

Mountain Maps in the New 2017 Edition Swiss World Atlas

Concept, Content, and Added Value

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Abstract. The new edition of the printed Swiss World Atlas was published in June 2017. This school atlas is the most used atlas in Swiss secondary schools (grades 7 – 13). Since the last edition in 2010, the atlas was completely restructured, revised, and updated with a contemporary design. Map formats are now standardised and the layout is more appealing. The atlas content has been supplemented with new sections, including a comprehensive introductory chapter that covers topics such as geo information, map projections, map types and structure, and map use competencies. Maps and thematic topics are listed in a clearly structured table of contents. In addition, extensive geographic name and subject indices make for easy atlas navigation. The 256-page book is completed by a fold-out general key and an attractive overview of countries showcasing their national flags. Among the 430 maps and illustrations in the new Swiss World Atlas, there are numerous new and revised mountain maps. This paper focuses on four newly designed mountain maps to illustrate the diversity of this map type and their content, concept and special characteristics. The map examples include the Bernina Mountains (Switzerland), Mount Kilimanjaro (Kenia/Tanzania), the Hawaiian Archipelago (USA), and Mount Everest (Nepal/China). Besides topography, the following thematic aspects are highlighted: touristic activities, climatic factors, vegetation aspects, socio-cultural or economic structures, temporal development of human actions and their impacts. Finally, the added value of these thematic combinations for teaching purposes is discussed.

Keywords: *mountain map, school atlas, geo information, secondary school level*

1 Introduction

1.1 The New Edition 2017 of the Swiss World Atlas

Since 1910, the Swiss World Atlas is the most used printed atlas in Swiss schools at the secondary school level (7th through 13th grade) (Swiss World Atlas 2017). It has been published in accordance with the geographic education needs set by the Swiss Conference of Cantonal

Ministers of Education (EDK). The other participating institutions are the Institute of Cartography and Geoinformation at ETH Zurich for the editorial work, and the Lehrmittelverlag Zurich for the marketing and distribution.

The new Swiss World Atlas was published in June 2017 (Fig. 1). It provides a map collection dealing with different kinds of physical-geographic features and social-economic phenomena for Switzerland and Europe, other countries, continents, large regions, and the



Figure 1: The new edition 2017 of the Swiss World Atlas, published in the three official Swiss national languages German, French, and Italian.

world. Based on an exemplary approach, over 430 maps and illustrations of different geographic extent, scale, and thematic content are available in the atlas. The new edition of the atlas is available in the three official Swiss national languages German, French and Italian.

1.2 Concept and Changes

The conceptualization of the new Swiss World Atlas 2017 was partially constrained by the previous edition in 2010. These constraints dictated the number of pages, the paper format and, at a technical level, reliance on the same printing process with six special atlas colours.

In many other respects, the 2017 edition has been completely redesigned, restructured, and updated.

For the didactic concept, the new curriculum for secondary schools and the framework curriculum of the Swiss Conference of Cantonal Ministers of Education (EDK) for elementary schools had to be considered (EDK 2018). The skills-oriented approach for these curricula is explicitly apparent in the new introductory chapter (see below).

The Swiss World Atlas has been updated with a new contemporary design. For example, the general layout has been made more appealing by using a new colour scheme in red, white, brown and grey. In addition, significantly more white space was included in the page margins and between maps or paragraphs. The new design of the front cover with a red globe on a white background is certainly the most recognisable element of this 'face-lifting'.

The 256-page book exhibits a modified atlas structure, a revised map sequence, and new atlas parts. It has been supplemented with a clearer table of contents page and topic list, as well as more comprehensive name and subject indices. New features include navigation aids, such as globes with overlaid map frames and side tabs, a fold-out general key, and a country overview (organised by continent and illustrated with national flags).

