

Report 2003–2007 of the ICA Commission on Mountain Cartography to the ICA General Assembly

0. Introduction, history

During the German-speaking Cartographic Congress in Interlaken/Switzerland in 1996, the Commission on High Mountain Cartography of the German Society of Cartography with representatives of the three German-speaking alpine countries was founded. In February 1998, the Commission organised a first workshop in the Silvretta area in Austria with 35 participants from 7 countries which demonstrated the breadth and necessity of this research area. Based on these precursor activities, the General Assembly of ICA at the ICC 1999 in Ottawa approved the ICA Commission on Mountain Cartography. Today, the activities of the two commissions are overlapping to a large extent.

1. Chair / Co-chair

Prof. Dr. **Lorenz Hurni** (Chair), Swiss Federal Institute of Technology (ETH) Zurich, Switzerland
Assistant Prof. Dr. **Karel Kriz** (Co-chair), University of Vienna, Austria

2. Members

Regular members

Manfred Buchroithner, Germany
Tom Patterson, USA
Maria Pla Toldrà, Catalonia, Spain

Corresponding members

Igor Drecki, New Zealand
Georg Gartner, Austria
Martin Gurtner, Switzerland
Shuji Iwata, Japan
Kristoffer J. Kristiansen, Norway
Dusan Petrovic, Slovenia
Waldemar Rudnicki, Poland
Theodor Wintges, Germany
Michael Wood, Scotland, UK (ICA Executive Committee)

3. Terms of reference 2003–2007

To further define the topics of Mountain Cartography and to promote the methods and knowledge of mountain cartography among scientists and professionals in cartography and related fields

by providing

- an updated, attractive web-site with information about Commission activities, links to other events and theme-specific knowledge
- an updated web-based compendium with links to related web-sites and bibliographic information

by continuing the well-established workshop series and by promoting publication activities (proceedings, web-proceedings, journal articles and special issues) and common research activities.

4. Business meetings

15. August 2003, Durban, SA
15 July 2005, A Coruña, Galicia/ES
31 March, 2006, Bohinj, Slovenia

Minutes are published at: <http://www.mountaincartography.org/cmc-meetings/meetings.html>

5. Workshops

5.1 4th ICA Mountain Cartography Workshop at Vall de Núria, Catalonia, Spain, 30th September – 2nd October 2004 (

by Karel Kriz, University of Vienna

The International Cartographic Association Commission on Mountain Cartography held its 4th Mountain Cartography Workshop in Spain in the region of Vall de Núria in the Catalan Pyrenees. This location is situated in the North of Catalonia, Spain, at 2.000 meters altitude and is surrounded by mountains that reach nearly 3.000 meters. The valley can only be reached by a silent cog railway and has a wealth of history and tradition, documented since 1087. It was a perfect meeting place to discuss and confer about current issues within the field of mountain cartography.

This workshop that is held biannually within the activities of the commission covered many topics related to mountain cartography such as avalanche and glacier mapping, relief presentation, tourist mapping, data capture, photogrammetry, remote sensing, geo-visualisation and multimedia. All in all there were 40 participants from Austria, Canada, France, Germany, Poland, Romania, Slovenia, Spain, Switzerland and the USA who spent three very interesting and fruitful days together.

The workshop was sponsored and perfectly organised by the ICC (Institut Cartogràfic de Catalunya) – special thanks go to Maria Pla and Blanca Baella - and covered the following six topics.

- Risk and natural hazard mapping, snow avalanches
- Cartography of glacial phenomena
- Visualisation, rendering, animation
- Alpine cartography, cave mapping, mountain tourist mapping
- Topographic mountain cartography: relief representation, hillshading, cliff drawing, remote sensing

Within the session “Risk and natural hazard mapping, snow avalanches” six papers were presented. Three of them dealt with snow avalanches in the areas of the Tyrolean Alps and Catalan Pyrenees. A further paper discussed a geo-spatial system for data management, modelling, visualisation, and analysis within an alpine valley that displayed the use of a Hazard Tool environment. One paper introduced an interesting approach to understand the dynamics of an avalanche path in the Pyrenees using tree damage and tree-ring information and explained the utilisation of environmental issue to understand avalanche hazards. The last presentation in this session dealt with LIDAR applications to rock fall hazard assessment in the Pyrenees (Vall de Núria) and examined two examples of possible applications related with the detection of potential instabilities areas and rock fall hazard assessment.

