Report 1999–2003 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
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 1999–2002

Main objectives

- Definition of the scope of subjects of high mountain cartography
- Promotion of mountain cartography
- Providing a platform to promote the exchange of ideas and scientific collaboration between scientists in high mountain cartography and related fields

Internal and external communication

- E-mail, web site, organisation of joint workshops on specific thematic subjects in mountain cartography
- Collaboration with other ICA and national commissions

Survey and indexing of topics within mountain cartography and its related fields

- Compilation of web-based compendium
- Collection of mountain cartography specific and related links
- Collection of bibliographic references
- Status of national mountain cartography activities (federal agencies, private companies, etc.)

Promotion of joint research projects with other organisations and ICA commissions

The intended products are:

- the web-site
- the compendium of mountain cartography (definitions, etc.)
- the bibliography
- the workshops and
- journal articles

4. Business meetings

- August 17,1999, Ottawa, Canada: Informal meeting of the proposed ICA Commission on Mountain Cartography during ICC Ottawa
- November 7, 1999, Vienna, Austria: 1st meeting
- March 31 2000, Alpinzentrum Rudolfshütte, Austria, 2nd meeting
- October 11, 2000, Berlin, Germany: 3rd meeting during INTERGEO 2000
- August 7, 2001, Beijing, China: 4th meeting during ICC Beijing
- 17. May 2002, Mt. Hood, Oregon, USA, informal meeting during workshop

5. Workshops

5.1 Second Workshop "High Mountain Cartography 2000" from March 29 to April 2, 2000 at Rudolfshütte, Austria

5.1.1 Introduction

44 participants from 9 nations gathered between March 29 and April 2, 2000 for the 2nd Workshop on High Mountain Cartography at Rudolfshütte/Austria. The workshop was held under the auspices of the ICA Commission on Mountain Cartography and was organised by *Manfred Buchroithner* and his team from the Technical University of Dresden/Germany and by *Heinz Slupetzky* of the University of Salzburg. It followed a similar event held two years before at Silvretta-Bielerhöhe/Austria (see ICA News No. 30). The aim of the workshop was to cover all aspects of the visualisation of high mountain terrain, both topographic and thematic, as well as multimedia developments.

5.1.2 Presentations

A first block of presentations covered current applications in topographic mapping. *Lorenz Hurni* of the Institute of Cartography at ETH Zurich presented the new multimedia version of the "Atlas of Switzerland", the Swiss national atlas. Besides the possibility to visualise every area of the country in panorama and block diagram mode using a 25 m DEM, the atlas also covers thematic and mountain related aspects such as tourism, population diminution, alpine transit, etc. Further information can be found at http://www.atlasofswitzerland.ch. *Ernst Hauber* (DLR, Berlin) et al. presented the first results of a high resolution mapping of the Sonnblick Glacier in Austria by the new digital HRSC-A camera which will also fly on the Mars Express mission in 2003. *Thomas Damoiseaux* of DLR Oberpfaffenhofen focused on InSAR mapping of mountainous areas. *Martin Heller* from the University of Zurich presented a new approach in terrain modelling using tension minimising triangular meshes. Two presentations by *Nikolas Prechtel* (TU Dresden) as well as by *Lorenz Hurni* and *Bernhard Jenny* (ETH Zurich) covered significant advances in analytical shading by applying a broad set of numerical and graphical tools on a DEM both locally and globally. *Karel Kriz* from the University of Vienna pledged for special topographic winter maps in accordance with winter activities in sports and tourism. *Blanca Baella* and *Maria Pla* from the Institut Cartografic de Catalunya presented first results of standardised generalisation routines for topographic mountain maps applied to a data base 1:5000. *Dusan Petrovic* from the University of Ljubljana covered aspects of different representations of mountain tracks on classical and multimedia maps. *Markus Hauser* (Zurich) closed the presentations by giving insight in his extensive topographical database of the Pamir mountains. He can provide this base data set to interested researchers for different thematic applications.

Participants of the the 2nd Workshop on High Mountain Cartography at Rudolfshütte/Austria.

Left: Applied mountain cartography I: Digging a snow profile for the Austrian avalanche bulletin.
Right: Applied mountain cartography II: Workshop participants on a ski climbing trip to the Sonnblick glacier.

