

# **Atlas of Switzerland 2.0**

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## **1. Introduction**

The Atlas of Switzerland, the Swiss National Atlas has been re-published as interactive Multimedia Atlas in 2000. That version consisted of a 2D-part, presenting statistical data covering Switzerland, based on administrative boundaries down to the community level. Furthermore, a 3D-part allowed to visualise Digital Elevation Model data with a resolution of 25 m nation-wide. In the meantime, over 13'000 copies of the CD-ROM have been sold, making it a best-seller for Multimedia products in Switzerland. It has also been presented at the Mountain Cartography Workshop at Rudolfshütte with special emphasis on mountain related themes.

In the meantime the atlas has been further developed both concerning an extended functionality and additional thematic data. The new version, available on CD and DVD, again consists of a 2D- and a 3D-part. The so-called "dual" concept, the originally foreseen splitting-up in a printed and a multimedia part was definitely given up, mainly due to economic and organisational reasons. Regarding the technical implementation, the new version has been entirely re-developed, compared to the first edition. Almost all software modules have been programmed from scratch. A detailed description of the technical concept can be found in Huber/Schmid (2003).

## **2. Interactive maps: insight into the two-dimensional part of the Atlas of Switzerland 2.0**

The 2D-part of the Atlas of Switzerland 2.0 approaches the classical form of a national atlas by providing information on two-dimensional thematic maps using choropleths, mosaics, diagrams, etc. The advantage of the new atlas maps however lay in their interactivity and in the inclusion of multimedia elements. The functions now include GIS-like analysis tools which can be based on geometrical references other than simple administrative boundaries, such as e.g. natural boundaries, raster data or modelled data (temperature isolines), etc. The spectrum of themes has been extended according to the overall theme of that version: Nature and Environment. The atlas now comprises about 1000 themes which can be converted on the fly into a variety of maps. It allows to access all functions and all data sets of the atlas.