The session on “Cartography of glacial phenomena” included four presentations that primarily considered issues on rock glaciers. Three papers had their focus in the Austrian Alps using photogrammetric methods to explain the retreat of a small debris-covered cirque glacier, the change detection of a mountain slope and a report for the years 1995-2004. The final paper introduced geomatic techniques applied to the cartography of rock glaciers in the Sierra Nevada and the Pyrenees.

The third main topic on “Visualisation, rendering, animation” included six very scientifically profound as well as visually appealing presentations. All contributions focused on special 3D methods and their utilisation for cartographic communication. Two demonstrations dealt with the basics of 3D visualisation concentrating on design and graphic variables as well as new approaches for mountain maps. One presentation introduced a very interesting application using True 3D methods by means of Lenticular Foil Technology. The concluding three papers all presented applied implementations of 3D visualisation methods in mountainous areas around the world – Olympic National Park (USA), Catalan Pyrenees (Spain) and Julian Alps (Slovenia).

The session on “Alpine cartography, cave mapping, mountain tourist mapping” comprised four presentations mainly focusing on different ways of communicating “mountain mapping”. One contribution introduced a concept of a new tourist map in the Tibles Mountains, Romania of a region that has not yet been intensively covered from a cartographic perspective for public purpose. Another presentation discussed an interesting approach on evaluating National Park Service 3D trailhead maps in order to understand whether 3D maps in general can be useful or even better than conventional maps for orientation. The final two papers discussed issues that had some connection to the past. One presentation brought back traditional panorama perspectives from the painter's can-

vas to the digital realm and explained how various approaches are associated to modern methods in cartography. Another contribution described an approach of designing and producing natural-colour shaded relief maps with satellite land cover data based on the pioneer knowledge of Hal Shelton, a retired USGS (US Geological Survey) cartographer.

The following session on “Topographic mountain cartography: relief representation, hillshading, cliff drawing” included six presentations that covered general topics of topographic mountain cartography. One contribution introduced a profound overview of free and low cost datasets for international mountain cartography demonstrating that a variety of data is available; however usability is in some cases restricted for quality use within topographic mountain cartography. Two presentations dealt with special mountain-related issues within the new version of the Atlas of Switzerland, describing the versatility and high quality of this outstanding product. The final three papers all showed examples of topographic mountain maps of different regions of the world – Cartography in the Andes: a new version of the topographic database and map of the Argentinean Republic at 1:100.000, Cordillera Real Bolivia by aero-photogrammetric restitution and “Nevado Ojos del Salado” - a new type of “Alpenverein” map generated for the world’s highest volcano.

The final session on “Topographic mountain cartography: relief representation, hillshading, remote sensing” that consisted of six papers, described a heterogeneous variety of issues concerning relief representation within topographic mountain cartography. One paper illustrated the use of hillshading in Canadian mountain cartography, explaining the past as well as the some what unsatisfactory current situation. Another contribution went into detail on field checking as a vital part of mountain mapping, elaborating on interesting details during the process of data acquisition. Two papers introduced ways of representing terrain using direction of slope and lighting as well as using height points for generalisation in trail maps. The final two presentations characterised the utilisation of aerial photographs as a useful tool for constructing maps of mountain areas as well as using mountain shadow profiles for geo-referencing historical documents.

All papers are published in the publication series of ICC. They can also be accessed at:
http://www.mountaincartography.org/cmc-publications/papers_nuria_04/index.html



Participants of the Núria workshop 2004.

