print product. The whole content is in accordance with the on the needs of the geographic education for the secondary school level, this means for students of the 7th until 13th grade. Due to its publication for more than 100 years, the printed "Swiss World Atlas" is often declared as a basic teaching aid in geographic education within Switzerland.



*Figure 1: The printed "Swiss World Atlas" contains more than 400 topographic or thematic maps and other representations.*

Like any approved teaching tool, many of the maps in the printed atlas reveal two weak points (Marty 2007): Firstly, the depicted region is always represented in an orthogonal projection. So, the different terrain shapes (e.g. peaks, ridges, valleys, and gorges, smooth or steep slopes) are described only by relief shading, contour lines, and some height points. This representation demands a considerable cognitive effort, especially for young students. Secondly, the content of the topographic and thematic maps is often too complex. Maps showing a detailed geological situation or economic structure can hardly be interpreted.

The project of a web-based school atlas in Switzerland (subtitle)

Due to these two deficits of many maps, the publisher of the printed school atlas, the Conference of the Directors of Education of the Swiss Cantons (EDK), has launched a research project to develop a digital school atlas covering mostly the contents of the printed edition. It has to be usable for both levels of the secondary school systems of Switzerland. Additionally, the atlas must be published at least in French, German and Italian so that it can be introduced in the classes of all national regions.

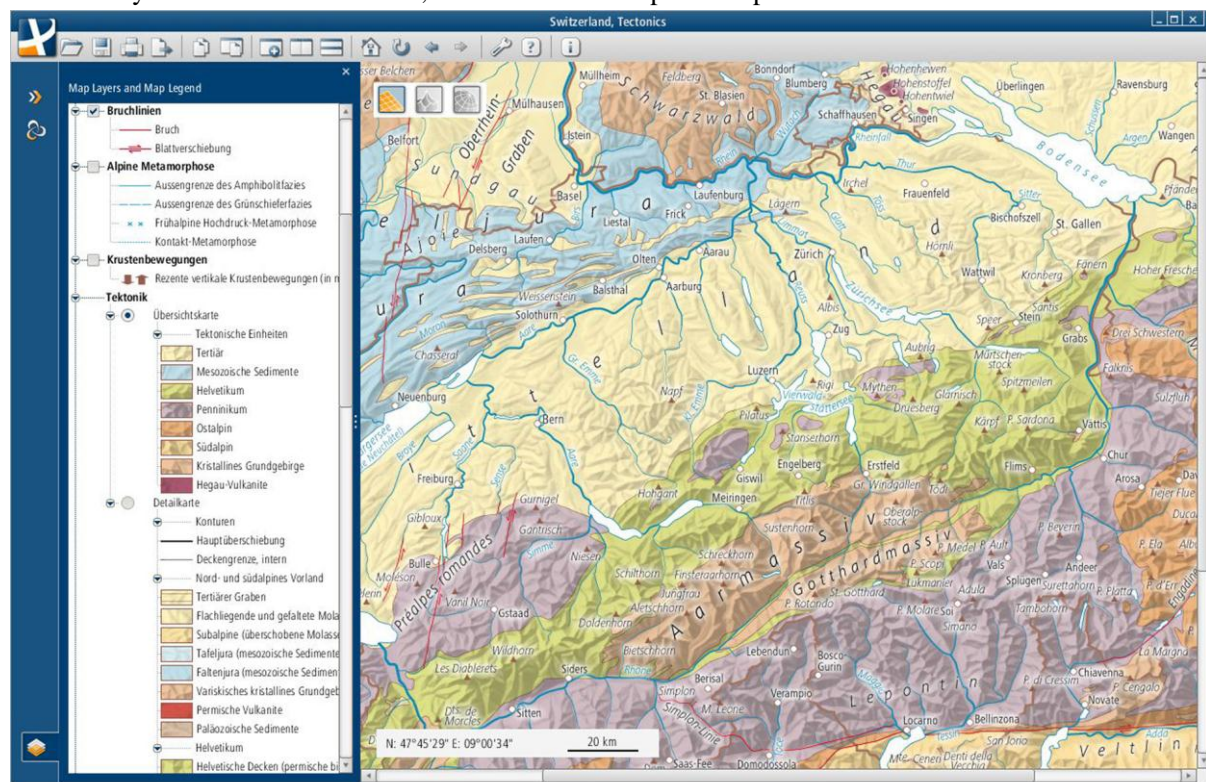
The Institute of Cartography at ETH Zurich is in the charge of this project since 2005 (Haeberling and Baer 2007). Within the last five years a new web-based and interactive atlas system has been developed and permanently refined. The first version of the innovative "Swiss World Atlas interactive" has been published in October 2010 and is now usable as a freely accessible web application (Swiss World Atlas 2011).