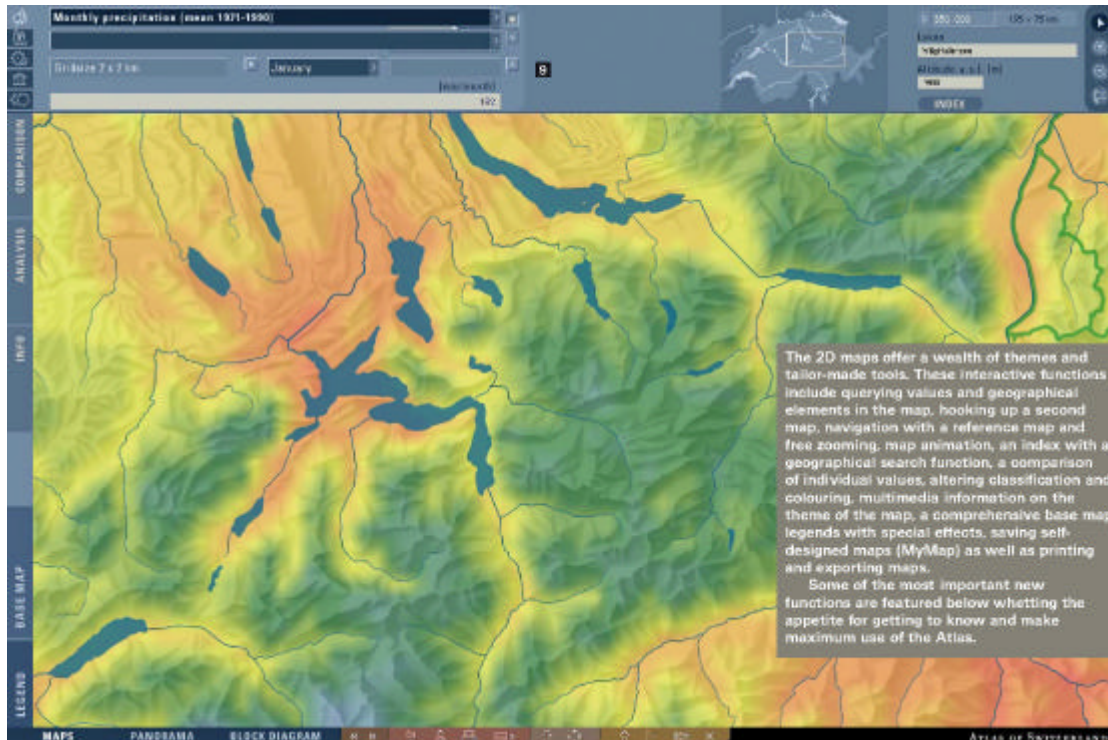


Figure 1: User interface of the 2D-part of the Atlas of Switzerland 2.0

## 2.1 Base map

The base map is the background for all map presentations in the atlas, it comprises a set of map layers which form the topographic foundation for the thematic views. This base map is combined from up to 18 layers that the user can combine as desired. Compared to the first edition, the covered perimeter is enlarged and new layers are introduced: e.g. a satellite orthophoto, glaciers and forests. The layers of the base map can be accessed via a fold-out menu on the lower left part of the command bar. The base map layers were prepared manually in different scales in advance to assure high map quality. Over 30 individual base maps in twelve groups were designed for the atlas. The base map can be queried independently from the thematic layers.

## 2.2 Legend

The legend adapts automatically to the variety of different map types. It allows altering colours, changing classifications and marking values or value classes. All legend items are also linked to the map query; the entry that contains the queried object's value is highlighted respectively. Map legends can now be organised hierarchically, the geological map can be split up in units and subunits (figure 2).



Figure 2: Legend of the geological map with units and subunits

### **2.3 Second map**

With each map, a related or complementary thematic map can be added for comparison. Both maps can be queried or switched upon demand. The transparency of the colours can be defined using a slider function. The menu bar on the upper left shows the two themes. The map themes which can be combined are carefully chosen according to thematic and graphic constraints.

Usually area based thematic maps (such as choropleth maps) and diagram maps can be combined.

### **2.4 Comparison and analysis**

Single values of a map can be compared easily: A click onto the map element displays the value as a coloured bar. If the map theme or the date is changed, the selected elements are kept for further comparing analyses. The values can also be sorted. Within a map the top ten and the last ten values can be displayed. As in the first version of the atlas, when displaying statistical values, classes can be defined, altered, added and colours can be assigned.

### **2.5 Information**

The atlas now contains for the first time real multimedia elements: Each map theme is accompanied by a short, informative text. Links lead further to graphics, images, sounds or short videos.

### **2.6 Index and pins**

The well-proven index function has been kept: The name index contains a list of place and regional names and names of the geographical map elements such as lakes or rivers. By clicking on the name, the object is centred on the screen. Three pins can be placed in the maps in order to mark interesting places. They can be moved and switched on and off.

### **2.7 Time**

Many maps contain different temporal statuses or time periods. As in the first atlas version, changes can be visualised as single maps or as animations.

### **2.8 MyMap, map album, export**

Map configurations which have been altered and designed individually using the analysis tools, can be saved and reloaded easily. A user-centred map album can be created. Furthermore, all maps can also be exported in different file formats and be printed with high resolution.

### **2.9 Atlas themes**

The atlas themes are divided into six thematic first level domains which are then subdivided into three more levels (from theme groups down to the single maps). In this version the emphasis is laid on the domain "Nature and Environment" which is covered by several hundred maps. The remaining domains contain mainly updated statistical data, accordingly to the themes in the first version of the atlas. The base map has been improved significantly. Numerous new layers, including a satellite image were added. The attributes of the objects have been increased, such as e.g. the place and mountain name database. Table 1 shows the first and second level theme groups.

First level	Second level theme groups in the Atlas of Switzerland 2.0
Base Map	Cities, Villages, Lakes, Rivers, Glaciers, Railway lines and stations, Cable car, Roads, Forest, Administrative boundaries, Mountains, Passes, Contour lines, Relief, Satellite image
Nature and environment	Weather and climate, Geology and resources, Soils, Water, Ice and snow, Landscapes, Vegetation, Fauna
Society	Population, Languages, Religion, Education, Health, Households
Economy	Labour, Agriculture, Industry, Services, Tourism, Construction, Habitation
State and Politics	Spatial units, Referenda, Elections, Public finances
Switzerland and Europe	Nature and environment, Society, Economics, State

Table 1: Theme groups in the Atlas of Switzerland 2.0

### 3. Mountains in colour: insight into the three-dimensional part of the Atlas of Switzerland 2.0

Colours help display the shape of the landscapes not only realistically but also in an artistic or cartographic way. Current digital applications, in combination with the appropriated geo-data allow the creation of a suitable appearance of the scenery. In this chapter an attractive method for visualising alpine landscapes in topographic three-dimensional maps will be presented.