The second session mainly covered multimedia aspects in mountain cartography. *Georg Gartner* (TU Vienna) provided information about the state-of-the-art in mapping using cellular WAP phones. Although the resolution of displays is very limited, one can imagine applications for mountain safety purposes. *Peter Sykora* (Uni Vienna) presented a GPS map interface for high mountain regions. *Theodor Wintges* and *Karsten Sänger* (University of Applied Sciences Munich) presented a 3D-map of a mountain tourist area using a specially developed 3D map symbology. Together with *Eduard Hörner*, *Theodor Wintges* then demonstrated a 3D animation of the avalanche catastrophe at Galtür/Austria. *Andi Neumann* (ETH Zurich), *Martin Heller* (Zurich) and *Manfred Buchroithner* (TU Dresden) reported on latest advances in 2D and 3D cave mapping using sophisticated surveying, mapping and display methods. The session closed with a hommage to the late *Heinrich Berann*, the most reknown panorama artist who passed away on December 4, 1999. *Michael Wood* (University of Aberdeen) remembered his personal relationship to *Heinrich Berann* and his time as a student at his home in Tyrol/Austria. *Tom Patterson* (US National Park Service) gave a deep insight into *Heinrich Beranns* artistic and constructive methods.
In the third block, different thematic applications in mountain cartography were presented. *Viktor Kaufmann* (TU Graz) reported on the reconstruction and visualisation of the retreat of glaciers in the Austrian Alps since 1850 by methods of dynamic computer animation. *Caterina Gentizon* and *Philippe Schoeneich* (Uni Lausanne) presented GIS and geomorphological mapping as management tools in alpine periglacial areas. *Klaus Granica* et al. (Joanneum Graz) reported on an EU sponsored project for monitoring and visualisation of protection forests in high-alpine terrain using satellite data. *Martin Galanda* (University of Vienna) presented an interactive information tool for on-line visuaisation of the avalanche bulletin. *Gloria Marti* (Institut Cartografic de Catalunya) informed about current avalanche mapping activities in the Catalonian Pyrenees whereas *Karel Kriz* reported about similar projects in Austria.

5.1.3 Special events

During several evening sessions and round tables, the participants had the opportunity to discuss the projects and other activities. Besides, *Heinz Slupetzky* and a group of participants recorded a snow profile of almost five meters depth for the official Austrian snow and avalanche bulletin. Some participants even trained their skiing and orientation skills on a ski climbing trip on the nearby Sonnblick glacier! All participants were very pleased and convinced by the organisation and the quality of the workshop. Our warmest thanks go to *Manfred Buchroithner*, *Heinz Slupetzky* and their collaborators! The proceedings of the workshop will be published by TU Dresden. It is planned to organise a next workshop from May 15 to 19, 2002 at Mount Hood, Oregon, USA.

5.2 Third ICA Mountain Cartography Workshop at Mount Hood, Oregon from May 15 to 19, 2002

5.2.1. Introduction

The latest workshop under the auspices of the ICA Commission on Mountain Cartography, brought application-oriented professional cartographers and scientists together for exchanging ideas and knowledge in an informal way. ICA mountain cartography workshops are held biannually, with previous meetings at Bielerhöhe/Silvretta and Rudolfshütte, both located in Austria. The workshop locations are carefully chosen and the organisation and style of the workshops make sure that the participants can meet within unique mountain landscape settings.
The 2002 workshop took place from May 15 to 19 at Timberline Lodge, close to Portland, Oregon, near the US west-coast. The lodge is an impressive building which was erected in 1937 using mammoth timbers and stone. It is located midway to the summit of Mt. Hood, a beautiful 3300 meter high volcano in the Cascade range. In the Seventies, the lodge served as an "atmospheric" background for *Stanley Kubrick's* film "The Shining", featuring *Jack Nicholson*.

The workshop covered a broad variety of topics related to mountain geo-data and mapping, including geo-visualisation, relief presentation, tourist mapping, avalanche mapping, glacier mapping, multimedia cartography, software applications and development, history of mountain mapping and much more.
The workshop was organised by *Tom Patterson* of the US National Park Service with support of *Aileen Buckley* of the University of Oregon at Eugene. Most of the 40 participants originated from Canada and USA. Other participants came from Switzerland, Austria, Spain and Japan.