The completely new introduction is a highlight of the newly added content (Fig. 2). Taking up 14 pages, it explains the principles of spatial geo-information or cartography, and encourages a skills-oriented approach to working with maps. Specific topics covered in

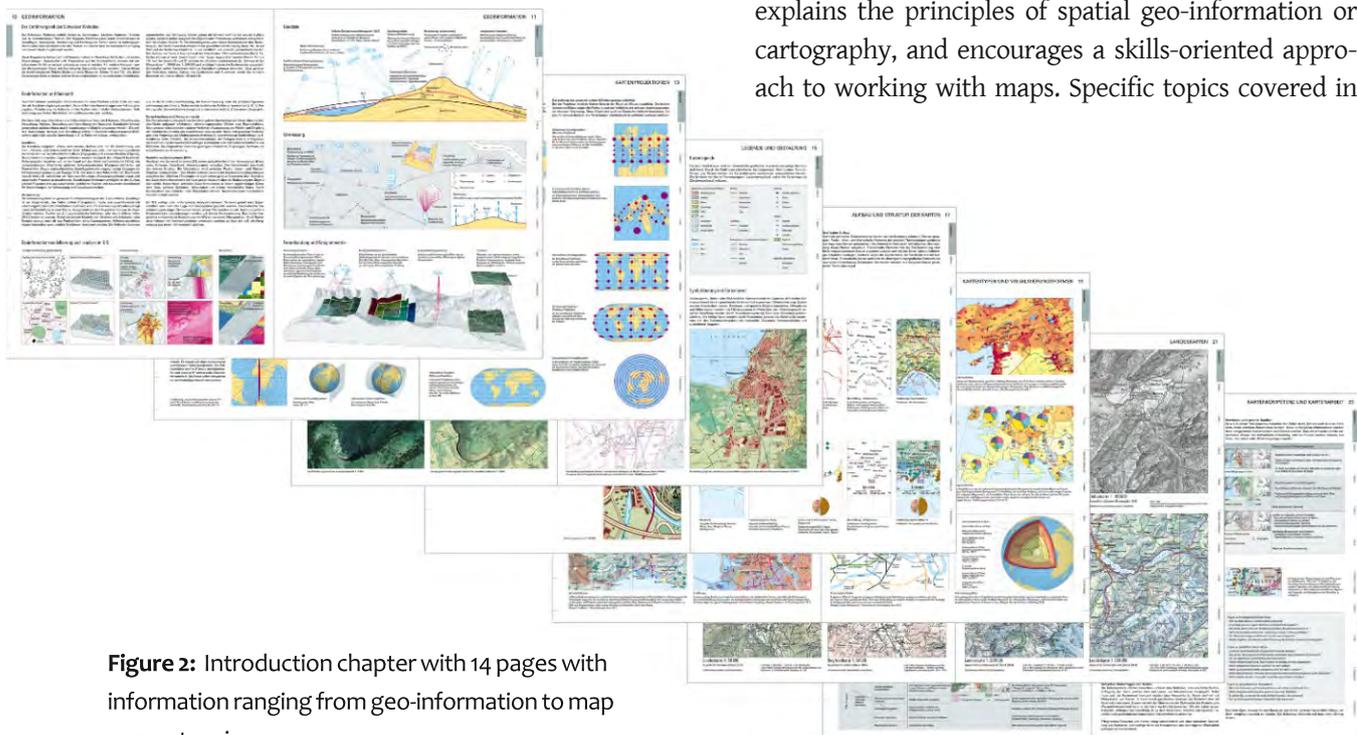


Figure 2: Introduction chapter with 14 pages with information ranging from geo-information to map competencies.

this chapter include geo-information, map projection, map key, map design, map scale, map generalization, map structure and content, map types and cartographic representations, the Swiss national map series, and map competencies and handling.