A realistic 3D-representation (e.g. satellite imaging) is not always requested. In combination with the topography, a specific topic can be highlighted via a special colour choice. The 3D-module of the Atlas of Switzerland 2.0 tries to integrate both aspects, that is the realistic and non-realistic visualisation. The atlas offers a wide range of different options to visualise the landscape (Huber / Sieber 2001).

#### 3.1 Navigation and orientation

Customised views of the 3D-model regarding location, elevation, viewing direction and angle can be created. The atlas provides the user with pre-defined panoramas and block diagrams, which can be modified via interactive tools. For navigation and orientation purposes, a 2D-reference map with details to the chosen landscape is integrated as well as information in the virtual scenery labelling mountains, passes, lakes, glaciers, regions and settlements.

In the panorama, a new viewpoint can be set directly within the terrain. At the same time an arrow can be used to choose an appropriate line of sight (figure 3).



Figure 3: Result of a defined viewpoint with the corresponding line of sight (right)

### 3.2 Base map elements

Panoramas and block diagrams are based on the DHM25 (Switzerland) and MONA (neighbouring countries) DEM. Base map elements such as satellite images, lakes (hydrology), forest (vegetation), settlements and even glaciers can be draped over the DEMs. These overlays can be switched on and off and combined in any manner. In addition, a transparency slider allows the user to manipulate the visual impact of each layer (figure 4).

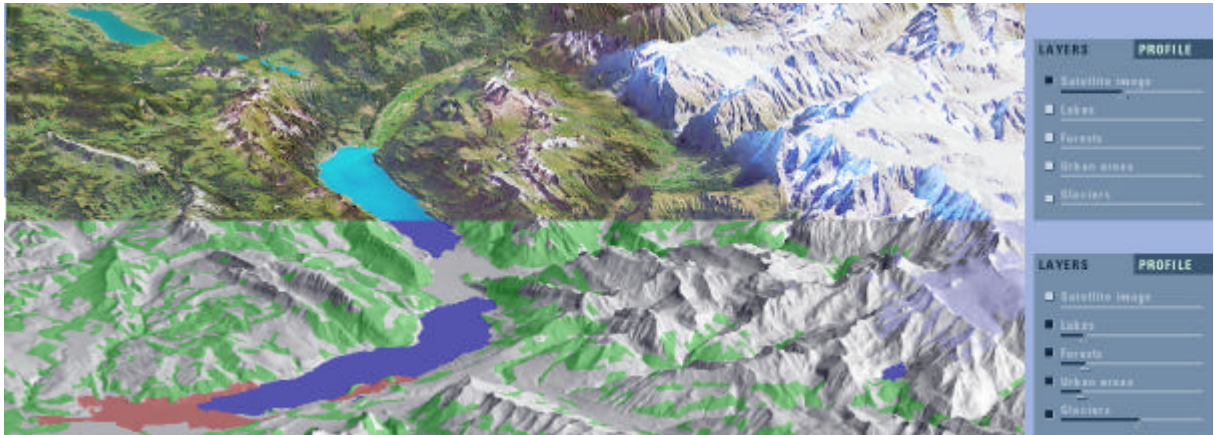


Figure 4: Map layers can be superimposed on the terrain singly or a few at a time. Satellite image (above), as well as lakes, forests, urban areas and glaciers combined (below).

### 3.3 Analysis and visualisation tools

Panoramas or block diagrams can be individually coloured for a visual analysis by assigning topic classes, other colours or a gradient. Classes can be added or deleted, and class boundaries can be shifted. By means of a precise visualisation, the user may be able to identify correlations and dependencies in the terrain model. For instance, these tools can help analyse potential danger zones based on information provided by slope, aspect, fog, distances, elevation or sunshine duration. Such “analysis-tools” have predefined colours, however they may be changed by the user and the settings can be saved. This also applies for more than 40 map topics for the atmosphere, lithosphere, hydrosphere and biosphere.