5.2 5th ICA Mountain Cartography Workshop at Bohinj, Slovenia, 29th March – 1st April, 2006

By Dr. Dušan Petrovič, University of Ljubljana

The 5th Workshop of International Cartographic Association, Commission on Mountain Cartography took place in Slovenia this spring. Previous mountain cartography workshops took place in the Austrian Alps (Silvretta 1988, Rudolfshütte 2000), North America’s Cascade Range (Mount Hood 2002) and the Catalan Pyrenees (Val de Nuria 2004). This year the mountain cartographers returned again to the Alps, but this time to the southern

limestone region. The workshop venue was “Gozdna šola” (forest school), which is the National Training Centre of the Scout Association of Slovenia. The centre is located near Lake Bohinj, 533 m above sea level, in Triglav National Park, a protected area of forests and mountains, including Triglav (2.864 m), the highest peak in Slovenia and the Slovenian national symbol.

The workshop was organized by the Section for Cartography, Association of Surveyors of Slovenia. Other contributors included The Faculty of Civil and Geodetic Engineering, University of Ljubljana; Surveying and Mapping Authority, Republic of Slovenia; Geodetic Institute of Slovenia; Local Tourist Organization Bohinj; Slovenia’s Government Public Relations and Media Office; Triglav National Park Authority; and, the Scout Association of Slovenia.

Fifty people attended the workshop, making it the largest mountain cartography gathering to date. Attendees came from Austria, Croatia, Germany, Poland, Slovenia, Switzerland and the USA. Staying at a small facility in the mountains for three days fostered professional interaction among the group. It was a requirement that almost everyone give a presentation. The presentations covered a range of research and production topics relating to the broad theme of mountain cartography. Specific topics included topographic mapping, relief representation, hill-shading, cliff drawing, cartography of glacial phenomena, risk and natural hazard mapping, snow avalanches and landslide hazards, geomorphological mapping, mountain tourist mapping, remote sensing applications, data models, data integration, digital elevation models, data capture, classification and representation, cartography and GIS tools applied to mountain data, visualization, rendering, animation, multimedia and Internet applications, LBS services.

The workshop started on the evening of Wednesday, March 29th with welcoming presentations by the local organizer, Dušan Petrovič and the Commission president, Lorenz Hurni. Next on the agenda was a keynote presentation by Msc. Martin Šolar, head of management and planning for the Triglav National Park Authority. Martin Šolar gave a slide show and discussed projects underway in the park and environmental and management problems that the park is facing.

On Thursday, participants gave 18 presentations in three sessions. The first session started off with presentations on mountain maps of North America. Tom Patterson, Andreas Neumann and Martin Gamache presented papers on developing a new visitor map of Glacier Bay National Park, Alaska; an interactive hiking map of Yosemite National Park; and the mountain cartography work by the Alpine Mapping Guild, respectively. Following this, Christian Häberling discussed conceptual aspects of 3D map integration in interactive school atlases. Bernhard Jenny spoke about the design of a panorama map with parallel and spherical projection. Brane Padjen and Damijan Jerič discussed how they made panoramic maps of Slovenia. Martin Gurtner concluded the session with a historical overview about compiling information on Swiss national topographic maps, from traditional field sheets to recent digital workflows.

The second session combined presentations on glacier mapping and remote sensing. Manfred Buchroithner presented on the development of three new types of glacier dynamic maps. Viktor Kaufmann and Richard Ladstädter described the monitoring of the Doesen rock glacier (Ankogel group, Austria) from 1995-2005. Mihaela Triglav Čekada explained photogrammetrical monitoring of the disappearing Triglav glacier in Slovenia. Wolfgang Sulzer discussed the challenges of mapping Mt. Aconcagua in the Andes with remote sensing techniques. The last presenter, Jacek Drachal, analyzed the appearance of mountain chains on satellite images provided by Google EARTH.