Characteristics of the "Swiss World Atlas interactive" (chapter title)

Types and content of map representations (subtitle)

Beside classic interactive topographic and thematic maps at city, country, continental, or world level, the "Swiss World Atlas interactive" provides supplementary representation types such as the block diagram, a virtual globe, and illustrative models.

Many printed maps were adapted and integrated in the web atlas with almost the same map content like in the printed atlas version (Fig. 2). Most of them are depicting geographic objects or processes at city level, at country level, at continent level, or even at world level. Their detailed map content as well as the legend and the functionality to control the appearance and to navigate through the map models is quite individually tailored. At the moment, some dozens of maps are implemented in the atlas framework.



*Figure 2: Screen shot of the new "Swiss World Atlas interactive" showing a section of the tectonic map of Switzerland, embedded in a user-friendly graphic user interface.*



The interactive block diagram is one of the innovative representation types (Fig. 3). Limited sections of diverse digital terrain models serve as basis. By combining and draping numerous thematic layers over a digital terrain model, these 3D maps present different physical phenomena or anthropogenic structures in a perspective view. Due to their dimensional compactness, they are predestined to be explored in detail.

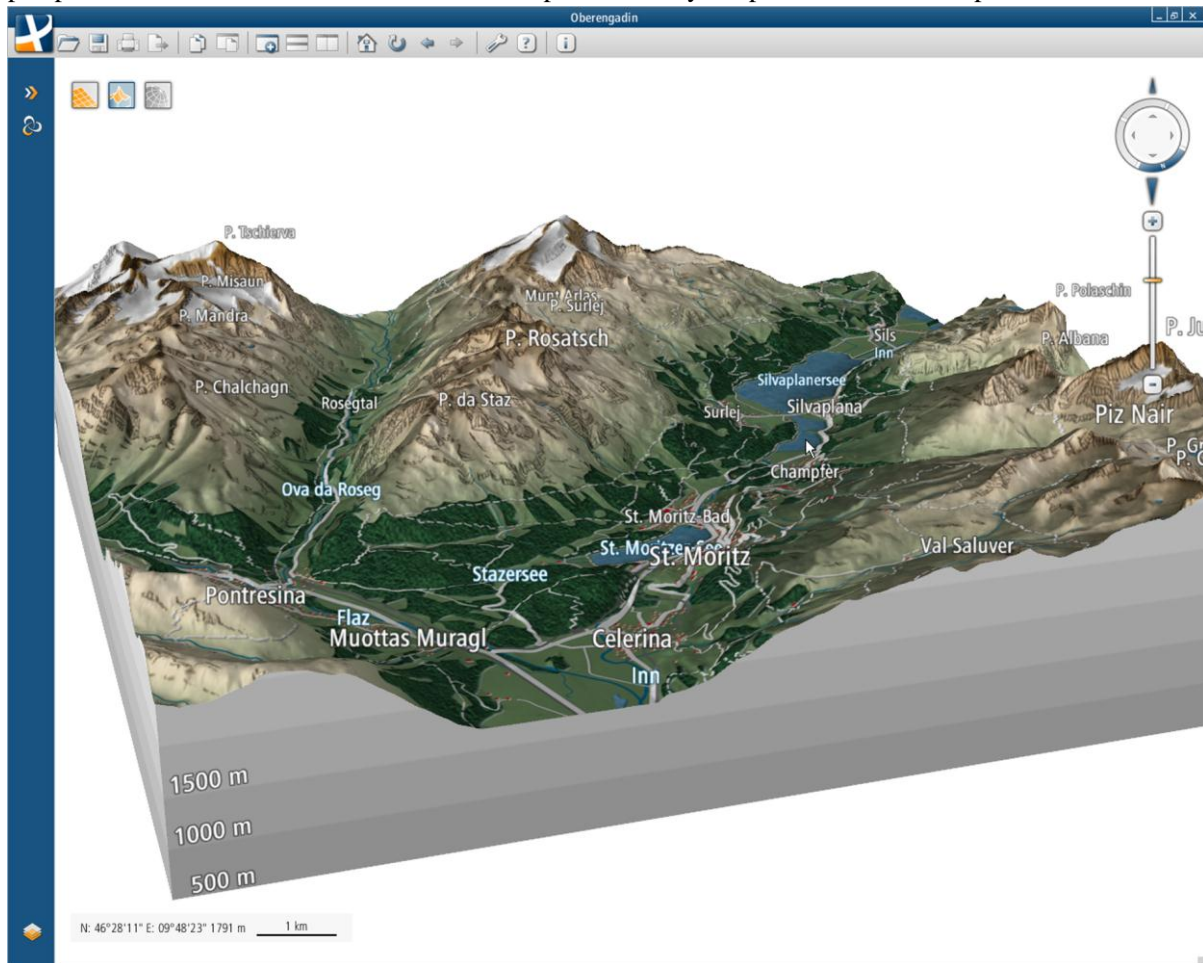


Figure 3: Block diagram depicting the region of the Upper Engadin Valley (Switzerland), draped with the texture of a summer situation.

In the "Swiss World Atlas interactive" a new virtual globe is also integrated (Fig. 4). However, it is less suitable for detailed representations like large scale maps or block diagrams, but better suited to present world wide structures or phenomena (Marty et al. 2009).