Profiles are also valuable for analysis: The Atlas of Switzerland 2.0 allows routes to be drawn into the terrain. The defined routes can be edited and saved. The user can adjust the vertical exaggeration of the profile. The simultaneous presentation of a topic can help to interpret additional information from the profile (figure 5).

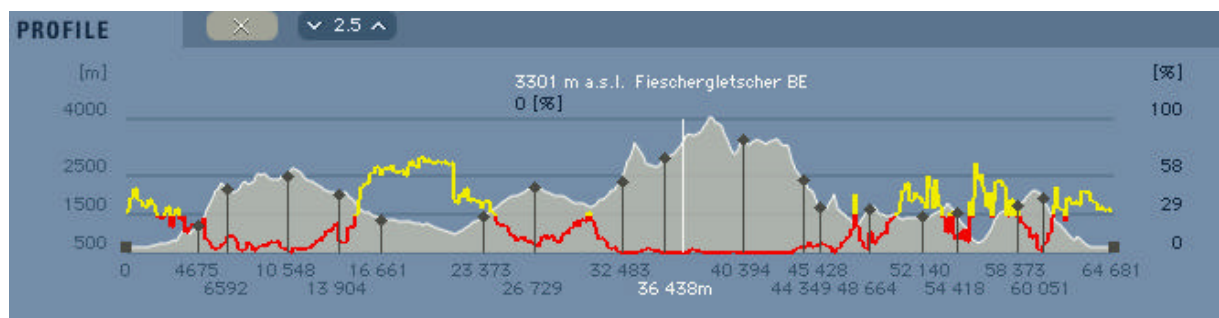


Figure 5: Profile combined with a peacock butterfly distribution, exaggeration 2.5x

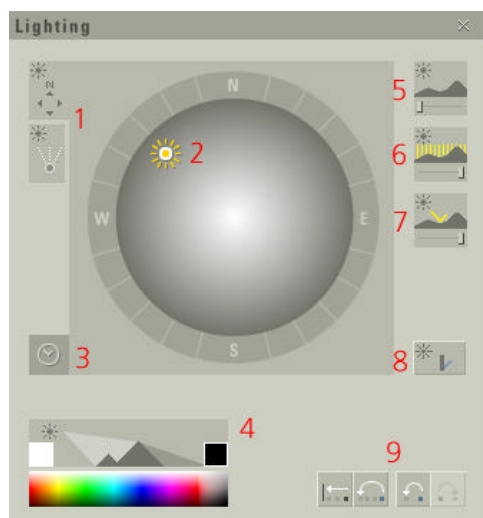
### 3.4 Photorealistic terrain representation

Apart from the satellite photos as an overlay, the effect tools “Fog” and “Background” are also useful for a photorealistic terrain representation of elevation models (figure 6). With the fog tool, – fog being a common weather phenomenon in the “Schweizer Mittelland” and areas near water in autumn – special properties can be set, such as layer boundaries, layer thickness and the colouring of the fog. As a result, scenarios such as a fog bank or a flood can be simulated. The haziness of the atmosphere and the resulting visibility can be set by using the background tool. It is also possible to define the colours and gradient of the sky. With the hypsography tool vegetation classes can be distinguished by colour and used in combination with base map elements such as forest and glaciers.



Figure 6: Test result of a photorealistic visualisation in the Atlas of Switzerland 2.0

The illumination can be controlled by specifying the position, date and time. Additionally, the contrast, as well as the brightness of the hillshading, can be increased or decreased. The cast shadow can be switched on or off (figure 7).