Session three, on GPS terrain applications / Risk and natural hazard mapping, consisted of six presentations. Gašper Mahnič showed a special GPS based device that enables users to locate points in the mountains and helps to interpret views. Krištof Oštir described the application of satellite remote sensing in natural hazard management relating to the Mount Mangart landslide. Michaela Kinberger discussed the importance of geo-communications and daily avalanche awareness. Vladimir Prebilič and Uroš Svete examined the problems and challenges for Mountain Rescue Service (GRS) in Slovenia. Miha Pavšek spoke about avalanche cadastre for the Slovenian Alps and its meaning for avalanche prevention. The sixth and final presentation by Stefan Räber discussed the manual renovation of a 3D relief model of the Valis Alps made decades ago by Eduard Imhof. Toni Mair of Switzerland did the renovations. Stefan Räber and Bernhard Jenny followed this after dinner that evening with a movie titled “Construction of 3D-reliefs”, which they directed. The movie provided an overview of the 3D relief work of Toni Mair, whose work was on exhibit at the workshop. Meeting Toni Mair and seeing his exceptional work was a great experience for every participant. The representatives of ETH Zürich used this opportunity to thank Toni for renovating the Imhof model.

Friday offered another 15 presentations, divided into three sessions. The first two sessions covered relief presentation and GIS analysis of mountainous areas. Jürg Gilgen showed the new topographic map series of Switzer-

land with a focus on rock, scree and glacier representation on them. David Theler spoke about an integrated GIS application dealing with geomorphological mapping and risk assessment in the western Swiss Alps. Dražen Tutić presented his experiences with analytical relief shading of Mount Medvednica above Zagreb. Methods to create rock drawing analytically were prepared by Tobias Dahinden and also by Simon Premože. Mr. Premože gave a second presentation about the processing of terrain data to preserve features in a DEM. Aileen Buckley and Charlie Frye described a data model for named features of the natural landscape. Michael Heuberger discussed terrain representation for small-scaled maps. Lorenz Hurni gave a presentation on integrated cartographic mountain information systems, which are important for the future presentation of mountain cartographic products. The next paper discussed a new DEM of Slovenia, made from various data sources and featuring enhanced geomorphological details by Tomaž Podobnikar, including a description of Triglav national park historical maps analysis, where Žiga Kokalj joined Tomaž. In the final presentation, Blaž Barborič spoke about coordinate homogenization in Triglav National Park and the problem of cross border data compatibility.

The last session, Visualizations and animations, consisted of three presentations. Katja Londerhausen and Nikolas Prechtel prepared an animated presentation of the Dresden "Altai-GIS". Lojze Miklavčič explained procedures for making a map of Lake Bohinj in natural looking manner. Dušan Petrovič examined the results of a user questionnaire on different types of 3D presentations. The session concluded with a discussion panel on design issues in mountain cartography today, led by Karel Kriz. The panel prompted an active debate. In the evening, Manfred Buchroithner demonstrated an interactive over fly above Gesäuse National Park in Austria. For entertainment afterwards, Dušan Petrovič presented videos that introduced the arduous sport of adventure racing.

On Saturday, the participants pursued different outdoor activities. A dozen participants climbed Mount Rodica (1966 m) and skied down to the valley in excellent snow conditions. Others spent the day alpine skiing at Vogel (the local ski area) and mountain biking. And others went sightseeing, including Savica Waterfall, Mostnica Gorge, the railway station and railroad tunnel at Bohinjska Bistrica, hay-racks in Studor, churches, or taking the cable car to Vogel for a view of Bohinj Lake far below. The workshop wrapped up with a farewell diner featuring Slovenian dishes.

During the workshop, Commission on Mountain Cartography members met to discuss Commission business and announce the next workshop. The 6th workshop of ICA Commission on Mountain Cartography will take place in Lenk, Switzerland, in February 2008.

All papers were published by the University of Ljubljana and by the Section for Cartography, Association of Surveyors of Slovenia. They can also be accessed at:

http://www.mountaincartography.org/cmc-publications/papers_bohinj_06/index.html



Participants of the Bohinj workshop 2006.