The maps in the Swiss World Atlas 2017 have also been updated, supplemented, and graphically revised. The atlas offers a global picture of our planet, featuring over 430 maps and images. The atlas also allows readers to make connections between different topics. Uniformly designed overview maps displaying the topography, political structure, and economic status of countries, major regions, and continents allow users to easily compare different geographical areas. This comprehensive overall view of the world is complemented by thematic maps on climate, geology, and population density.

Furthermore, the new atlas features many more maps addressing specific topics such as environment, resources, transportation, energy, natural hazards, and conflicts. Some of the atlas' traditional relief maps have been supplemented with high-resolution satellite images of distinctive landscapes. New descriptive infographics, profiles, and perspective views have also been included to illustrate complex geographical issues.

The atlas also introduces new map design standards: The minimum map size is now a quarter page, and the map scales for the different map types are unified (both with a few exceptions). Additionally, the font Univers Next Pro is the standard map and atlas font.

More generally, a new technical workflow for the atlas was developed and standardised. This workflow begins with the introduction of GIS-based data handling for base map data, followed by semi-automated processes for data extraction (for indices and listings), standardised map and page design, and processing with graphic and layout software.

2 Mountain Maps in the Swiss World Atlas

2.1 General Characteristics of Mountain Maps

We define a mountain map as a cartographic representation that depicts and emphasises topographic features and any kind of thematic features specific to mountainous areas (Haeberling 2015). Thus, mountain maps show the diverse land forms (e.g. mountain ridges and valleys, slopes and cliffs, peaks, and saddles) as well as the typical land cover (e.g. lakes, forests, meadows and

pastures, glaciers, rocky and scree areas) in a mostly rocky or hilly landscape. Additionally, a diversity of natural objects (e.g. rivers, waterfalls, springs, caves, isolated trees, or rocks) or man-made features (e.g. settlements or single houses, roads and railroads, transport lifts and cables, dams) can be represented. Such content is often available in official national maps depicting a mountainous region. However, most mountain maps are thematic maps that combine a topographic base map with other topics such as tourism, transportation, economy, vegetation, or climate. Unlimited thematic combinations are possible, as is also the case for school atlases.

2.2 Mountain Maps for Teaching Purposes

With a mountain map, students can learn to interpret relationships between terrain and geographic features (e.g. geology, vegetation types, precipitation) or processes (e.g. avalanches, rock falls, transitional grazing, and precipitation). Therefore, mountain maps with their terrain depiction in the form of hill shading, contour lines, elevation points, or hypsometric tinting are best suited to teach students map reading and how to geographically interpret the terrain. This will help teachers explain natural or anthropogenic developments and demonstrate their impacts on the regional or global biosphere or atmosphere to the students. Maps of glacier retreat as a result of climate change are a notable example of such relationships.

2.3 Mountain Maps in the Swiss World Atlas

The 2017 edition of the Swiss World Atlas contains more than 20 mountain maps, ranging from large scale (1: 50,000) to small scale (1: 3,500,000). They depict the distinctive topography of selected regions all over the world, combined with specific natural, socio-cultural, or economical topics.

Students working with these mountain maps should learn to localise and analyse selected geographic topics contained within the topography. They could also be instructed to locate and compare the presented area within other maps in the atlas.

From a technical point of view, the base data (vector or raster data) for the mountain maps were derived from different data sources, mainly from Swisstopo (2018), Natural Earth (2018), USGS (2018), and OpenStreetMap (2018). These data were pre-processed and