Mt. Hood volcano in Oregon, USA

Participants of the 3rd ICA Mountain Cartography workshop

1) Greg Hughes, 2) Geno Carpentier, 3) Erik Strandhagen, 4) Robert Krimmel, 5) Martin Gamache, 6) Pat Dunlavey, 7) Todd Ackerman, 8) Andreas Neumann, 9) Dan Van Dorn, 10) Dave Imus, 11) Michael Fisher, 12) Simon Premoze, 13) Nancy Alexander, 14) Sven Etzold, 15) Roger Wheate, 16) Patrick Nairz, 17) Karel "Charly" Kriz, 18) Chris Denton, 19) Randy Edwards, 20) Aileen Buckley, 21) Jeff Nighbert, 22) Patrick Kennelly, 23) Adina Racoviteanu, 24) Tobias Dahinden, 25) Matthew Hampton, 26) Blanca Baella, 27) Jonathan Thies, 28) Bernhard Jenny, 29) Lawrence Faulkner, 30) Heinz Slupetzky, 31) Martin Gurtner, 32) Stefan Raeber, 33) Christian Haeberling, 34) Alex Tait, 35) Tom Patterson, 36) Maria Pla, 37) Mike Hermann, 38) Roland Duhaime, 39) Shizuo Nakamura
Not on picture: Hans Doegl, Walter Gruber, Bill Stoehr, and Werner Trichtl

5.2.2 Workshop Programme and contributions

5.2.2.1 Opening

The workshop was officially opened on Wednesday evening, May 15, with a keynote presentation by *Lawrence Faulkner*, president of the "Solid Terrain Modelling Inc.". This company produces millcut physical terrain models using digital terrain-data and textures – e.g. derived from remote sensing or any other thematic data – to print on the resulting models. Lawrence presented his company's story of success starting by "cutting off the cable to adapt a printer" in his garage to a multi-employee company with customers like the US-Army or National Geographic Society.

5.2.2.2 Sessions

The first session covered themes on 3D-modelling. The spectrum reached from data capturing for DEM generation using LIDAR to computer-assisted panorama maps and to and to 3D-object modelling in mountain maps. The second session focussed on the digital production of shaded reliefs. *Dan van Dorn* tested and compared several computer programmes for analytical shading. One of those packages – "Shadow", developed by *Bernhard Jenny* at ETH Zurich – was presented afterwards. An interesting contribution by *Jeff Nighbert* terminated the morning. He tried to explain by psychological reasons the apparent size of the moon on the horizon in relation to the size of mountains. In the third session, information about projects in glacier photogrammetry were given. A remarkable software "Photomodeller" which allows 3D modelling from terrestrial images was presented by *Heinz Slupetzky* and *Walter Gruber* from the University of Salzburg. The following session covered various visualisation software packages and the web graphics format SVG (Scalable Vector Graphics). *Alex Tait* of Equator Graphics presented for instance the creation of virtual volcano landscapes using the Bryce3D rendering software.

The next morning, *Karel Kriz* from the University of Vienna presented a map containing area-based slope indications which is sold in Austria as avalanche hazard maps for ski tourists. Together with *Patrick Nairz* of the Tyrolean avalanche centre he demonstrated a database-driven on-line snowheight map of Tyrol. *Tom Patterson* explained the generation of a high quality, photo-realistic map of Grand Teton National Park, produced within ½ day (!) using standard graphics software like Photoshop. *Patrick Kennelly* talked about visual 3D effects of contour lines and their ability to replace a shaded relief. Two presenters reported about mountain map history, a theme which so far has almost been neglected within the ICA Commission on Mountain Cartography. *Matthew Hampton* showed examples of earliest cartographic products covering parts of the US Northwest. *Michael Fisher* presented outstanding examples of Canadian mountain maps which resulted among others from the collaboration with Swiss cartographers, e.g. the map of Columbia Ice-field between Jasper and Banff. *Blanca Baella* and *Maria Pla* offered an insight into the activities of the Institut Cartogràfic de Catalunya which leads numerous large cartographic projects in an international context, e.g. in South America. The presentation by *Dave Imus* and *Pat Dunlavey* provoked some controversies, since they stipulated the use of paper and pencil instead of a graphics software for generalisation and homogenisation of GIS data for cartographic purposes.