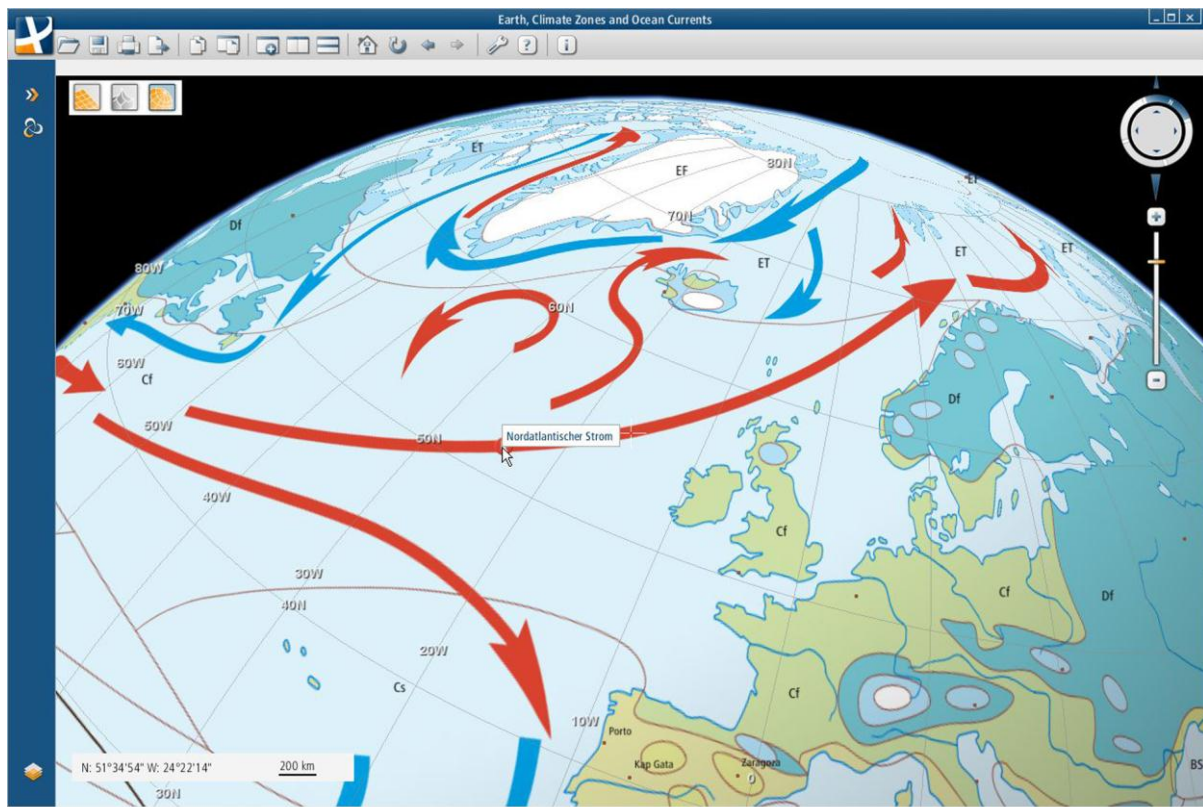
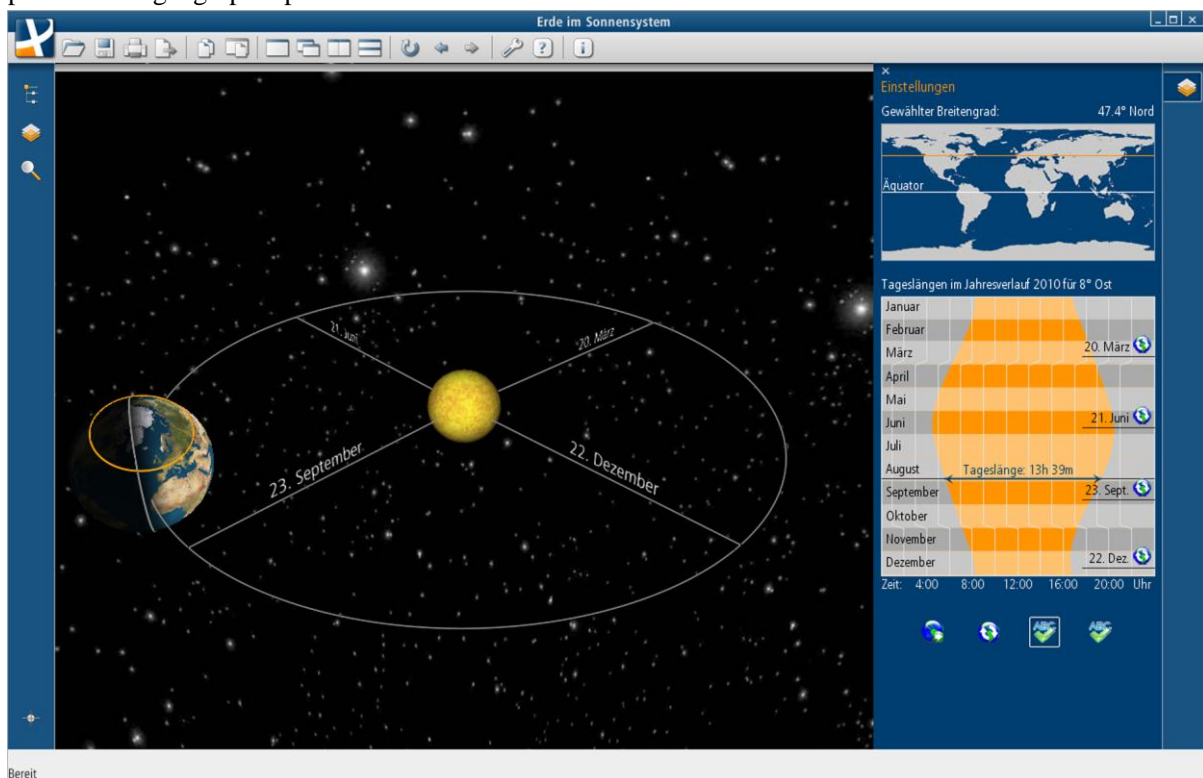


Figure 4: Screen shot of a zoomed section of the implemented virtual globe, showing the global climate zones and ocean currents.

Supplementary dynamic illustrative models offer an alternative to explore the static info graphics out of the printed atlas in a different, but also more memorable way (Fig. 5). Such models could combine components of movement, changes of geometries, graphics and diagrams representing statistical values or key figures, and other expression forms. The interactive handling of such models together with the observation of the dynamic sequences allows an intuitively recognising of interrelated structures and processes of geographic phenomena.





*Figure 5: Dynamic illustrative 3D model of the earth revolution around the sun, additionally explained by interactive diagrams.*