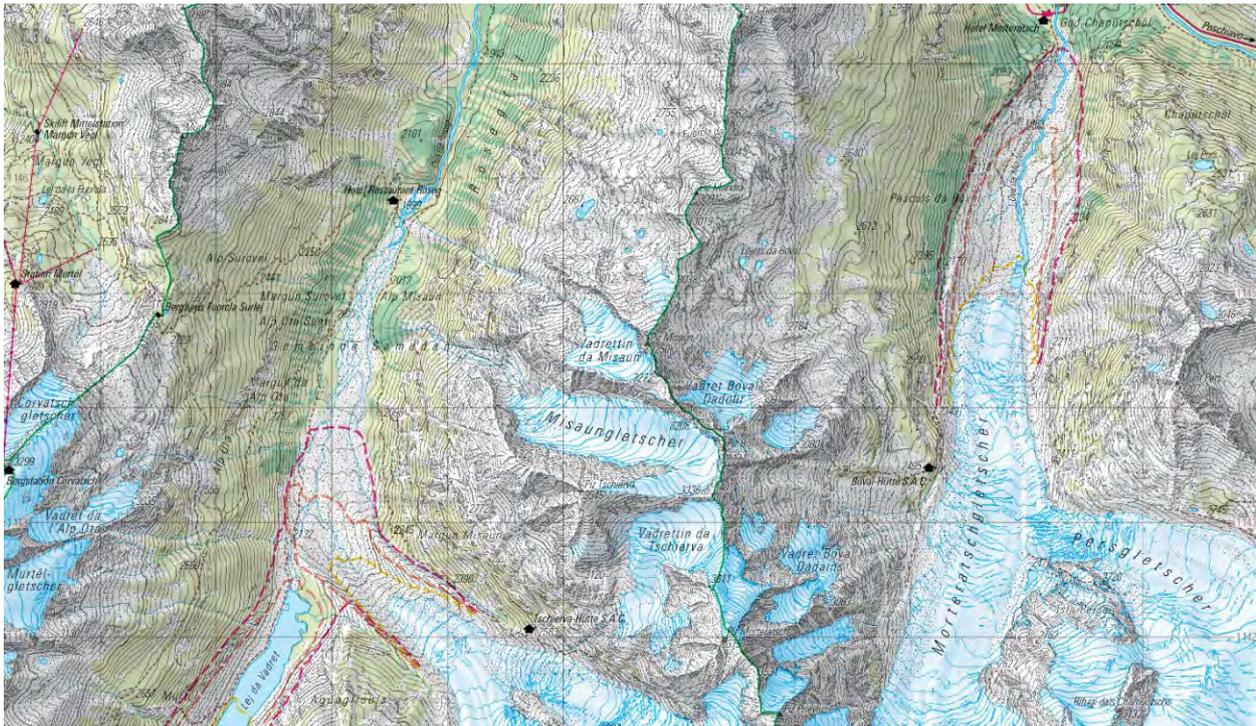


Figure 3: Reduced section of the map 'Bernina Mountains' (Swiss World Atlas 2017, p. 31).

generalised with ArcGIS 3D Analyst (Esri 2018) for generating contour lines, and with Blender (2018) and Adobe Photoshop (2018) for the hill shading. These data were then integrated and graphically designed within a standardised map file template using Adobe Illustrator (2018).

2.4 Map Examples

The following four examples of mountain maps in the Swiss World Atlas demonstrate the diversity of regions, thematic contents, didactic purposes and cartographic specifics discussed above.

2.4.1 Map Example 'Bernina Mountains'

The new mountain map of the Bernina Mountains (Switzerland) has been designed for a full page and at a scale of 1:50,000 (Fig. 3). It replaces two small maps (1/6 page each) in the 2010 edition.

Besides the total topographic situation and land cover, the new map prominently shows the retreat of all glaciers within the map extent from 1850 until 2008. Additional information on touristic infrastructure (e.g. railway station, campground, restaurants and mountain cabins) is shown that may be of interest for Swiss school classes that are planning a field trip to witness the

glacier retreat along the highly popular 'Morteratsch Glacier' theme trail.

Special cartographic characteristics of this map include the grey cliff drawings and the blue glacier crevasses, both extracted from the Swiss Map Raster 50 (Swisstopo 2018), the rasterised Swiss national map LK50. A remarkable feature of this map is the bi-coloured shaded relief for the glaciated area (blue) and the non-glaciated area (grey), which was derived from the single-coloured, manually drawn shaded relief of the Swiss national map LK50 (Fig. 4).