5.2.2.3 Workshop closing

The workshop was closed on Saturday. That last day was devoted to informal discussions and outdoor activities. In the evening a closing banquet was held with a guest-speaker from National Geographic Maps, *Bill Stoehr*, the founder of the "Trails Illustrated" map series. The main message he transmitted was "to give the user what (s)he wants, not what the map-author intends to give her/him". Bill also talked about existing and future "mapping-on-demand-systems" (map kiosks) which allow map-users to customise and print out their individual maps.

5.2.3 Special Demonstrations

Christian Häberling of ETH Zurich showed three-dimensional animated representations of Mt. Matterhorn and Mt. Hood. The examples provoked a broad interest among the workshop participants although such visualisations do not yet reach the high graphic level of conventional maps, also due to a lack of broadly accepted cartographic design rules for that map type.

5.2.3.1 Presentation of the Web-site "Mount Hood Visualisation"

In the framework of *Marc Dobler's* diploma thesis at the Institute of Cartography of ETH Zurich, an Internet presentation covering the Mount Hood area (Oregon/USA) shows possibilities of integrating terrain, remote sensing, vector and other digital map data, mostly provided by *Tom Patterson* for that workshop. An ortho-photo and several thematic raster data layers (e.g. precipitation, geology) are presented in different combinations. All cartographic representations are shown on a special web-site. Allowing visitors to get a wonderful virtual overview of this attractive mountain area. http://www.karto.ethz.ch/dobler/mthood

5.2.3.2 Flight around Mt. Matterhorn

In another visualisation project at the Institute of Cartography of ETH Zurich, perspective views and short fly-through-movies around Mt. Matterhorn (on the Swiss/Italian border) were created. An extract of the Swiss National Map 1:25'000, combined with an ortho-photo and geologic data, was draped over the digital elevation model DHM25 with a resolution of 25 m. The results can also be accessed on a special web-site.
http://www.karto.ethz.ch/dobler/matterhorn

5.2.4 Map exhibition

In the forefield of the workshop, the organiser *Tom Patterson* already called for the presentation of different, new map products; a call which was followed by numerous participants. Almost 100 commercial maps, project drafts or scientific posters were shown, among them some outstanding examples:

- Several maps by the U.S. National Park Service (Tom Patterson) depicting National Parks in Oregon and Hawaii; They are distributed in the park visitor centres as leaflet or single 2D or 3D maps.
- A large-sized cartographic panorama representation (2 x 0.6 m) depicting chronologically the events in a battle of the American civil war. It was produced by *Alex Tait* (Equator Graphics, Silver Spring/MD).
- Specimens of a leaflet about avalanche hazards for winter tourists in the Schneeberg area in Austria, containing map representations and perspectives, produced by *Karel Kriz* (University of Vienna) and *Patrick Nairz* (Tyrolean avalanche centre).
- Contributions by the Institute of Cartography of ETH Zurich: Two large-size drafts of geomorphologic mappings in the Swiss National Park (student work by *Stefan Felix*) and the poster describing the thesis of *Marc Dobler* about the mentioned visualisation of Mount Hood.
- The Swiss Federal Office of Topography presented the latest edition of ski tourism maps based on the National map 1:50'000 with indicated avalanche danger zones.

Tom Patterson, the main organiser of the 3rd Mountain Cartography Workshop

5.2.5 Outdoor activities

At the time of the workshop, a snow cover in the Mt. Hood area allowed several participants for skiing activities. Event the ascent to the summit by ski was possible, although the use of the ski-lift for the first part of the tour was prohibited due to legal reasons. Instead, the mountaineers were forced to be towed by a snow-mobile (!) from the hotel to the upper station of the ski-lift. The snow-cover, however, was rather thin and even "conventional" hikes (by foot) off the ski tracks were possible. The heated swimming pool outside the lodge permitted relaxation from the cartographic and alpine adventures. On an optional three-day geographic post-workshop excursion, about a dozen participants had the possibility to visit several national Parks of the US Northwest, including the Columbia River Gorge, Mt. St. Helens and Mt. Rainier. While the group was lucky with the weather in the Columbia River Gorge and could really enjoy the impressive landscape, water-falls and diverse botany, the two volcanoes were hiding behind thick clouds.