5.3 Supported events, conference sessions

8th International Symposium on High Mountain Remote Sensing Cartography, 2004, La Paz, Bolivia

ICC 2005, A Coruña: Two sessions on Mountain Cartography

9th International Symposium on High Mountain Remote Sensing Cartography (HMRSC-IX), September 14–22, 2006, Graz and Hohe Tauern National Park, Austria

ICC 2007, Moscow: Two sessions on Mountain Cartography

6. *Commission publications (proceedings, book chapters, special journal issues, web-sites)*

Patterson, Tom (Ed.), 2002: 2002 ICA Mountain Cartography Workshop. Online-Proceedings.

http://www.mountaincartography.org/mt_hood/proceedings.html

Hurni, Lorenz; Kriz Karel and Heinz Wanner (Eds.), 2003: Themenheft Gebirgskartographie (Special issue Mountain Cartography), Kartographische Nachrichten 5/2003

Hurni, Lorenz; Kriz, Karel; Patterson, Tom and Roger Wheate (Eds.), 2003: Special issue: ICA Commission on Mountain Cartography, Cartographica 1/2 2001. Also published at:

http://www.mountaincartography.org/cmc-publications/cartographica_2001.html

Jenny, Bernhard and Stefan Räber, 2003: <http://www.reliefshading.com>

Buchroithner, Manfred, 2004: Proceedings of the 7th International Symposium on High Mountain Remote sensing Cartography, Bishkek, Kyrgistan, 2002, Dresden University of Technology, Institute for Cartography.

<http://www.kfunigraz.ac.at/geowww/hmrsc/proceedings7.htm>

Buckley, Aileen; Hurni, Lorenz; Kriz, Karel; Patterson, Tom and Jeff Olsenholler, 2004: Cartography and Visualization in Mountain Geomorphology. In: Bishop, M. and J. Shroder (Hrsg.): Geographic Information Science and Mountain Geomorphology. Springer-Praxis.

ftp://ftp.karto.ethz.ch/pub/pub_pdf/2004_Buckley_Hurni_etal_MountainGeomorphology.pdf

Pla, Maria and Blanca Baella (Eds.), 2004: Proceedings of the 4th Mountain Cartography Workshop, Vall de Núria, 30th September – 2nd October 2004. Monografies techniques, 8. Institut Cartographic de Catalunya 338 p. All papers are also published at:

http://www.mountaincartography.org/cmc-publications/papers_nuria_04/index.html

Kaufmann, Viktor and Wolfgang Sulzer, 2006: Proceedings of the 8th International Symposium on High Mountain Remote Sensing Cartography. Grazer Schriften der Geographie und Raumforschung, 41. Institute for Geography and Regional Science, Karl Franzens University Graz. 110 p. All papers are also published at:

<http://www.kfunigraz.ac.at/geowww/hmrsc/proceedings8.htm>

Sutter, Felix; Räber, Stefan and Bernhard Jenny, 2006: <http://www.terrainmodels.com/>