2.4.2 Map Example 'Mount Kilimanjaro'

The small (1/6 page) mountain map of Mount Kilimanjaro (Tanzania/Kenya) in the 2010 atlas edition has been updated and enlarged to 1/4 page at a scale of 1:1,000,000 (Fig. 5). The map shows not only the popular hiking routes and touristic infrastructure, but also the agricultural land use, mineral resources and national parks of this African region. The map is supplemented with two climatic diagrams for the north and the south slopes of this volcanic massif, allowing students to recognise relationships between economic and touristic development and different climatic conditions. A cartographic highlight of this map is the analytical hill shading.

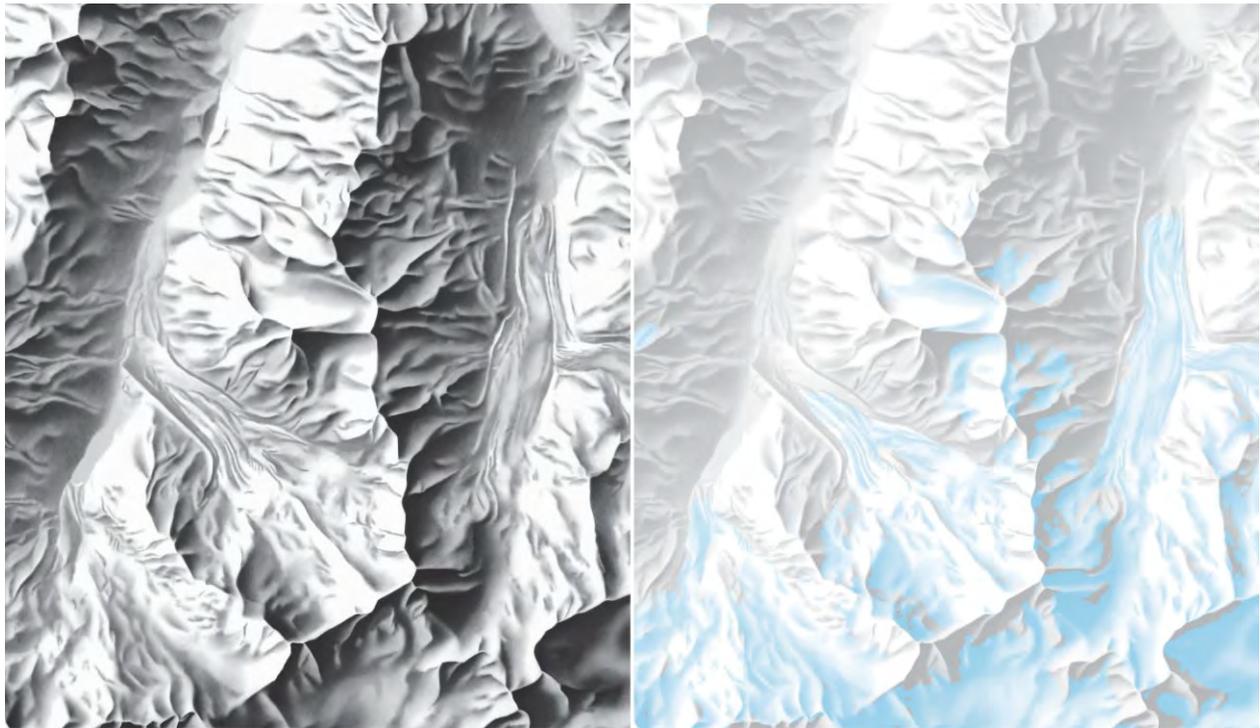


Figure 4: Hill shadings for the map 'Bernina Mountains': Original relief (left; Swisstopo 2018) and the bicoloured shaded relief (right) with glaciated area (light blue) and non-glaciated area (grey; Swiss World Atlas 2017).