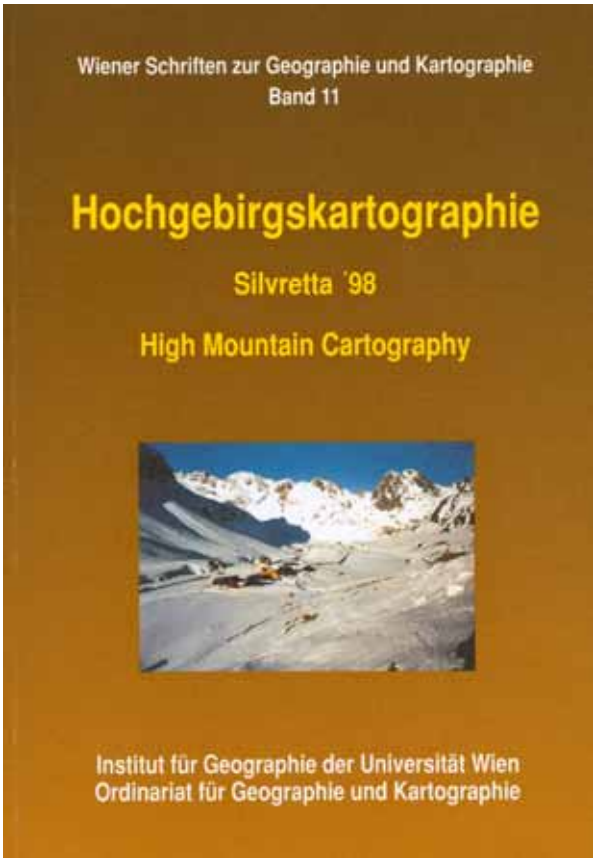
The warmest thanks of all participants go to Tom Patterson and his team for the excellent organisation of the workshop and the excursion in this very scenic and impressive landscape. The full papers (pdf) are published on the web-site of the ICA Commission on Mountain Cartography http://www.karto.ethz.ch/ica-cmc. The next workshop will take place in Nuria (Pyrenees, Spain) in the week of October 4, 2004.

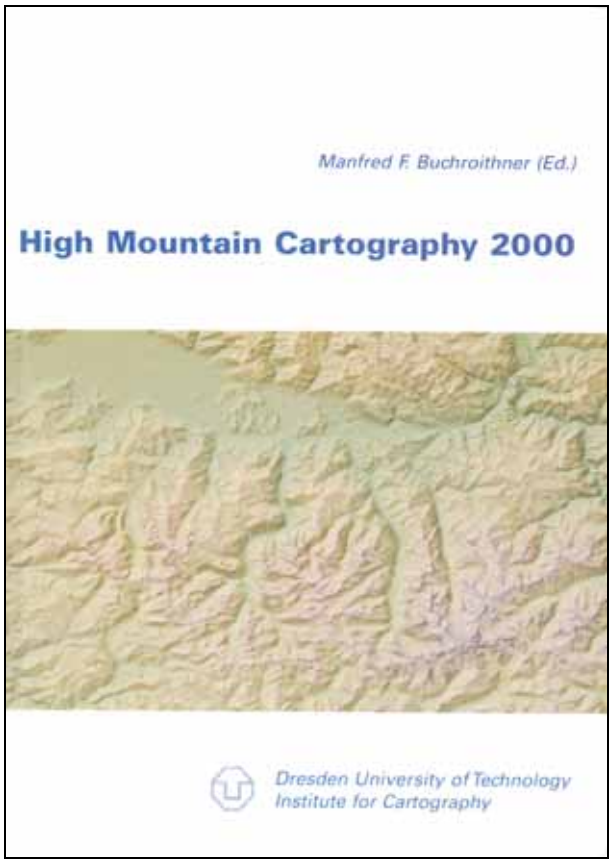
5.3 Supported events, conference sessions