#### Distinctive graphic appearance (subtitle)

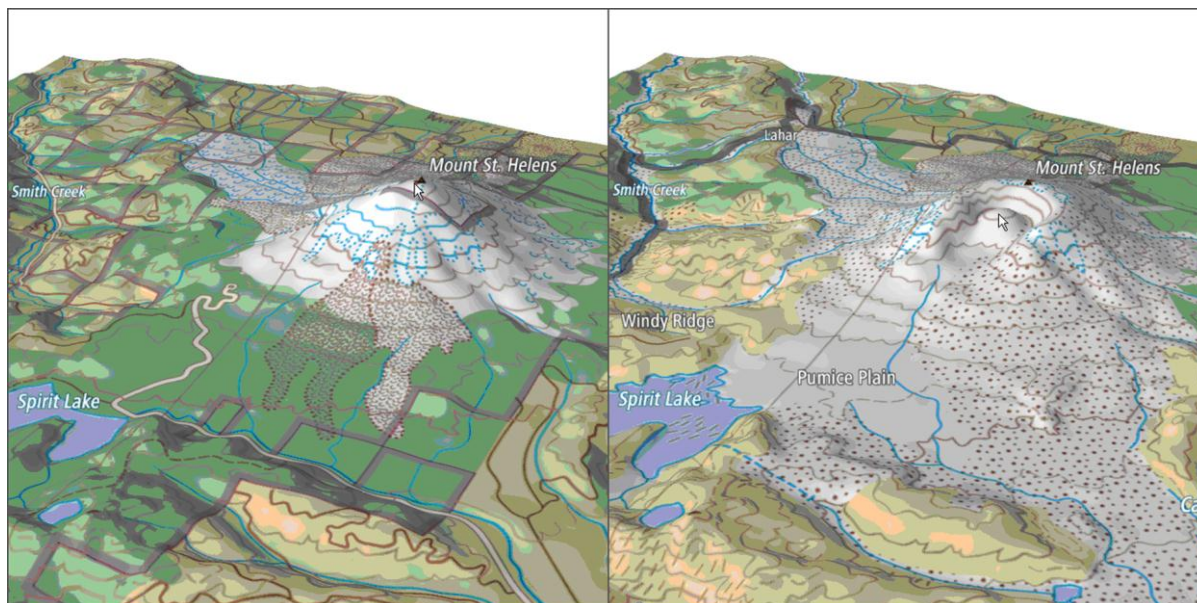
Although the relation to the printed maps is unmistakable; the graphic appearance of the interactive representations in the "Swiss World Atlas interactive" must be different. Due to their display on screen, they are presented in a highly elaborated graphic style to differentiate each object class very clearly and to present the map content always in a readable and attractive way. For this optimised screen display, the line geometry and thickness had to be drawn more generalised and distinctively. This means also that the used map font had to be chosen as sans-serif text (Fig. 6). Moreover, the general applying of halo effects for labels achieve a better readability at every zoom level. Furthermore, the colour contrast between the different map object classes had to be enhanced.



*Figure 6: Section of the interactive city map of Paris with a distinctive sans serif labelling, including applied halo effects.*

#### Functionality and technology of the atlas (subtitle)

A clearly arranged graphical user interface was designed to integrate all necessary control commands and functionalities to allow the intuitive handling of the atlas (Cron et al. 2009). The atlas consists of a wide range of functions, which are implemented and structured for users at the aimed school levels. The functions are programmed flexibly for future developments. The whole atlas functionality can be divided in three main function groups (Cron et al. 2009): The first group contain functions to search and select a representation (map search by different methods, e.g. selection of region; map frames; geographic or thematic key words). In a second group there are functions to display the map model with its thematic content (e.g. layer control; geographic information display) and to navigate (e.g. mode selection; zoom-in; zoom-out; panning; rotating; tilting). Especially tools for map selection as well as functions for map comparisons or map synchronisation are implemented for an efficient atlas use (Fig. 7). Finally, the third group comprehend general functions and tools to control the atlas application (e.g. atlas start; language selection; saving function; printing function; export function with added map elements; copying function; adding new map windows; arranging open map windows; loading saved maps; help; system information; atlas exit).



*Figure 7: Comparison of two block diagrams of the region of Mount St. Helens volcano (USA) before (left) and after (right) the eruption of 1980.*

The "Swiss World Atlas interactive" is totally programmed in Java and is using the Java Web start technology (Java 2011). Started within the favourite web browser, the atlas software firstly checks the current version of Java of the computer. If the version is not sufficient to start the atlas, then Java would be updated automatically. The virtual globe is based on the well-known NASA World Wind virtual globe software (NASA 2011). Diverse parts are customised, especially the label placing and label displaying (Mary et al. 2009).

Didactic concept and potential use of the new web-atlas for geographic education (chapter title)

General didactic considerations (subtitle)

Like the printed version, the "Swiss World Atlas interactive" is produced for the secondary school levels (from 7th to 13th grade). Thus, the atlas has to consider a broad range of different levels of students' knowledge and the expected demands by teachers. In the Swiss school system for example, two succeeding school levels are explicitly distinguished. The first secondary school level ranges from age 12 to 15 years and the second level from 16 to 19 (high school) (Wikipedia 2011).