2.4.3 Map Example 'Hawaiian Islands'

The 2010 atlas edition contained a small map (1/6 page, 1:10,000,000) of the Hawaiian Islands (USA), whereas the updated map in the 2017 edition fills half of a page at a scale of 1:35,000,000 (Fig. 6). The Hawaiian Islands showcase impressive topography from more than 5000 m below sea level to the 4207 m summit of Mauna Kea, the highest volcano in the archipelago. Thus, it is an ideal topographic situation to show the below- and above-sea relief with a detailed, newly-generated hill shading across the entire Hawaiian Island chain. A small-scale inset map provides information about the shift of the Hawaiian-Emperor chain and the movement of the Pacific tectonic plate. The map thus allows students to reconstruct the genesis of the different islands of Hawaiian chain, taking into account the age of each island that is shown below its name. A larger-scale map of Kilauea printed on the same atlas page illustrates volcanic activities and agricultural land use, and nine climate diagrams describe the climatic conditions around the islands. The 'Hawaiian Islands' map will help students interpret the broader context of Pacific island chains and their volcanic origins.

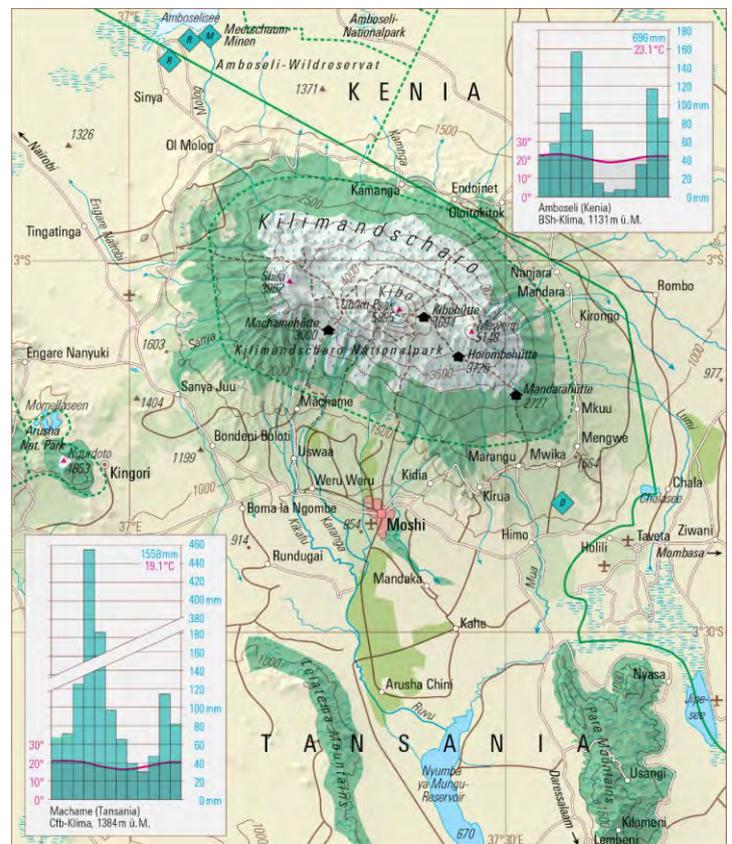


Figure 5: Map 'Mount Kilimanjaro' (Swiss World Atlas 2017, p. 119).