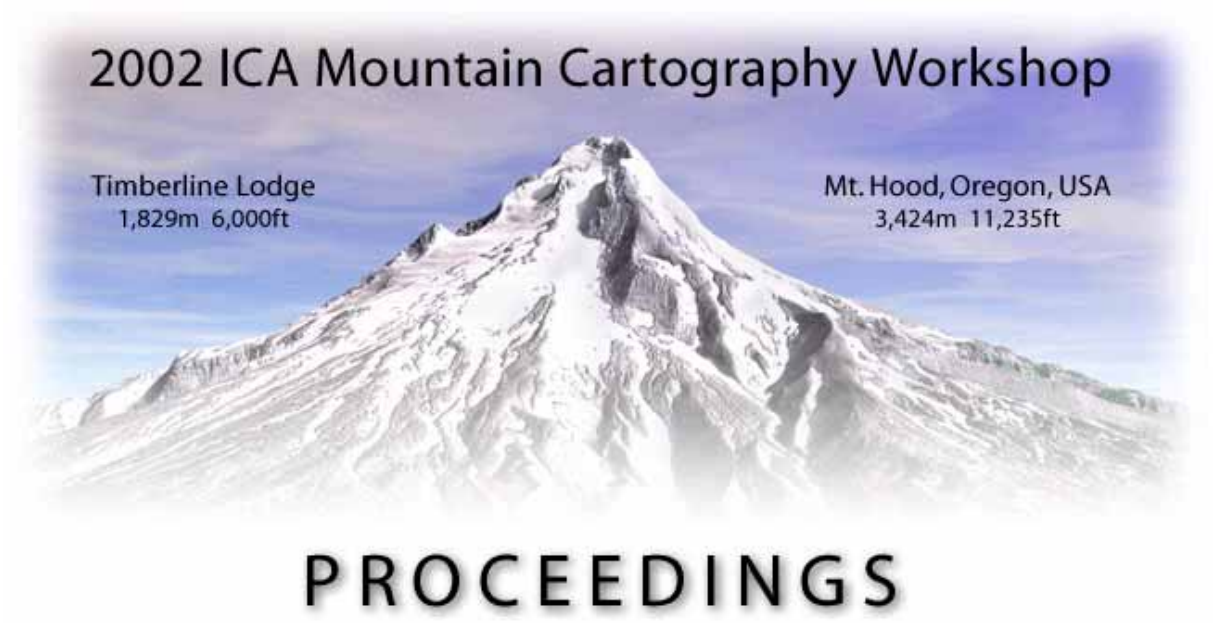
- ICC 1999 Ottawa, August 17, 2001: Session on Relief Depiction
- September 3–18, 2000, Addis Abbeba, Ethiopia and Nairobi, Kenya: Sixth International Symposium on High-Mountain Remote Sensing Cartography (HRMSC VI)
- ICC 2001 Beijing, August 7/8, 2001: Two sessions on Mountain Cartography
- July 15–26, 2002, Bishkek, Kyrgyz Republic, Seventh International Symposium on High-Mountain Remote Sensing Cartography (HMRSC VIII)
- September 19–23, 2002, Zakopane, Poland: EnviroMount 2002 Conference
- ICC 2003 Durban, August 14, 2003: Session on Mountain Cartography
- German Geography Days, Berne, Switzerland, September 30, 2003: Session on Mountain Cartography

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

- Kriz, Karel (Ed.), 1998: Hochgebirgskartographie Silvretta '98. Proceedings Silvretta Workshop, Wiener Schriften zur Geographie und Kartographie, vol. 11, Institute of Geography and Regional Science, University of Vienna (http://www.gis.univie.ac.at/karto/home/info/schriften/baende/band11.html, see figure)
- Buchroithner, Manfred (Ed.), 2000: High Mountain Cartography 2000. Proceedings of the Second Symposium of the Commission on Mountain Cartography of the International Cartographic Association held at the Alpine Centre Rudolfshütte, Austria from 29 March to 2 April 2000. Kartographische Bausteine, Vol. 19, Institute of Cartography, Technical University of Dresden (http://www.tu-dresden.de/fghgik/publish/kb/kb.html, see figure)
- Patterson, Tom (Ed.), 2002: 2002 ICA Mountain Cartography Workshop. Proceedings. http://www.karto.ethz.ch/ica-cmc/mt_hood/proceedings.html (see figure)
- Jenny, Bernhard and Stefan Räber: http://www.reliefshading.com (see figure)
- ISPRS Journal of Photogrammetry and Remote Sensing. Special issue: Geomatics in Mountainous Areas – The International Year of the Mountains 2002, Volume 57, Issues 1-2, November 2002. Download
- Hurni, Lorenz; Kriz, Karel; Patterson, Tom and Roger Wheate (Eds.), 2003: Special issue: ICA Commission on Mountain Cartography, Cartographica 1/2 2001 (in press)
- Hurni, Lorenz; Kriz Karel and Heinz Wanner (Eds.), 2003: Themenheft Gebirgskartographie (Special issue Mountain Cartography), Kartographische Nachrichten 5/2003 (in press)
- Buckley, Aileen; Hurni, Lorenz; Kriz, Karel; Patterson, Tom and Jeff Olsenholler: Cartography and Visualization in Mountain Geomorphology. In: Bishop, M. and J. Shroder (Hrsg.): Geographic Information Science and Mountain Geomorphology. Springer-Praxis (in press)