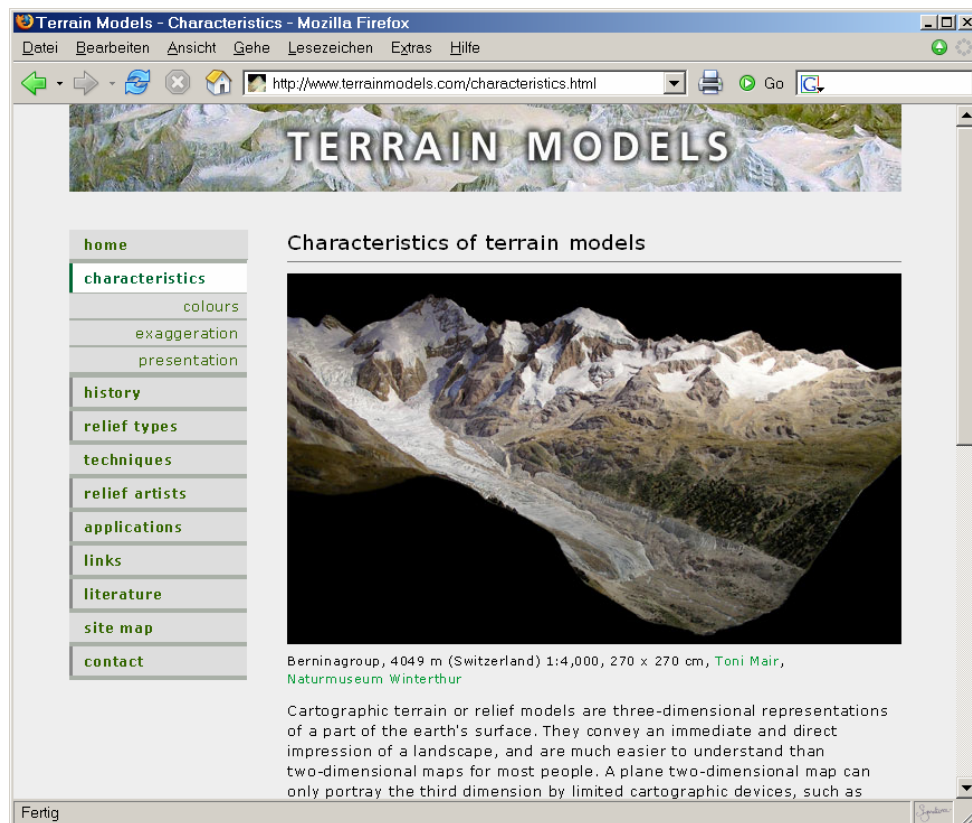
ICC 2005: Proceedings of the 22nd International Cartographic Conference A Coruña, Sessions on Mountain Cartography: 6 papers (CD-ROM). All papers are also published at: http://www.mountaincartography.org/cmc-publications/2005_ica_coruna.html

Petrovič, Dušan (Ed.), 2007: Proceedings of the 5th Mountain Cartography Workshop, Bohinj, Slovenia, 29 March – 1 April 2006. Published by the Association of Surveyors of Slovenia, Section for Cartography and the University of Ljubljana, Faculty of Civil and Geodetic Engineering. 285 p. All papers are also published at:

http://www.mountaincartography.org/cmc-publications/papers_bohinj_06/index.html



Commission workshop proceedings 2004 and 2006



<http://www.terrainmodels.com>: History and tutorial covering the art and techniques of terrain modelling

7. Website

The commission web-site <http://www.mountaincartography.org> has been entirely redesigned and extended by all commission publications by Stefan Räber, the webmaster of the Institute of cartography at ETH Zurich. The new entries in Web-based compendium were very rare, it is therefore switched off.



New commission website

8. Financial planning

The commission has used the financial contribution provided by ICA within the reporting period, mainly for reservation fees at the workshop locations, printing costs and website design. We propose to spend the contribution for the next period for the same items.

9. Comments, lessons learned

As in the first four years, the scope of topics has been rather broad and consequently participants in the workshops still form a rather mixed group. Two interest groups can be observed: Specialist in the fields of topographic mapping and relief representation, and thematic specialists with GIS applications in mountainous areas. This interesting combination make the workshops unique and always create a real mountain cartography spirit.

The list of members must be revised, since many official members still have been proven rather less active than non-official members.

A replacement of the web compendium must be discussed in the commission. Alternatives are book publications on mountain cartography, e.g. with a collection of authored chapters, special journal issues, etc.

10. Review of terms of reference 2003–2007

To further define the topics of Mountain Cartography and to promote the methods and knowledge of mountain cartography among scientists and professionals in cartography and related fields

by providing

- an updated, attractive web-site with information about Commission activities, links to other events and theme-specific knowledge **Achieved!**
- an updated web-based compendium with links to related web-sites and bibliographic information **Discontinued, should be replaced.**

by continuing the well-established workshop series (**Achieved!**) and by promoting publication activities (proceedings, web-proceedings, journal articles and special issues) (**Achieved!**) and common research activities (**Limited, some bilateral activities**).