As said before, the "Swiss World Atlas interactive" follows also an exemplary approach in respect of geographic regions and of physical-geographic or social-economic aspects. Beside the worldwide representation of the topographic situation by overview maps and the anthropogenic situation by complex land use and economic maps, many other geographic structures and processes can only be shown in detail for small areas. Of course, they could not cover all parts of the world. This means: if geography teachers would like to teach these phenomena he or she has to explain and to treat the provided examples.

In general, the interactive atlas comprehends not the whole map collection of the printed version. Only a selection of favoured or indispensable maps and illustrative representations has been chosen. Anyhow, a great number of (small-scale to large-scale) topographic and thematic representations are currently available.

Potential use and additional value of the atlas (subtitle)

The "Swiss World Atlas interactive" serves for diverse teaching methods. It can also be used as a source in order to prepare lessons or exams.

The representations can be projected on a wall in the class room, so that teachers can explain the discussed regions with their characteristic geographical aspects in front of the class, much like a classic wall map. The students are invited to follow the instructions from the projected map. By switching map layers on and off or by zooming in and out, certain interrelations or structures can be highlighted explicitly. Thus, the additional value of the interactive use of the atlas as a presentation medium gives the teacher more possibilities to interact directly with his or hers students.

For students, the "Swiss World Atlas interactive" could also serve as an additional information source while individually learning at home. If they are able to manipulate and navigate the maps and block diagrams interactively, the students can individually explore the focused geographic regions or can search



for specific geographic correlations to solve their assigned tasks. The transfer of geographic knowledge happens in a playful but also target-oriented manner. Especially computer-accustomed students will certainly appreciate this way of learning.

The atlas is also predestined to serve as a preparation tool for geography teachers. By configuring and saving different map files of the focused thematic circumstances; teachers can prepare a story-board in advance to present the prepared maps at the next opportunity. It is also possible for them to create working documents or written exam questionnaires by exporting incomplete maps (or sections of maps) and import them into a layout software as rasterised images. Many geography teachers will appreciate about these offered functions. Comparing to the printed atlas, the additional value of the "Swiss World Atlas interactive" is obvious: the digital atlas easily provides them with customised and precise maps. This also means to save considerably time and effort.

Experiences and outlook (chapter title)

First experiences (subtitle)

Since the publication of the "Swiss World Atlas interactive" at the end of October 2010, first experiences about how geography teachers use the Swiss World Atlas interactive in class are very promising. Most of the comments the editorial board got from the different user groups (e.g. teachers, students, and other interested people) are highly positive in respect to the usability, the graphic style, and the functionality. Despite of the currently limited content the atlas convinces the users of its easy start and handling as well as of the cartographic quality. Furthermore, the majority of the users are very pleased about the free availability via the Internet.

Teachers appreciate especially the many possibilities to head the students' attention to the key issues of geographic subjects. They point out that especially the students' sense of orientation was activated, when they used perspective views of mountain maps. Thus, representations such as block diagrams or the virtual globe attract the students' attention enormously. Generally, comparison and synchronisation of two or more maps with different map content are also regarded as being valuable to recognise the interrelations between different geographic aspects within a given regional context. Otherwise, students admire the coolness factor of the atlas, especially of the block diagrams and the virtual globe.

Further development (subtitle)

In future, the current state of the "Swiss World Atlas interactive" will be developed further in respect of the content and functionality. Many new maps out of the printed "Swiss World Atlas" will be adapted and enriched with interactivity to enhance the atlas. In particular, the map labelling and the corresponding map legends must be translated for the four intended language versions.

Besides designing and introducing more interactive maps, block diagrams, and illustrative models, additional atlas parts could be considered and implemented. Such parts could be a GIS module which teaches students in the handling of geographic data. Another idea would be a dynamic planetarium which is intended to replace the static display of the sky's hemispheres.

Additionally, more investigations are planned to evaluate the use and the added value of the interactive maps and 3D representations in more detail. The results of these upcoming investigations will help to improve and refine the atlas. Not least, the publisher must consider also a business plan for a paid version of the "Swiss World Atlas interactive" to commercialise and to refinance the expenses of this innovative web atlas.

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