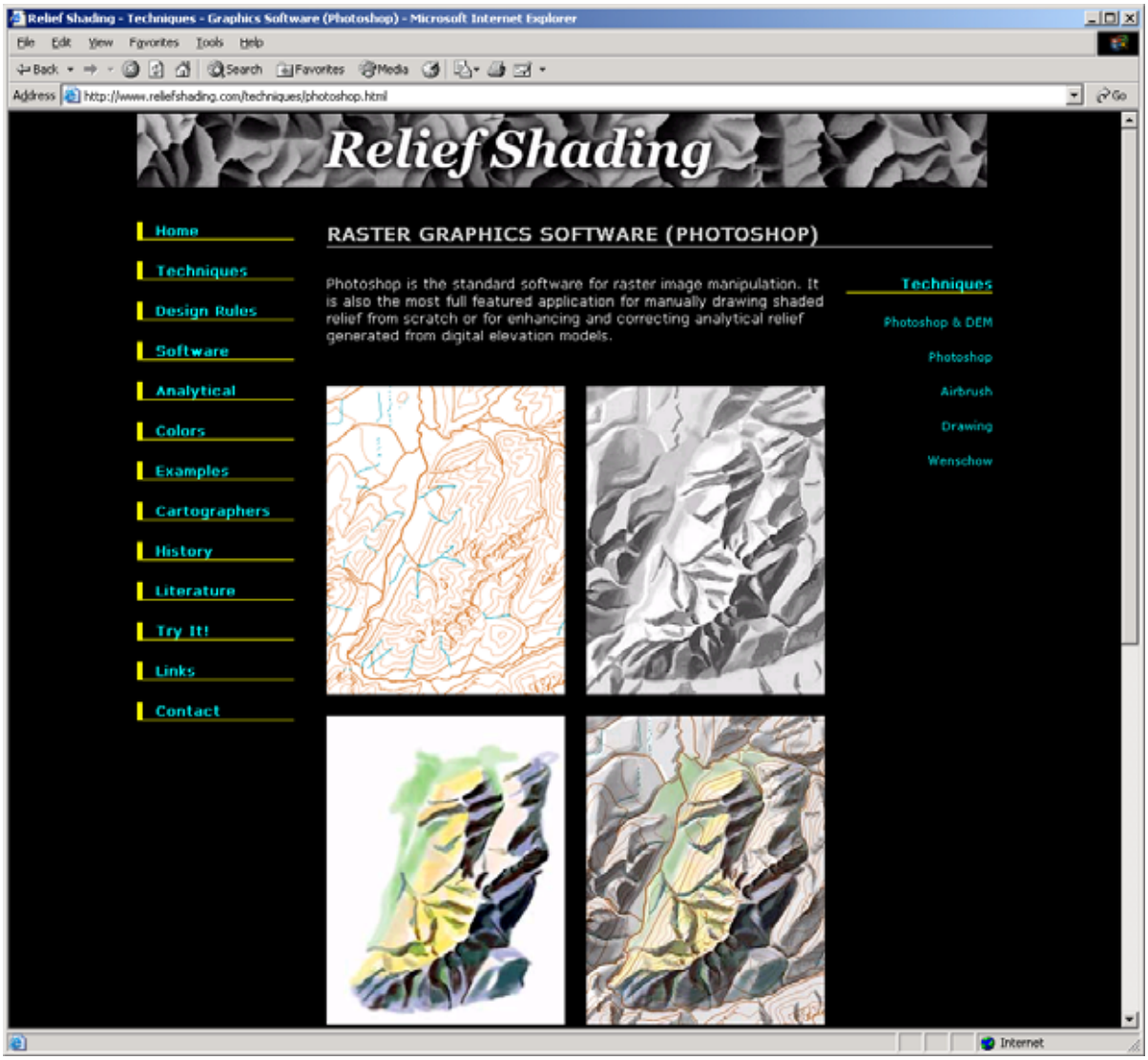






http://www.karto.ethz.ch/ica-cmc/mt_hood/proceedings.html

Commission workshop proceedings 1998–2002



http://www.reliefshading.com: History and tutorial covering the art and techniques of hill-shading

7. Website

The commission web-site http://www.karto.ethz.ch/ica-cmc/ has been set up and used throughout the four years with success. However, currently the web-site looks a little bit old-fashioned and heterogeneous. An updating of the web-site will be one of the major terms of reference for the next period. The web-based compendium (http://hermes.gis.univie.ac.at/php/icahoo/cmc.php) with the possibility to link MC-relevant information within a consistent framework has proven to be useful, but the should be promoted to a broader audience.

8. Financial planning

The commission has not used the financial contribution provided by ICA within the reporting period. It is therefore proposed to transfer the amount to the next period and mainly use for promotion and publication purposes (built-up of new web-site, support of paper- and on-line commission proceedings).

9. Comments, lessons learned

The scope of topics has been rather broad and consequently participants in the workshops form a rather mixed bunch. Official members have been proven rather less active then non-official members. It seems – like in other ICA commissions – that voluntary work like the establishment of a compendium or special publications is not very attractive, also due to the regular workload of the members. The only events which really attract people are the workshops. This trend should be discussed in the EC. The terms of reference therefore need to be refocused (see next two chapters).

10. Review of terms of reference 1999–2002

Main objectives

- Definition of the scope of subjects of high mountain cartography
  Indirectly achieved by topics within workshops and compendium
- Promotion of mountain cartography
  Generally well achieved: Workshops with broad audience; special session at Geography Days Berne 2003
- Providing a platform to promote the exchange of ideas and scientific collaboration between scientists in high mountain cartography and related fields
  Well achieved during workshops; web-site lacks of attraction to exchange ideas