11. Proposed terms of reference 2007–2011

Based on the experiences during the reporting period and the review comments, the commission proposes to focus on the following terms of reference for the period 2007–2011:

To further define the topics of Mountain Cartography and to promote the methods and knowledge of mountain cartography among scientists and professionals in cartography and related fields

by providing

- an updated, attractive web-site with information about Commission activities, links to other events and theme-specific knowledge
- an updated web-portal with links to related web-sites and bibliographic information
- emphasis in large scale topographic mapping, cartographic design issues and map related representations

by continuing the well-established workshop series and by promoting publication activities (proceedings, web-proceedings, journal articles and special issues) and common research activities.

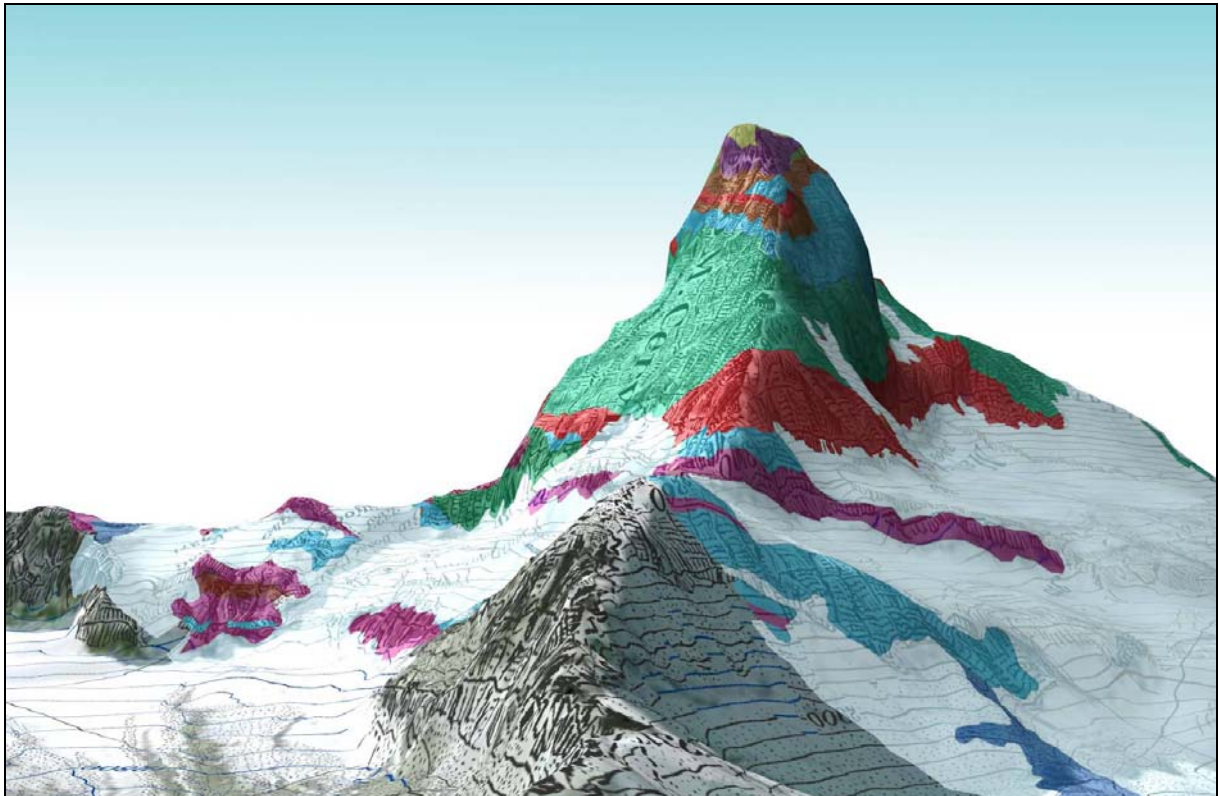
12. Future activities

The commission will continue its highly successful series of workshops with a next workshop in Lenk/CH from February 11–15, 2008 (see <http://www.mountaincartography.org>). Further workshops in British Columbia (CAN) and/or Romania are envisaged.

Zurich and Vienna, July 10, 2007

Lorenz Hurni

Chair/Co-chair of the ICA Commission on Mountain Cartography



Matterhorn in Switzerland: Topographic map overlaid with geology (ETH Zurich)