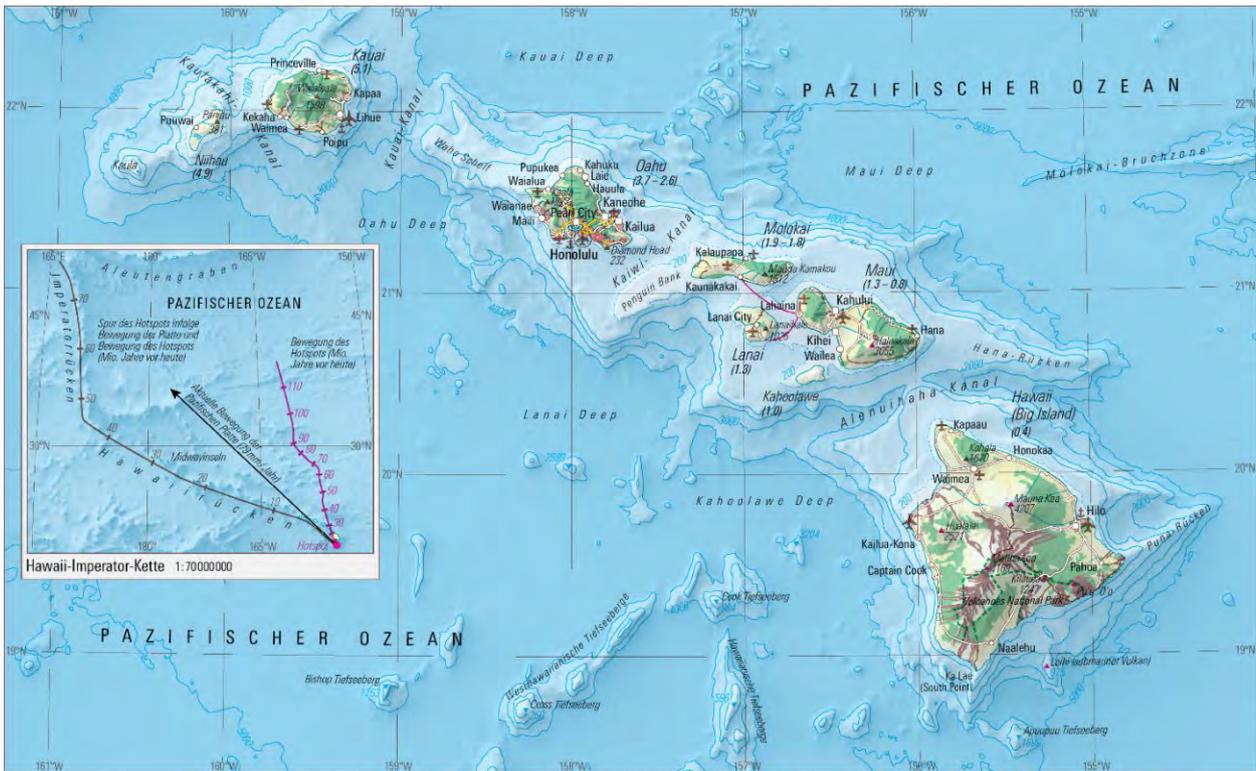


Figure 6: Reduced map 'Hawaiian Islands' (Swiss World Atlas 2017, p. 166).