Internal and external communication

- E-mail, web site, organisation of joint workshops on specific thematic subjects in mountain cartography
  OK. see above comments concerning web-site
- Collaboration with other ICA and national commissions
  Could be improved! Joint workshops?

Survey and indexing of topics within mountain cartography and its related fields

- Compilation of web-based compendium
  Good implementation. Unfortunately only fed by 2–3 members, promotion necessary
- Collection of mountain cartography specific and related links
  See Compendium
- Collection of bibliographic references
  Only partly done within compendium
- Status of national mountain cartography activities (federal agencies, private companies, etc.)
  Only marginally done within compendium

Promotion of joint research projects with other organisations and ICA commissions

Only marginally, can be improved

The intended products are:

- the web-site
  Achieved, can be improved
- the compendium of mountain cartography (definitions, etc.)
  Achieved. Promotion necessary
- the bibliography
  Only partly done within compendium
- the workshops and
  2 workshops. Great success!
- journal articles
  2 special issues, 1 book chapter. Success!

11. Proposed terms of reference 2003–2007

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 2003–2007:

The ICA Commission on Mountain Cartography

- further defines the topics of Mountain Cartography
- promotes the methods and knowledge of mountain cartography among scientists and professionals in cartography and related fields

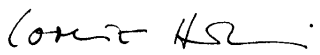
by providing

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

12. Future activities

Several special issues of journals and book chapters edited under the auspices of the commission are currently in print (see chapter 6). The web-site will be updated and extended as mentioned. The commission will continue its highly successful series of workshops intends to meet again in Nuria, Catalonia, in the last week of September 2004 to have a workshop and in 2006 in Davos or Slovenia.

Zurich, July 24, 2003 (Corrected: July 5, 2005/LH)



Lorenz Hurni
Chairman of the ICA Commission on Mountain Cartography