- 1 The “sun” is placed in relation to the points of North, East, South and West or in relation to the camera
- 2 Light source
- 3 Opens a panel in which the date and time of illumination of the terrain and of the shadow cast can be selected
- 4 Colour control for light and shadows
- 5 Brightness
- 6 Contrast
- 7 Colour reduction
- 8 Turns on / off shade cast on the terrain forms
- 9 Default, Reset, Back and Forward Button

Figure 7: Lighting tool

### 3.5 Non-realistic visualisation

Through colour manipulation, aesthetically appealing effects can be achieved. Such tools enable the user to produce landscapes drawn with watercolour, pop art, abstract or even sketch-like painting schemes.

The following illustrations try to simulate artistic drawings by using the Atlas of Switzerland 2.0 (figures 8-13).



Figure 8: Bernese Alps in a sketch-like painting

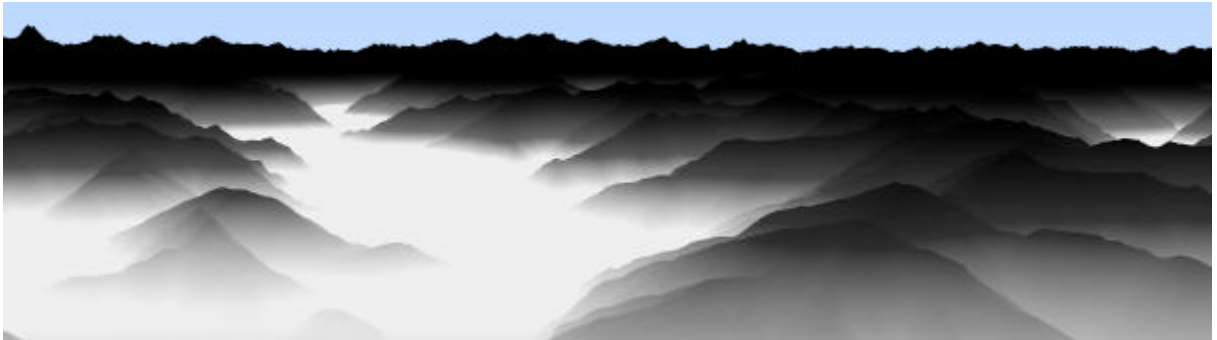


Figure 9: Fog with alpine silhouette



Figure 11: Early morning mist



Figure 12: Alpenglow

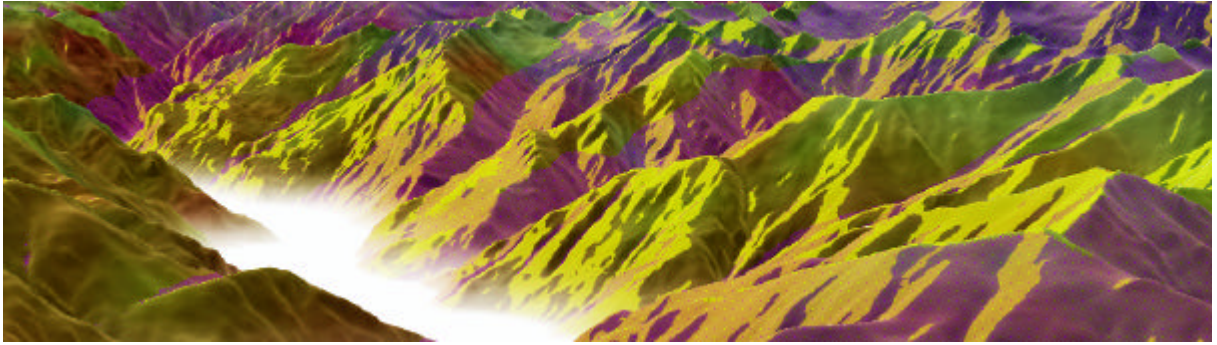


Figure 13: Shadow combined with slope and aspect, the number of colours was reduced

### **Literature:**

Huber, Stefan and Christoph Schmid (2003): 2<sup>nd</sup> Atlas of Switzerland: Interactive Concepts, Functionality and Techniques. Proceedings of the 21<sup>st</sup> International Cartographic Conference, Durban, South Africa, 2003, 1398–1405

Huber, Stefan and René Sieber (2001): From Flatland to Spaceland, Concepts for Interactive 3D Navigation in High Standard Atlases. Proceedings of the 20<sup>th</sup> International Cartographic Conference, Beijing, China, 2001, Volume 2 841–850