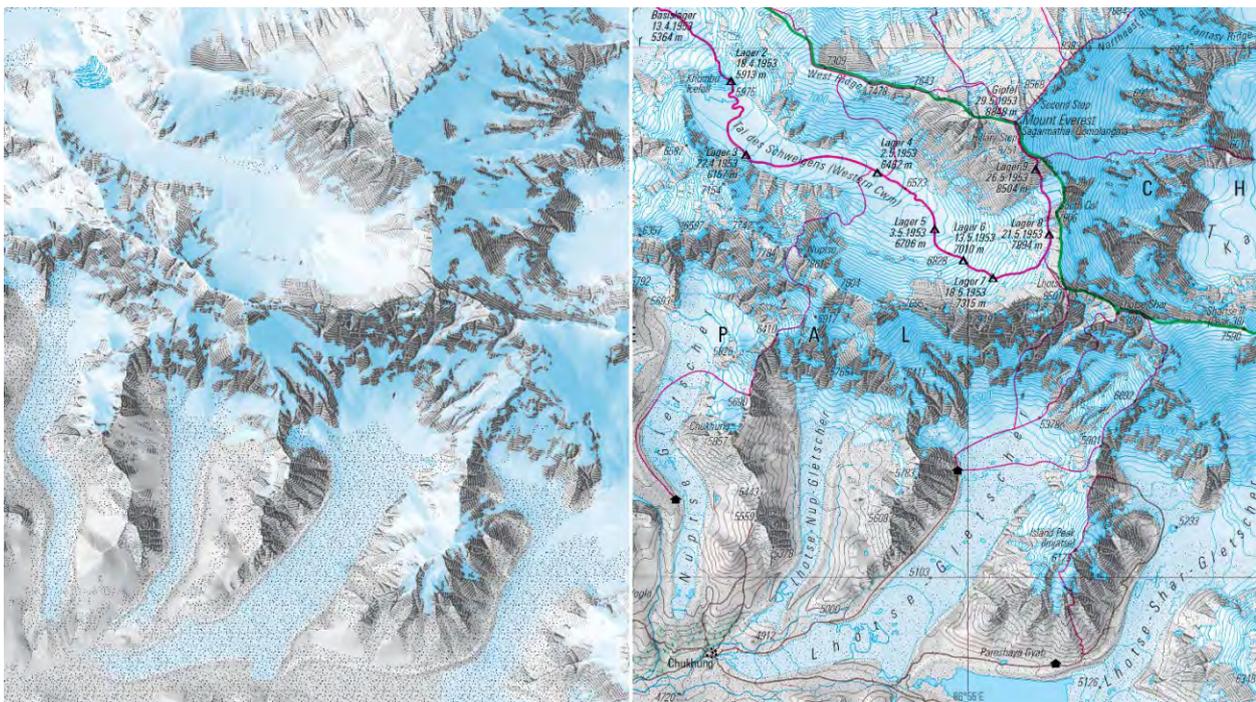


Figure 7: Reduced sections of the map 'Mount Everest'; with cliff drawings, scree symbolisation and the bicoloured hill shading (left), and the final map (right) (Swiss World Atlas 2017, p. 144).

2.4.4 Map Example 'Mount Everest'

A mountain map of Mount Everest (Nepal/China) with its environment has been an indispensable part of the Swiss World Atlas for decades. For the 2017 edition, the

map has been completely revised and expanded from 1/6 page at 1:200,000 to 1/2 page at 1:100,000. The new map shows the high-alpine topographic environment in more detail (Fig. 7). Also shown are the different expedition routes (which are often mentioned in news

reports), camps, and other touristic infrastructure. The map will thus allow teachers and students to discuss and recognise the problems that high touristic pressure may inflict on a very remote region.

Cartographic items of interest on this map include the automatically-generated cliff drawings and scree symbolisation in the Swiss style, developed by R. Geisthövel in his PhD thesis (2017). Another attractive cartographic design element is bi-coloured hill shading for the glaciated area (blue) and the non-glaciated area (grey), similar to the 'Bernina Mountains' map example.

3 Conclusions and Future Directions

The new 2017 edition of the printed Swiss World Atlas contains many thematic mountain maps. Some have been revised from the previous 2010 edition, others are completely new. With the diversity of depicted regions and topics, the atlas offers a set of useful and informative mountain maps for teachers and students in Swiss schools to acquire geographic knowledge and develop map interpretation skills.

Future evaluations will assess to what degree the editorial team met the intended goals for didactic and teaching purposes. So far, since the publication of the new atlas in summer 2017, our dedicated user groups have not yet provided much feedback specifically about the mountain maps. More statements from teachers about the usability and quality of the mountain maps needs to be collected. Alternatively, our evaluation methods could also include observing or testing students' map reading or geographic problem solving skills.

Since its first edition in 1910, the Swiss World Atlas has been continuously updated and revised. In this tradition, work on the next edition has already started, including some revisions of mountain maps. These changes will not only include corrections of errors in labels or numbers, but also thematic data updates and cartographic refinements (e.g. label placement).

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